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UNIVERSITY OF DENVER
WATER LAW REVIEW

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CASE NOTE

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MANUSCRIPT SUBMISSION GUIDELINES FOR AUTHORS

EDITORIAL POLICY

The Water Law Review welcomes the submission of articles of timely interest to the water law community. Articles should discuss topical issues in water law and related areas, such as environmental and natural resource law, and land use. They should provide an original, analytical, and in-depth treatment of the issue rather than a summary of previous research efforts. Anonymous peer review of articles is available upon request. In addition to articles, the Water Law Review also invites submissions of shorter works, such as book reviews, commentaries, and bibliographies.

STYLE

Articles should be well organized, concisely written, and presented in an articulate and scholarly manner. Accordingly, authors should minimize their use of direct quotes.

FORMAT

Manuscripts considered for publications must be typed, double-spaced, and formatted to fit on 8½ x 11 paper. The text should be broken into appropriate headings and subheadings and should conform to the Chicago Manual of Style (16th ed. 2010). Citations to references and authorities should be contained in footnotes. Footnotes may also include elaboration on points raised in the text or references to research sources pertaining to points peripheral to those discussed in the text. Footnotes must conform with *The Bluebook: A Uniform System of Citation* (20th ed. 2016), published by the Harvard Law Review Association. Footnotes should be current as of the date of submission. Send hardcopy submissions to: University of Denver Water Law Review, 2255 East Evans Avenue, #447, Denver, Colorado, 80208. Email electronic submissions, as an attached file in Microsoft Word format, to wlr@law.du.edu.

The Water Law Review will accept submissions at any time. For consideration for publication in the spring journal, submissions should be received by November 1 of the prior year. For consideration for publication in the fall journal, submissions should be received by August 1.

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Fred Cheever Dedication, DU Water Law Review

by Greg Hobbs

There's always a risk when you take to the waters. Maybe not enough to float your boat. Maybe a bank-ripping torrent scouring out your woody vegetation.

As this issue goes to press, we celebrate Faculty Advisor Fred Cheever, lover of the lands, the waters, and the peoples of the West. In this twentieth year of the *Water Law Review's* existence, he stands atop our masthead. In addition to being Faculty Advisor, we name him scholar, colleague, counselor, friend.

We grieve for his wife, Mary, and his beloved daughters, Elizabeth and Laurel. When the joy of a family Dinosaur National Monument whitewater adventure turns tragic, shall we curse the river that takes him?

We know well enough of Fred and his family to say "Never!"

Each of us will recall the day and hour we learned of Fred going before us. My wife, Bobbie, and I were walking to breakfast past Emily Dickinson's Amherst home when we received Professor Cai's startling message the day of our granddaughter Shannon's graduation from Northampton High.

There's nothing coincidental about congruency. Fred from the heritage of a New England writing family. Fred written into the horizon of each new western day as we reflect on him.

Alone and in a Circumstance (No. 1167, 1870) Emily writes "If any take my property/
According to the Law/ The statute is my Learned Friend/ But what redress can be/ For an offense
nor here nor there/ So not set in Equity—/ That larceny of time and mind/ The marrow of the
Day/ By spider, or forbid it Lord/ That I should specify."

Emily's brother, father, and grandfather were lawyers. Through them she found, nonetheless, going beyond the law requires entering into the natural world and stretching mortality's limitations, "Untenable to Logic/ But possibly the one —." *The things we thought we should do* (No. 1293, 1874).

May Fred Cheever's voice continue to sound high and clear within our watersheds.

Fred Cheever

His light is on.

You can see him in the dawn
when western snow-packed peaks awake

When rivulets gather strength
in forested watersheds

And run

Out of the public domain
into his office

Singing of books, incoming messages
and students checking in

For example, Roosevelt, Pinchot,
followed by his favorite characteristic

Pronunciation . . . (pause) . . .“Right?”

As, by way of commentary and open invitation
for further discussion, he grins

Embracing the lands, the peoples, the creatures
of the West so completely you might say,

By right of appropriation, they thoroughly
possessed him

As though the river were ever calling him “home.”

(for Mary, Elizabeth, Laurel and Fred’s Very Many Students)

Greg Hobbs 6/15/2017
Co-Director, Environmental & Natural Resources
Program, DU Law

Citations are to Thomas H. Johnson, Editor, *The Complete Poems of Emily Dickinson* (Little, Brown and Company, Third Printing 1960).



Photo, Fred Cheever and Patty Limerick with students of Justice Hobbs’ Colorado Legal History Class, February 23, 2016

EDITOR'S NOTE

Volume 20, Issue II of the *University of Denver Water Law Review* opens with a very special tribute to Professor Federico Cheever written by Justice Gregory Hobbs. In Professor Cheever, the *Review*, the Sturm College of Law, and the entire environmental and natural resources community lost one of its most beloved advocates and friends. Professor Cheever championed the *Review* from its earliest days, and he impacted the lives of all current, former, and future students in so many ways. Professor Cheever was instrumental in the journal's success every year. I have no doubt that those who had the privilege of knowing him and learning from him will carry on his legacy.

In the beginning of the 2016-2017 academic year, the members of the *Review* set out to establish a more robust institutional knowledge so that its members – old and new – would better understand what makes the *Review* such a special publication. In that spirit, the *Review* asked its first Editor-in-Chief, Dr. Vicki Spencer, to write a brief piece discussing her efforts and the efforts of the many stakeholders who made their vision for the *Review* a reality 20 years ago. Please enjoy her piece entitled, *The Beginning of a Legacy*. The Volume 20 staff and editorial board thoroughly enjoyed the glimpse it provides into the effort that went into making the *Review* a reality.

Our lead article is the final component of the collaborative piece that first appeared in Volume 20, Issue I entitled, *Fifty Years of Evolving Water Law and Management in the U.S.* The first three articles in Issue I provided retrospectives on the development of water law in the states of Delaware, Kansas, and Montana. The fourth article, *Interstate Water Litigation in the West: A Fifty-Year Retrospective*, was written by Professor Burke Griggs from the Washburn University School of Law. His article provides a comprehensive and thorough discussion of the development of interstate litigation in the United States. In addition to discussing much of the history of interstate litigation in the U.S., Professor Griggs addresses the most recent developments in ongoing disputes in the Southeastern U.S.

We are thrilled to bring you the second article entitled, *Regulating the Packaged Water Industry in Africa: Challenges and Recommendations*. The article was written by Ms. Jessica Vapnek and Ms. Ashley Williams, and brings a unique perspective to the *Review*. Namely, the article utilizes policy and science to advocate for changes in African environmental law, health law, and water law. The article's appendices describe case studies and analyze scientific outcomes that warrant the changes advocated by Ms. Vapnek and Ms. Williams.

The next piece, *Deference, Due Process, and the Definition of Water: Dredging the Clean Water Act*, was written by Hunter Higgins. Mr. Higgins recently graduated from the Pepperdine University School of Law. His article discusses some of the historical background and current controversy surrounding the courts' and the Environmental Protection Agency's definition of "navigable waters" particularly in light of the recently promulgated definition of "Waters of the United States."

As part of the *Review's* 20th Anniversary, the editorial board reached out to several authors of articles that previously appeared in the journal and inquired about their willingness to update those articles. A few of those authors agreed to participate, and their article updates comprise the next section of Volume 20, Issue II. It is our hope that the *Review* will be able to continue publishing this section in many issues to come, as the evolving nature of water law makes these updates particularly interesting and helpful for our readers.

The first article update, written by Mr. Casey Funk, Ms. Amy M. Cavanaugh, and Mr. James M. Wittler is entitled, *Water Exchanges 201*, and provides an update to Mr. Funk's 1998

article, *Basic Exchange 101*. There have been substantial developments in the water exchanges context in the many years since the *Review* published *Basic Exchange 101*, and these authors capture those changes in the update. These changes are especially prevalent in judicial opinions, of which there were very few at the time of the original publication. Much like *Basic Exchange 101*, the article update contains several helpful diagrams.

The second article update is entitled, *Update to A Survey of State Instream Flow Programs in the Western United States*. This article update was authored by Cynthia Covell, Ms. Whitney Phillips, and Ms. Alyson Scott. Ms. Covell's original survey of instream flow programs in the West appeared in the very first issue of the *Review*. As one can imagine, there have been substantial changes to instream flow programs during the time since the article's original publication.

Mr. Zach Smith, staff attorney for the Colorado Water Trust, authored the third article update entitled, *Making Colorado's Rivers a (Senior) Priority*. The changes that have occurred for Colorado's instream flow program since Ms. Covell's original article in 1998 are so extensive that the authors agreed that the changes warranted an article specific to Colorado. Mr. Smith kindly agreed to provide that comprehensive overview, which describes the state's unique approach to ensuring that its rivers continue to flow.

The final article update is Justice Gregory Hobbs' *Eleventh Update to Colorado Water Law*. In this update, Justice Hobbs provides a synopsis of recent water-related statutes and case law in Colorado. Specifically, Justice Hobbs provides readers with excerpts from some of the most important recent cases in Colorado water law, including, among others, the *Grand Valley Water Users Ass'n v. Busk-Ivanhoe, Inc.*

I am excited to bring you our student-written content for Volume 20, Issue II. As always, our student members work hard to bring you thorough, accurate analysis of the trending issues in water law. In addition to our usual court reports, we also have a book note, a legislative report, and a case note in this issue. Furthermore, this issue provides brief overviews of each panel that occurred at the *Review's* Symposium in April. We also had several students attend and write about conferences in Portland and Los Angeles. As always, we hope you find our student coverage of these recent water cases, books, and conferences useful in your practice and research.

Finally, I would like to thank you, the readers, for your continued support of the *Review*. Whether it is reading the content, attending the symposium, or participating on the advisory board, your willingness to engage with the *Review* provides the foundation for its success. In the Volume 21 editorial board, the *Review* is left with highly capable students and leaders, and I look forward to the *Review's* continued success for many years to come.

Blaine Bengtson
Editor-in-Chief

The Beginning of a Legacy

The *University of Denver Water Law Review* began in 1997 when the outgoing editor of the *Water Court Reporter* called a meeting with the newly appointed staff. At the time, I had no idea that this small group of students could change the educational experience for DU law students for years to come. When the outgoing editor explained the Reporter's mission and our responsibilities, I naively asked why the publication did not include academic articles like other law journals. The *Water Court Reporter* was successful in its own right, and, even though others had asked the same question, no one had been able to take the publication to the next level.

As an evening student, I worked full-time as Executive Director of Sponsored Programs and Technology Transfer at the University of Colorado in Denver and didn't need a new challenge. I already had my hands full with responsibilities as a Chancellor's Scholar and an editor of the *Denver Journal of International Law and Policy*. But the new staff of the *Water Court Reporter* encouraged me to utilize my experience in academia to lay the groundwork for starting up a water law journal. I could not refuse.

Although I knew creating a new academic journal would be very different from publishing a well-established journal, I did not realize exactly how much it would involve. By taking it one step at a time, it became manageable. The first step was to schedule a meeting with Dean Robert Yegge to discuss the concept. Dean Yegge graciously listened to my presentation but concluded the meeting with skepticism. He was not totally convinced that law students who come and go would have the wherewithal to see the project through to completion. Nonetheless, Dean Yegge said he would give his support if we could accomplish the following: 1) find a faculty sponsor, 2) raise funds to finance the journal, and 3) recruit students capable of doing all the work.

At Dean Yegge's suggestion, I met with Professor Federico Cheever to see if he would be our advisor. Professor Cheever recommended that I approach Professor George (Rock) Pring who taught the water law courses at DU. Even though I did not know Dr. Pring, he agreed to a meeting. Initially, he was reluctant because he thought it would be worse to start a journal and have it fail than to have no journal at all. However, after explaining my business plan, Dr. Pring was pleased to accept.

Dr. Pring was instrumental throughout the start-up process and played a major role in its continued success. He suggested contacting David Phillipps, Director of the Rocky Mountain Mineral Law Foundation (RMMLF), because the foundation had grant funds available. I felt encouraged as I had a strong track record of writing successful grant proposals. If we could get a grant, it would help cover publication costs until we were able to build our subscriber list.

After RMMLF awarded us with a grant, Dean Yegge also provided some start-up funds from his discretionary budget. The next step after securing funding was to talk with publishers and develop a budget and publication timeline. There were two law journal publishers at the time and, after interviewing both, I selected Joe Christensen, Inc. in Nebraska because they offered the best price and their contact person offered the most support for a start-up publication.

The publisher made me realize there are a lot more decisions to be made in publishing an academic journal than I had anticipated. They range from minor details, such as the paper size and the font type, to more substantial decisions regarding publication goals. As editor, I had to answer the following questions: What should the cover look like? Would I provide a logo design? How should the pages be laid out? What sections should be included? I also needed to decide the following: How would we solicit and select articles? Who would edit and cite check them? How could we recruit more staff? Could we get more staff on board to produce the first edition? What would be their job descriptions? How would we recruit an advisory board? What would be the board's role? Who would be our target audience? How would we market the journal? How could we solicit subscribers and how much should we charge? Could we collect

enough money to publish future issues? More importantly than making the decisions, I needed to act quickly to publish an issue before our small staff graduated.

The organizational tasks were time consuming, but thankfully not daunting as I relied upon my administrative and managerial experiences to coordinate the project. What I lacked were contacts in the water community. My master's degree in International Studies and contacts in the area of Asian Studies were not very helpful. In law school, I had taken courses in environmental and natural resources law, but had no experience in a law firm. Fortunately, I could rely upon the other Water Court Reporter editors (Jon Alby, Art Folsom, Greg Lemkau, Christina Longhitano, Matthew Paulson and Rebecca Welborn), as well as law school faculty to recruit Advisory Board members.

Our first Advisory Board consisted of Colorado Supreme Court Justice Lohr, State Engineer Hal Simpson, Denver Water Manager Hamlet "Chips" Barry, First Assistant Attorney General Wendy Weiss, Rocky Mountain Mineral Law Foundation Director David Phillips, and several well-known practicing attorneys from around the state. These individuals helped recruit authors, made recommendations regarding content, and helped spread the word as we solicited subscribers.

In discussing the articles, the editors were passionate about creating a journal that would become the "go-to" publication for water practitioners, as well as attorneys. We agreed to begin by focusing on Colorado water issues, expand later to Western water issues, and ultimately include global water concerns. We were honored that Colorado Supreme Court Justice Gregory J. Hobbs, Jr. agreed to write an historical overview of Colorado water law for our first issue. It was just what we needed to launch a new publication on water law, and the significance of his continued contributions is undeniable. In addition to publishing articles written by water law authorities, we were unanimous about retaining the Water Court reports. There was no question that they were valuable to practitioners. Additionally, the reports, book reviews, and book notes would provide research and writing opportunities for journal staff.

After reviewing many other law journals, I recommended the following content: subscription information, manuscript solicitation and guidelines, editorial Board recognition, advisory board and DU law faculty acknowledgment, and the editor's note. At the eleventh hour, Professor Pring suggested adding a tribute page to recognize prominent past members of the water law community. Staff decided the editor-in-chief should write the tribute. The first issue honored L. Ward Bannister who taught at the University of Denver College of Law from 1899 to 1904 and was a special lecturer at Harvard and Columbia Universities. He was remembered for developing a water law course that served as a model for law schools for many years.

While the other editors pounded the pavement soliciting articles and subscribers, I gathered information from other law journal editors about recruiting staff through a testing process. I wrote the exam, instructions, and answer sheets. We administered the exam before spring semester ended and added twenty well-qualified students to the staff. But everything else took longer than expected. This meant the first issue was now on track for publication in the summer.

As the term was ending, we only had a couple articles and I learned a valuable lesson — one that both Dean Yegge and Professor Pring had foreseen. When push comes to shove, students begin to panic about the bar exam and publishing a journal is no longer a top priority in the spring. I too began to panic. Not just about the bar exam, but about fulfilling my promise to Dean Yegge and Dr. Pring that we would not fail. Realizing I could not finish the journal alone, I was grateful that Production Editor, Rebecca Wellborn, also had a passion to succeed. She tenaciously coaxed authors to submit their articles, regardless of the amount of editing that remained. We said we would do it. We also agreed to research sources that needed to be acknowledged and to complete the citations. Thanks to many, many hard-pressed hours, Rebecca helped get the first issue to press.

Students today probably have no idea of what it was like to edit a journal twenty years ago. Although university resources had progressed from typewriters to computers, our computers had been dug out of storage and were old; the software was primitive by today's standards. Our files were so large the computers kept crashing and we repeatedly lost updated information. The editing process was slow, tedious, and frustrating. We barely finished editing in time for the bar exam and did not meet the publisher's deadline. The first issue was not published until Fall 1997, but all the pieces were in place. In the end, it was satisfying to know that we had laid the groundwork, documented all the steps, and found shortcuts that would make the next issue much easier to produce.

To celebrate publication of the first issue of the *Water Law Review*, we held a formal luncheon with the Advisory Board members. Over the years, these board meetings have continued to serve as a means of soliciting ideas for improving the journal and recognizing all the individuals contributing to the journal's success. Reflecting back, it's hard to believe what a small group of students accomplished in a short period of time. I am proud to have been a part of this group and look forward to reading the *Water Law Review* and keeping up-to-date with water issues.

Dr. Vicki L. Spencer
Founding Editor of the *Water Law Review*

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INTERSTATE WATER LITIGATION IN THE WEST: A FIFTY-YEAR RETROSPECTIVE

BURKE W. GRIGGS*

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I. INTRODUCTION: THE STRUCTURAL REALITIES OF INTERSTATE WATER ALLOCATION

Persons of Sovereign Authority, because of their Independency, are in continually jealousies, and in the state and posture of Gladiators, having their weapons pointing, and their eyes fixed upon one another; that is, their Forts, Garrisons, and Guns upon the Frontiers of their Kingdoms; and continually Spies upon their neighbours, which is a posture of War.

— Thomas Hobbes¹

ROBERT T. STEPHAN, ATTORNEY GENERAL OF KANSAS: Our armies are massed at the border.

J. D. MACFARLANE, ATTORNEY GENERAL OF COLORADO: What are they going to drink?

—Arkansas River Compact Administration meetings, Lamar, Colorado, circa 1982²

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1. THOMAS HOBBES, *LEVIATHAN* 90 (Richard Tuck ed., Cambridge Univ. Press 1991) (1651).

2. Personal Conversation with J. D. MacFarlane, former Colorado Attorney General, in

I have twenty thousand words, more or less, to discuss the last fifty years of interstate water litigation in the West. That is a small allocation for a large territory. Worse, the conflicts that invite and often require such litigation are built into the legal and political frameworks of western water. The dominance of these structures can obscure historical change.

Consider the country and the political geography. The West is the largest but most water-short region in the United States, where small and irregular river basins descend from above fourteen thousand feet to sea level across thousands of river miles of hugely various terrains.³ These basins do not correspond with the state lines drawn by politicians unable or unwilling to recognize their “arbitrary and, therefore, stupid” cartography.⁴ As lawyers for Colorado complained regarding a suit between Wyoming and Nebraska, “Colorado is in the case because of the geographical accident of artificial boundaries which have placed the headwaters of the North Platte in Jackson County, Colorado.”⁵ Aside from minor adjustments, the states are stuck with their boundaries.⁶

Next, consider the inherent problems of federalism in western water. State water codes usually conflict with each other and with federal water law, frustrating basin-wide water management.⁷ Interstate compacts can address some of

Denver, Colo. (July 2009).

3. Supreme Court decisions concerning interstate water disputes typically begin with a description of the river at issue. See, e.g., *Kansas v. Colorado*, 543 U.S. 86, 90 (2004) (J. Breyer, describing the Arkansas River as a river once “proudly called the ‘Nile of America.’”). Others, including a future justice of the Court, saw the Nile elsewhere: Felix Frankfurter & James M. Landis, *The Compact Clause of the Constitution: A Study in Interstate Adjustments*, 34 *YALE L.J.* 685, 701 (1925) (“the Colorado River is the Nile for the Southwest; the State of Colorado its Soudan.”).

4. MARC REISNER, *CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER* 47 (rev. ed. 1993); see also DOUGLAS R. LITTLEFIELD, *CONFLICT ON THE RIO GRANDE: WATER AND THE LAW, 1879-1939*, at 9-10 (2008). The Republican River is a good example of this original flaw: due to the Nebraska-Kansas boundary established by the Kansas-Nebraska Act of 1854, ch. 59, 10 Stat. 277 (1854), the State of Kansas is both upstream and downstream of the State of Nebraska under the Republican River Compact. Republican River Compact, arts. VI, VII, and VII, ch. 104, 57 Stat. 86 (1943); see also *Republican River Compact Synopsis*, Republican River Water Conservation District, at “Articles VI, VII, and VII,” <http://www.republican-river.com/CompactInfo/RepublicanRiverCompact1942/RepublicanRiverCompactSynopsis/ta-bid/160/Default.aspx>.

5. Brief for the State of Colorado, Impleaded Defendant at 3, *Nebraska v. Wyoming*, 325 U.S. 589 (1945), 1945 WL 48348 at *3.

6. See, e.g., *Oklahoma v. Texas*, 256 U.S. 70, 87-93 (1921) (affirming the boundary between Oklahoma and Texas as the south bank of the Red River, as established by earlier treaties between the United States and the King of Spain, Treaty of Amity, Settlement, and Limits, U.S.-Spain, Feb. 22, 1819, 8 Stat. 252; and between the United States and the United Mexican States, Treaty of Limits, U.S.-Mex., Jan. 12, 1828, 8 Stat. 372, and in accordance with *United States v. Texas*, 162 U.S. 1 (1896)); see also *New Mexico v. Colorado*, 267 U.S. 30, 37 (1925) (affirming the earlier survey of the 37th Parallel as that established by the Darling (1868) and Major Preston (1874) surveys, not the 1903-04 survey by Howard B. Carpenter, which would have transferred “a large strip of territory from Colorado to New Mexico”); and *Texas v. New Mexico*, 276 U.S. 557, 557-58 (1928) (modifying the Court’s earlier opinion in 275 U.S. 279 (1927) to account for the effects of accretion on the course of the Rio Grande, which had served as a boundary between the two states until the boundary was settled by survey).

7. For a discussion of the problems between the territorial period and the Reclamation Act of 1902, see JOHN WESLEY POWELL, *REPORT ON THE LANDS OF THE ARID REGION OF THE UNITED STATES: WITH A MORE DETAILED ACCOUNT OF THE LANDS OF UTAH* (W. Stegner ed., Univ. of Nebraska Press 2004) (1879); see also WALLACE STEGNER, *BEYOND THE HUNDREDTH MERIDIAN: JOHN WESLEY POWELL AND THE SECOND OPENING OF THE WEST* 217 (1954); and DONALD J. PISANI, *TO RECLAIM A DIVIDED WEST: WATER, LAW, AND PUBLIC POLICY 1848-*

this troublesome diversity,⁸ but because they are the product of negotiation, they are riddled with both unintentional flaws and intentional ambiguities.⁹ Regardless of how an interstate river has been allocated—whether by an interstate compact,¹⁰ a judicial apportionment,¹¹ or an act of Congress¹²—upstream states enjoy a permanent advantage over downstream states. That is because the law of gravity always trumps the equal footing doctrine:¹³ “there is always the danger that the upper state[s] will simply shut off the water.”¹⁴ Among themselves, the western states have long harbored a “deep-seated hostility” to federal power and jurisdiction.¹⁵ Federal agencies have regularly reciprocated that hostility with over-reaching efforts to reserve and secure water supplies for Bureau of Reclamation (Reclamation) irrigation projects and other federal interests.¹⁶ For all of

1902 (1992). For a discussion of the period between the Reclamation Act and World War II, see DONALD J. PISANI, *FROM THE FAMILY FARM TO AGRIBUSINESS: THE IRRIGATION CRUSADE IN CALIFORNIA AND THE WEST, 1850-1931* (1984). For an extensive discussion of the problem since World War II (but one that focuses on California), see Amy Kelley, *Staging a Comeback: Section 8 of the Reclamation Act*, 18 U.C. DAVIS L. REV. 18 (1984).

8. See Frankfurter & Landis, *supra* note 3, at 695–703.

9. Charles J. Meyers, *The Colorado River*, 19 STAN. L. REV. 1, 12, 24–25 (1966) (on the Colorado River Compact); Paul Elliott, *Texas' Interstate Water Compacts*, 17 ST. MARY'S L.J. 1241, 1261–62 (1986).

10. For an example of a compact reached after extensive interstate litigation, see the Arkansas River Compact, ch. 155, 63 Stat. 145 (1949).

11. See generally *Kansas v. Colorado*, 206 U.S. 85 (1907) (asserting the power of the Court to equitably apportion interstate rivers); *Nebraska v. Wyoming*, 325 U.S. 589, 618 (1945) (setting forth the Court's multi-factor analysis for equitable apportionment); *Colorado v. New Mexico*, 459 U.S. 176, 183 (1982) (stating the current formulation for equitable apportionment).

12. An Act Relating to the Construction of a Dam and Reservoir on the Rio Grande, in New Mexico, for the Improvement of the Flood Waters of Said River for Purposes of Irrigation, ch. 798, 33 Stat. 814 (1905) (apportioning the Rio Grande between New Mexico and Texas); *Arizona v. California*, 373 U.S. 546, 560 (1963) (holding that Congress has the power to apportion interstate waters, and that the Boulder Canyon Project Act of 1928, ch. 42, 45 Stat. 1057, effected such a complete statutory apportionment of the states of the Lower Colorado River Basin (California, Arizona, and Nevada)). For the Rio Grande apportionment, see LITTLEFIELD, *supra* note 4, at 114–30; for a historical critique of the apportionment decision in *Arizona v. California*, see Norris Hundley, Jr., *Clio Nods: Arizona v. California and the Boulder Canyon Act—A Reassessment*, 3 WESTERN HIST. Q. 455–82 (1972). In a dispute over the Missouri River two decades later, South Dakota imitated Arizona's argument, arguing that the O'Mahoney-Milliken Amendment to the Flood Control Act, 33 U.S.C. § 701-1(b) (2012), apportioned the Missouri River Basin between upstream consumptive uses and downstream navigation uses, but the Court denied its motion for leave to file. *South Dakota v. Nebraska*, 475 U.S. 1093 (1986). Since *Arizona v. California*, Congress has apportioned an interstate stream only once, in the 1990 Truckee-Carson-Pyramid Lake Water Rights Settlement Act, Pub. L. No. 101-618, 104 Stat. 3289, 3294–324 (1990), explicitly apportioning the Truckee River, the Carson River, and Lake Tahoe between California and Nevada.

13. See Act for Admission of Kansas Into the Union, ch. 20, 12 Stat. 126 (1861) (memorializing the request by the Territory of Kansas to the Congress of the United States “to admit the said territory into the union as a state, on an equal footing with the other states”); *Pollard v. Hagan*, 44 U.S. 212 (1845); *Shively v. Bowlby*, 152 U.S. 1 (1894); *Kansas v. Colorado*, 185 U.S. 125, 143, 145 (1902); *Arizona v. California*, 373 U.S. 546, 596–97 (1963). However, in *Kansas v. Nebraska & Colorado*, the Court, for the first time, explicitly acknowledged the inherent advantages of upstream states in the context of interstate compact disputes: “[p]ossessing the privilege of being upstream, Nebraska can (physically, though not legally) drain all the water it wants from the Republican River.” *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1057 (2015).

14. Meyers, *supra* note 9, at 11.

15. *Arizona v. California*, 373 U.S. 546, 612 (1963) (Harlan, J., dissenting).

16. The most prominent example of federal action is probably the “Rio Grande Embargo”

this chronic mutual resentment, cooperative federalism has nonetheless “developed water resources in an engineering effort unparalleled in history.”¹⁷

Then consider how the permanent problem of water shortage has become worse, as increased demand for water outstrips a falling and failing supply. The population of the West has grown faster than any other region of the United States over the past half-century. Technology has enabled ever-greater and more consumptive water usage, causing the permanent depletion of western aquifers and rivers.¹⁸ Global climate change has altered the timing of western hydrological cycles, making droughts more severe, frequent, and enduring.¹⁹ It also threatens the validity of a fundamental precedential assumption of natural resources law and policy—that climatic and hydrological conditions in the future will generally be like those of the past.²⁰ An over-populated and evermore desiccated West should secure the inevitability of further interstate conflicts.²¹ Extended droughts have rehabilitated Malthusian visions of permanent scarcity and depletion.²² Between inevitability and permanence, there seems to be little room for history.²³

Finally, consider the problem of definition. More broadly conceived as disputes between sovereigns, the subject of interstate water litigation falls into four main categories. The first comprises suits between states under the Supreme Court’s original jurisdiction, to resolve disputes over interstate allocations established by compact or judicial decree.²⁴ The second includes suits brought by Native American tribes against states and the United States to secure water rights impliedly reserved under federal law for tribal lands and reservations, usually at the expense of established state law-based water rights held by

(1896-1925), in which successive Secretaries of the Interior prevented water supply development on the public domain in Colorado and northern New Mexico, to protect downstream interests in southern New Mexico, Texas, and Mexico. The Department of the Interior imposed similar embargoes in the North Platte River in Wyoming (to protect inflows to Pathfinder Dam and Reservoir and the irrigation interests downstream in Nebraska), and in the Salt River in Arizona (to protect irrigation in the Phoenix area). See LITTLEFIELD, *supra* note 4, at 170-74, 183-87; see also DONALD J. PISANI, *State vs. Nation: Federal Reclamation and Water Rights in the Progressive Era*, in WATER, LAND, AND LAW IN THE WEST: THE LIMITS OF PUBLIC POLICY, 1850-1920 38-49 (1996).

17. GEORGE CAMERON COGGINS, CHARLES F. WILKINSON, & JOHN D. LESHY, *FEDERAL PUBLIC LAND AND RESOURCES LAW* 12 (5th ed., 2002); see also REISNER, *supra* note 4; DONALD WORSTER, *RIVERS OF EMPIRE: WATER, ARIDITY AND THE GROWTH OF THE AMERICAN WEST* (1992).

18. See LEONARD F. KONIKOW, U.S. GEOLOGICAL SURVEY, *SCIENTIFIC INVESTIGATIONS REPORT 2013-5079, GROUNDWATER DEPLETION IN THE UNITED STATES (1900-2008)* 4-5 (2013).

19. A. Park Williams et al., *Contribution of Anthropogenic Warming to California Drought during 2012-2014*, 42 *GEOPHYSICAL RESEARCH LETTERS* 6819 (2015).

20. John D. Leshy, *Federal Lands in the Twenty-First Century*, 50 *NAT. RESOURCES J.* 111, 113-14 (2010).

21. See, e.g., *Water Challenges*, DEPT. OF THE INTERIOR, <https://www.doi.gov/water> (last accessed Sept. 15, 2015); see generally WILLIAM DEBUYS, *A GREAT ARIDNESS: CLIMATE CHANGE AND THE FUTURE OF THE AMERICAN SOUTHWEST* (1994).

22. PAOLO BACIGALUPI, *THE WATER KNIFE: A NOVEL* (2015).

23. See generally HERBERT BUTTERFIELD, *THE WHIG INTERPRETATION OF HISTORY* (1931).

24. Since *Arizona v. California*, 373 U.S. 546 (1963), the Court has not found another congressional apportionment of interstate waters; see *supra* note 12.

non-Indians.²⁵ These lawsuits typically produce basin-wide water rights adjudications in state court.²⁶ The third category concerns federal public lands: excluding Alaska, the federal estate in the West approaches 350 million acres—nearly half the total acreage of the West.²⁷ This category includes a wide variety of suits between western states and the United States, concerning such matters as federal reserved water rights apart from those held by tribes.²⁸ The final category concerns water quality, whether brought by tribes, states, or the United States, usually under the Clean Water Act.²⁹

This is all too much to consider. Woody Allen comically summarized *War and Peace* as a novel that “is about Russia.”³⁰ The enduring conflicts between states over western rivers can be similarly summarized as something that “is about water.” Readers looking for a comprehensive legal survey of the subject should look elsewhere.³¹ What, then, to do here? Interstate water litigation in the West is the recurring consequence of the longstanding structural relationships of western water, and of the irreconcilable conflicts among hydrological and geological facts, arbitrary and flawed political decisions, and constitutional and legal fictions. The original sins of interstate water allocation have repeatedly required litigation brought under the original jurisdiction of the Supreme Court. A brief history of this litigation cannot do these structures justice; it is better to stress the role of contingency. If these structures and structural conflicts do not change over time (and for the most part, they have not), then it is something

25. See, e.g., *Winters v. United States*, 207 U.S. 564 (1908); *Colville Confederated Tribes v. Walton*, 647 F.2d 42 (9th Cir. 1981).

26. See generally John E. Thorson et al., *Dividing Western Waters: A Century of Adjudicating Rivers and Streams*, 8 U. DENV. WATER L. REV. 355 (2005); John E. Thorson et al., *Dividing Western Waters: A Century of Adjudicating Rivers and Streams, Part II*, 9 U. DENV. WATER L. REV. 299 (2006). While groundwater has not driven tribal water rights adjudications, it has complicated efforts to reach workable and enduring accommodations between the federal reserved rights of tribes and their members, and the state law-based water rights of other citizens. See, e.g., *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water Dist.*, 849 F.3d 1262 (9th Cir. 2017). For useful summaries of groundwater in the reserved water rights context, see Thorson et al., *id.*; Judith M. Royster, *Indian Tribal Rights to Groundwater*, 15 KAN. J.L. & PUB. POL’Y 489 (2006); Lawrence J. MacDonnell, *General Stream Adjudications, the McCarran Amendment, and Reserved Water Rights*, 15 WYO. L. REV. 313 (2015); Jason A. Robison, *Wyoming’s Big Horn General Stream Adjudication*, 15 WYO. L. REV. 243 (2015). For a useful study of the first fifty years of tribes’ rights to water, see generally JOHN SHURTS, *INDIAN RESERVED WATER RIGHTS: THE WINTERS DOCTRINE IN ITS SOCIAL AND LEGAL CONTEXT, 1880S-1930S* (2000).

27. CAROL HARDY VINCENT ET AL., CONGRESSIONAL RESEARCH SERVICE, *FEDERAL LAND OWNERSHIP: OVERVIEW AND DATA* 21 (2017), <https://fas.org/sgp/crs/misc/R42346.pdf> (tabulating federal acreage across the eleven western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, excluding Alaska and Hawaii)). The federal government owns roughly 640 million acres across the United States; of that total, over 224 million acres are located in Alaska. *Id.* at 1, 21.

28. See, e.g., *United States v. New Mexico*, 438 U.S. 696 (1978); *Cappaert v. United States*, 426 U.S. 128 (1976).

29. See, e.g., *City of Albuquerque v. Browner*, 97 F.3d 415 (10th Cir. 1996) (upholding tribal water quality standards set by the Pueblo of Isleta that were more stringent than federal standards, based on tribes’ statutory right to be treated as states for purposes of the Clean Water Act); *New Mexico v. Colorado*, 582 U.S., No. 147 Orig. (2017) (order denying New Mexico’s motion for leave to file a bill of complaint against Colorado for the Gold King mine spill of August, 2015, which originated in Colorado and polluted the Animas and San Juan Rivers in New Mexico).

30. READER’S DIGEST, vol. 91, p. 120 (Oct. 1967).

31. See, e.g., Bret C. Birdsong & Douglas A. Grant, *Water Apportionment Compacts Between States*, *WATERS AND WATER RIGHTS*, §§ 46.01 to 46.30 (3d ed., 2017).

beyond them that has forced litigation. Something, presumably, that is about water.

Over the past fifty years, that water has been groundwater. Across most of the western states, water law developed into a state of reliable maturity and general doctrinal consistency roughly between 1890 and 1950, when the West's available water supplies were predominantly surface water supplies.³² Because groundwater was relatively unimportant by comparison during that period, western groundwater law and its attendant doctrines remained marginal and balkanized.³³ No less an authority than Elwood Mead confidently predicted that the "millions and millions of acres" of fertile and gently sloping farmland outside the reach of surface-water irrigation projects across the West "will never be farmed, however, because water is lacking."³⁴ The industrial groundwater revolution proved Mead wrong, and turned the world of western water upside down during the postwar period. Groundwater irrigation soon dwarfed surface water irrigation across much of the West, and especially across the Great Plains.³⁵ As pumping depleted the surface flows of interstate rivers, groundwater raised new boundary issues—jurisdictional, legal, and technical—that groundwater depletion made impossible to ignore, disturbing interstate water relations established by compact or decree.

This article looks back across the cases that confronted that epochal disturbance, highlighting their principal causes, characteristics, and consequences. Most of these cases concerned the construction and application of interstate compacts enacted prior to the groundwater revolution.³⁶ Part II of this article

32. The first systematic treatments of western water law date from the decades on either side of the Reclamation Act of 1902. *See, e.g.*, JOHN NORTON POMEROY, A TREATISE ON THE LAW OF WATER RIGHTS AS THE SAME IS FORMULATED AND APPLIED TO THE PACIFIC STATES, INCLUDING THE DOCTRINE OF APPROPRIATION AND THE STATUTES AND DECISIONS RELATING TO IRRIGATION (1893); CLESSON S. KINNEY, A TREATISE ON THE LAW OF IRRIGATION AND WATER RIGHTS AND THE ARID REGION DOCTRINE OF APPROPRIATION OF WATERS (1894); ELWOOD MEAD, IRRIGATION INSTITUTIONS: A DISCUSSION OF THE ECONOMIC AND LEGAL QUESTIONS CREATED BY THE GROWTH OF IRRIGATED AGRICULTURE IN THE WEST (1903); HENRY P. FARNHAM, THE LAW OF WATERS AND WATER RIGHTS (1904); SAMUEL C. WIEL, WATER RIGHTS IN THE WESTERN STATES (1905). A second round of treatises and codifications emerged during the 1940s and 1950s. *See, e.g.*, WELLS A. HUTCHINS, SELECTED PROBLEMS ON THE LAW OF WATER RIGHTS IN THE WEST (1942).

33. *See, e.g.*, WIEL, *supra* note 32, at §§ 72–80 (describing contemporary legal categories of groundwater and their attendant doctrines).

34. MEAD, *supra* note 32, at 6.

35. Nebraska is probably the best example, given its large groundwater supplies. Since 1950, surface water irrigation has remained relatively static, watering approximately 1 million acres. By contrast, groundwater irrigation has boomed, rising from approximately 500,000 acres in 1950 to over 7 million acres by 1990. Vincent H. Dreeszen, *Water Availability and Use*, FLAT WATER: A HISTORY OF NEBRASKA AND ITS WATER 82 (Charles A. Flowerday ed. 1993).

36. By contrast, interstate water decrees are unusual. The Court is exceedingly reluctant to apportion interstate rivers by decree, and has defended that reluctance with the principled requirement that "[T]he threatened invasion of rights must be of serious magnitude and it must be established by clear and convincing evidence." *New York v. New Jersey*, 256 U.S. 296, 309 (1921); *see also Colorado v. New Mexico*, 467 U.S. 310, 314–21 (1984). (Although the Court has not yet decided the appropriate standard of proof for liability under an interstate compact, Special Masters in compact cases have uniformly used the preponderance of evidence standard. *Kansas v. Colorado*, 514 U.S. 673, 693 (1995); *see Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *infra* note 174, at 40–43.). The Court has issued equitable apportionment decrees allocating water supplies between states in only three watersheds—the Laramie, the

reviews the first half-century of conflict between Kansas and Colorado over the Arkansas River (1902-1949), a seminal conflict that generated and still illuminates many of the archetypal arguments and characteristics of modern interstate water litigation. Part III provides a similarly brief review of the groundwater revolution, including the western states' failure to integrate groundwater within the legal structures of interstate compact administration and within their own distinct state water laws. That failure owed something to the surface-water assumptions of most interstate compacts, but it also resulted from the states' internal political calculations, which favored groundwater development at the expense of depleted—but compacted—surface flows.

Part IV summarizes the principal interstate compact cases of the groundwater revolution: *Texas v. New Mexico*, which litigated the Pecos River Compact;³⁷ *Kansas v. Colorado*, which litigated the Arkansas River Compact;³⁸ and *Kansas v. Nebraska & Colorado*, which twice litigated the Republican River Compact.³⁹ These cases revolved around three interdependent issues. The threshold issue was that of compact interpretation: because these compacts predated the groundwater revolution, did the compacts and their allocations account for groundwater supplies and the effects of groundwater pumping? In litigating this textual issue, states redeployed pre-compact arguments to serve their respective interpretations of the compacts, but they also brought extensive historical analysis to bear upon the intended hydrological scope of the compacts. The Court repeatedly found that these compacts did include groundwater, but that general finding raised the second issue: by what method should the Court quantify the hydrological effects of groundwater pumping on the states' respective allocations? Resolving this difficult technical issue required the use of groundwater modeling. As the states put forth competing groundwater models, modeling and accounting disputes became the most heavily litigated component of these cases. The final issue concerned remedies: how

Delaware, and the North Platte Rivers. See *Wyoming v. Colorado*, 259 U.S. 419 (1922) (Laramie River Decree); *New Jersey v. New York*, 283 U.S. 336 (1931), *modified* 347 U.S. 995 (1954) (Delaware River Decree); *Nebraska v. Wyoming*, 325 U.S. 589 (1945) (North Platte Decree). The enforcement of an interstate decree is subject to the preponderance of evidence standard, but the modification of a decree is subject to the same standard of clear and convincing evidence that is required for initial apportionments. *Nebraska v. Wyoming*, 507 U.S. 584, 590-93 (1993). The Court has modified interstate decrees in response to both stipulated agreements and litigation. See, e.g., *Nebraska v. Wyoming* 345 U.S. 981 (1953) (decree amended pursuant to a stipulation and cross-motion of the parties; and *Nebraska v. Wyoming*, 534 U.S. 40 (2001) (approving the Final Settlement Stipulation, dismissing all claims with prejudice, and amending the 1945 and 1953 decrees). In two other cases, the Court allocated the entire water supply of an interstate river to one state. In *Arizona v. California*, the Court allocated the waters of the Gila River (a tributary of the Colorado River which flows from New Mexico into Arizona) to Arizona. 373 U.S. 546, 594-95 (1963). This case, which serves as the most prominent example of congressional apportionment of an interstate river (the Colorado River), is to some degree an equitable apportionment case (of the Gila River) as well. *Id.* at 560. In *Colorado v. New Mexico*, the Court allocated the waters of the Vermejo River (which flows from Colorado to New Mexico) entirely to New Mexico, rejecting the Special Master's recommendation of a decree awarding 4,000 acre-feet of the river's water supply to Colorado. *Colorado v. New Mexico*, 467 U.S. 310, 324 (1984).

37. *Texas v. New Mexico*, 482 U.S. 124, 129 (1987).

38. *Kansas v. Colorado*, 514 U.S. 673, 677 (1995).

39. *Kansas v. Nebraska & Colorado*, 525 U.S. 1101 (1999); *Kansas v. Nebraska & Colorado*, 563 U.S. 915 (2011).

should the Court determine the appropriate damages for past compact violations and order other relief that would serve to deter states from committing violations in the future? Litigation over remedies involved close coordination among groundwater modelers, water engineers, and economists. Interstate water litigation, like other forms of complex litigation, has become a thoroughly interdisciplinary enterprise.

Part IV includes a discussion of the cases currently before the Court concerning interstate groundwater supplies. The first case is *Montana v. Wyoming & North Dakota*, a dispute between Wyoming and Montana over the Yellowstone River Compact that has addressed the issue of how groundwater supplies related to irrigation and to coal-bed methane production fall within the compact's allocations.⁴⁰ The second case is *Texas v. New Mexico & Colorado*, a dispute between Texas and New Mexico over the Rio Grande Compact that addresses the issue of how groundwater pumping in New Mexico affects compact allocations and the Rio Grande Project, a Reclamation project with lands in both New Mexico and Texas.⁴¹ The third case is *Florida v. Georgia*, a dispute involving groundwater depletions across the waters of the Apalachicola-Chattahoochee-Flint river basin (ACF Basin)—waters that are not subject to an interstate compact, but over which the U.S. Army Corps of Engineers (Corps) exercises substantial control.⁴² The Rio Grande and ACF Basin cases have raised important questions about the role of the United States in interstate water litigation. The final case is *Mississippi v. Tennessee*, a novel dispute over the water supplies of an interstate aquifer that is not connected to an interstate river.⁴³ Because these are pending cases, Part IV provides some informed speculation about how the Court might employ its established interstate groundwater jurisprudence to resolve them.

Part V explores two of the most important and revealing consequences of interstate groundwater litigation. Litigation has served the salutary purpose of forcing necessary legal reforms within states' water codes, reforms that have enabled more effective regulation of groundwater pumping. Yet litigation has also forced the development of alternative mechanisms to comply with interstate compacts and the Court's decrees, such as water right retirement programs and stream augmentation projects. Part VI concludes with several observations about interstate water litigation. It has forced states to integrate groundwater within the federalist structures of interstate water governance, but it has not yet forced the states to meet their interstate obligations by confronting the problem of groundwater depletion. Interstate water litigation has also revealed problematic political and jurisdictional asymmetries across interstate basins, while exposing troubling inconsistencies on the part of the United States. And the means by which states have chosen to comply with their interstate obligations have raised basic questions about western water law doctrine. Throughout, this article relies heavily upon the reports issued by Special Masters in these cases. While they lack the power of the Court's decisions, they provide a level of historical detail, context, and analysis which the Court's decisions rarely do.

40. See *infra* text accompanying notes 159–79, 251–81.

41. See *infra* text accompanying notes 180–208.

42. See *infra* text accompanying notes 333–56.

43. See *infra* text accompanying notes 357–418.

II. INTERSTATE WATER LITIGATION BEFORE THE GROUNDWATER REVOLUTION

At the turn of the twentieth century, there were few settled rules for how to divide interstate waters among the sovereigns which claimed them.⁴⁴ Over the next several decades, both state and federal litigants marched into this legal wilderness, frequently equipped with uncompromising legal and technical positions. The Court discredited the parties' respective arguments on the grounds that they were fundamentally inequitable. Through the assertion of its considerable equitable powers, the Court sought to establish more diplomatic relations between both the states and the United States; but it generally fell to the states themselves to resolve the underlying causes of these early conflicts.

The long dispute over the waters of the Arkansas River during the first half of the twentieth century presents the paradigmatic example of how sovereigns with competing claims to an interstate river—and conflicting intrastate water laws—tend to put forth polarizing legal principles.⁴⁵ Kansas originally claimed the right to the river's continuous, "uninterrupted and unimpeded flow," as it existed "before any human interference."⁴⁶ Such a claim was based on the English common law and its riparian water law doctrines, which Kansas had adopted at statehood.⁴⁷ For its part, Colorado denied that Kansas had any right to the Arkansas, and claimed all of the water that originated within Colorado based on its own constitutional commitment to the prior appropriation doctrine, and without regard to any downstream impact in Kansas.⁴⁸ Colorado also found merit in the Harmon Doctrine, a roughly contemporary doctrine of international law asserting sovereignty over natural resources originating within the sovereign's borders.⁴⁹ Not to be outflanked by these diametrically opposed claims—and eager to secure water rights for irrigation projects to be built under the "so-called Reclamation Act" of 1902⁵⁰—the United States attacked them both

44. LITTLEFIELD, *supra* note 4, at 6.

45. And irreconcilable pronunciations of the name of the river. "The Arkansas River is unique in that the pronunciation of its name changes from State to State. In Colorado, Oklahoma, and Arkansas, it is pronounced as is the name of the State of Arkansas, but in Kansas, it is pronounced Ar-KAN-sas." *Kansas v. Colorado*, 514 U.S. 673, 677 (1995). Chief Justice Rehnquist's diplomatic observation supports Mark Twain's opinion that "foreigners always spell better than they pronounce." MARK TWAIN, *THE INNOCENTS ABROAD* 145 (Library of America ed., 1984) (1869).

46. *Kansas v. Colorado*, 206 U.S. 46, 57, 85, 98 (1907).

47. *Wear v. State of Kansas ex rel. Brewster*, 245 U.S. 154, 157 (1917). Under the riparian doctrine, the reasonable use of water is an inherent common law attribute of riparian property. For discussions of Kansas's riparian water law, see *Shamleffer v. Council Grove Pecrless Mill Co.*, 1877 WL 935 (1877); *Emporia v. Soden*, 1881 WL 905 (1881).

48. *Kansas v. Colorado*, 206 U.S. at 46, 57, 85, 98; *Kansas v. Colorado*, 185 U.S. 125, 143 (1902).

49. *Kansas v. Colorado*, 206 U.S. at 97-98; James S. Lochhead, *An Upper Basin Perspective on California's Claims to Water from the Colorado River—Part I: The Law of the River*, 4 U. DENV. WATER L. REV. 290, 295, n.17 (2001); Stephen C. McCaffrey, *The Harmon Doctrine One Hundred Years Later: Buried, Not Praised*, 36 NAT. RESOURCES. J. 725 (1996). Colorado made the same argument fifteen years later in *Wyoming v. Colorado*. 259 U.S. 419, 457 (1922) ("[I]t is the right of Colorado as a state to dispose, as she may choose, of any part or all of the waters flowing in the portion of the river within her borders, 'regardless of the prejudice that it may work' to Wyoming . . .") The Court again rejected the argument. *Id.* at 466.

50. *Kansas v. Colorado*, 206 U.S. at 46, 56.

as incorrect and claimed instead that any unappropriated waters in the western states remained within the purview of federal sovereignty.⁵¹

Colorado made a similarly aggressive hydrological argument: that the Arkansas River was not an interstate resource at all. Rather, the river was two distinct rivers. The first river originated in the Colorado Rockies and terminated near the Kansas-Colorado border, having exhausted its mountain runoff-fed supplies; this river was thus wholly (and conveniently) within the domain and ownership of Colorado.⁵² A second, plains-type river emerged at or near the state line, "from springs and branches . . . to flow onward through Kansas and Oklahoma towards the Gulf of Mexico."⁵³ Colorado's attempt to divide the Arkansas River into two different rivers promised a signal legal benefit: if the Court accepted Colorado's theory, then it need not effect an interstate apportionment at all.⁵⁴ Kansas had no truck with Colorado's theory; it simply stressed the fact of interstate flows upon which its irrigating citizens had long relied.⁵⁵

These divergent legal and hydrological arguments revealed what has since become a reliable pattern in interstate water litigation. States take positions justified by their respective water law codes and by their own interpretations of water-based federalism.⁵⁶ Unsurprisingly, these positions accord nicely with the respective interests of the states, which probably explains why their readings of these codes were also selective.⁵⁷ The Court repudiated these absolutist positions in *Kansas v. Colorado*. It rejected both Colorado's legal claim to absolute dominion of the river's supplies and Kansas's rival legal claim to the river's uninterrupted flows, holding instead that the river should be allocated according to "the equitable apportionment of benefits between the two states resulting from the flow of the river"⁵⁸ It similarly rejected Colorado's theory of two rivers, based upon the same principle of equitable apportionment, and recognizing the reliance by Kansas irrigators upon flows originating well upstream of the Kansas-Colorado border.⁵⁹

Most importantly of course, the Court declared its power to effect the equitable apportionment of an interstate river.⁶⁰ Having nonetheless asserted this robust equitable power, and having deflected the parties' most aggressive

51. *Id.* at 86-87; PISANI, *supra* note 16, at 42-48 (on the efforts of Morris Bien). The United States maintained its claim of ownership to unappropriated water as late as 1945. *See infra* note 68.

52. *Kansas v. Colorado*, 206 U.S. at 115.

53. *Id.*

54. *Id.* at 52-53.

55. *Id.* at 48. Kansas did, however, offer a hydrological theory of its own: that below the Arkansas River flowed a second, subterranean river, with "distinct and continuous flow as of a separate stream." *Id.* at 114. The Court rebuked that theory, stressing the hydrological interconnection between the surface flows of the Arkansas River and its alluvial groundwater. *Id.* at 114-15.

56. *See infra* text accompanying notes 140-58.

57. Kansas had adopted the doctrine of prior appropriation for the western part of the state as early as 1886—a fact not acknowledged in the Court's 1907 decision, probably because of Kansas's riparian legal position in that case. 1886 Kan. Sess. Laws 154 ("[A]s between appropriators, the one first in time is the first in right."); *Kansas v. Colorado*, 206 U.S. at 104-05.

58. *Kansas v. Colorado*, 206 U.S. at 46, 118.

59. *Id.* at 117.

60. *Id.* at 46, 118.

legal and technical arguments, the Court declined to apportion the river: the Court was not "satisfied that Kansas has made out a case entitling it to a decree."⁶¹ The opposing doctrinal positions asserted in *Kansas v. Colorado* probably informed the Court's reticence, a reticence supported by the Court's high standard of proof in interstate cases.⁶²

When the Court did exercise its powers of equitable apportionment, the obstacle of fundamental and opposing legal doctrines did not arise. In *Wyoming v. Colorado* (1922), the Court apportioned the Laramie River between two prior appropriation states by applying the doctrine at the interstate level.⁶³ That apportionment, "between two states having an identical system of laws in respect to the use of water from flowing streams,"⁶⁴ defeated Colorado's reassertion of the Harmon Doctrine,⁶⁵ and informed subsequent negotiations over the Colorado River Compact.⁶⁶ In *New Jersey v. New York* (1931), the Court equitably apportioned the Delaware River Basin among eastern states with similar riparian doctrines.⁶⁷ And in *Nebraska v. Wyoming* (1945), the Court equitably apportioned the North Platte River between two prior appropriation states by using that doctrine as the guiding principle, but accounting for other equitable factors and their importance as well, which informed the extent of deviation from priority. The equitable calculus of the North Platte decree relegated to academic irrelevance the United States' reassertion of a right to the unappropriated waters in each state.⁶⁸

On the Arkansas though, the Court's reticence immediately provoked further litigation. Between 1909 and 1923, Kansas irrigation companies brought several lawsuits against Colorado irrigation companies to obtain an adjudication of priorities to their respective ditches; two of these suits produced settlements

61. *Id.* at 117.

62. *See supra* note 36.

63. *Wyoming v. Colorado*, 259 U.S. 419 (1922). The Court had anticipated this interstate logic in *Kansas v. Colorado*: in denying the claim of Kansas to the uninterrupted waters of the Arkansas River based on its own allegiance to the riparian doctrine, "which recognizes the right of appropriating the waters of a stream . . . subject to the condition of an equitable division between the riparian appropriators," the Court found that Kansas "cannot complain if the same rule is administered between herself and a sister state." *Kansas v. Colorado*, 206 U.S. at 104-105.

64. *Finney Cty. Water Users Ass'n v. Graham Ditch Co. et al.*, 1 F.2d 650, 652 (D. Colo., 1924).

65. *Wyoming v. Colorado*, 259 U.S. at 457 (claiming that "it is the right of Colorado as a state to dispose, as she may choose, of any part or all of the waters flowing in the portion of the river within her borders, 'regardless of the prejudice that it may work' to Wyoming . . .") The Court rejected the argument, as it had in *Kansas v. Colorado* fifteen years before. *Id.* at 466; *see supra* note 58.

66. *Wyoming v. Colorado*, 259 U.S. 419; Colorado River Compact, ch. 42, 45 Stat. 1057 (1928) (negotiated 1921-22). That legislation did not include the text of the compact it enacted; in this regard the Colorado River Compact is unique. The text of the Colorado River Compact first occurs at 70 Cong. Rec. 324-25 (1928). For a discussion of the context in which the Colorado River Compact was negotiated, see NORRIS HUNDLEY, JR., *WATER AND THE WEST: THE COLORADO RIVER COMPACT AND THE POLITICS OF WATER IN THE AMERICAN WEST* (2d ed., 2009).

67. *New Jersey v. New York*, 283 U.S. 336 (1931), *decree amended by* 347 U.S. 995 (1954) (Delaware River Decree).

68. *Nebraska v. Wyoming*, 325 U.S. 589, 611-12, 616 (1945); *see supra* note 51. Although Wyoming follows the prior appropriation doctrine for both surface and groundwater, Nebraska does so only for surface water; *see infra* text accompanying note 107.

that established interstate priority schedules.⁶⁹ In response, Colorado sued Kansas in 1928 to enjoin these suits and schedules; Kansas answered with a renewed complaint of Colorado's overuse and a renewed request for an equitable apportionment of the Arkansas River.⁷⁰ This second round of interstate litigation over the Arkansas presented a different set of technical and doctrinal problems. Despite extensive fact-finding by the Special Master, the Court again declined to apportion the river in 1943, because Kansas did not establish that Colorado's increases in irrigation between 1907 and 1943 had worked sufficient harm to Kansas. Indeed, new upstream reservoirs and irrigation improvements constructed in Colorado since 1907 had actually increased flows into Kansas, by increasing return flows from those improvements to the Arkansas River.⁷¹ A second flaw in Kansas's case lay in the state's own doctrinal impotence. Its hybrid water law code, one that was generally riparian but provided for prior appropriation rights from the streams of western Kansas,⁷² prevented Kansas from demonstrating harms allegedly incurred by all of its western irrigators as a consequence of Colorado's diversions.⁷³ In brief, the Court could not apportion what Kansas could not quantify.⁷⁴ One year later, the Kansas Supreme Court held that the state's water law was essentially powerless to regulate groundwater pumping.⁷⁵ These two decisions immediately forced fundamental reform in Kansas water law; and in 1945, Kansas adopted the prior appropriation doctrine for both surface and groundwater statewide.⁷⁶

The second round of *Kansas v. Colorado*, alongside other developments, eventually brought some peace to the Arkansas River Valley. The Court's decision in *Hinderlider v. La Plata River & Cherry Creek Ditch Co.* (1938) provided newfound security for the interstate compact mechanism.⁷⁷ Meanwhile, the construction of John Martin Reservoir, a federal reservoir on the Arkansas River in eastern Colorado operated by the Corps, required the two states to execute various interim agreements regarding the management of its supplies.⁷⁸ Together, these finally enabled Kansas and Colorado to follow the Court's repeated and earnest advice—that they apportion the river themselves, “pursuant

69. For a summary of this litigation, see *Colorado v. Kansas*, 320 U.S. 383, 386–89 (1943). Kansas irrigators could seek this relief because they held prior appropriation rights; see *supra* text accompanying note 57.

70. *Id.* at 388–89.

71. *Id.* at 396–98. The Court stressed that while Arkansas River flows had failed to reach the Kansas state line for most years between 1895 and 1907, “substantial amounts” of water had crossed the line since 1908. *Id.* at 398.

72. See *supra* text accompanying notes 47 and 57.

73. *Colorado v. Kansas*, 320 U.S. at 395–99, 400.

74. *Id.* at 398–99.

75. *State ex rel. Peterson v. Kan. State Bd. of Agric.*, 149 P.2d 604 (Kan. 1944) (holding that the Division of Water Resources lacks statutory authority to regulate groundwater).

76. For a summary of these developments, see Burke W. Griggs, *The Political Cultures of Irrigation and the Proxy Battles of Interstate Water Litigation*, 57 NAT. RESOURCES. J. 1, 29–30 (2017).

77. *Hinderlider v. La Plata River & Cherry Creek Ditch Co.*, 304 U.S. 92 (1938) (holding that the Colorado State Engineer could administer pre-compact rights to honor the state's obligations under the La Plata River Compact between Colorado and New Mexico); for a discussion of the impact of *Hinderlider* on subsequent compacts, see DANIEL TYLER, SILVER FOX OF THE ROCKIES: DELPHUS E. CARPENTER AND WESTERN WATER COMPACTS 274–77 (2003).

78. Arkansas River Compact, art. II, ch. 155, 63 Stat. 145 (1949).

to the compact clause of the Federal constitution.⁷⁹ The litigation had not been for naught: indeed, the Arkansas River Compact of 1949 significantly relied upon its findings to establish the relative rights of the states both to the river and to the supplies stored in John Martin Reservoir.⁸⁰

Across the West, the need for state-federal cooperation in managing interstate river basins for both irrigation and flood control projects motivated the negotiation and enactment of similar compacts during the 1930s and 1940s.⁸¹ Through the mechanism of the compact, state and federal parties sought to quantify and to equitably apportion interstate waters among the compacting states. The United States effectively required interstate compacts as a condition for the states to obtain new federal water storage facilities in their respective basins.⁸² It further required these compacts to contain explicit protections for federal interests in interstate basins—especially Reclamation projects.⁸³

III. THE GROUNDWATER REVOLUTION

By the mid-1960s, the Court, the States, and Congress appeared to have met the basic legal challenges posed by the West's interstate waters.⁸⁴ The Court had set rules for their equitable allocation.⁸⁵ Just as importantly, the Court's reticence to so allocate and the unpredictability of such an allocation had convinced the states to do so themselves, by negotiating interstate compacts. The western states' earlier claims to the exclusive ownership of the waters within their borders, and their arguments that water resources development undertaken by the United States should be subject exclusively to state control, eventually fell into disregard.⁸⁶ Based largely on the security that these compacts provided to federal interests, especially to Reclamation, Congress funded the

79. *Colorado v. Kansas*, 320 U.S. 383, 392 (1943). As early as 1902, the Court had pointed out the advantages of a compact between the two states. *Kansas v. Colorado*, 185 U.S. 125, 140 (1902).

80. Arkansas River Compact, art. II-V, ch. 155, 63 Stat. 145 (1949).

81. Interstate water allocation compacts enacted in these decades include the following: Rio Grande Compact, ch. 151, 53 Stat. 785 (1939) (among Colorado, New Mexico, and Texas); Republican River Compact, ch. 104, 57 Stat. 86 (1943) (among Colorado, Nebraska, and Kansas); Belle Fourche River Compact, ch. 64, 58 Stat. 94 (1944) (between South Dakota and Wyoming); Upper Colorado River Basin Compact, ch. 48, 63 Stat. 31 (1949) (among Arizona, Colorado, New Mexico, Utah, and Wyoming); Arkansas River Compact, *supra* note 50 (between Colorado and Kansas); and Pecos River Compact, ch. 184, 63 Stat. 159 (1949) (between New Mexico and Texas).

82. First Interim Report of Barton H. Thompson, Jr., Special Master at 6, *Montana v. Wyoming & North Dakota*, No. 137 Orig. (Feb. 10, 2010) [hereinafter *Montana v. Wyoming & North Dakota*, 2010 First Interim Report].

83. For a discussion of this issue on the national level, see REISNER, *supra* note 4. For a treatment focused on Kansas, see Burke W. Griggs, *Beyond Drought: Water Rights in the Age of Permanent Depletion*, 62 U. KAN. L. REV. 1263, 1276–80 (2014).

84. See Meyers, *supra* note 9.

85. *Id.*; see also *supra* notes 10–12. The standard overview of the equitable apportionment doctrine is A. Dan Tarlock, *The Law of Equitable Apportionment Revisited, Updated, and Restated*, 56 U. COLO. L. REV. 381 (1985).

86. See, e.g., *Merrill v. Bishop*, 287 P.2d 620 (Wyo. 1955). For critiques of this position, see Frank J. Trelease, *Government Ownership and Trusteeship of Water*, 45 CAL. L. REV. 638 (1957); B. Abbott Goldberg, *Interposition—Wild West Water Style*, 17 STAN. L. REV. 1 (1964); Eva H. Morreale, *Federal-State Water Conflicts over Western Waters—A Decade of Attempted “Clarifying Legislation,”* 20 RUTGERS L. REV. 423 (1966).

construction of hundreds of reservoirs and irrigation districts across the West. Interstate comity, the noble idea memorialized in the preambles of western interstate river compacts, appeared at last to be realizable.⁸⁷

Unfortunately, the security of water supply provided by these legal, political, and infrastructural achievements was quickly threatened by technological disruption on a regional scale. Since the late nineteenth century, westerners had known about the vast groundwater supplies within alluvial aquifers and deeper aquifers such as the High Plains-Ogallala Aquifer.⁸⁸ In *Kansas v. Colorado*, the Court had likewise noted the potential for groundwater development in the Arkansas River Basin.⁸⁹ Contemporary water law scholars stressed the interdependence of surface water and groundwater supplies, advocating for legal reforms that would unify surface and groundwater rights into a coherent administrative regime.⁹⁰ The issue remained largely theoretical as long as irrigators lacked the means to pump groundwater cheaply enough for agricultural use; but by 1955 or so, those means were at hand. New Deal and postwar federal power projects had electrified much of the rural West, thanks partly to hydroelectric power plants sited within Reclamation projects.⁹¹ Wartime technological advancements produced the high-capacity centrifugal water pump, powered by electric or internal combustion motors; inventors soon applied these breakthroughs to farming, developing the center-pivot irrigation system.⁹²

Center-pivot irrigation transformed the waterscape of the West.⁹³ Previously limited to land irrigable by gravity, irrigation spread to wherever farmers could profitably pump groundwater.⁹⁴ The effect on interstate water supplies was immediate and substantial. Surface flows of the Arkansas River in Colorado had long suffered from over-appropriation; indeed, the river was fully appropriated by the turn of the twentieth century, and in most years, water rights

87. The shibboleth of interstate comity typically occurs in the preamble or the first article of most interstate water allocation compacts. *See, e.g.*, Arkansas River Compact, Preamble, ch. 155, 63 Stat. 145 (1949). But not one interstate compact contains a built-in mandatory remedy for noncompliance. The Arkansas River Compact contains a provision allowing the compact administration to refer disputed matters for binding arbitration, but the administration must vote unanimously to do so. It has never done so. *Id.* art. VIII, § D, 63 Stat. at 150.

88. *See, e.g.*, ERASMUS HAWORTH, U.S. GEOLOGICAL SURVEY, UNDERGROUND WATERS OF SOUTHWESTERN KANSAS (1897); GEORGE EVERT CONDRA, U.S. GEOLOGICAL SURVEY, GEOLOGY AND WATER RESOURCES OF THE REPUBLICAN RIVER VALLEY AND ADJACENT AREAS, NEBRASKA 31-39 (1907). In deference to common usage, this article uses the terms "High Plains-Ogallala Aquifer," "Ogallala Aquifer," or just "Ogallala" interchangeably.

89. *Kansas v. Colorado*, 206 U.S. 46, 114 (1907) ("If the bed of a stream is not solid rock, but earth, through which water will percolate . . . undoubtedly water will be found many feet below the surface, and the lighter the soil the more easily will it find its way downward and the more water will be discoverable by wells or other modes of exploring the subsurface.").

90. *See, e.g.*, Samuel C. Wiel, *Need of Unified Law for Surface and Underground Water*, 2 S. CAL. L. REV. 358, 362 (1929) (noting that the "connection between surface streams and groundwater is usual, and in fact invariable.").

91. RICHARD WHITE, *THE ORGANIC MACHINE: THE REMAKING OF THE COLUMBIA RIVER*, 71 (1995); CHARLES F. WILKINSON, *CROSSING THE NEXT MERIDIAN: LAND, WATER, AND THE FUTURE OF THE WEST* 266 (1992).

92. JAMES AUCOIN, *WATER IN NEBRASKA: USE, POLITICS, POLICIES* 38-41 (1984); *see generally* D. E. GREEN, *LAND OF THE UNDERGROUND RAIN: IRRIGATION ON THE TEXAS HIGH PLAINS, 1910-1970* (1981).

93. AUCOIN, *supra* note 92, at 38-41.

94. *Id.*

junior to 1880 rarely received their full decreed quantities.⁹⁵ Groundwater pumping significantly exacerbated this situation, increasing from 31,000 acre-feet in 1950 to as much as 230,000 acre-feet by 1965—an increase due almost entirely to wells constructed after the Arkansas River Compact was enacted in 1949.⁹⁶ On the Pecos River in New Mexico, whose flows depend upon artesian groundwater supplies, pumping from artesian wells was depleting the river of 20,000 acre-feet every year.⁹⁷ Depletions averaged nearly one acre-foot per acre in the basin between 1950 and 1983.⁹⁸ And in the Republican River Basin in Nebraska, the number of wells expanded from approximately 500 at the time the Republican River Compact was enacted in 1943 to more than 4,500 by 1965, and to over 18,000 by 2000, with commensurate increases in irrigated acreage.⁹⁹

Across the West, the disruptive technology of modern groundwater irrigation “began to erode the early promise” of interstate compacts in the West.¹⁰⁰ But while compacts and their administration can be plagued with chronic flaws, the failure to consider interstate groundwater supplies was not among them. As early as 1941, the states negotiating the Republican River Compact understood that groundwater was an integral part of the compact’s allocations.¹⁰¹ Reclamation did its best to estimate the impacts of groundwater pumping on its reservoirs in the Republican River Basin.¹⁰² Similarly, the Pecos River Compact of

95. Report of Arthur L. Littleworth, Special Master, at 55, *Kansas v. Colorado*, No. 105 Orig. (July 29, 1994) [hereinafter *Kansas v. Colorado*, 1994 Report, vol. II], http://www.supremecourt.gov/SpecMastRpt/ORG105V1_071994.pdf.

96. *Id.* at 8–9, nn. 9–10.

97. Report of Jean S. Breitenstein, Special Master, on Obligation of New Mexico to Texas Under the Pecos River Compact, at 29–32, *Texas v. New Mexico*, No. 65 Orig. (Oct. 15, 1979), 1979 U.S. S. Ct. Briefs LEXIS 1846 [hereinafter *Texas v. New Mexico*, 1979 Report]. Artesian wells tap groundwater supplies that are confined within geologic formations at higher elevations; as a consequence, they produce water at the wellhead under their own hydrostatic pressure. Artesian groundwater supplies formed a significant part of the available water supplies of the Pecos River Basin in southeastern New Mexico, especially between Roswell and McMillan; they used to “carry abundant water at all seasons.” CASSIUS A. FISHER, U.S. GEOLOGICAL SURVEY, PRELIMINARY REPORT ON THE GEOLOGY AND UNDERGROUND WATERS OF THE ROSWELL ARTESIAN AREA, NEW MEXICO 5, 9–21 (1906).

98. Report of Charles J. Meyers, Special Master, at 24, n. 8, *Texas v. New Mexico*, No. 65 Orig. (July 29, 1986) [hereinafter *Texas v. New Mexico*, 1986 Report].

99. Final Report of Vincent L. McKusick, Special Master, with Certificate of Adoption of the Republican River Compact Administration (RRCA) Groundwater Model at 18, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (Sept. 17, 2003) [hereinafter *Kansas v. Nebraska & Colorado*, 2003 Final Report with Certificate].

100. *Kansas v. Colorado*, 1994 Report vol. I, *supra* note 95, at 8. Another “erosive” factor was, paradoxically, contemporary federal conservation efforts to reduce soil erosion through subsidizing watershed dams and farm terracing efforts across the Great Plains. These conservation measures may have significantly reduced runoff from farms into the tributaries and federal reservoirs of interstate rivers such as the Republican River. *See, e.g.*, REPUBLICAN RIVER COMPACT SETTLEMENT CONSERVATION COMMITTEE FOR THE REPUBLICAN RIVER COMPACT ADMINISTRATION, IMPACTS OF NON-FEDERAL RESERVOIRS AND LAND TERRACING ON BASIN WATER SUPPLIES x-xi, 128–36 (June 2014).

101. First Report of Vincent L. McKusick, Special Master, (Subject: Nebraska’s Motion to Dismiss), at 23–31, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (Jan. 28, 2000) [hereinafter *Kansas v. Nebraska & Colorado*, 2000 Report].

102. It woefully underestimated them. *See, e.g.*, BUREAU OF RECLAMATION, U.S. DEPARTMENT OF THE INTERIOR, BOSTWICK DEFINITE PLAN REPORT 1953: WATER SUPPLY, FLOOD CONTROL, & SEDIMENT, 38, 42–44 (1953) (assuming that groundwater pumping would

1949 was fundamentally informed by contemporary understandings of the complex groundwater hydrology of the lower reach of the Pecos River Basin.¹⁰³

Rather, it was the legal and policy failure to respond to the impacts of modern groundwater irrigation on a regional scale that caused the administration of certain compacts to break down.¹⁰⁴ The staggering increases in groundwater pumping, and the commensurate depletions they inflicted upon interstate streamflows, produced different legal and political responses depending on their location.¹⁰⁵ Some of these differences had to do with state law diversity in the interstate compact context.¹⁰⁶ Nebraska, for example, has never extended the prior appropriation doctrine to groundwater, opting instead for the doctrine of reasonable use.¹⁰⁷ Moreover, Nebraska has maintained its commitment to local control over groundwater, delegating regulatory authority to local Natural Resources Districts (NRDs) instead of the state's Department of Natural Resources (DNR), which has centralized jurisdiction over surface water rights.¹⁰⁸ Without the centralized power to reduce groundwater pumping to protect senior surface rights, and with local groundwater irrigators opting not to reduce their use, pumping continued apace in Nebraska.¹⁰⁹ In Colorado, most of the large irrigation wells in the Arkansas River Basin were drilled before the state required anything beyond a ministerial permit; when the State Engineer attempted to regulate groundwater pumping by bringing those wells within his jurisdiction under the prior appropriation system, the Colorado Supreme Court repeatedly struck down those efforts.¹¹⁰

Yet these doctrinal and jurisdictional complications do not tell the whole story; never underestimate the power of a state's self-interest. Consider New Mexico, a state with similar constitutional commitments to the doctrines of beneficial use and prior appropriation as Colorado,¹¹¹ and with generally the same comprehensive and centralized jurisdictional powers over groundwater as Kansas.¹¹² Nonetheless, the New Mexico State Engineer's office made the deliberate choice to favor beneficial use at the expense of priority: it granted an excessive number of groundwater permits, but neglected priority administration during

be limited to municipal and industrial demands in the Republican River Basin, and that losses to reservoirs would be limited to seepage and evaporation, without considering depletions to groundwater baseflow caused by groundwater pumping for irrigation).

103. *Texas v. New Mexico*, 462 U.S. 554, 557-61 (1983).

104. *Id.* at 558-62.

105. *Id.*

106. *Id.*

107. *In re Metro. Util. Dist. of Omaha v. Merritt Beach*, 140 N.W.2d 626, 635-37 (Neb. 1966).

108. NEB. REV. STAT. § 46-702 (2010) ("The Legislature also finds that natural resources districts have the legal authority to regulate certain activities and, except as otherwise specifically provided by statute, as local entities are the preferred regulators of activities which may contribute to ground water depletion.").

109. *Kansas v. Nebraska & Colorado*, 2003 Final Report with Certificate, *supra* note 99, at 18.

110. *Felhauer v. People*, 447 P.2d 986, 997 (Colo. 1968); *Kuiper v. Atchison, Topeka & Santa Fe Ry.*, 581 P.2d 293, 296-97 (Colo. 1978); *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 8-9, n. 10, 118-19.

111. Compare COLO. CONST. art. XVI, §§ 5, 6 with N.M. CONST. art. XVI, § 2.

112. Compare N.M. STAT. ANN. §§ 72-2-1 to 72-2-18, 72-12-1 to 72-12-28 (2015) with KAN. STAT. ANN. § 82a-706 (2015).

times of shortages.¹¹³ As a consequence of this choice, groundwater pumping in the New Mexico portion of the Pecos River Basin expanded at the expense of both senior surface rights in New Mexico and Texas's allocation under the Pecos River Compact.¹¹⁴ In retrospect, it is easy to criticize such a selective application of New Mexico water law, or to attack Nebraska's bifurcated water law system for failing to protect prior surface rights from groundwater pumping.¹¹⁵ But such legalistic critiques would themselves be partial, obscuring the more important motivations behind these flaws. For the over-pumping of groundwater is often the result of political calculations that determine state action—and state inaction, which is often just as deliberate—regardless of the particulars of the state's water code. Time and again, the economic benefits of groundwater pumping have led states to disobey their compact obligations rather than to make the politically unpopular decision to reduce pumping.¹¹⁶

Such political calculation can also be sound cost-benefit analysis. The plaintiff state must summon the political and financial resources to undertake and maintain litigation, which is expensive and can take decades.¹¹⁷ Under the rules of the Supreme Court's original jurisdiction, a plaintiff state must first obtain leave to file its petition; only if the Court grants the motion for leave and survives motions to dismiss does the case proceed to trial before a Special Master appointed by the Court.¹¹⁸ Proving non-compliance with the compact at issue requires proving over-consumption upstream, which in turn requires baseline historical data concerning wells, groundwater pumping, and water use; but upstream states have traditionally not gathered or kept such data, partly because there is no reason to assist the downstream plaintiff state in proving up its case.¹¹⁹ Without pumping data, "[t]rying to calculate what usable Stateline flows would have been in the absence of the compact violations . . . is a most formidable task."¹²⁰ Lack of well data can also enable the defendant state to claim equitable defenses, such as laches,¹²¹ and any number of affirmative defenses, such as blaming streamflow depletions on phreatophytes rather than on pumping upstream.¹²² Litigation before the Special Master can produce unexpected results

113. G. EMLÉN HALL, *HIGH AND DRY: THE TEXAS-NEW MEXICO STRUGGLE FOR THE PECOS RIVER* 119–21 (2002).

114. *Id.*

115. See, e.g., *Hill v. State*, 894 N.W.2d 208 (Neb. 2017); see also *Frenchman-Cambridge Irrigation Dist. v. Neb. Dep't of Nat. Res.*, 801 N.W.2d 253 (Neb. 2011). For a review of the problem in Nebraska, see J. David Aiken, *Hydrologically-Connected Ground Water, Section 858, and the Spear T Ranch Decision*, 84 NEB. L. REV. 962 (2006).

116. See *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1057 (2015) (noting the economic incentives for Nebraska to withhold water owed to Kansas, pay resulting damages, and still come out ahead are a "recipe for breach"); see, e.g., John B. Draper & Jeffrey J. Wechsler, *Gunboats on the Colorado: Interstate Water Controversies, Past and Present*, 55 ROCKY MTN. MIN. L. INST. § 18, 18-27 to 18-32 (2009).

117. Draper & Wechsler, *supra* note 116, at 18-10 to 18-12.

118. SUP. CT. R. 17 (2013); see Draper & Wechsler, *supra* note 116, at 18-8 to 18-12.

119. *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 145.

120. *Id.*

121. Colorado asserted the defense of laches, but neither Special Master Littleworth nor the Court accepted it. *Id.*, at 147–70; *Kansas v. Colorado*, 514 U.S. 673, 687–89 (1995).

122. *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 145; Pecos River Compact, ch. 184, 63 Stat. 159 (1949), at art. II(c) (excepting the diminution of stream flows caused by "encroachment of salt cedars or other like growth" from the definition of "deplete by man's activities"

at trial, while further surprises can occur when the Court overturns the Special Master's recommendations¹²³ or allows non-state parties to intervene.¹²⁴ The Court's equitable powers in interstate water disputes can be so substantial as to rewrite settlement agreements among the states.¹²⁵ And if a plaintiff state eventually prevails, the defendant state has almost certainly reaped the economic benefits obtained from water over-consumption prior to the lawsuit and even during its pendency.¹²⁶

IV. LITIGATING THE GROUNDWATER REVOLUTION

Despite these obstacles, by the last quarter of the twentieth century downstream states had little choice but to seek relief from the Court. Depletions caused by upstream surface diversions and groundwater pumping had reached intolerable levels, as had the level of upstream states' intransigence; together, these convinced downstream states to abandon the diplomatic means of resolving interstate differences through their respective compact administrations and to become plaintiffs instead.¹²⁷ In 1974, Texas filed against New Mexico over the Pecos River Compact.¹²⁸ In 1985, Kansas filed against Colorado over the Arkansas River Compact.¹²⁹ In 1998, Kansas filed a separate suit against Nebraska over the Republican River Compact;¹³⁰ and in 2010, it filed again, to

in the Pecos River Compact).

123. See, e.g., *Texas v. New Mexico*, 462 U.S. 554, 557-61 (1983) (reversing the Special Master's recommendation to reform the Pecos River Commission by adding a third-party, tie-breaking vote).

124. See generally *South Carolina v. North Carolina*, 558 U.S. 256 (2010) (allowing intervention by non-state parties).

125. *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1059-64 (2015) (approving, by a 5-4 decision, the Special Master's recommendation to modify the accounting procedures in the Final Settlement Stipulation of 2002-2003, despite its non-severability provision). The dissent strongly critiqued this extension of the Court's equitable power. See *id.* at 1071-74 (Thomas, J., dissenting); see also *infra* note 250.

126. In *Arizona v. California*, California extended the trial for as long as its lawyers could manage; "it had a vested interest in delay, since each year of irresolution meant 300 billion more gallons [or about 921,000 acre-feet] of water for the state." REISNER, *supra* note 4, at 261. In *Kansas v. Nebraska & Colorado*, Nebraska continued to increase its number of wells in the Republican River Basin even after Kansas had filed its motion for leave to file a petition in 1998. See *Kansas v. Nebraska & Colorado*, Final Report with Certificate, 2003, *supra* note 99.

127. See *Texas v. New Mexico*, 462 U.S. 554, 562 (1983) (where compact commission failed to resolve dispute, forcing Texas to become a plaintiff to force New Mexico to honor the compact). Interstate water compacts typically establish a compact administration to effect the terms of the compact. See, e.g., *Arkansas River Compact*, art. VIII, ch. 155, 63 Stat. 145 (1949). See, e.g., *Texas v. New Mexico*, 462 U.S. at 561.

128. *Texas v. New Mexico*, 462 U.S. at 562. The Court granted Texas's motion for leave to file a bill of complaint in 1975. *Texas v. New Mexico*, 421 U.S. 927, 927 (1975).

129. *Kansas v. Colorado*, 543 U.S. 86, 90-91 (2004). Kansas alleged that groundwater "development" in Colorado, in particular increases in ground water consumption through new and existing wells, had "materially depleted" the water otherwise available "for use" by Kansas's "water users." *Id.* at 91. The terms in quotation marks originate in Article IV-D of the Arkansas River Compact, which requires that the "the waters of the Arkansas River . . . shall not be materially depleted in usable quantity or availability for use to the water users in Colorado and Kansas under this Compact by such future development . . ." *Arkansas River Compact*, art. IV-D, ch. 155, 63 Stat. 145 (1949).

130. Motion for Leave to File Bill of Complaint, Bill of Complaint, and Brief in Support of Motion for Leave to File Bill of Complaint, at 4, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (May 1998), 1998 WL 35862312. Kansas's motion for leave was granted in 1999. *Kansas v.*

enforce the same compact.¹³¹ Across this litigation, tendencies and patterns from the pre-compact era of interstate water litigation resurfaced, such as the taking of aggressive (and starkly opposed) legal and technical positions. This time, however, the Court focused its energies on interpreting and applying the compacts to groundwater, and directed its equitable powers to ensuring that these compacts would still bind the states in the turbulent wake of the groundwater revolution.

A. THE IMPORTANCE OF HISTORICAL ANALYSIS IN COMPACT INTERPRETATION

First, there is the threshold matter of compact interpretation. Because a compact is both a contract and a federal statute, the principles of contract law and statutory interpretation typically intermingle in interstate litigation.¹³² The Court presumes that interstate compacts are “the subject of careful consideration before they are entered into, and are drawn by persons competent to express their meaning and to choose apt words in which to embody the purposes of the high contracting parties.”¹³³ If the text of a compact is unambiguous within its historical context, the text is conclusive.¹³⁴ If the text is ambiguous, then it is appropriate for the Court to examine extrinsic evidence of the negotiation history of the compact and its legislative history.¹³⁵ Yet all interstate compacts are ambiguous because they result from intense and iterative negotiations.¹³⁶ More importantly, because most interstate compacts were enacted before groundwater came to dominate irrigation across the West, interstate groundwater litigation required the Court to resolve competing historical interpretations of the compacts under its review.

Across the different allocation formulas set forth in the Pecos, Arkansas, and Republican River Compacts, the most important issue in all three cases was “the extent to which the compact’s water apportionment restrict[ed] groundwater pumping.”¹³⁷ Unsurprisingly, the states took strongly divergent positions on this common issue. But over nine decades after the diametrically opposed legal positions set forth in *Kansas v. Colorado*—which today are as obsolete as the hydrological theories upon which they partially depended—the breadth of that divergence is nonetheless striking.¹³⁸ The first round of litigation in *Kansas v. Nebraska & Colorado* provides one such example. The Republican River

Nebraska & Colorado, 525 U.S. 1101, 1101 (1999).

131. Motion for Leave to File Petition, Petition, and Brief in Support, at 4, 9, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (May 2010), 2010 WL 10807806 [hereinafter 2010 Kansas Motion for Leave]. Kansas’s motion for leave to file a petition was granted in 2011. *Kansas v. Nebraska & Colorado*, 563 U.S. 915, 915 (2011).

132. See, e.g., *Texas v. New Mexico*, 462 U.S. at 564 (citing *Cuyler v. Adams*, 449 U.S. 433, 438 (1981)).

133. *New Jersey v. Delaware*, 552 U.S. 597, 615–16 (2008) (quoting *Rocca v. Thompson*, 223 U.S. 317, 332 (1912)).

134. *Kansas v. Colorado*, 514 U.S. 673, 690 (1995); see also *Connecticut Nat’l Bank v. Germain*, 503 U.S. 249, 253–254 (1992) (stating the cardinal rule in interpreting statutes is that unambiguous wording is conclusive).

135. *Oklahoma v. New Mexico*, 501 U.S. 221, 235, n.5 (1991).

136. See Meyers, *supra* note 9.

137. *Kansas v. Nebraska & Colorado*, 2000 Report, *supra* note 101, at 37.

138. See *supra* sources and text accompanying notes 46–55.

Compact refers neither to “surface water” nor to “groundwater,” but rather allocates the “virgin water supply,” which the compact defines as “the water supply within the Basin undepleted by the activities of man.”¹³⁹ In its petition, Kansas alleged that Nebraska’s thousands of wells in the Republican River Basin, together with its failure to protect surface flows, had caused Nebraska to appropriate far more of the “virgin water supply” of the basin than the Republican River Compact allocated to Nebraska.¹⁴⁰ Kansas’s position was anchored in the compact, but it accorded nicely with Kansas’s own water code, which had extended the prior appropriation doctrine to both surface and groundwater and placed both supplies under the centralized jurisdiction of the state’s Chief Engineer soon after the enactment of the compact in 1943.¹⁴¹ In response, Nebraska took the position that the compact did not restrict groundwater pumping at all, because it never mentions groundwater—a position generally consistent with Nebraska’s reasonable use doctrine and its delegation of groundwater regulation to NRDs.¹⁴² Further, Nebraska accused Kansas of the opposite extreme, of claiming millions of acre-feet of High Plains-Ogallala Aquifer groundwater supplies that were clearly not hydrologically connected to the waters of the basin (even though Kansas never actually made this claim).¹⁴³ For its part, Colorado was most concerned about the Ogallala, and dedicated its efforts to the proposition that the compact did not allocate Ogallala groundwater but only alluvial groundwater.¹⁴⁴ This proposition accorded well with Colorado water law, which during the 1960s had established a fundamental statutory distinction between tributary and non-tributary groundwater.¹⁴⁵

These positions took the old wine of pre-compact arguments—bold and mutually incompatible assertions of the states’ sovereign control of water supplies within their boundaries, in accordance with their respective water law codes—and decanted them into new but similarly incompatible vessels of compact interpretation.¹⁴⁶ They also took place during the same decade in which the United States was making similarly bold claims to unappropriated water supplies for federal lands in the West.¹⁴⁷ These claims and the arguments supporting them were analogous to those put forth by Reclamation earlier in the

139. Republican River Compact, art. II, ch. 104, 57 Stat. 86 (1943).

140. *Kansas v. Nebraska & Colorado*, 2000 Report, *supra* note 101, at 18.

141. *See supra* text accompanying notes 72–76.

142. *Kansas v. Nebraska & Colorado*, 2000 Report, *supra* note 101, at 21.

143. *Id.* at 22.

144. *Id.* at 41–44.

145. *See* Water Right Determination and Administration Act of 1969, COLO. REV. STAT. §§ 37-92-101–37-92-602 (2016) (establishing the statutory regime for tributary groundwater, which qualifies as “waters of the state” under COLO. CONST. art. XVI, §§ 5–6 and is therefore subject to the doctrine of prior appropriation and its attendant protections); Colorado Ground Water Management Act of 1965, COLO. REV. STAT. §§ 37-90-101–37-90-143 (2016) (establishing the statutory regime for designated groundwater, which does not so qualify, and is governed by a less stringent version of the doctrine).

146. *See supra* text accompanying notes 46–54.

147. In 1979, Solicitor Leo Krulitz of the Department of the Interior issued a legal opinion asserting that, in the absence of an explicit congressional directive to the contrary, a federal agency may claim and use whatever unappropriated water is necessary to carry out congressionally authorized management programs for federal lands, without regard to state law. Dept. of Interior Solicitor’s Opinion No. M-36914, “Federal Water Rights of the National Park Service, Bureau of Reclamation and the Bureau of Land Management,” 86 I.D. 553 (1979). This opinion, which

twentieth century, most notably in *Kansas v. Colorado* and *Nebraska v. Wyoming*.¹⁴⁸

Whereas those earlier cases had wrestled with fundamental problems of equitable allocation absent an interstate compact, the later cases placed a premium on historical analysis, to uncover the states' original positions regarding how groundwater affected the equitable apportionments set forth in the compacts themselves.¹⁴⁹ In resolving these disparate claims about the intent of the compacting states, the Special Masters considered extensive documentation amassed and organized by historians and other experts specializing in water law.¹⁵⁰ To buttress New Mexico's defense in *Texas v. New Mexico*, State Engineer Steve Reynolds hired G. Emlen Hall, a water lawyer with expertise in the history of nineteenth-century Spanish and Mexican water law, as well as a command of the engineering archives of the Pecos River Commission.¹⁵¹ Hall's work served to explain New Mexico's position regarding the state of the Pecos River at the time the compact was negotiated—the now-infamous “1947 Condition,” the compact term around which much of that litigation revolved.¹⁵² In *Kansas v. Colorado*, the states held “disparate views on the intent and meaning” of the Arkansas River Compact, ruling out an agreed statement of facts in the case.¹⁵³ To support its interpretation of that document, the Kansas litigation team hired Dr. Douglas R. Littlefield to compile an extensive two-volume history of the compact, based on hundreds of thousands of pages of sources from archives across the United States.¹⁵⁴ In reviewing that history and the twelve days of Dr. Littlefield's cross-examination by Colorado, Special Master Arthur L. Littleworth found that “the accuracy and thoroughness of his historical presentation

became known as the federal non-reserved water rights theory, provoked a firestorm of criticism by western states and considerable critical scholarly comment; it was soon restricted in January 1981 by Krulitz's successor, Solicitor Clyde O. Martz. Dept. of Interior Solicitor's Opinion No. M-36914 (Supp.), “Supplement to Solicitor Opinion No. M-36914, on Federal Rights of the National Park Service, Fish and Wildlife Service, Bureau of Reclamation and Bureau of Land Management,” 88 I.D. 253 (1981). Solicitor William H. Coldiron repudiated the federal non-reserved water rights theory in September of that year. Dept. of Interior Solicitor's Opinion M-36914 (Supp. I), “Non-Reserved Water Rights—United States Compliance with State Law,” (Sept. 11, 1981). In 1982, the Office of Legal Counsel concluded that the federal non-reserved water rights theory “does not have a sound legal or constitutional basis and does not provide an appropriate legal basis for assertion of water rights by federal agencies.” Theodore B. Olson, Assistant Attorney General, Office of Legal Counsel, Federal “Non-Reserved” Water Rights, Memorandum for the Assistant Attorney General, Land and Natural Resources Division 328, 383 (June 16, 1982) [hereinafter Olson Memorandum]. For the arguments of Reclamation decades before, see *supra* text accompanying notes 51–68.

148. Olson Memorandum, *supra* note 147, at 363, n.80 (recognizing the Krulitz Opinion as analogous to that put forth by the United States in *Nebraska v. Wyoming*, 325 U.S. 589, 615 (1945)). The United States had made the same claim decades before in *Kansas v. Colorado*; see *supra* note 51.

149. See *supra* text accompanying notes 135–36.

150. Perhaps the most luminary legal expert in an interstate compact case was the late Professor Joseph L. Sax, who submitted an expert report concerning riparian jurisdiction on behalf of the State of Delaware in *New Jersey v. Delaware*, 552 U.S. 597, 610–11 (2008). Delaware was the prevailing party in that case. *Id.* at 609.

151. HALL, *supra* note 113, at 132–33.

152. *Id.*; *Texas v. New Mexico*, 482 U.S. 124, 126 (1987).

153. *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 27.

154. *Id.* at 71–72.

generally hold up well.”¹⁵⁵ In *Kansas v. Nebraska & Colorado*, Kansas again hired Dr. Littlefield to assemble the documentary history of the Republican River Compact, to support Kansas’s claim that the compact incorporated groundwater.¹⁵⁶ Largely as a consequence of these efforts, in all three cases, the Special Masters and the Court found that the compacts at issue “included the effects of groundwater pumping despite the absence [in the compact] of the term ‘groundwater.’”¹⁵⁷ As Special Master McKusick wrote, “neither the parties to the [Republican River] Compact, nor the Congress and the President who approved it, could have intended that an upstream State could, with impunity, unilaterally enlarge its allocation by taking some of the virgin water supply before it reached the stream flow.”¹⁵⁸

Recovering the intended place of groundwater within interstate compacts that predate the groundwater revolution has likewise figured prominently in two pending cases before the Court. The first, *Montana v. Wyoming & North Dakota*, concerns Wyoming’s violations of the Yellowstone River Compact, a compact enacted in 1951.¹⁵⁹ Besides its allegations of compact violations related to increased surface use and reservoir storage in Wyoming, Montana alleged that Wyoming had also violated the compact by allowing groundwater development for irrigation and other uses, and by allowing the pumping of groundwater associated with coal-bed methane production in two tributary basins, the Tongue and Powder River Basins.¹⁶⁰ Wyoming took the position that the compact governed surface water but not groundwater, based on the fact that the compact never uses the term “groundwater”—just as Nebraska had argued regarding the Republican River Compact in *Kansas v. Nebraska & Colorado*.¹⁶¹ In line with that position, Wyoming suggested that Montana could request Wyoming (and North Dakota) to renegotiate the compact, or bring an equitable apportionment action in the Court to apportion groundwater.¹⁶²

Wyoming’s arguments gained little traction with Special Master Barton H. Thompson, Jr., a professor of law at Stanford and an expert in water law.¹⁶³ He first noted the decisions in the Arkansas and Republican River cases, in which the Court had found that those compacts regulate groundwater pumping even though they never use the word “groundwater.”¹⁶⁴ He then examined the text of the Yellowstone River Compact, and found that its language was “sufficiently broad and inclusive to encompass at least some forms of groundwater that are hydrologically connected to the surface waters of the Powder and Tongue

155. *Id.* at 72–73. Colorado offered no historian in opposition. *Id.* at 73.

156. *Kansas v. Nebraska & Colorado*, 2000 Report, *supra* note 101, at 23–24, 26, n. 17. Dr. Littlefield is also an expert on the Rio Grande: see LITTLEFIELD, *supra* note 4.

157. *Kansas v. Nebraska & Colorado*, 2000 Report, *supra* note 101, at 37.

158. *Id.* at 21.

159. Yellowstone River Compact, Pub. L. No. 82-231, 65 Stat. 663 (1951). The Court granted Montana’s motion for leave to file its complaint in 2008. *Montana v. Wyoming & North Dakota*, 552 U.S. 1175 (2008).

160. *Montana v. Wyoming & North Dakota*, 2010 First Interim Report, *supra* note 82, at 12, 43.

161. *Id.* at 43; see *supra* text accompanying note 142.

162. *Montana v. Wyoming & North Dakota*, 2010 First Interim Report, *supra* note 82, at 53.

163. BARTON H. THOMPSON, JR., JOHN D. LESHY, & ROBERT H. ABRAMS, *LEGAL CONTROL OF WATER RESOURCES: CASES AND MATERIALS* (5th ed. 2012).

164. *Montana v. Wyoming & North Dakota*, 2010 First Interim Report, *supra* note 82, at 43.

Rivers.”¹⁶⁵ In support of this finding, Special Master Thompson provided a brief but effective review of the historical context of western water law during the five decades leading up to the enactment of the Yellowstone River Compact.¹⁶⁶ The Court has long recognized (since *Kansas v. Colorado* in 1907) that groundwater that is hydrologically interconnected with a surface stream should “in at least some instances” be treated as part of that stream.¹⁶⁷ The Court has likewise construed western water law to prohibit the interception and collection of “groundwater that otherwise would have flowed to surface appropriators.”¹⁶⁸ Contemporary water law scholars recognized that groundwater was an important component of a surface water course,¹⁶⁹ as did the Montana Supreme Court.¹⁷⁰ Amendments to the water codes of both Montana and Wyoming enacted after the groundwater revolution had begun in earnest—for Wyoming in 1947 and 1957, and for Montana in 1973—formalized the legal integration of hydrologically interconnected groundwater and surface water.¹⁷¹ Having reviewed the language of the Yellowstone River Compact within the historical context of its negotiations and contemporary western water law and practice, Special Master Thompson reached a carefully wrought conclusion: the compact protected Montana’s pre-1950 uses from interference by at least some forms of groundwater pumping within the basin from after 1950, where that groundwater is hydrologically interconnected to the surface channels of the Yellowstone River and its tributaries.¹⁷² This interference potentially included the pumping of groundwater associated with coal-bed methane production; but a determination of “exactly what groundwater is covered or the exact circumstances under which groundwater pumping” violates the compact required subsequent briefing and fact-finding.¹⁷³ Neither Montana nor Wyoming took an exception to this conclusion.¹⁷⁴

The historical context of the Yellowstone River Compact and the history of

165. *Id.* at 44.

166. *Id.* at 45–53.

167. *Id.* at 47 (citing *Kansas v. Colorado*, 206 U.S. 46, 114–115 (1907)); see *supra* note 55.

168. *Id.* at 48 (citing *Snake Creek Mining & Tunnel Co.*, 260 U.S. 596, 606 (1923), which construed Utah law). Special Master McKusick relied upon the same case. *Kansas v. Nebraska & Colorado*, 2000 Report, *supra* note 101, at 23.

169. *Id.* at 48–49 (discussing, among others, Wiel, *supra* notes 32 and 90).

170. *Id.* at 49 (citing *Smith v. Duff*, 102 P. 984, 986 (Mont. 1909) and *Ryan v. Quinlan*, 124 P. 512 (Mont. 1912)).

171. *Id.* at 49–50 (internal citations omitted).

172. *Id.* at 53–54, 90. The year 1950 plays a central role in the Yellowstone River Compact: Article V(A) provides that appropriative rights to the waters of the Yellowstone River system existing as of January 1, 1950 “shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.” *Yellowstone River Compact*, Pub. L. No. 82-231, 65 Stat. 663 (1951).

173. *Id.* at 53–54, 90; for Special Master Thompson’s resolution of this issue, see *infra* text accompanying notes 264–75.

174. Second Interim Report of Barton H. Thompson, Jr., Special Master, Liability Issues, at 25, *Montana v. Wyoming & North Dakota*, No. 137 Orig. (Dec. 29, 2014) [hereinafter *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report]. In *Montana v. Wyoming & North Dakota*, 563 U.S. 368 (2011), the Court affirmed Special Master Thompson’s First Interim Report (*supra* note 82), against Montana’s exception, holding that the Yellowstone River Compact permitted Wyoming to approve more efficient surface-water irrigation systems so long as the water conserved by those efficiency gains was applied to the same acreage irrigated in 1950.

its administration returned as litigated matters during the second phase of *Montana v. Wyoming & North Dakota*, which dealt with liability issues.¹⁷⁵ Dr. Littlefield, the historian and veteran expert witness from the Arkansas and Republican River cases,¹⁷⁶ reappeared in the service of Montana; Wyoming sought to exclude his testimony, provoking motion pleading on the admissibility and scope of his expert testimony.¹⁷⁷ Special Master Thompson admitted Dr. Littlefield's report, but limited his testimony to intrastate procedures required under the compact.¹⁷⁸ In determining Wyoming's liability for its compact violations, Special Master Thompson relied upon other witnesses, who provided testimony regarding the shortages Montana had suffered for storage and direct-flow rights.¹⁷⁹

The second case pending before the Court, *Texas v. New Mexico & Colorado*, concerns New Mexico's alleged noncompliance with the Rio Grande Compact.¹⁸⁰ As a lawyer for New Mexico remarked, "people have been fighting over this river for about 400 years and there's a lot of information to be imparted."¹⁸¹ Texas alleges that New Mexico has violated the compact by authorizing the diversion of surface water and hydrologically connected groundwater downstream of Elephant Butte Reservoir in the long reach between the reservoir and the Rio Grande Project, a Reclamation project predating the compact and with lands in both New Mexico and Texas.¹⁸² Texas contends that these diversions violate the compact because once New Mexico delivers water to the reservoir as required by the compact, it belongs exclusively to the beneficiaries of the Rio Grande Project, and is thus legally unavailable for any intermediate diversions within New Mexico.¹⁸³ According to Texas, these intercepting diversions of water below the reservoir have deprived Texas of tens of thousands of

175. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at 31-32.

176. See *supra* text accompanying notes 154-56.

177. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at App. I, I-27 to I-29, I-32, I-34, I-35 (docket sheet).

178. *Id.* at 32.

179. *Id.* at 99-200.

180. The Court granted Texas's motion for leave to file its complaint in 2014. *Texas v. New Mexico & Colorado*, 134 S. Ct. 1050 (2014); First Interim Report of A. Gregory Grimsal, Special Master, at 2-3, *Texas v. New Mexico & Colorado*, No. 141 Orig. (Feb. 9, 2017) [hereinafter *Texas v. New Mexico & Colorado*, 2017 First Interim Report]. For the cases that precipitated this original action, see *New Mexico v. Elephant Butte Irrigation Dist.*, CV-96-888 (N.M. 3d Jud. Dist., filed Sept. 24, 1996) (adjudication determining the rights to the water of the Rio Grande between Elephant Butte Reservoir and New Mexico-Texas state line); *New Mexico v. United States*, 2013 WL 1657355 (D. New Mex., 2013) (suit by New Mexico against Reclamation, alleging that it is improperly operating the Rio Grande Project).

181. *Texas v. New Mexico & Colorado*, 2017 First Interim Report, *supra* note 180, at 31 (internal citations omitted). The Rio Grande Compact has been the subject of two earlier cases, *Texas v. New Mexico & Colorado*, 342 U.S. 874 (1951), and *Texas v. Colorado*, 389 U.S. 1000 (1967).

182. *Texas v. New Mexico & Colorado*, 2017 First Interim Report, *supra* note 180, at 4-5, 92-116. The Rio Grande Project was established by Congress in 1905. *Id.* at 99-101 (internal citations omitted). The states had agreed to an interim compact in 1930, Act of June 17, 1930, ch. 506, 46 Stat. 467, largely to protect the Rio Grande Project, *id.* at art. XII, 46 Stat. 772. In 1935, the states extended the interim compact to 1937, Act of June 5, 1935, ch. 177, 49 Stat. 325. Congress approved the permanent compact in 1939. Rio Grande Compact, ch. 155, 53 Stat. 785 (1939).

183. *Texas v. New Mexico & Colorado*, 2017 First Interim Report, *supra* note 180, at 5. The

acre-feet annually.¹⁸⁴ The United States successfully intervened in the case to protect its interests in the Rio Grande Project.¹⁸⁵

New Mexico responded with a full-throated defense of its sovereign power to regulate water within the state. While New Mexico accepts that the compact does require it to deliver the requisite amount of water to Elephant Butte Reservoir, New Mexico asserts that the compact imposes no obligations upon New Mexico to limit post-compact development within New Mexico to ensure that deliveries to the Rio Grande Project arrive at the New Mexico-Texas state line.¹⁸⁶ According to this interpretation, New Mexico may intercept and divert water between the reservoir and the Texas border “because that water—and indeed, the entire administration of the Rio Grande Project within New Mexico—is governed by New Mexico state water law.”¹⁸⁷

The case once again highlights the aggressive legal positions that have become hallmarks of interstate water litigation in both its pre-compact and post-compact periods. Texas demands that the Rio Grande be allowed “to flow unimpeded” by any diversions between Elephant Butte Reservoir and Rio Grande Project lands, as Kansas similarly demanded of the Arkansas River in its original lawsuit against Colorado.¹⁸⁸ New Mexico has responded by asserting that its sovereignty and the primacy of its own state water law should determine interstate water distribution,¹⁸⁹ as Colorado responded to Kansas’s claims over a century ago,¹⁹⁰ and as Nebraska asserted in 1998-2000 regarding groundwater hydrologically connected to the Republican River.¹⁹¹ And in defense of Reclamation interests, the United States has made forceful claims against the upstream state’s sovereign control of its waters,¹⁹² as it did for unappropriated water supplies during both the pre-compact and post-compact periods.¹⁹³ This time, however, the water supplies have been appropriated within both New Mexico and Texas by the Rio Grande Project, which explains the United States’ intervention in the case.¹⁹⁴

The signal difference between these periods is, of course, the existence of interstate compacts. New Mexico’s claims do not rest upon some bald reassertion of the Harmon Doctrine.¹⁹⁵ Rather, New Mexico relies upon an aggressive

Rio Grande Compact contains explicit reference to the Rio Grande Project. Rio Grande Compact, art. 1.k, ch. 155, 53 Stat. 786 (1939).

184. Texas v. New Mexico, & Colorado 2017 First Interim Report, *supra* note 180, at 5.

185. Texas v. New Mexico & Colorado, 134 S. Ct. 1783 (2014); Texas v. New Mexico & Colorado, 2017 First Interim Report, *supra* note 180, at 2-3.

186. Texas v. New Mexico & Colorado, 2017 First Interim Report, *supra* note 180, at 7.

187. *Id.* at 211.

188. *Id.* at 5; for Kansas’s position in the 1902-1907 litigation over the Arkansas River, see *supra* text accompanying note 46.

189. Texas v. New Mexico & Colorado, 2017 First Interim Report, *supra* note 180, at 7, 211.

190. See *supra* text accompanying notes 48-49.

191. See *supra* text accompanying notes 142-43.

192. Texas v. New Mexico & Colorado, 2017 First Interim Report, *supra* note 180, at 6.

193. See *supra* note 16 and text accompanying notes 51, 68, and 147. The United States made a similar claim in 1906 to all the unappropriated waters of the Rio Grande, for the Rio Grande Project. Texas v. New Mexico & Colorado, 2017 First Interim Report, *supra* note 180, at 104-06 (internal citations omitted).

194. Texas v. New Mexico & Colorado, 2017 First Interim Report, *supra* note 180, at 6.

195. See *supra* text accompanying notes 49 and 65.

interpretation of the Rio Grande Compact, one which argues that in approving the compact, New Mexico limited its state sovereignty only by agreeing to deliver water to Elephant Butte Reservoir; any further concession would constitute a relinquishment of its sovereignty and a disavowal of the Court's longstanding recognition of the primacy of state water law under the Reclamation Act.¹⁹⁶ Special Master A. Gregory Grimsal disagreed: the "unambiguous text and structure" of the Rio Grande Compact were sufficient to require New Mexico to relinquish control of Rio Grande Project water permanently once it delivers water to Elephant Butte Reservoir,¹⁹⁷ because the compact "integrates the Rio Grande Project wholly and completely," thereby protecting both deliveries to and releases from the reservoir for project purposes.¹⁹⁸

Perhaps more importantly, Special Master Grimsal conducted an independent investigation of the long history of the Rio Grande and the legal-historical context of the Rio Grande Compact negotiations to bear upon his interpretation of the compact. As he stressed at the beginning of his report, "the meaning and scope' of the 1938 Compact 'can be better understood when [the Compact] is set against its background.'"¹⁹⁹ He devoted over half of his nearly three-hundred-page report to reconstituting the historical context of the river's development, starting with the Treaty of Guadalupe Hidalgo (1849) and its creation of the International Boundary Commission, proceeding to the development of the Rio Grande Project, and concluding with the decade of negotiations which culminated in the 1938 compact itself.²⁰⁰ In discrediting New Mexico's claim to have the right to recapture waters downstream from Elephant Butte Reservoir, Special Master Grimsal emphasized the historical evidence surrounding the compact: "the purpose and history of the 1938 Compact confirm the reading that the signatory states intended to use the Rio Grande Project to guarantee delivery of Texas's . . . equitable apportionment of the stream, thereby supporting the finding that Texas has, in fact, stated a claim under the 1938 Compact."²⁰¹ Five decades of historical evidence—most notably of the records of the Rio Grande Project, of the interim compacts and compact commission meetings, and correspondence contemporary with the ratification of the Rio Grande Compact, all contained in a DVD attached to the Report—supported one emphatic conclusion: "it is unfathomable to accept that Texas would 'trade away its right to the Court's equitable apportionment,' . . . had it contemplated then that New Mexico would be able to disown its obligations under the 1938 Compact and simply recapture water it delivered to the Project, destined for Texas, upon its immediate release from the Reservoir."²⁰² Special Master Grimsal further found that the long history of the Court's application of the doctrine of equitable apportionment—anchored most firmly in both *Hinderlider's* affirmation of the interstate compact mechanism and the Court's own

196. *Texas v. New Mexico & Colorado*, 2017 First Interim Report, *supra* note 180, at 211, 215-16 (internal citations omitted).

197. *Id.* at 194, 195.

198. *Id.* at 198.

199. *Id.* at 8 (quoting *Arizona v. California*, 373 U.S. 546, 552 (1963)).

200. *Id.* at 31-187.

201. *Id.* at 204 (internal citations omitted).

202. *Id.* at 209 (quoting *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1052 (2015)). For the index of material contained in the DVD, see *id.* at vii-xiii.

equitable apportionment decrees—also prohibits New Mexico from intercepting and recapturing Rio Grande Project water after its release from Elephant Butte Reservoir. Acting upon Special Master Grimsal's recommendation, the Court denied New Mexico's motion to dismiss in October, 2017.²⁰³

Special Master Grimsal's report in *Texas v. New Mexico & Colorado* raises an interesting evidentiary issue: should the Court allow his extensive but independent historical investigation to support his recommendations—and thus become the law of the case—without providing the parties to that litigation an opportunity to analyze and challenge his investigation? As set forth above, *Texas v. New Mexico*, *Kansas v. Colorado*, *Kansas v. Nebraska & Colorado*, and *Montana v. Wyoming & North Dakota* all involved extensive historical analyses produced by the party states, which Special Masters and the Court evaluated in reaching their conclusions regarding the appropriate historical meaning and context of the compacts under review.²⁰⁴ The issue has divided the parties to the Rio Grande litigation. Colorado and New Mexico contend that Special Master Grimsal's historical investigations and conclusions, to the extent they support his recommendations, should not be allowed to become the law of the case.²⁰⁵ Going further, amicus briefs filed in support of New Mexico's exceptions have set forth additional historical materials.²⁰⁶ The United States disagrees, arguing instead that the pleadings are sufficient to support Special Master Grimsal's recommendation to deny New Mexico's motion to dismiss, without reliance on his independent investigation of the compact's history and historical context.²⁰⁷ Nonetheless, all parties to the litigation agree that further proceedings should provide for the parties to analyze and supplement the historical conclusions of Special Master Grimsal.²⁰⁸ The authoritative nature of his historical findings thus remains an open issue.

Taken as a whole, the historical analyses and conclusions contained in these reports and decisions are notable for several reasons. First and most importantly, they firmly incorporated groundwater into compacts that had been negotiated and enacted decades before large-scale groundwater pumping greatly expanded water usage across their respective basins. There is a second and less

203. *Id.* at 210–17. Indeed, Special Master Grimsal cited *Nebraska v. Wyoming*, 515 U.S. 1, 16–18 (1995) to emphasize that “this is not the only instance where equitable apportionment is premised upon the operation of a federal reclamation project and its distribution of water pursuant to [a Reclamation] contract, as the Court has recognized.” *Id.* at 213, n. 54. *Texas v. New Mexico & Colorado*, — S. Ct. —, 2017 WL 4506765 (Oct. 10, 2017) (denying New Mexico's motion to dismiss).

204. See *supra* text accompanying notes 150–78.

205. *Texas v. New Mexico & Colorado*, State of Colorado's Exceptions to the First Interim Report of the Special Master 9–12 (June 9, 2017); *Texas v. New Mexico & Colorado*, State of New Mexico's Exceptions to the First Interim Report of the Special Master 49–55 (June 9, 2017) (both generally requesting the Court to abstain from adopting the historical judgments of Special Master Grimsal as the law of the case).

206. *Texas v. New Mexico & Colorado*, Brief Amicus Curiae of City of Las Cruces, New Mexico 21–29 (June 9, 2017); *Texas v. New Mexico & Colorado*, Brief Amicus Curiae of New Mexico Pecan Growers 8–16 (June 9, 2017).

207. *Texas v. New Mexico & Colorado*, Reply Brief for the United States 21–23 (July 28, 2017).

208. *Id.* at 23. The Court's 2017 order denying New Mexico's motion to dismiss did not address this issue and did not set it for oral argument. *Texas v. New Mexico & Colorado*, — S. Ct. —, 2017 WL 4506765 (Oct. 10, 2017).

obvious aspect to these reports and decisions: they firmly and consistently refused to allow the states' aggressive litigation positions—and their state-law doctrinal supports—to stand. In *Kansas v. Nebraska & Colorado*, Special Master McKusick deftly displaced these to the periphery, largely ignoring the states' legal and jurisdictional categories of groundwater and focusing instead on the actual effects of groundwater pumping on compacted river systems.²⁰⁹ In *Montana v. Wyoming & North Dakota*, Special Master Thompson provided an authoritative analysis grounded in both the record and his own expertise in western water law to deny (albeit with professorial precision) Wyoming's claim that the Yellowstone River Compact excluded groundwater.²¹⁰ In the Rio Grande litigation, Special Master Grimsal deployed the river's voluminous history to discredit New Mexico's claim of sovereign jurisdiction over flows whose diversion and use were governed by the Rio Grande Compact and its integration of the Rio Grande Project.²¹¹ Such practical restraint resembled the Court's earlier refusals to adopt litigant states' aggressive pre-compact positions.²¹² Finally, the Court's integration of hydrologically connected groundwater into interstate compacts has consistently reaffirmed the enforceability of the compact mechanism as first established in *Hinderlider*, but within a waterscape unimaginable in 1938—one dominated by groundwater pumping on a basin-wide scale.²¹³ In light of these decisions, it seems clear that states that seek to exclude groundwater from interstate compacts are tilting at windmills.

B. THE CENTRAL ROLE OF HYDROLOGIC MODELING

All interstate water litigation relies heavily upon experts: their expert reports, their testimony, and their performance under cross-examination. In a typical scenario, water resource engineers, groundwater modelers, and other groundwater experts cooperate to measure and calculate the water shortages suffered by the downstream state as a result of an upstream state's over-consumption. Next, agronomists take these water shortage calculations and compute the decrease in crop yields that result from insufficient water supplies. Agricultural economists then estimate the monetary damages, both primary and secondary, that were caused by these lower yields, typically through the use of economic models; these estimations include losses in tax revenue, as well as the time value of money (assessed as prejudgment interest).²¹⁴

Arriving at the right number for water over-consumption—upon which most subsequent expert analysis depends—is a difficult task because of the often-complex interactions between the groundwater supplies and the diverse surface

209. *Kansas v. Nebraska & Colorado*, 2000 Report, *supra* note 101, at 37.

210. *See supra* text accompanying notes 165–72.

211. *See supra* text accompanying notes 199–203.

212. *See supra* text accompanying notes 45–62.

213. *See supra* text accompanying note 77.

214. For a summary of the damages phase of *Texas v. New Mexico*, see HALL, *supra* note 113, at 193–96. For a superb presentation of economic damages in interstate water litigation, see Third Report of Arthur L. Littleworth, Special Master, at app. 1–86, *Kansas v. Colorado*, No. 105 Orig. (Aug. 31, 2000) [hereinafter *Kansas v. Colorado*, Third Report, 2000], <http://www.supremecourt.gov/SpecMastRpt/ORG105-8-2000EXB1-9.pdf>; *see also* Report of William J. Kayatta, Jr., Special Master, at 136–72, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (Nov. 15, 2013) [hereinafter *Kansas v. Nebraska & Colorado*, 2013 Report].

waters of an interstate basin, and because of how groundwater pumping affects these interactions.²¹⁵ The movement of groundwater baseflow and its effect upon surface water supplies, as well as the impact of groundwater pumping on both baseflow and surface flows, cannot be easily measured; there is no groundwater equivalent for surface gages and flumes. Rather, the dynamics of groundwater must be estimated primarily through the use of hydrologic models, whose accuracy can be evaluated according to measurable well depths and stream flows.²¹⁶ The dominant technological development in western water since 1965—high-volume groundwater irrigation—has driven the most important technological development in interstate water litigation—computer-based groundwater modeling.²¹⁷ Groundwater modeling experts perform tasks that seem mysterious to the layman. They quantify what is unseen—depletions to groundwater baseflow caused by pumping—and then calculate the impact of those depletions on the visibly absent—diminished surface flows.

As a consequence, groundwater modeling has proven to be the most difficult and contentious component of an interstate water case, both within the teams of states' respective technical experts and between the states themselves. In *Texas v. New Mexico*, the first Special Master, Jean Breitenstein, warned the engineers and other technical experts from both states that they should evaluate the impacts of groundwater pumping based on sound science, not self-interest.²¹⁸ New Mexico engineers did not heed his warning; they were soon pressuring their groundwater modelers to deliver particular results rather than to assemble a realistic model of the basin's hydrology, one that would obey the technical requirements for compliance with the Pecos River Compact.²¹⁹ Texas and New Mexico eventually agreed on a groundwater modeling approach, largely because Breitenstein's successor, Charles J. Meyers, had threatened to employ his own if the states could not agree.²²⁰

On the Arkansas River, Kansas and Colorado also faced a hydrological system daunting in its complexity. The states' groundwater modelers were tasked with modeling the basin's many features, both natural and man-made: its highly variable flows across one hundred fifty river miles; the impact of John Martin Reservoir, a large federal reservoir, and numerous large private reservoirs; transmountain flows from the western slope of Colorado; surface diversions and the

215. THOMAS C. WINTER, JUDSON W. HARVEY, O. LEHN FRANKE & WILLIAM M. ALLEY, U.S. GEOLOGICAL SURVEY CIRCULAR 1139, GROUND WATER AND SURFACE WATER: A SINGLE RESOURCE 58–60 (1998).

216. NATIONAL JUDICIAL COLLEGE & DIVIDING THE WATERS INITIATIVE, HYDROLOGIC MODELING BENCHMARK 33–39 (2011) [hereinafter BENCHMARK].

217. *Id.* at 33.

218. HALL, *supra* note 113, at 172, n.22 (citing transcripts from 1977 hearings in *Texas v. New Mexico*). In the Arkansas River litigation, Special Master Littleworth made a similar warning: "The issue should not be, however, which state might gain an advantage . . . but rather which model input is likely to produce more accurate results." Fourth Report of Arthur L. Littleworth, Special Master, at 55, *Kansas v. Colorado*, No. 105 Orig. (Oct. 2003) [hereinafter *Kansas v. Colorado*, Fourth Report, 2003].

219. HALL, *supra* note 113, at 171–73; Pecos River Compact, arts. II(g), III(a), ch. 84, 63 Stat. 159 (1949) (determining compact compliance based on the hydrological condition of the Pecos River Basin in 1947, the "1947 condition," a condition defined by a technical report of the Pecos River Compact Commission Engineering Advisory Committee).

220. HALL, *supra* note 113, at 171–73.

reuse of surface flows by twenty-three different irrigation canals in Colorado, operating under priority administration on an hourly basis; the reuse of surface flows; the consumptive use of various crops and phreatophytes; the pumping of over one thousand high-capacity wells; and the effects of fallowing land to offset pumping impacts.²²¹ “And the model is then asked,” noted Special Master Littleworth dryly, “to estimate what usable Stateline flows in the river would have been at any point in time if there had been no post-compact well pumping.”²²²

Given the opportunities for error across such a complex system, mistakes were inevitable. Nonetheless, the courtroom combat over groundwater modeling in *Kansas v. Colorado* must rank as one of the most intense, extensive, and grueling in the history of interstate litigation. Of the two hundred seventy days of trial in that case, about two hundred of them concerned controversies over groundwater modeling.²²³ Kansas based its estimates of Colorado’s compact violations on the results of outputs from Kansas’s “Hydrologic-Institutional Model,” (H-I Model), developed to estimate depletions in stateline flows from 1950 to 1985 caused by post-compact wells.²²⁴ Colorado subjected Kansas experts to withering attacks, especially its lead technical expert, Timothy J. Durbin.²²⁵ The attack took a heavy toll on Durbin and the Kansas case. Special Master Littleworth’s clinical description understates the severity of the situation by a country mile, and it is worth excerpting here.

After testifying for approximately one month, under direct and cross-examination, Mr. Durbin suffered a breakdown and was admitted to a psychiatric hospital. In the latter part of his cross-examination, it began to appear that a number of errors had been made in various Kansas exhibits, including at least one significant mistake in the coding instructions to the Kansas hydrologic-institutional model. Kansas began to file overnight revisions, sometimes more than once, to certain key conclusionary exhibits. This computer model was crucial to the Kansas case.

The trial was recessed while I attempted to find out more about Durbin’s condition and when he would be able to return. A medical report was obtained from his attending physician, and Colorado requested that I obtain a second opinion which it paid for. I kept the details of these medical reports confidential, although their general conclusions were made known to the parties. From my conversations with the two psychiatrists, and my review of their reports, I concluded that to protect Mr. Durbin’s future well-being, and ultimately the proper presentation of the Kansas case, he should not be pressured into returning. It was clear that he would not have been able to resume his trial responsibilities soon, if at all.²²⁶

221. *Kansas v. Colorado*, Fourth Report, 2003, *supra* note 218, at 109.

222. *Id.* at 109–10.

223. Correspondence with John B. Draper (Dec. 1, 2015) (notes on file with author). Mr. Draper served as Kansas’s counsel of record in the case. The liability phase of the trial lasted 141 trial days. See *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 28.

224. First Report of Arthur L. Littleworth, Special Master, at 228–36, *Kansas v. Colorado*, No. 105 Orig., vol. II (July 29, 1994) [hereinafter *Kansas v. Colorado*, 1994 Report, vol. II], http://www.supremecourt.gov/SpecMastRpt/ORG105V2_071994.pdf.

225. *Id.* at 236–40.

226. *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 28–29. Another of Kansas’s

These circumstances forced Kansas to move for a continuance, which it received, and to prepare replacement experts for a full replacement case.²²⁷ Steven P. Larson, a pioneer in the field of groundwater modeling, replaced Durbin as the state's chief modeling expert, and Kansas modified the H-I Model, partially in response to recommendations made by Colorado experts.²²⁸ The modified H-I Model produced much lower estimates of stateline depletions—nearly half as much as those which Kansas had originally alleged.²²⁹ Colorado then put forth a competing groundwater model, but eventually agreed to use the modified H-I Model, largely because its estimates of stateline depletions were generally lower than the Colorado model.²³⁰

The fight over the H-I Model did not end there; it continued for another decade. A major controversy concerned how accurately the modified H-I Model measured water consumption by crops.²³¹ The model had originally employed an estimate of potential evapotranspiration, or PET, which was based on the long-established, modified Blaney-Criddle formula, a temperature-based method of estimating seasonal crop water use.²³² Neither state advocated for the continuance of the Blaney-Criddle formula; rather, they proposed competing methods that would replace it as the model input for PET.²³³ Kansas proposed the Penman-Monteith equation, while Colorado advocated for a different reference equation, the 1982 Kimberly Penman method.²³⁴ The controversy over PET “became a major trial issue.”²³⁵ In resolving that controversy, Special Master Littleworth considered the rival methods and the information supporting their accuracy, which included weather and climate data, adjustments for aridity, irrigation management and salinity—all of which relied upon extensive expert testimony.²³⁶ The Special Master found that the PET values to be used in the modified H-I Model should be those advocated by Kansas.²³⁷

Following that fight, Colorado next challenged the fitness of the modified H-I Model for calculating compact compliance on a prospective basis, in addition to its original function, that of estimating Colorado's depletions and compact violations retrospectively.²³⁸ Special Master Littleworth found that the modified H-I Model was not adequate for the purpose of assessing compliance on an annual basis, as Kansas had sought.²³⁹ Instead, he sided with Colorado, which had proposed that the model evaluate compliance based on a ten-year rolling

chief expert witnesses, Brent E. Spronk, died unexpectedly, postponing trial for several months in 1996. See Second Report of Arthur L. Littleworth, Special Master, at 6, *Kansas v. Colorado*, No. 105 Orig. (Sept. 9, 1997) [hereinafter *Kansas v. Colorado*, Second Report, 1997].

227. *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at app. 86–95.

228. *Id.* at 29–30; *Kansas v. Colorado*, 1994 Report, vol. II, *supra* note 224, at 294–96.

229. *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 29–30.

230. *Kansas v. Colorado*, 1994 Report, vol. II, *supra* note 224, at 305; see also *Kansas v. Colorado*, Second Report, 1997, *supra* note 226, at 9–10.

231. *Kansas v. Colorado*, Fourth Report, 2003, *supra* note 218, at 53–79.

232. *Id.* at 53–54.

233. *Id.* at 54.

234. *Id.*

235. *Id.*

236. *Id.* at 55–78.

237. *Id.* at 78–79.

238. *Id.* at 95–106.

239. *Id.* at 108–09.

average—a significant victory for Colorado, which gained the flexibility afforded by ten-year compliance horizons.²⁴⁰ Ultimately, a modified version of the H-I Model emerged, convincing both the Special Master and the Court of the extent of Colorado's violations, and prescribing a path forward for future compliance.²⁴¹ The trial exposed the model's flaws, which the parties remedied and improved.²⁴² The Arkansas River Compact Administration continues to use the modified H-I Model in applying the terms of the Court's decree, and the two states have revised the model on a regular basis.²⁴³

By contrast, *Kansas v. Nebraska & Colorado* avoided litigation over groundwater modeling altogether. After Special Master McKusick ruled that the “virgin water supply” allocated by the Republican River Compact required the accounting of all groundwater depletions to streamflow caused by pumping, the Court implicitly rejected Nebraska's argument to the contrary by denying its motion to dismiss.²⁴⁴ The case then moved into its next phase: how the states would conduct discovery to construct a hydrologic model for the Republican River Basin.²⁴⁵ Undoubtedly informed by the scorched earth of *Kansas v. Colorado* (a case still active at the time Special Master McKusick made his legal ruling over groundwater in 2000), the states moved for a stay to enable mediation and negotiation regarding the joint development of a groundwater model.²⁴⁶ The stay was granted, and in less than two years, the three states succeeded in negotiating the Final Settlement Stipulation of 2002 (FSS), whose principal technical achievement is the Republican River Compact Administration Groundwater Model (RRCA Model), developed by all three states with the important assistance of the United States Geological Survey (USGS) and Reclamation.²⁴⁷ While groundwater modeling experts have criticized certain aspects of the RRCA Model,²⁴⁸ Special Master McKusick, almost certainly mindful of previous litigation, stressed the superiority of a groundwater model produced through the process of a negotiated settlement compared to one otherwise emerging

240. *Id.* at 139.

241. *Id.* at 122–24.

242. *Id.*

243. The H-I Model was revised in 2011 and 2015, by mutual agreement of the States. Agreement on H-I Model Changes to Address Increases in Irrigation Efficiency for Pumped Groundwater, *Kansas v. Colorado*, No. 105 Orig. (Sept. 2011, amended Aug. 2015), <http://www.supremecourt.gov/SpecMastRpt/2011%20Agreement%20as%20Amended%20August%202015.pdf> (last accessed Apr. 4, 2017). The BENCHBOOK authors create a false dichotomy between good and undocumented groundwater models. See *supra* BENCHBOOK, note 216, at 74–77. Just because a model is undocumented, such as the modified H-I model, which emerged from the *Kansas v. Colorado* litigation (see *supra* notes 223–37 and accompanying text), does not make it a bad model.

244. Second Report of Vincent L. McKusick, Special Master (Subject: Final Settlement Stipulation), at 36, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (Apr. 16, 2003) [hereinafter, *Kansas v. Nebraska & Colorado*, Second Report, 2003], http://www.supremecourt.gov/SpecMastRpt/ORG126_4162003.pdf; see also *Kansas v. Nebraska & Colorado*, 530 U.S. 1272 (2000) (denying Nebraska's motion to dismiss).

245. *Kansas v. Nebraska & Colorado*, Second Report, 2003, *supra* note 244, at 21–22.

246. *Id.* at 23.

247. *Kansas v. Nebraska & Colorado*, Final Report with Certificate, 2003, *supra* note 99, at 6, 10–52.

248. BENCHBOOK, *supra* note 216, at 220.

from a typical “battle of the experts.”²⁴⁹ The RRCA Model has generally succeeded as the tool by which the states measure the impacts of groundwater pumping and its effects on compliance across the basin and its sub-basins. Tellingly, when *Kansas v. Nebraska & Colorado* returned to the Court in 2010, the RRCA Model was not a subject of dispute among the states.²⁵⁰

Conflict over groundwater modeling returned to the Court in the second phase of *Montana v. Wyoming & North Dakota*.²⁵¹ Special Master Thompson had earlier found that the Yellowstone River Compact protects Montana from “at least some forms” of post-1950 groundwater pumping, “where the groundwater is hydrologically connected to the surface channels of the river and its tributaries.”²⁵² The next task was to determine whether those pumping impacts, in particular those related to coal-bed methane extraction in the Tongue River Basin, reduced stateline flows in violation of the compact.²⁵³ Wyoming had earlier argued, unsuccessfully, that the compact did not include groundwater.²⁵⁴ Wyoming now took a similarly aggressive legal and technical position: the hydrological connection between coal-bed methane-related groundwater depletions and surface flows was too tenuous to include those alleged impacts within

249. *Kansas v. Nebraska & Colorado*, Second Report, 2003, *supra* note 244, at 73–77. For a detailed description of the RRCA Model, see generally *Kansas v. Nebraska & Colorado*, Final Report with Certificate, 2003, *supra* note 99. For criticism of Special Master McKusick’s faith in cooperatively-developed groundwater models, see *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1072 (2015) (Thomas, J., dissenting) (quoting Colorado’s groundwater model expert, Dr. Willem Schreüder, for his claim that at the time the RRCA Model was constructed, he was “intellectually aware” of certain problems with it, but did not believe that “that was going to be a big deal.”).

250. The states did, however, contest some accounting procedures that computed the states’ respective allocations. See e.g., Report of Vincent L. McKusick, Final Settlement Stipulation vol. 3, at F-1 to F-3, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (Dec. 15, 2002) [hereinafter *Kansas v. Nebraska & Colorado*, FSS, 2002]. The Court accepted the Special Master’s recommendation that these procedures be modified, despite the non-severability clause of the FSS, which includes the accounting procedures. *Kansas v. Nebraska & Colorado*, 538 U.S. 720 (2003). As a consequence, the Court altered the procedures it had previously approved by decree in 2003, altering the established combination of model runs and thereby lessening Nebraska’s burden to reduce groundwater pumping. *Kansas v. Nebraska & Colorado*, 135 S. Ct. at 1059–64. Chief Justice Roberts dissented on this issue, opining “I do not believe our equitable power . . . permits us to alter the Accounting Procedures to which the States agreed.” *Id.* at 1064. He joined Justices Thomas, Scalia, and Alito in this regard, who stressed that the States did not make a mistake in the accounting procedures, and so the contract remedy of reformation was not available; indeed, the “terms of the Settlement are thus crystal clear.” *Id.* at 1071 (Thomas, J., dissenting). “If there is any mistake in this Settlement, it is not a mistake in writing, but in thinking. The parties knew what the methodology was and they expressly agreed to that methodology. They simply thought the methodology would work better than it did. Even though the methodology they agreed upon was imperfect, a writing may be reformed only to conform with the parties’ actual agreement, not to create a better one.” *Id.* at 1072. The Court’s 5-4 decision on this issue could have a chilling effect on subsequent settlement agreements, even those with explicit technical methodologies and non-severability clauses.

251. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at 200–19.

252. *Id.* at 201; see *supra* text accompanying notes 163–72.

253. *Id.* at 200–01. Montana had originally alleged broader violations related to groundwater pumping; those related to excessive pumping for both irrigation and coal-bed methane extraction occurring across both the Powder and Tongue River Basins. See *supra* text accompanying notes 160–65. By 2014, the issue had apparently narrowed to that of pumping for coal-bed methane extraction, and in the Tongue River Basin alone.

254. See *supra* text accompanying notes 161–73.

the compact.²⁵⁵ The Yellowstone River Compact emphasizes the protection of the states' respective rights to the basin according to the doctrine of prior appropriation.²⁵⁶ Wyoming argued further that both Wyoming and Montana had previously determined that the hydrological connection between coal-bed methane-related groundwater production and the appropriated surface waters within their states was also too tenuous to warrant intrastate regulation under their respective appropriation systems; therefore, the Court should not disturb those determinations.²⁵⁷

Special Master Thompson quickly disposed of these legal arguments. First, regardless of the states' respective laws related to coal-bed methane production, they had no bearing upon the ultimate question in an interstate compact case—"the meaning of the Compact and not the intrastate practices of the parties to the Compact."²⁵⁸ He then pointed out that the prior appropriation water codes of both Wyoming and Montana did provide protections to holders of surface appropriation rights against interference caused by coal-bed methane-related groundwater pumping.²⁵⁹ Therefore, the depletions caused by such pumping could violate the compact. Regardless of state water laws and the technical positions of state water officials, "this Court is the ultimate arbiter of the connection between CBM [coal-bed methane] groundwater production and surface flows for determining whether there has been a violation of the Yellowstone River Compact in this case."²⁶⁰

Montana had the twofold burden of establishing that hydrological connection and then showing that pumping related to coal-bed methane groundwater production in Wyoming had produced compact violations. As its name implies, coal-bed methane is found within the pore space of coal deposits, where hydrostatic pressure holds it in place. Producing coal-bed methane is a two-step process. First, the driller relieves that holding pressure by pumping groundwater out of the coal deposit; dewatered and depressured, the gas then migrates to fractures within the coal deposit. Next, the driller sinks production wells into the coal deposit to pump out the gas. Coal-bed methane extraction produces significant amounts of groundwater, known as produced water; this groundwater production can affect and potentially impair both nearby wells and hydrologically connected surface waters.²⁶¹ Yet as with any other use of groundwater, the relationship between pumping and surface flows is often attenuated

255. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at 204-05.

256. *Yellowstone River Compact*, Pub. L. No. 82-231, 65 Stat. 663, art. V (1951).

257. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at 205.

258. *Id.* at 206 (citing *Kansas v. Nebraska & Colorado*, 538 U.S. 720 (2003)).

259. *Id.* at 206-07 (providing citations to relevant Wyoming and Montana water law).

260. *Id.* at 208.

261. *Id.* at 200. The permitting systems of prior appropriation states vary in their approach to whether the pumping of groundwater for coal-bed methane production constitutes a beneficial use of water that requires an appropriation permit. Montana does not require an appropriation permit, because Montana does not recognize coal-bed methane production to be a beneficial use of water unless the produced water is later used for a recognized beneficial use such as irrigation. Holders of water rights impaired by dewatering wells related to coal-bed methane production thus do not have protections under Montana water law, but they can pursue compensation under the Montana Coal Bed Methane Protection Act of 2001, Mont. Code Ann. § 76-15-905(b)

in volume and in time: “the pumping of one acre-foot of water from a groundwater aquifer may reduce surface flow by only a fraction of that amount, and the effect might not appear for months or years.”²⁶² Montana had little difficulty in meeting its first burden: Wyoming generally conceded that coal-bed methane production in the Tongue River Basin of Wyoming had caused hydrological impacts upon Tongue River flows.²⁶³

That raised Montana’s second burden—that of showing, through the use of groundwater modeling, that these hydrological impacts caused Wyoming to violate the Yellowstone River Compact. In deciding this issue, Special Master Thompson refereed a fight between two groundwater modeling experts and veterans of interstate groundwater litigation: Mr. Steven P. Larson for Montana, and Dr. Willem Schreüder for Wyoming.²⁶⁴ Larson did not construct an independent groundwater model to estimate the effects of coal-bed methane groundwater production on Tongue River flows, probably because developing and refining groundwater models is an expensive enterprise. Rather, he relied upon a model that the Bureau of Land Management (BLM) had developed to assess coal-bed methane-related groundwater impacts in the nearby Powder River Basin.²⁶⁵ Employing the BLM model effectively required Montana experts to deduce estimated pumping impacts on the Tongue River based on their own professional judgment.²⁶⁶

Montana’s decision to rely upon the BLM model proved difficult to defend

(2016). *Id.* at 207 (discussing Montana law). By contrast, Wyoming requires an appropriation permit for water uses related to coalbed-methane production; but as Wyoming State Engineer Patrick Tyrrell testified in the Yellowstone case, no surface appropriator in Wyoming has ever brought an impairment complaint against the holder of one, and so the State Engineer has never needed to determine the hydrological connection between coal-bed methane dewatering wells and senior water rights or to regulate them in priority. *Id.* at 206-207 (discussing Wyoming law); *but see* William F. West Ranch, LLC v. Tyrrell, 206 P.3d 722 (Wyo. 2009) (dismissing as non-justiciable a declaratory judgment action brought by senior water rights holders against the State Engineer and Board of Control for their alleged failure to administer junior rights held by coal-bed methane operators; the court held that the plaintiffs must first pursue the administrative remedy of a well interference action). The court in *Tyrrell* did state, however, that “we do not want to leave the impression that we approve of the State’s administration of CBM water. [The plaintiffs] raise serious allegations of damages to their property from CBM water and failures on the part of the State to properly regulate CBM water statewide.” *Id.* at 737. In Colorado, ranchers with senior wells in the San Juan Basin brought an impairment action against coal-bed methane operators, alleging that dewatering constituted a beneficial use of water that required a permit from the State Engineer—and one that must be administered in deference to their senior rights. The Colorado Supreme Court agreed: because coal-bed methane operators both depend upon the hydrostatic pressure of groundwater to hold the gas in place, and then divert that water to dewater the deposit, the water used in coal-bed methane production was an integral part of the coal-bed methane extraction process—as opposed to “nuisance water,” as the operators described it—and so the court held that the operators must obtain appropriation rights. *Vance v. Wolfe*, 205 P.3d 1165, 1170-73 (Colo. 2009). Upon the issuance of that decision, the Colorado State Engineer became, at least for a time, the most important regulator of coal-bed methane production in Colorado.

262. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at 211.

263. *Id.* at 219.

264. *See supra* text accompanying notes 228 and 249.

265. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, note 174 *supra*, at 211-12.

266. *Id.* at 211-12 (citing the expert report of Dale E. Book, Montana’s primary expert witness); *id.* at 215.

at trial. Wyoming first attacked the appropriateness of the BLM model: it covered eight thousand square miles of the Powder River Basin but did not address pumping impacts on the Tongue River specifically; moreover, Wyoming argued that the BLM model suffered from limited data for observation wells, produced water amounts, and the basin's geology, making it inappropriate to calculate the local effects of coal-bed methane production on the Tongue River.²⁶⁷ Indulging in the high, uncluttered ground reserved for rebuttal experts whose client need not invest in and defend its own model, Dr. Schreüder attacked Montana's efforts to apply the BLM model to the Tongue River Basin. He testified that only a small, locally-focused area model, rather than a large regional one such as the BLM model, could calculate such impacts with credibility.²⁶⁸ Wyoming experts then undercut the assumptions Larson made concerning water consumption and groundwater recharge in the Tongue River Basin. Dr. Schreüder argued that the BLM model failed to properly estimate the effects of groundwater pumping on evapotranspiration by local phreatophytes—trees and other riparian plants that consume large amounts of shallow alluvial groundwater. Because pumping lowered the water table, it deprived local phreatophytes of water, reducing their evapotranspiration and thus potentially offsetting groundwater depletions caused by pumping; Montana's apparent inattention to this phenomenon reduced both the amount and the credibility of Montana's depletion estimates.²⁶⁹ Based on expert testimony by geologists and hydrologists for Wyoming, Special Master Thompson also found that Mr. Larson had misinterpreted data relating to how much produced water that was stored in impoundment reservoirs seeped back into the groundwater system; that misinterpretation had produced an under-estimation of groundwater recharge, and thus a commensurate over-estimation of groundwater depletions.²⁷⁰

Wyoming then turned to the more technical issue of how Larson had evaluated the accuracy of the BLM model's results as applied to the Tongue River Basin. Dr. Schreüder criticized him for failing to calibrate the BLM model to local baseflows in the Tongue River—that is, a failure to compare the model's estimated depletions with actual water levels measured at observation wells—and to adjust the model accordingly.²⁷¹ While Special Master Thompson recognized the difficulties of calibration, he nonetheless found that the lack of calibration "raised serious questions regarding the reliability of the BLM model in calculating impacts of CBM groundwater pumping on the Tongue River."²⁷² Finally, Wyoming criticized Larson for not undertaking a formal analysis of the BLM model's overall sensitivity to the various inputs and assumptions he had used in applying that model to the Tongue River Basin; without such a systematic sensitivity analysis, it was difficult to evaluate the potential impact of these inputs and assumptions, and how the model's calculations would change with different

267. *Id.* at 212–13.

268. *Id.* at 213.

269. *Id.* at 213–14. For the groundwater modeling battle over evapotranspiration in the Arkansas River Basin—a fight over crop, rather than phreatophytic, evapotranspiration—see *supra* text accompanying notes 231–37.

270. *Id.* at 215–17.

271. *Id.* at 214–15.

272. *Id.* at 215.

inputs and assumptions.²⁷³ For all of these reasons, Special Master Thompson ultimately found that Montana had failed to prove that it was injured by groundwater pumping related to coal-bed methane production in Wyoming for the years at issue.²⁷⁴ Wyoming's compact violations were limited to the overuse of surface water supplies.²⁷⁵

Montana's unsuccessful effort to use the BLM model to establish compact violations underscores some of the structural difficulties that downstream states face in proving up their case. Unless the plaintiff state invests in a groundwater model that is tailored to the specific hydrological characteristics of the basin or sub-basin at issue, it becomes vulnerable to the attacks that Wyoming successfully deployed. Yet even if Montana had invested in such a model, its defensibility would depend upon data compiled and controlled by the upstream state—data that the upstream state is unlikely to gather in the first place, or refuse to provide without compulsion, lest that data be weaponized to its own detriment.²⁷⁶ Wyoming came prepared with an explanation for its own lack of data regarding the hydrological connection between coal-bed methane-related groundwater pumping and depleted surface flows: the need for such data had not yet arisen within Wyoming itself.²⁷⁷ *Kansas v. Colorado* produced an epic fight over groundwater modeling because large-scale, long-term groundwater depletions were central to that case, but the depletions alleged in *Montana v. Wyoming & North Dakota* were miniscule by comparison.²⁷⁸ Given the relative unimportance of groundwater in the Yellowstone case, it seems probable that Montana made an informed decision to do its best with the BLM model. In response, Wyoming put forth a rebuttal worthy of an idiot-savant—and it succeeded. It led with a stubbornly uninformed denial that groundwater is part of the Yellowstone River Compact, together with a naïve suggestion to renegotiate it accordingly.²⁷⁹ It followed with an incorrect recitation of the compacting states' intrastate groundwater laws.²⁸⁰ Then—and only then, apparently—it depended upon a formidable expert witness specializing in “applied research and development activities in mathematical modeling and computational mechanics, including groundwater modeling.”²⁸¹ At bottom, Wyoming prevailed on the groundwater issue largely by skillfully leveraging its own ignorance. Without the data necessary to transpose the BLM model to the hydrological dynamics of the Tongue River Basin, calibrate it accordingly, and conduct a formal sensitivity analysis of locally-informed model inputs, Montana's efforts largely failed. There is a lesson here, and at least one downstream state has asked the Court

273. *Id.* at 218.

274. *Id.* at 219.

275. *Id.* at 231; *Montana v. Wyoming & North Dakota*, 136 S. Ct. 1034 (2016).

276. *See supra* text accompanying notes 119–22.

277. *See supra* note 261.

278. In *Kansas v. Colorado*, the Court found that over-pumping in Colorado caused 428,005 acre-feet of depletions between 1950 and 1996. *See infra* text accompanying note 299. By contrast, Montana alleged just 1,079 acre feet of depletions in the Tongue River Basin for just two years, 2004 and 2006. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at 212.

279. *See supra* text accompanying notes 161–73.

280. *See supra* text accompanying notes 257–60.

281. *Montana v. Wyoming & North Dakota*, 2014 Second Interim Report, *supra* note 174, at App. H-9 (describing Dr. Schreüder).

to learn it. In *Texas v. New Mexico & Colorado*, Kansas filed an amicus brief recommending that the Court adopt the presumption that interstate compacts cover any extraction of groundwater that reduces apportioned stream flow.²⁸²

C. COMPLIANCE THROUGH DETERRENCE: THE FORM AND MEASURE OF COMPACT DAMAGES

The goal of interstate compact water litigation is to secure a decision that motivates and if necessary compels the violating state to comply with its compact obligations. Because violating a compact can be in the rational (and political) self-interest of an upstream state, it may not always comply unless forced to do so—through the powers of the Court.²⁸³ Recall that compacts are not just contracts; they are federal statutes, equitably apportioning interstate water supplies.²⁸⁴ As a consequence, the efficient breach of an interstate compact has provided neither an excuse nor an escape for the violating state.

Indeed, perhaps the most influential legal scholar of the Law and Economics movement as applied to water, Charles J. Meyers,²⁸⁵ made that abundantly clear in his role as Special Master in *Texas v. New Mexico*.²⁸⁶ First, he recommended that Texas, the successful plaintiff state, was entitled to be repaid in water; accordingly, he recommended that New Mexico be ordered to make deliveries of water to Texas to compensate for its overuse.²⁸⁷ Second, in a decision that shocked New Mexico, those water damages could be retrospective; he flatly found no merit in New Mexico's position that the Pecos River Compact did not authorize relief for past noncompliance.²⁸⁸ As a result, the scope of a violating state's obligations was no longer limited to remedying its current and future overuse.²⁸⁹ Under Special Master Meyers's recommendation, New Mexico would therefore be required to compensate for its 340,100 acre feet of overuse between 1950 and 1983 by delivering 34,010 acre-feet to Texas every year for ten years—in addition to meeting its annual compact obligations.²⁹⁰ Worse for New Mexico, bad-faith failure to make good on these deliveries could lead to the imposition of a penalty in kind, or "water interest," requiring further deliveries.²⁹¹ Both states filed exceptions to the report, and in 1987, the Court somewhat softened the blow to New Mexico.²⁹² While it upheld the Special Master's authorization of retrospective relief for Texas, the Court gave New Mexico the

282. Brief of the State of Kansas as Amicus Curiae in Support of Texas, at 7–12, *Texas v. New Mexico & Colorado*, No. 141 Orig. (Aug. 4, 2017).

283. See *supra* sources and text accompanying notes 116–26.

284. *Texas v. New Mexico*, 462 U.S. 554, 564 (1983) (citing *Cuyler v. Adams*, 449 U.S. 433, 438 (1981)).

285. See generally CHARLES J. MEYERS & RICHARD POSNER, MARKET TRANSFERS OF WATER RIGHTS: TOWARDS AN IMPROVED MARKET IN WATER RESOURCES (1973); see also NAT'L WATER COMM'N, WATER POLICIES FOR THE FUTURE (1973), <https://www.gpo.gov/fdsys/pkg/CZIC-hd1694-a57-1973/html/CZIC-hd1694-a57-1973.htm>.

286. See generally *Texas v. New Mexico*, 1986 Report, *supra* note 98. Special Master Meyers succeeded Special Master Breitenstein.

287. *Id.* at 35–38.

288. *Id.* at 38, 28–42; HALL, *supra* note 113, at 175–79.

289. *Texas v. New Mexico*, 482 U.S. 124, 129 (1987).

290. *Id.* at 127–28; *Texas v. New Mexico*, 1986 Report, *supra* note 98, at 36.

291. *Texas v. New Mexico*, 1986 Report, *supra* note 98, at 33, 36–37.

292. *Texas v. New Mexico*, 482 U.S. at 128.

option of paying for its noncompliance with either money or water.²⁹⁸ To that end, the Court remanded the case back to Special Master Meyers with instructions to determine the appropriate remedy.²⁹¹ The states subsequently settled the retrospective noncompliance issue for \$14 million in 1990.²⁹⁵

The decision had an immediate impact on interstate water litigation.²⁹⁶ In its original petition in *Kansas v. Colorado* (which the Court granted leave to file in 1986), Kansas had not sought money damages for Colorado's longstanding violations of the Arkansas River Compact.²⁹⁷ After the Court issued its 1987 decision in *Texas v. New Mexico*, Kansas amended its petition, praying for money damages.²⁹⁸ Kansas succeeded in proving up damages. The Court found that Colorado had depleted usable stateline flows caused by post-compact pumping in Colorado for 1950 through 1996 by 428,005 acre-feet.²⁹⁹ For these amounts, the Court awarded Kansas over \$34 million for Colorado's violations—the first time that the Court awarded money damages for violations of an interstate compact in a contested proceeding.³⁰⁰ Importantly, however, Colorado succeeded in limiting Kansas's claims for prejudgment interest. Kansas had argued that it was entitled to damages reaching back to 1950, the first year of the compact; Colorado countered that Kansas should only receive prejudgment interest back to 1985, when it filed suit.³⁰¹ The Court held that prejudgment interest should extend to 1968—when, according to Special Master Littleworth, Colorado should have known it was violating the Arkansas River Compact.³⁰²

In the final phase of that case, Kansas sought to recover its expert witness fees, which were substantial, given the expert-intensive nature of interstate water

293. *Id.* at 129–33.

294. *Id.* at 132.

295. *Texas v. New Mexico*, 494 U.S. 111 (1990) (accepting the states' Joint Motion for Entry of Stipulated Judgment, requiring New Mexico to pay Texas \$14 million for its breaches of the Pecos River Compact for the years 1952 through 1986).

296. According to Hall, the 1987 decision started a “cottage industry” in interstate lawsuits, motivated by the potential for “huge” money damages. HALL, *supra* note 113, at 189. But the damages received in interstate water compact litigation are dwarfed by the subsequent costs of compliance; see *supra* and *infra* notes 295, 431–32 and associated text (\$14 million in damages in *Texas v. New Mexico*, compared with \$100 million in compliance costs incurred by New Mexico for water rights retirements); see also *infra* notes 320, 433–34, and 453–58 and associated text (\$5.5 million in damages assessed against Nebraska in *Kansas v. Nebraska & Colorado*, compared with more than \$200 million in compliance costs incurred by Colorado and Nebraska for water rights retirements and augmentation projects). So far, the only interstate water case with alleged damages that qualify as truly “huge” would be *Mississippi v. Tennessee*, where the State of Mississippi claims damages of not less than \$615 million. Mississippi Motion for Leave, *infra* note 359, at 21, ¶ 55; see also *infra* note 373 and associated text.

297. *Kansas v. Colorado*, 533 U.S. 1, 24 (2001) (O'Connor, J., dissenting).

298. *Id.* at 24–25; see *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 18–19.

299. Fifth and Final Report of Arthur L. Littleworth, Special Master, at 3, *Kansas v. Colorado*, No. 105 Orig., vol. II (Jan. 31, 2008) [hereinafter *Kansas v. Colorado*, Fifth and Final Report, 2008]; *Kansas v. Colorado*, 556 U.S. 98, 103 (2009).

300. *Kansas v. Colorado*, 533 U.S. 1, 8, 20 (2001) (remanding the case to the Special Master for a determination of damages); *Kansas v. Colorado*, Fifth and Final Report, 2008, *supra* note 299, at 3, 16–20 (awarding damages to Kansas of \$34,615,156).

301. *Kansas v. Colorado*, 533 U.S. at 12.

302. *Id.* at 12–16.

litigation.³⁰³ Colorado had a ready defense in the federal statutory limit of \$40 per day for expert witness court appearances.³⁰⁴ The states' conflicting claims raised important issues regarding the relationship between the costs and procedures available under regular federal court jurisdiction, which is regulated by Congress, and the Court's original jurisdiction, which arguably is not. Needless to say, Kansas argued that the Court should not be bound by the former's limits.³⁰⁵ In a nominal victory for Kansas, the Court recognized the difference, and made clear that it was not so bound; but the real victory was Colorado's, as the Court found that the federal statutory limits were appropriate, and declined to impose the actual and considerable costs related to expert witnesses that Kansas had incurred.³⁰⁶

Both *Texas v. New Mexico* and *Kansas v. Colorado* concerned decades of noncompliance, and their numerous legal and factual issues required extensive litigation over both liability and damages. *Kansas v. Nebraska & Colorado* (1998-2003) also concerned Nebraska's long-term overpumping, but that case settled before going to trial; the FSS did not impose any stipulated damages in water or money.³⁰⁷ Yet almost as soon as the Court approved the FSS,³⁰⁸ Nebraska relapsed into noncompliance, overusing its 2005-2006 compact allocations by over 35,000 acre-feet annually.³⁰⁹ Intent to enforce the Compact and the FSS, Kansas promptly took the matter to arbitration and then to the Court.³¹⁰ It sought monetary damages equivalent to Kansas's losses for 2005-06 or Nebraska's gains from its noncompliance, whichever was greater.³¹¹

Kansas's claim for disgorgement was based in both hydrology and law. Nebraska's sustained overpumping of groundwater created long-term depletions to streamflows and transit losses in the Republican River Basin, as measured by the RRCA Groundwater Model, as well as lagged depletions to groundwater baseflow.³¹² Because these losses had accumulated over time, Nebraska's overuse under the compact exceeded Kansas's water shortage; as a consequence, Nebraska's financial gains were "very much larger than Kansas' loss, likely by more than several multiples."³¹³

The earlier interstate groundwater cases provided precedents for awarding

303. *Kansas v. Colorado*, 556 U.S. at 99.

304. *See id.* 99-101; 28 U.S.C. § 1821(b) (1996).

305. *See generally* Stephen R. McAllister, *Can Congress Create Procedures for the Supreme Court's Original Jurisdiction Cases?*, 12 GREEN BAG 2d 287 (2009).

306. Those fees exceeded \$9 million. *Kansas v. Colorado*, 556 U.S. at 100-01. Chief Justice Roberts filed a concurring opinion to stress the Court's independent authority "to decide on its own, in original cases, whether there should be witness fees and what they should be." *Id.* at 109 (Roberts, C.J., concurring). *Contra* SHAPIRO ET AL., SUPREME COURT PRACTICE 620, n.5 (10th ed., 2013) (discussing numerous cases).

307. *Kansas v. Nebraska & Colorado*, Second Report, 2003, *supra* note 244; *see also* *Kansas v. Nebraska & Colorado*, FSS, 2002, *supra* note 250.

308. *Kansas v. Nebraska & Colorado*, 538 U.S. 720 (2003).

309. *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1053 (2015) (70,869 acre-feet over the 2005-2006 period at issue).

310. Under the terms of the FSS, a dispute must be submitted to non-binding arbitration before going to the Court. *See Kansas v. Nebraska & Colorado*, FSS, 2002, *supra* note 250, at 37.

311. 2010 Kansas Motion for Leave, *supra* note 131, at 12.

312. *Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 105-06.

313. *Id.* at 178.

to Kansas the financial gains that Nebraska had obtained from its noncompliance. In *Texas v. New Mexico*, the Court had broadly discussed the possibility of disgorgement as one remedy it could apply under its equitable powers, but the question of the measure of damages was not presented, and so the Court declined to impose the remedy.³¹⁴ In *Kansas v. Colorado*, Kansas had requested disgorgement of Colorado's gains, and Special Master Littleworth took that request seriously. Ultimately, however, he declined to do so, stressing that the impact of large-scale groundwater pumping on stateline flows was not a well-understood phenomenon in the 1950s and 1960s, and that Colorado did not willfully violate the compact.³¹⁵

Nebraska's conduct in the wake of the FSS told a different story. By 2003, Nebraska fully understood the impacts of excessive groundwater pumping on streamflows in the Republican River Basin, thanks to the accounting procedures of the FSS and the RRCA Groundwater Model, both to which it had agreed; but it failed to take adequate steps to insure against noncompliance.³¹⁶ According to Special Master William J. Kayatta, Jr., "Nebraska hoped to comply, but knowingly failed."³¹⁷ He found that disgorgement, albeit in a limited amount, was appropriate for 2005-06, the only years at issue in the case.³¹⁸ However, if Nebraska failed to comply with the compact in the future, it could be forced to disgorge all of its profits gained by noncompliance.³¹⁹ In 2015, the Court approved Special Master Kayatta's disgorgement recommendation, finding that Nebraska had "recklessly gambled with Kansas's rights" and should therefore pay \$5.5 million in damages and disgorgement accordingly.³²⁰ The Court officially put Nebraska on notice that if it were to relapse again into noncompliance, it "may again be subject to disgorgement of gains—either in part or in full, as the equities warrant."³²¹

The Court's disgorgement precedent in *Kansas v. Nebraska & Colorado* has spurred subsequent plaintiff states to seek the same remedy, but so far without success. In *Montana v. Wyoming & North Dakota*, Montana claimed that it should be entitled to disgorgement damages, based on its claim that Wyoming had repeatedly dismissed Montana's legitimate concerns about Wyoming's upstream administration of the Yellowstone River system.³²² Special Master Thompson denied Montana's claim, finding that Wyoming's conduct did not rise to the level of knowing, willful, and reckless disregard for the Yellowstone River Compact that Nebraska had clearly shown for the Republican River Com-

314. *Texas v. New Mexico*, 482 U.S. 124, 132 (1987).

315. *Kansas v. Colorado*, Second Report, 1997, *supra* note 226, at 77, 80.

316. *Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 106-12.

317. *Id.* at 112.

318. At approximately 35,000 acre-feet of annual overuse for 2005-2006, Nebraska's annual violations of the Republican River Compact greatly exceeded those of New Mexico under the Pecos River Compact (approximately 10,000 acre-feet per year, between 1950 and 1983) and of Colorado under the Arkansas River Compact (also approximately 10,000 acre-feet per year, between 1950 and 1996). See *supra* notes 290 and 299 and accompanying text.

319. *Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 103-87.

320. *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1056-57 (2015).

321. *Id.* at 1059.

322. Opinion of the Special Master on Remedies at 18-19, *Montana v. Wyoming & North Dakota*, No. 137 Orig. (Dec. 19, 2016).

compact; the dispute over the former resulted from good-faith differences in compact interpretation.³²³ (He also noted that the Court's disgorgement decision in *Kansas v. Nebraska & Colorado* was a significantly divided one.³²⁴) However, Special Master Thompson did not rule out disgorgement damages entirely. Rather, he concluded that they might be appropriate in the future, if Wyoming were to willfully or recklessly ignore the Court's rulings in the case; if it did, then "disgorgement damages would play a valuable role in deterring future violations without improperly penalizing Wyoming or providing a windfall to Montana."³²⁵ Although his recommendation awaits the Court's final decision, Special Master Thompson's recognition of the utility of the disgorgement remedy as a deterrent to future noncompliance may well broaden its application beyond the Republican River Basin.

D. GROUNDWATER LITIGATION IN EASTERN INTERSTATE BASINS

The archetypical interstate water conflicts have been western conflicts. They began with the seminal all-or-nothing fight between Kansas and Colorado over the Arkansas River, one that the Court resolved by establishing the doctrine of equitable apportionment.³²⁶ They continued during the "century-long political psychodrama of fear" between Arizona and California over the Colorado River.³²⁷ And as the groundwater revolution depleted river basins across the southern High Plains, they produced showdowns over the hydrological scope of the Pecos, Arkansas, and Republican River Compacts.³²⁸ True to the western genre, commentators have indulged themselves with scenes of lawyers and engineers fighting it out in cowboy boots and bolo ties; and writers who should know better misquote Mark Twain.³²⁹ As if to perpetuate the stereotype, the justices of the Court, schooled near the banks of the Charles, Housatonic, and Hudson Rivers, with nary a "genuine westerner" among them,³³⁰ eagerly analogize groundwater supplies to barnyard animals.³³¹ Yet just as Twain moved

323. *Id.* at 20–21.

324. *Id.* at 20.

325. *Id.* at 21 (discussing *Kansas v. Nebraska & Colorado*, 135 S. Ct. 1042, 1052 (2015)). For Mississippi's claim to disgorgement damages in *Mississippi v. Tennessee*, see *infra* text accompanying note 373.

326. See *supra* Part II.

327. JOHN FLECK, WATER IS FOR FIGHTING OVER AND OTHER MYTHS ABOUT WATER IN THE WEST 66 (2016).

328. See *supra* Part IV.A–IV.B.

329. Twain's alleged quote that "whiskey is for drinking, but water is for fighting over" has populated numerous stories on western water, even scholarly ones. See, e.g., Stephen D. Mossman, 'Whiskey is for Drinkin' but Water is for Fightin' About': A First-Hand Account of Nebraska's Integrated Management of Ground and Surface Water Debate and the Passage of L.B. 108, 30 CREIGHTON L. REV. 67 (1996). Responsible journalists have pointed out the error. FLECK, *supra* note 327, at 6.

330. The accusation is that of the late Justice Scalia, who made it despite (or because of) the long tenure of Justice Kennedy, who hails from Sacramento; but "California does not count." *Obergefell v. Hodges*, 135 S. Ct. 2584, 2629 (2015) (J. Scalia, dissenting).

331. See, e.g., *Kansas v. Nebraska & Colorado*, No. 126 Orig., Oral Argument, Oct. 14, 2014, Tr. at 7, www.supremecourt.gov/oral_arguments/argument_transcripts/2014/126,%20orig_pp14.pdf (J. Breyer, analogizing Nebraska's allegation of a mutual mistake in the accounting procedures of the FSS to a situation in which "I bought 17 cows from the barn and it turned out the barn didn't have any cows. It just had horses.")

from the gold country of California to Connecticut, both sustained drought and increased groundwater pumping have spread eastward over the last several decades into regions long associated with floods rather than droughts.³³² As a consequence, so too has interstate water litigation over groundwater supplies. Two pending cases merit discussion here, largely because they reveal several of the tensions and patterns that first emerged out west.

The first case, *Florida v. Georgia*,³³³ concerns the ACF Basin, a large and diverse basin extending from the foothills of the Blue Ridge Mountains north-east of Atlanta down through western Georgia, eastern Alabama, and finally to the Florida panhandle and the Gulf of Mexico. The Corps effectively controls the basin, operating five dams and four reservoirs on the Chattahoochee, including Lake Lanier, upon which Atlanta depends for its municipal water supply; eleven smaller non-federal dams regulate both the Chattahoochee and the Flint. These rivers merge at Lake Seminole, from which the Apalachicola River flows, traverses the Florida panhandle, and drains into the Gulf of Mexico at Apalachicola Bay. The bay's ecosystem supports one of the most productive estuaries in the northern hemisphere, as well as hundreds of endangered or threatened animal and plant species.³³⁴

Longstanding conflicts among hydropower, municipal, industrial, and irrigation interests have made the ACF Basin a rich habitat for litigation as well. It began in 1990, eventually developing into extensive multi-state and multi-district litigation focused on the Corps' authority to manage the waters of the basin.³³⁵ Meanwhile, the states and the United States agreed to a temporary compact in 1997, but the compact did not apportion the ACF Basin; it did little more than set out a process for negotiating one.³³⁶ When negotiations for a permanent compact broke down, the ACF Compact expired on its own terms in 2003.³³⁷ The resolution of the cases involving the Corps' authority required the Corps to issue a new manual governing its basin operations.³³⁸ Concerned by what it viewed as the two most serious threats to the fisheries and ecological sustainability of Apalachicola Bay—the Corps' new manual, now authorized to allocate increased quantities of storage to consumptive uses higher in the basin, and the increased groundwater pumping for irrigation in southern Georgia—Florida brought an original jurisdiction suit in 2013, seeking an equitable apportionment of the ACF Basin.³³⁹ The Court accepted the case in 2014.³⁴⁰

332. See, e.g., JOHN M. BARRY, *RIISING TIDE: THE GREAT MISSISSIPPI FLOOD OF 1927 AND HOW IT CHANGED AMERICA* (1997).

333. *Florida v. Georgia*, 135 S. Ct. 471 (2014).

334. For a more detailed description of the ACF Basin, see Report of Ralph L. Lancaster, Jr., Special Master, at 4-10, *Florida v. Georgia*, No. 142 Orig. (Feb. 14, 2017) [hereinafter *Florida v. Georgia*, 2017 Report].

335. See *Fed. Power Customers, Inc. v. Geren*, 514 F.3d 1316 (D.C. Cir. 2008); In re MDL-1924 Tri-State Water Rights Litig., 644 F.3d 1160 (11th Cir. 2011).

336. *Apalachicola-Chattahoochee-Flint River Basin Compact*, Pub. L. No. 105-104, 111 Stat. 2219 (1997) [hereinafter *ACF Compact*].

337. Special Master Lancaster lamented that "it is apparent that both States have allowed acrimony and accusations of bad faith to permanently poison their approach to management of the waters of the Basin." *Florida v. Georgia*, 2017 Report, *supra* note 334 at 12, n. 18.

338. *Id.* at 12-13.

339. *Id.* at 13-16.

340. *Florida v. Georgia*, 135 S. Ct. 471 (2014).

Florida made a strong case that increased and more consumptive water use upstream in the ACF Basin had inflicted serious harms upon the Apalachicola Bay region.³⁴¹ These harms included the collapse of its oyster fisheries in 2013, threatening their long-term sustainability.³⁴² The obvious suspect for this collapse was Georgia, and Special Master Ralph I. Lancaster was sympathetic to Florida's claims: "[a]s the evidentiary hearing made clear, Florida points to real harm and, at the very least, likely misuse of resources by Georgia."³⁴³ Georgia's irrigated acreage in the ACF Basin has expanded elevenfold since 1970, but the state has taken few measures to limit irrigation; its irrigation permits contain no quantitative limitations on pumping.³⁴⁴ During the 2011-12 drought, one of the worst on record in the region, Georgia avoided making a drought declaration so that it could avoid the administrative burden of following its own statutes to reduce water usage; on the contrary, it continued to issue irrigation permits.³⁴⁵ Georgia was unrepentant. Assuming the mantle of the defiant upstream state, Georgia steadfastly maintained the uncompromising position that "its agricultural water use should be subject to no limitations, regardless of the long-term consequences for the Basin."³⁴⁶

Florida had suffered definite and severe harms; Georgia's agricultural water use was definitely unreasonable.³⁴⁷ There were just two problems with Florida's case, but to Special Master Lancaster, they were fatal. First, the Corps effectively controlled basin flows affecting Apalachicola Bay.³⁴⁸ The Corps' operational protocols for regulating reservoir levels and river flows in its projects across the ACF Basin—including, ironically, those to protect downstream species in Florida listed as threatened or endangered under the Endangered Species Act—broke the necessary link of causation between Georgia's increased consumptive water usage and reduced streamflow crossing into Florida.³⁴⁹ Unless the Corps changed these protocols, Court-ordered increases in flows in the ACF Basin's reservoir system upstream would not necessarily pass into Florida during times of drought and low flows—even if the Court were to impose a water consumption cap upon Georgia's usage upstream.³⁵⁰ The Corps' ability to regulate flows across the ACF Basin enabled it to offset increased streamflows with increased reservoir storage in Georgia, pursuant to its "extensive discretion" to "release (or not release) water largely as it sees fit," and there "is no guarantee that the Corps will exercise its discretion to release or hold back water at any particular time."³⁵¹ Despite testimony to the contrary based upon extensive modeling by Florida experts, Florida did not meet its burden to prove, by the

341. Florida v. Georgia, 2017 Report, *supra* note 334, at 31-34.

342. *Id.* at 31-32.

343. *Id.* at 31.

344. *Id.* at 32-33 (noting an increase from under 75,000 irrigated acres to more than 825,000 acres); *id.* at 34.

345. *Id.* at 33-34.

346. *Id.* at 34 (internal citations omitted).

347. *Id.*

348. *Id.* at 6, 35-46.

349. These protocols included the Corps' general operations, as well as the Revised Interim Operating Plan issued in May 2012 and the Proposed Water Control Manual developed in the wake of the 1990-2012 litigation. *Id.* at 36-46, 61.

350. *Id.* at 61-62.

351. *Id.* at 69.

Court's standard of clear and convincing evidence in equitable apportionment cases, that reductions in Georgia's water usage would provide a material benefit to Florida.³⁵²

The second problem also involved the Corps: it was completely absent from the litigation.³⁵³ The Corps was not a party to the case, did not waive its sovereign immunity, and showed no interest in entering the interstate fight; no representative of the Corps even appeared at the eleven-day trial.³⁵⁴ Because the Corps was not a party, no Court decree could "mandate any change" in the Corps' operations of the ACF Basin; and so "without the ability to bind the Corps," the Court could not assure Florida that its injury "can be redressed by an order equitably apportioning the waters of the Basin."³⁵⁵ Despite Georgia's aggressive and wholly inequitable assertion that its water usage should remain entirely unregulated, Georgia nonetheless prevailed at trial, based mostly on its bedrock response to Florida's suit: that only a change in Corps operations could provide the remedies Florida sought.³⁵⁶

The second case, *Mississippi v. Tennessee*, presents a new and completely subterranean frontier in interstate water litigation.³⁵⁷ While the Court has resolved earlier interstate cases by requiring the accounting of groundwater pumping impacts upon interstate river basin supplies, this case is limited to groundwater alone.³⁵⁸ Mississippi does not allege that Tennessee's pumping is depleting the flows of the Mississippi River; rather, it alleges that that pumping is depleting groundwater supplies located entirely within Mississippi.³⁵⁹ The case thus raises the possibility of the Court equitably allocating the waters of an interstate aquifer that is largely independent of an interstate river system. As such, it may have important consequences in other areas where groundwater is not effectively connected to surface water supplies, such as the High Plains-Ogallala Aquifer.³⁶⁰

352. *Id.* at 68-70.

353. *See supra* the cases cited in note 335.

354. *Florida v. Georgia*, 2017 Report, *supra* note 334, at 3, 36, App. A48-A49.

355. *Id.* at 3.

356. *Id.* at 16.

357. *Mississippi v. Tennessee*, 135 S. Ct. 2916 (2015).

358. *See supra* Part IV.A-IV.B.

359. State of Mississippi's Motion for Leave to File Bill of Complaint in Original Action, Complaint, and Brief in Support of Motion, at 5, ¶ 14, *Mississippi v. Tennessee*, No. 143 Orig. (June 6, 2014) 2014 WL 5319728 [hereinafter *Mississippi Motion for Leave*]. Mississippi's prayer for relief includes the request that Tennessee use the Mississippi River as an alternate source of supply. State of Mississippi's Motion for Leave to File Bill of Complaint in Original Action, Complaint, and Brief in Support of Motion, at 23-24, ¶ D, *Mississippi v. Tennessee*, No. 143 Orig. (June 6, 2014), 2014 WL 5319728 [hereinafter *Mississippi Complaint*]. If the Mississippi River does become involved, the Court may need to revisit its analogy of the Arkansas to the Nile; see *supra* note 3. If there is an American Nile, the much larger Mississippi (including its aquifers) would be a more appropriate candidate, especially after it receives the waters of the Ohio River at Cairo, Illinois, and flows downstream past Memphis.

360. Two qualifications are in order. First, all aquifers are highly various formations; and by "effectively connected," I mean a connection between groundwater pumping and surface flows that is discernible in judicial time, not geological time. Courts tend not to endorse projections of groundwater depletion that extend beyond several decades. *See, e.g., Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 119-22 (criticizing Kansas experts' sixty-year projections of groundwater depletions in the Nebraska portion of the Republican River Basin). Second, the potential equitable allocation of an interstate aquifer raises difficult boundary questions about the relationship between those aquifer supplies that have been found to be part of the equitable

The dispute originated as one between Mississippi and the City of Memphis in federal court.³⁶¹ After Mississippi's claims were denied and the Court denied certiorari, the dispute moved to the Court under its original jurisdiction, and the Court granted Mississippi's motion for leave in 2015.³⁶² Mississippi alleges that Tennessee's groundwater pumping from the interstate Sparta Sand Aquifer (or, as it is called in Tennessee, the Memphis Sand Aquifer), mostly for municipal supplies used by the City of Memphis, has taken groundwater supplies from underneath Mississippi that would otherwise have remained there.³⁶³ Mississippi is not seeking an equitable apportionment of the aquifer, but rather advances a claim of absolute ownership to groundwater allegedly taken from beneath Mississippi's sovereign borders by the municipal wells of Memphis.³⁶⁴ The Court's acceptance of the original jurisdiction case suggests that it may consider these arguments of absolute ownership.³⁶⁵

Mississippi's unorthodox suit depends upon a mixture of legal and technical arguments. First, Mississippi contends that the doctrine of equitable apportionment—the doctrine of federal common law that, absent a compact, governs disputes between states concerning an interstate stream—should not govern the resolution of this dispute.³⁶⁶ That doctrine should not apply, argues Mississippi, because the water supplies within the aquifer are neither an interstate resource nor hydrologically connected to an interstate stream.³⁶⁷ Second, because that doctrine allegedly does not govern, the equal footing doctrine should apply instead.³⁶⁸ According to Mississippi, the latter doctrine applies to groundwater that is not hydrologically connected to a surface stream, and thus grants to Mississippi the sole authority to govern water supplies held by the aquifer, which, Mississippi presumes, are located solely within its borders.³⁶⁹ Finally, Mississippi

allocations of established interstate compacts and those that have not; *see supra* text accompanying notes 141–45.

361. Hood *ex rel.* Mississippi *v.* City of Memphis, 533 F.Supp.2d 646 (N.D. Miss. 2008), *aff'd*, 570 F.3d 625 (5th Cir. 2009), *cert. denied*, 130 S. Ct. 1319 (2010) (dismissing Mississippi's claim that the City of Memphis was wrongfully taking Mississippi groundwater under FED. R. CIV. P. 19, by finding that Tennessee was an indispensable party but could not be joined without divesting the district court of its jurisdiction).

362. Mississippi *v.* Tennessee, 135 S. Ct. 2916 (2015).

363. Mississippi Motion for Leave, *supra* note 359, at 5. In this case, the states cannot even agree to the name of the contested water supply; *see supra* note 45.

364. Mississippi Complaint, *supra* note 359, at 5–20 (June 6, 2014); Brief of the State of Mississippi in Support of Motion for Leave to File Bill of Complaint in Original Action, at 17–21 (June 6, 2014) [hereinafter Mississippi Brief in Support of Motion].

365. Noah D. Hall and Joseph Regalia, *Interstate Groundwater Law Revisited: Mississippi v. Tennessee*, 34 VA. ENVTL. L.J. 152, 162 (2016). Between Mississippi's claim of absolute ownership and Tennessee's assertion that the aquifer be equitably apportioned, Hall and Regalia recommend that the doctrine of interstate nuisance should apply instead. *Id.* at 198–202. *See also* Christine A. Klein, *Owning Groundwater: The Example of Mississippi v. Tennessee*, 35 VA. ENVTL. L.J. __ (2017, forthcoming).

366. Memorandum of Decision by Eugene E. Siler, Jr., Special Master, on Tennessee's Motion to Dismiss, Memphis and Memphis Light, Gas, & Water Division's Motion to Dismiss, and Mississippi's Motion to Exclude, at 19, Mississippi *v.* Tennessee, No. 143 Orig. (Aug. 12, 2016) [hereinafter Mississippi *v.* Tennessee, 2016 Decision] (citing Colorado *v.* New Mexico, 459 U.S. 176, 183 (1982)).

367. *Id.* at 20.

368. *Id.* at 20–21.

369. *Id.*

claims that Tennessee's groundwater pumping is actionable at state law as a trespass, and thus a violation of its state sovereignty: Tennessee has allegedly "invaded Mississippi's sovereign territory, committed trespass against Mississippi, converted Mississippi natural resources, and intentionally violated Mississippi water law."³⁷⁰ Mississippi's claim of trespass rests upon the same factual presumption that the groundwater at issue is not interstate water; it "originated in Mississippi and was naturally stored and resided" there.³⁷¹ Although Mississippi concedes that the geological formation of the aquifer underlies both states, it distinguishes that formation from the groundwater supplies contained within the aquifer beneath Mississippi. That water is not interstate water because Tennessee "must mechanically pump the water from underneath Mississippi's borders in order to produce and use it."³⁷² Drawing on the recent precedent of the Court's disgorgement award in *Kansas v. Nebraska & Colorado*, Mississippi has prayed for disgorgement relief, alleging damages of \$615 million—a figure nearly eighteen times greater than that awarded to Kansas in *Kansas v. Colorado*.³⁷³

The Tennessee defendants and the United States (acting as amicus curiae) answered Mississippi's allegations using the Court's long-established interstate precedents. Citing the long line of cases between *Kansas v. Colorado*³⁷⁴ through *Colorado v. New Mexico*,³⁷⁵ the defendants chiefly stressed that these precedents require the application of the equitable apportionment doctrine: because the aquifer is an interstate resource rather than a purely intrastate one, Mississippi has failed to state a cognizable action and is thus not due any relief until the aquifer is equitably allocated accordingly.³⁷⁶ The defendants argued that the equal footing doctrine has no bearing on this case because that doctrine concerns title to lands within state boundaries, and the Court has never held that a state has exclusive title to subsurface groundwater flowing through an interstate aquifer.³⁷⁷ Both Tennessee and the United States contested Mississippi's state-law based claims of trespass and conversion: there was no physical trespass into the lands of Mississippi, as Mississippi law requires; and Mississippi state law does not confer state ownership upon interstate groundwater in place.³⁷⁸ As for Mississippi's geological distinction between the aquifer formation that underlies Mississippi and Tennessee and the allegedly distinct water supplies it holds, such a distinction would effectively preclude Tennessee from pumping, since

370. Mississippi Complaint, *supra* note 359, at 5, ¶ 14.

371. *Id.*

372. *Id.* at ¶ 50; Mississippi v. Tennessee, 2016 Decision, *supra* note 366, at 6–7.

373. Mississippi Complaint, *supra* note 359, at 21, ¶ 55; *Kansas v. Colorado*, Fifth and Final Report, 2008, *supra* note 299, at 3, 16–20 (awarding damages to Kansas of \$34,615,156). Given the lack of an interstate compact or other contract between the two states, it may be more difficult to establish that the theories of restitution supporting disgorgement would apply in this case. See *supra* text accompanying notes 311–25.

374. *Kansas v. Colorado*, 206 U.S. 46 (1907).

375. *Colorado v. New Mexico*, 459 U.S. 176 (1982); *Colorado v. New Mexico*, 467 U.S. 310 (1984).

376. Brief of Defendant State of Tennessee in Opposition to State of Mississippi's Motion for Leave to File Bill of Complaint in Original Action, at 14–21, Mississippi v. Tennessee, No. 143 Orig. (Sept. 5, 2014) 2014 WL 5449619; Mississippi v. Tennessee, 2016 Decision, *supra* note 366, at 7–10.

377. Brief for the United States as Amicus Curiae, at 12, Mississippi v. Tennessee, No. 143 Orig. (May 2015).

378. Mississippi v. Tennessee, 2016 Decision, *supra* note 366, at 9–11.

doing so would cause water to flow out of Mississippi.³⁷⁹ In sum, replied the defendants, Mississippi's suit "contravene[s] basic principles of water law."³⁸⁰

The most remarkable aspect of Mississippi's position is its atavism, recombining legal and technical arguments that the Court discredited generations ago, and applying them to the novel legal situation of an aquifer that is effectively unconnected to an interstate stream.³⁸¹ But that atavism has its reasons. First, the Court could assert its powers under the equitable apportionment doctrine (which seems likely), but then decline to apportion the aquifer, as it did so repeatedly with the Arkansas River.³⁸² Such a finding would likely lead to a dismissal. Second, the Court could assert its equitable apportionment powers and then exercise them; but the Court's current equitable apportionment calculus would likely produce an apportionment unsatisfactory to Mississippi. In *Colorado v. New Mexico*, the Court articulated that calculus, updating the earlier version established in *Nebraska v. Wyoming*.³⁸³ That calculus does not favor Mississippi, largely because the case presents a conflict between high-value municipal wells in Memphis and lower value aquaculture and irrigation uses in northern Mississippi.³⁸⁴ The Vermejo River dispute pitted a proposed industrial use for a steel mill in Colorado against established irrigation uses of lower value in New Mexico; but the Court nonetheless found that Colorado had not met its burden—one of clear and convincing evidence—of showing that its benefits would outweigh New Mexico's harms.³⁸⁵ Given its lower-value uses, Mississippi would likely struggle to establish that an allocation protecting those uses would outweigh Tennessee's long-established, higher-value municipal uses. Moreover, the doctrine of equitable apportionment can apply to future uses, and in evaluating those future uses, the Court accounts for how reasonable and practical conservation measures might make water available for a supplementary equitable allocation.³⁸⁶ Because agricultural use typically dwarfs all other uses of interstate water supplies, conservation measures applied to agriculture (and aquaculture) in Mississippi would likely yield even more water for supplemental apportionment to higher-value municipal uses in Tennessee.³⁸⁷

Perhaps most relevant, the decisions in *Colorado v. New Mexico* stressed that a state in which an interstate river originates does not have an automatic entitlement to a share of that river; such a rule is inconsistent with the Court's equitable apportionment jurisprudence.³⁸⁸ In prior appropriation states, the location of a state's border is therefore "essentially irrelevant to the adjudication

379. Brief for the United States as Amicus Curiae, *Mississippi v. Tennessee*, *supra* note 377, at 13.

380. *Id.*

381. See *supra* text accompanying notes 46–59, 360.

382. See *supra* text accompanying notes 61–62, 69–74.

383. *Colorado v. New Mexico*, 459 U.S. 176 (1982); *Colorado v. New Mexico*, 467 U.S. 310 (1984) (setting forth the Court's current approach to equitable apportionment).

384. Mississippi Complaint, *supra* note 359, at 23.

385. *Colorado v. New Mexico*, 467 U.S. at 323–24.

386. *Colorado v. New Mexico*, 459 U.S. at 189–90; *Colorado v. New Mexico*, 467 U.S. at 321–22.

387. See Hall & Regalia, *supra* note 365, at 196–97; *Colorado v. New Mexico*, 459 U.S. at 187–88.

388. *Colorado v. New Mexico*, 467 U.S. at 323 (citing *Colorado v. New Mexico*, 459 U.S. at 181, n. 8).

of . . . sovereigns' competing claims" over a shared river.³⁸⁹ While *Colorado v. New Mexico* involved two states that are constitutionally committed to the prior appropriation doctrine, such a holding should extend to riparian states. Recall the Court's rejection of the "two rivers" approach in *Kansas v. Colorado*, a case litigated when Kansas remained mostly a riparian state.³⁹⁰ In a salmon case contemporary with the Vermejo cases, the Court held that "a state may not preserve solely for its own inhabitants natural resources located within its borders," and that this principle is "at the root of the doctrine" of equitable apportionment.³⁹¹ These holdings apply to groundwater, which is a natural resource (and also an article of commerce).³⁹² The weight of these authorities probably explains Mississippi's steadfast resistance to the equitable apportionment doctrine.

Mississippi's state-law arguments also recall the chauvinism of earlier cases, where states championed their respective state water laws and regularly attacked their rivals as defective and insufficient, both in pre-compact equitable apportionment cases and post-compact groundwater cases.³⁹³ While plaintiff states have deployed the facts of upstream overuse effectively, attacks on a neighboring state's water code have rarely succeeded.³⁹⁴ The Court does not appear to be interested in making judgments about the efficacy of one state's water law regime against another's; and the Court's longstanding reticence to exercise its equitable powers is well-supported by cherished precedents for avoiding such an impolitic choice.³⁹⁵ Moreover, the Harmon Doctrine has been dead for over a century, and the Court will not exhume it.³⁹⁶ Mississippi's trespass and conversion claims will require Mississippi to show harm; and while Mississippi has alleged permanent harms as a result of Tennessee's municipal pumping, the modeling work already performed by the USGS may discredit that allegation by showing that the Sparta Sand Aquifer is a shared interstate resource.³⁹⁷ Finally, Mississippi's state-law trespass claims appear to conflict with Mississippi water law itself. All water in the Magnolia State, whether surface water or groundwater, "is hereby declared to be among the basic resources of this state" and "therefore belong[s] to the people of this state"³⁹⁸ And the use of groundwater "shall not constitute absolute ownership or absolute rights to the use of such waters, but such waters shall remain subject to the principle of beneficial use."³⁹⁹ Mississippi law therefore makes clear that the property right in groundwater is a use right, unlike Texas, where it has been held to be owned in

389. *Id.* at 323.

390. *See supra* text accompanying notes 46–48, 52–55, and 58–59.

391. *Idaho v. Oregon & Washington*, 462 U.S. 1017, 1024, 1025 (1983). This is consistent with the anti-hoarding principle in *Hughes v. Oklahoma*, 441 U.S. 322 (1979).

392. *Sporhase v. Nebraska*, 458 U.S. 941, 951 (1982).

393. *See supra* text accompanying notes 47–57, 188–94; *see also Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 122–27.

394. *See, e.g., Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 105–12, 122–27.

395. *Id.*; *see also supra* note 36.

396. *See supra* text accompanying notes 58, 65.

397. *See infra* note 412.

398. MISS. CODE ANN. § 51-3-1 (2015).

399. *Id.* § 51-3-13.

place as an attribute of the overlying land.⁴⁰⁰ Given the Court's longstanding emphasis on the principle of beneficial use in equitable apportionment cases, it may well look askance at Mississippi's assertion that its water supplies should be defended in place.⁴⁰¹

Special Master Eugene E. Siler, Jr. treated Mississippi's claims with considerable skepticism when he issued his first report in 2016. Casting doubt upon Mississippi's threshold claim that the equitable apportionment doctrine should not apply to interstate groundwater resources, he returned repeatedly to the expansive rule originally announced in *Kansas v. Colorado*: the doctrine applies whenever "the action of one State reaches through the agency of natural laws into the territory of another State."⁴⁰² He found that such a situation existed here, given Mississippi's own concessions: none of Tennessee's wells and pumps are located in Mississippi, but that pumping reduces water levels there; the Sparta Sand Aquifer formation extends into Tennessee; and the water within that formation moves between the states.⁴⁰³ Thus, Mississippi's complaint "appears to have failed to plausibly allege that the water at issue is not interstate in nature."⁴⁰⁴ He then dispensed with Mississippi's alternative equal-footing claim, relying largely upon the Vermejo River cases (and contemporary wildlife cases, whose Commerce Clause jurisprudence parallels the Court's equitable apportionment jurisprudence) to conclude that the equal footing doctrine did not apply to disputes over the depletion of interstate water supplies; Mississippi was not automatically entitled to water supplies originating within its borders.⁴⁰⁵ As for Mississippi's attempt to distinguish between the interstate geology of the Sparta Sand Aquifer formation and the allegedly non-interstate water supplies within that formation, Special Master Siler dredged up Colorado's ancient, long-abandoned "two-rivers" theory from *Kansas v. Colorado*, to bury Mississippi's similar attempt.⁴⁰⁶ He quickly dispatched Mississippi's state law claims of trespass and conversion on the grounds that they were displaced by federal common law—that of equitable apportionment.⁴⁰⁷

But he did not recommend dismissal. He recognized that the doctrine of equitable apportionment is the Court's sole avenue through which a state may

400. *Edwards Aquifer Auth. v. Day*, 369 S.W.3d 814, 831–32 (2012) (applying the law regarding ownership of oil and gas in place beneath a landowner's land—that of "absolute title"—to the ownership of groundwater in place.).

401. See, e.g., *Kansas v. Colorado*, 206 U.S. 85, 97–98 (1907).

402. *Mississippi v. Tennessee*, 2016 Decision, *supra* note 366, at 20, 30–31 (quoting *Kansas v. Colorado*, 206 U.S. at 97–98).

403. *Id.* at 32.

404. *Id.*

405. *Id.* at 20–24, 31 n.5 (citing *Colorado v. New Mexico*, 459 U.S. 176, 181, n. 8 (1982)); *Colorado v. New Mexico*, 467 U.S. 310, 323 (1984); *Idaho ex rel. Evans v. Oregon*, 462 U.S. 1017, 1025 (1983)).

406. *Id.* at 31–32 (citing *Kansas v. Colorado*, 206 U.S. at 115 (1907) for the proposition that "no Supreme Court decision appears to have endorsed one State suing another State, without equitable apportionment, for the depletion of water that is part of a larger interstate resources by limiting its claims to a specific portion of the water."). Earlier in his decision, Special Master Siler noted that Mississippi's identification of the water at issue as intrastate water is a legal conclusion only. *Id.* at 25.

407. *Id.* at 24, 35. For Special Master Thompson's similar impatience with Wyoming's state law claims in *Montana v. Wyoming & North Dakota*, but within the context of an interstate compact, see *supra* text accompanying notes 258–60.

pursue a claim against another state for “depleting the availability of interstate waters within its borders,” and noted that dismissal would likely be appropriate under the Federal Rules of Civil Procedure, since Mississippi had disclaimed a request for such an apportionment.⁴⁰⁸ Yet cases brought under the Court’s original jurisdiction are not bound by the federal rules, and the Court has regularly advised Special Masters to “err on the side of over-inclusiveness in the record” to assist the Court in deciding original jurisdiction cases.⁴⁰⁹ In light of that advice, Special Master Siler ordered an evidentiary hearing and subsequent pleadings limited to the threshold issue of whether the aquifer and its water supplies are an interstate resource.⁴¹⁰

Special Master Siler’s decision recalls the judicial prudence of earlier interstate compact cases, where Special Masters deflected doctrinaire legal arguments about interstate groundwater supplies by issuing straightforward orders to establish threshold hydrological facts.⁴¹¹ Yet *Mississippi v. Tennessee* presents a groundwater modeling situation that is distinct from these earlier cases. Unlike the Pecos and Arkansas River cases, where the states litigated competing groundwater models, or the Republican River cases, where the groundwater model emerged cooperatively, *Mississippi v. Tennessee* presents a third situation: the USGS, unaffiliated with either of the litigant states, has already developed groundwater modeling tools for the Sparta Sand Aquifer and the other aquifers of the region.⁴¹² Indeed, the pre-existence of this USGS modeling work has enabled the states to employ it against each other. Mississippi has apparently relied upon it to estimate the amount of depletions to the aquifer caused by Tennessee’s groundwater pumping.⁴¹³ Conversely, Tennessee will likely employ the modeling work to establish what it has alleged in its pleadings—that if Tennessee’s pumping affects Mississippi, then that is proof that the Sparta Sand Aquifer has an “interstate character” for which equitable allocation is appropriate.⁴¹⁴

If Special Master Siler and the Court find that the Sparta Sand Aquifer is an interstate water resource (as seems likely), then dismissal should follow, unless the Court takes the unlikely step of ordering additional proceedings to effect an equitable allocation.⁴¹⁵ Were it to dismiss the case, the Court may issue a recommendation to negotiate an interstate compact, as it has recommended in the past.⁴¹⁶ Yet following through on such a recommendation would be daunting, given the reach and multi-layered complexity of the larger groundwater system of which the Sparta Sand Aquifer is a part—the Mississippi Embayment

408. *Id.* at 35 (noting the appropriateness of dismissal pursuant to FED. R. CIV. P. 12(c) for a federal case outside of the Court’s original jurisdiction).

409. *Id.* at 35–36.

410. *Id.* at 36. The hearings will probably take place in late 2017 or early 2018. *Mississippi v. Tennessee*, No. 143 Orig., Case Management Plan 11–12 (Oct. 26, 2016).

411. *See supra* text accompanying notes 149–74, 209–12.

412. BRIAN R. CLARK, RHEANNON M. HART, & JASON J. GURDAK, U.S. GEOLOGICAL SURVEY, GROUNDWATER AVAILABILITY OF THE MISSISSIPPI EMBAYMENT, PROFESSIONAL PAPER 1785 (2011).

413. *Mississippi* Complaint, *supra* note 359, at ¶¶ 20–26.

414. *Id.* at ¶¶ 15–19.

415. *See supra* note 36.

416. *See supra* text accompanying note 79; for a less optimistic view, *see supra* note 337.

Regional Aquifer System.⁴¹⁷ Were they to achieve a negotiated settlement short of an interstate compact, the states should be chastened by the recent example of *Kansas v. Nebraska & Colorado*, where the Court asserted its vast equitable powers to rewrite an important technical aspect of an earlier (and decreed) settlement.⁴¹⁸

V. THE EVOLUTION OF INTERSTATE COMPACT COMPLIANCE IN GROUNDWATER-DEPENDENT BASINS

A. INTERSTATE LITIGATION AS A FORCING TOOL FOR STATE LAW REFORM IN GROUNDWATER

Interstate litigation has proven to be a powerful forcing tool for state law reform in groundwater. Kansas fundamentally rewrote its water code in 1945, largely in response to its failure to secure an equitable allocation of the Arkansas River, and in the hope of securing a defensible compact allocation on the Republican River.⁴¹⁹ More recently, Special Master Kayatta's belief that Nebraska's post-2007 legislative response to the problem of its noncompliance constituted a new era in Nebraska water law and policy kept him from imposing a higher amount of disgorgement.⁴²⁰ That belief raises an important point. Across the West, interstate compact litigation has served the salutary and politically difficult purpose of achieving important legal reforms in the regulation of groundwater pumping. Colorado struggled to regulate post-compact alluvial wells in the Arkansas River Basin during the 1950s, 1960s, and even the 1970s.⁴²¹ *Kansas v. Colorado*, however, provided the necessary impetus that allowed Colorado's State Engineer to reduce groundwater pumping significantly through rulemaking. Colorado's 1995 rules for wells in the Arkansas River Basin ordered the pumping of all post-compact wells discontinued, unless their depletions to usable stateline flows could be replaced in accordance with a plan approved by the State Engineer.⁴²² The same rules similarly limited the aggregate pumping from all pre-compact wells to 15,000 acre-feet annually.⁴²³ The need for Colorado to

417. This aquifer system consists of both confined and unconfined (or alluvial) components and lies beneath seven states (Alabama, Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee). The Sparta Sand Aquifer is a confined aquifer within this system. See CLARK, HART, & GURDAK, *supra* note 412, *passim*.

418. See *supra* note 250.

419. See *supra* text accompanying notes 72–76.

420. *Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 112.

421. See text accompanying note 110; see also *Kansas v. Colorado*, 1994 Report, vol. I, *supra* note 95, at 8–9. The 1973 pumping rules for the Arkansas River, which were in effect during the *Kansas v. Colorado* litigation, did not reduce groundwater pumping. “Dr. [Jeris] Danielson, then State Engineer for the State of Colorado, was called as a hostile witness during the trial of this case. He acknowledged that the 1973 rules and regulations have not, in fact, reduced pumping below the 1973 levels. Indeed, pumping increased.” *Id.* at 125.

422. COLO. DIV. OF WATER RES., AMENDED RULES AND REGULATIONS GOVERNING THE DIVERSION AND USE OF TRIBUTARY GROUNDWATER IN THE ARKANSAS RIVER BASIN, Rule 3.1 (1995). This Order replaced the 1973 rules.

423. *Id.* at 3, Rule 3.2. For Special Master Littleworth's discussion of the efficacy of these rules, see *Kansas v. Colorado*, Fourth Report, 2003, *supra* note 218, at 8–10.

comply with its interstate compacts has also promoted compact-specific rule-making in the Republican River and Rio Grande Basins.⁴²¹ Groundwater models developed in response to interstate litigation have also enabled downstream states such as Kansas to effect important reforms in groundwater management.⁴²⁵

The two rounds of litigation in *Kansas v. Nebraska & Colorado* have similarly motivated Nebraska to make changes to its water code. In the wake of the 1998-2003 litigation, the Nebraska legislature required Nebraska's NRDs to adopt and implement "Integrated Management Plans" (IMPs), to promote better cooperation between the NRDs, which exercise local control over groundwater, and Nebraska DNR, which exercises centralized control over surface water—largely to ensure compliance with the Republican River Compact.⁴²⁶ Nebraska has also enacted statutes defining both "overappropriated" and "fully appropriated" river basins, with corresponding regulatory requirements.⁴²⁷ Special Master Kayatta stressed the importance of these statutory changes, as well as changes in its Republican River IMPs, in convincing him that Nebraska had significantly restructured its regulation of groundwater pumping.⁴²⁸ It is probably too early to evaluate the effects of these changes. So far, they have survived constitutional scrutiny.⁴²⁹

B. ALTERNATIVE COMPLIANCE MECHANISMS

Sadly for states upstream, the efficient breach of an interstate compact is not a legally available strategy.⁴³⁰ Happily, however, there is a compliance strategy that exchanges money for water while avoiding the political pitfalls of reducing groundwater pumping: the state leases or purchases irrigation rights, and then temporarily or permanently retires them, thereby reducing its water consumption. New Mexico has shouldered a heavy financial burden to comply with the demands of paying off the water debt to Texas imposed by the Court in the Pecos River litigation. By 2000, New Mexico had spent more than \$40 million for its Water Rights Acquisition Program (WRAP), purchasing over 25,000 acre-feet of water rights appurtenant to nearly 9,000 acres in the lower

424. COLO. CODE REGS. § 402-16 (2015); see COLO. DIV. OF WATER RES., RULES GOVERNING NEW WITHDRAWALS OF GROUND WATER IN WATER DIVISION 3 AFFECTING THE RATE OR DIRECTION OF MOVEMENT OF WATER IN THE CONFINED AQUIFER SYSTEM (2004) (establishing rules for the Rio Grande Basin). See also COLO. REV. STAT. § 37-92-501(4) (2015) (requiring that groundwater use "shall not unreasonably interfere" with Colorado's ability to comply with the Rio Grande Compact).

425. Northwest Kansas Groundwater Management District No. 4, for example, adapted the RRCA Model to create the "Northwest Kansas Groundwater Model," which estimates impacts of groundwater pumping on both streamflows in the South Fork Republican River and upon Ogallala groundwater levels. The latter model enabled the Kansas Chief Engineer to establish a local enhanced management area pursuant to Kan. Stat. Ann. § 82a-1041, reducing groundwater pumping by twenty percent. See KAN. DEP'T OF AGRIC., ORDER OF DESIGNATION APPROVING THE SHERIDAN 6 LOCAL ENHANCED MANAGEMENT AREA WITHIN GROUNDWATER MANAGEMENT DISTRICT NO. 4 at 12 (2013), <http://dwr.kda.ks.gov/LEMAs/SD6/LEMA.SD6.OrderOfDesignation.20130417.pdf>.

426. NEB. REV. STAT. § 46-715(1) (2011).

427. *Id.* § 46-713(3)-(4)(a) (2011).

428. *Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214, at 112-19.

429. *Hill v. State*, 894 N.W.2d 208 (Neb. 2017); *Garey v. Nebraska Dep't of Nat. Res.*, 759 N.W.2d 919 (2009); *Kiplinger v. Nebraska Dep't of Nat. Res.*, 803 N.W.2d 28 (2011).

430. See *supra* sources and text accompanying notes 285-325.

Pecos River Basin.⁴³¹ By 2009, it had spent approximately \$100 million in total for water rights retirements.⁴³² In Colorado's portion of the Republican River Basin, the Republican River Water Conservation District (RRWCD) has also pursued an aggressive retirement policy. Financed by its own substantial irrigated land and water right assessments⁴³³ and assisted by a low-interest loan from the State of Colorado, the RRWCD spent around \$51 million by 2011 to purchase and retire water rights.⁴³⁴

To protect their sovereign rights under these various compacts, the states naturally seek federal subsidies.⁴³⁵ The most common federal programs are the Conservation Reserve and Enhancement Program (CREP),⁴³⁶ the Environmental Quality Incentives Program,⁴³⁷ and the (recently repealed) Agricultural Water Enhancement Program.⁴³⁸ These programs pay landowners to retire their lands from irrigation, typically on a temporary basis.⁴³⁹ Surface rights and groundwater rights close to the river bring the highest prices, because their retirement brings the highest returns in stream flow.⁴⁴⁰ By taxing themselves, and by obtaining state and federal funds to purchase and retire irrigation rights, irrigators can better maintain their current pumping levels on lands not enrolled in such programs.

A second alternative to reducing groundwater pumping is the "augmentation plan"—the "euphemism of choice" for relocating water supplies into depleted river basins.⁴⁴¹ By the time interstate groundwater cases came to be litigated in the 1980s and 1990s, augmentation plans had been in use in both Colorado and New Mexico.⁴⁴² An augmentation plan enables junior groundwater rights (such as the post-compact wells in Colorado's portion of the Arkansas River Basin) to continue to pump during water shortages as long as they have a state-approved and legally binding plan to "augment" the water supply, by

431. HALL, *supra* note 113, at 214.

432. Draper & Wechsler, *supra* note 116, at 18–38.

433. The annual assessment is \$14.50/acre for land irrigated by groundwater. *Water Use Fees*, REPUBLICAN RIVER WATER CONSERVATION DISTRICT, http://www.republicanriver.com/RRWC_DInfo/WaterUseFees/tabid/105/Default.aspx (last visited Jan. 29, 2016).

434. In Re: Non-Binding Arbitration Pursuant to the Final Settlement Stipulation, *Kansas v. Nebraska & Colorado, Colorado Compact Compliance Pipeline Dispute*, Arbitrator's Final Decision, Oct. 7, 2010, at 5, <http://www.republicanriver.com/LinkClick.aspx?fileticket=W8kbf%2blFmAI%3d&tabid=72> [hereinafter *Kansas v. Nebraska & Colorado, Arbitrator's Final Decision, 2010*] (summarizing Colorado's 2010 testimony about the costs of water rights retirements in its portion of the Republican River Basin for the purposes of compact compliance).

435. In this regard, western water managers have followed the western stockmen's creed concerning the federal government: "Get out and give us more money." WALLACE STEGNER, *THE UNEASY CHAIR: A BIOGRAPHY OF BERNARD DEVOTO* 302 (1988) (quoting DeVoto).

436. 16 U.S.C. §§ 3831–3835 (2012).

437. 16 U.S.C. § 3839aa to aa-8 (2012).

438. 16 U.S.C. § 3839aa-9 (repealed 2014).

439. See, e.g., 16 U.S.C. § 3831(e)(1) (2014) (establishing a general contract range of between 10 and 15 years for CREP lands).

440. See *Conservation Reserve Enhancement Program (CREP)*, REPUBLICAN RIVER WATER CONSERVATION DISTRICT, <http://www.republicanriver.com/Programs/CREP/tabid/110/Default.aspx> (last visited Jan. 29, 2016).

441. REISNER, *supra* note 4, at 264.

442. For New Mexico, see N.M. STAT. ANN. § 72-12(A)(4) (2015) (Right of Replacement); see also HALL, *supra* note 113, ch. 5. For Colorado, see COLO. REV. STAT. § 37-92-103(9) (2014) ("plan for augmentation").

providing substitute water to senior rights that would otherwise be affected by such out-of-priority pumping.⁴⁴³ Colorado has applied this concept at the interstate level to zero its shortfalls under the Rio Grande Compact, by diverting San Luis Valley groundwater into the Rio Grande before it crosses into New Mexico; in the immediate wake of *Texas v. New Mexico*, New Mexico considered a similar but more ambitious plan, but shelved it in favor of WRAP.⁴⁴⁴ In 2003, state and federal stakeholders within New Mexico entered into the 2003 Pecos Settlement Agreement, under which New Mexico's Interstate Stream Commission operates two augmentation well fields and pipelines to supply water to the Pecos River under specified water-short conditions, to ensure compliance with the Pecos River Compact.⁴⁴⁵ Colorado has also relied upon replacement water from the western slope to offset stream depletions due to groundwater pumping in the Arkansas River Basin.⁴⁴⁶

The Republican River litigation has brought augmentation plans to the front and center of interstate compliance strategies in that basin.⁴⁴⁷ Colorado introduced the concept during the FSS negotiations, and the states agreed to allow such plans, subject to the unanimous approval of the states in each instance.⁴⁴⁸ Aside from rain, they have become the most important compliance tools for both Colorado and Nebraska. Their augmentation projects pump groundwater from supplies that are hydrologically more distant from the Republican River, such as the High Plains-Ogallala Aquifer, pumping that creates a smaller effect on the compact accounting than pumping from wells closer to the river, such as alluvial wells.⁴⁴⁹ The projects then pipe that groundwater to tributaries of the river and dump it there, where it augments streamflows.⁴⁵⁰ This artificial transportation of more distant groundwater compensates for depletions to streamflow caused by groundwater pumping closer to the streams, tributaries, and mainstem of the river, which accordingly has a greater effect on the compact accounting.⁴⁵¹ These plans do not augment the water supply of the basin; rather, they use low-impact groundwater pumping (as determined by the compact accounting procedures and the RRCA Model) to offset the effects of high-impact groundwater pumping (also as determined by the same procedures and model).⁴⁵²

443. COLO. REV. STAT. § 37-92-103(9) (2014); *see also* Cache LaPoudre Water Users Ass'n v. Glacier View Meadows, 550 P.2d 288, 293-94 (Colo. 1976).

444. *See* HALL, *supra* note 113, at 199.

445. NEW MEXICO *EX REL.* STATE ENGINEER, NEW MEXICO INTERSTATE STREAM COMMISSION, U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION, CARLSBAD IRRIGATION DISTRICT, & PECOS VALLEY ARTESIAN CONSERVANCY DISTRICT, SETTLEMENT AGREEMENT 10-12 (2003), www.ose.state.nm.us/Compacts/Pecos/PDF/settlement_03-25-2003.pdf (establishing obligations for augmentation well pumping).

446. *Kansas v. Colorado*, Fourth Report, 2003, *supra* note 218, at 10-24.

447. For a more extensive discussion of interstate augmentation plans in the Republican River Basin, *see* Griggs, *supra* note 76, at 44-49.

448. *Kansas v. Nebraska & Colorado*, FSS, 2002, *supra* note 250, § III.B.1.k, at 15.

449. *Kansas v. Nebraska & Colorado*, Final Report with Certificate, 2003, *supra* note 99, *passim*, and especially at App. A (RRCA Model DVD).

450. *Id.*

451. *Id.*

452. *Kansas v. Nebraska & Colorado*, FSS, 2002, *supra* note 250, at vol. I.17-25, App. C1; *Kansas v. Nebraska & Colorado*, Final Report with Certificate, 2003, *supra* note 99, *passim*, and especially at App. A (RRCA Model DVD). The RRCA Model has been regularly updated since

In Colorado, the RRWCD has spent approximately \$50 million to construct its Compact Compliance Pipeline (CCP), which can pump 25,000 acre-feet of Ogallala water annually.⁴⁵³ The CCP then pipes it to a point just upstream of the gage at the Nebraska border, dumping it into the North Fork of the Republican River to ensure Colorado's compliance on the North Fork.⁴⁵⁴

Nebraska has built two similar augmentation projects. One pumps as much as 15,000 to 20,000 acre-feet of groundwater annually and pours it into Rock Creek, a distant tributary of the Republican River.⁴⁵⁵ The other, the Nebraska Cooperative Republican Platte Enhancement Project (N-CORPE), can pump up to 65,000 acre-feet of deep groundwater from beneath Lincoln County, Nebraska, and pour it into Medicine Creek, a tributary of the Republican River, and into the Platte River system as well.⁴⁵⁶ In 2014, Nebraska's Rock Creek and N-CORPE augmentation projects together pumped 65,000 acre-feet of groundwater into the Republican River system.⁴⁵⁷ While these projects are expensive—N-CORPE alone cost approximately \$130 million—they are less expensive than reducing groundwater pumping to comply with the Republican River Compact.⁴⁵⁸ Absent the Rock Creek and N-CORPE plans, compact requirements would force the retirement from irrigation of approximately 330,000 acres in Nebraska's portion of the Republican River Basin, causing a commensurate decline in assessed land values of between \$500 and \$900 million.⁴⁵⁹

The impact of these augmentation plans has been substantial. With a combined annual capacity of 110,000 acre-feet, these three augmentation plans can compensate for significant groundwater over-pumping in Colorado and Nebraska under the Republican River Compact.⁴⁶⁰ Hydrologically, they rely upon and deplete largely non-renewable groundwater; ironically, they cause their

2003. See www.republicanrivercompact.org.

453. *Kansas v. Nebraska & Colorado*, Arbitrator's Final Decision, 2010, *supra* note 434, at 5.

454. *The Pipeline*, REPUBLICAN RIVER WATER CONSERVATION DIST., <http://www.republicanriver.com/Pipeline/tabid/101/Default.aspx> (last visited Nov. 17, 2015).

455. Russ Pankonin, *First Water Flows from Rock Creek Augmentation Project*, GRANT TRIB. SENTINEL, http://www.granttribune.com/index.php?option=com_content&view=article&id=7834%3Afirst-water-flows-from-rock-creek-augmentation-project&Itemid=64 (last accessed Mar. 10, 2016).

456. *About N-CORPE*, www.ncorpe.org/about (last accessed Mar. 5, 2017).

457. Russ Pankonin, *Augmentation Pumping from Lincoln County Project Complete*, WAUNETA BREEZE (Apr. 9, 2015), http://www.waunetanebraska.com/index.php?option=com_content&view=article&id=6137:augmentation-pumping-from-lincoln-county-project-complete ("In 2014, more than 20,000 acre-feet were pumped from [the] Rock Creek [project]."); Kamie Stephen, *N-CORPE Ceases Republican River Compliance*, N. PLATTE TELEGRAPH, (Apr. 22, 2015 3:00 AM), http://www.nptelegraph.com/news/local_news/n-corpe-ceases-republican-river-compliance/article_036cd71f-bb18-5c85-883a-f98e3506d3d8.html. N-CORPE pumped approximately 45,000 acre-feet in 2014. *Hearing on L.R. 323 Before the Nat. Res. Comm.*, 104th Leg., First Sess. 5 (Neb. 2015) (statement of Senator Mike Groene). For more information on the N-CORPE project, see www.ncorpe.org (last accessed Jan. 29, 2016).

458. Republican River Compact Arbitration, N-Corpe Augmentation Plan, Direct Testimony of Dr. Jasper E. Fanning (2014), Exhibit N30000, at 3, http://dwr.kda.ks.gov/NCORPE_Trial_Exhibits_All/Nebraska/NE%20Exhibits/NCORPE_N30000.pdf (last accessed Mar. 5, 2017) (estimating the total land and construction costs of the N-CORPE pipeline as \$120 to \$130 million).

459. *Overview*, N-CORPE, <http://www.ncorpe.org/overview> (last accessed Mar. 5, 2017).

460. By way of comparison, see Republican River Compact, art. IV, ch. 104, 57 Stat. 86 (1943) (establishing original default allocations of 54,100 acre-feet and 234,500 acre-feet of consumptive use to Colorado and Nebraska respectively).

own, additional depletions to streamflows, which in turn must also be offset under the compact accounting.⁴⁶¹ These hydrological facts aside, augmentation plans have already made a significant impact on the way in which states manage their compact allocations. Unlike delivery compacts such as the Colorado River Compact or the Rio Grande Compact, the Republican River Compact effectively adopted something like the precautionary principle: it allocates the water supplies of the basin across its various sub-basins and requires retrospective accounting.⁴⁶² These features encouraged a certain amount of conservatism in how the states planned their water consumption—a conservatism that the groundwater revolution sorely tested, a test that the states mostly failed. By contrast, augmentation not only enables augmenting states to replace surface water supplies with increased groundwater pumping; it also enables them to retune the river's flows across the basin. Augmentation has thus changed the dynamics of compliance from one dependent upon the basin's natural hydrology to one built upon an artificial water delivery system.

VI. CONCLUSION

This article began with an assertion of the underlying structures of interstate water relations. It has surveyed how the groundwater revolution forced litigation, which in turn has produced decisions and settlements that have transformed those relations over the past half-century. With these historical developments in mind, let it end with some observations about that transformation. Readers should receive them with two cautions, however. First, be mindful of the tangled coexistence of the Court's federal common-law jurisprudence concerning interstate water relations with the unique features of each interstate basin, compact, and decree. Second, beware of "the old familiar story of heroic efforts to subdue a desert and at the same time maintain an action in court over a contested water right."⁴⁶³

The first observation concerns balance. The first half-century of interstate water disputes was tumultuous, but it eventually achieved a workable *détente* between two recurring rivalries: those between states, and those between the states and the United States. The year 1902 witnessed both the filing of *Kansas v. Colorado* and the enactment of the Reclamation Act; five decades later, most of the West's important interstate river basins had been allocated pursuant to interstate compacts or decrees, according to the doctrine of equitable apportionment.⁴⁶⁴ The compacts called for joint action by the states and the United States, including the protection of federal investments and interests in interstate basins—typically, reservoirs and irrigation projects upon which the compacting states predominantly depended for their water supply.⁴⁶⁵ The Court protected the compact mechanism against rival state law claims, ensuring the security and

461. *Kansas v. Nebraska & Colorado*, FSS, 2002, *supra* note 250, §IV.H, at 25.

462. Republican River Compact, art IV, ch. 104, 57 Stat. 86, 88-89 (1943).

463. MEAD, *supra* note 32, at 307 (quoting Professor S. Fortier, of Bozeman, Montana).

464. See *supra* text accompanying notes 63-83.

465. See, e.g., Republican River Compact, ch. 104, 57 Stat. 86 (1943) at art. I (stating that a major purpose of the compact is "to promote joint action by the States and the United States"); *id.* at art. X (protecting the property of the United States); Rio Grande Compact, ch. 151, 53 Stat. 785 (1939) at art X (specifically protecting the Rio Grande Project).

durability of the states' equitable apportionments.⁴⁶⁶ Congress and the Executive, through Reclamation and the Corps, built most of the West's interstate water infrastructure accordingly, in general (but not complete) deference to state law.⁴⁶⁷ With the titanic exception of *Arizona v. California* (1952-1963), the 1950s and 1960s produced relatively little interstate water litigation in the West. Federal reservoir and irrigation projects regulated and stabilized interstate surface water supplies, which were, for a time, their principal and even exclusive water supplies.

Yet the groundwater revolution destabilized these supplies, eventually overwhelming surface water diversions across the West.⁴⁶⁸ That loss of stability eventually caused a collision between federal surface-water infrastructure and non-federal groundwater development. By the 1970s the ever-lowering water levels of Reclamation reservoirs had become sources of interstate conflict—and indicators of the growing hydrological imbalance inflicted by excessive groundwater pumping. Yet the Court, as well as the litigant states, largely addressed that imbalance—largely because the most prominent interstate groundwater cases were compact cases.⁴⁶⁹ Compacts provide a fundamental protection to their member states: the Court can interpret and enforce compacts, but it cannot rewrite them.⁴⁷⁰ Compacts achieve equitable allocations of basin water supplies, and once the states (and Congress) have fixed those allocations, the Court will not order relief inconsistent with their terms, “no matter what the equities of the circumstances might otherwise invite.”⁴⁷¹ Accordingly, the Court required the integration of the effects of groundwater pumping on compacted river basin water supplies, mitigating—for a time—the seriousness of the hydrological imbalance wrought by the groundwater revolution. Despite these decisions, however, groundwater's dominance has continued, exacerbating the already profound hydrological imbalance in western water. To comply with compacts in groundwater-dependent basins, states are making unprecedented investments in groundwater augmentation projects.⁴⁷² Across the West's groundwater-dependent interstate river basins, the solution to an upstream state's overpumping of groundwater is to pump groundwater—but then to deliver it to the stream.

The second observation also concerns balance: specifically, the difficult balancing problems within jurisdiction and water-based federalism. The dominance of groundwater development has revealed problems of jurisdictional asymmetry. Between rival states, the Court's jurisdiction is both original and exclusive.⁴⁷³ Furthermore, there must be no alternative forum to resolve the conflict.⁴⁷⁴ Between a state and the United States, however, jurisdiction is original but not exclusive, and the appropriate forum is federal court, as in the major cases involving Reclamation or the Corps.⁴⁷⁵ Unless the United States waives its

466. *Hinderlider v. La Plata River & Cherry Creek Ditch Co.*, 304 U.S. 92 (1938).

467. *See supra* text accompanying notes 17, 81-83.

468. *See supra* Part III.

469. *See generally supra* Part IV.

470. *Texas v. New Mexico*, 462 U.S. 554, 564 (1983).

471. *Id.*

472. *See supra* text accompanying notes 441-62.

473. U.S. CONST. art. III, § 2, cl. 2; 28 U.S.C. § 1251(a).

474. *Mississippi v. Louisiana*, 506 U.S. 73, 77 (1992).

475. 28 U.S.C. § 1251(b); *see also supra* note 335.

sovereign immunity, the Court lacks jurisdiction to decide the case—to determine the appropriate rights, duties, and roles for these federal entities, which have become the pivotal and dominant actors in interstate river basins—even if the United States is a necessary party.⁴⁷⁶ This asymmetry has not traditionally been a problem in interstate compact litigation, largely because federal interests receive explicit protections in most compacts, even if the United States is not a signatory party to them, and water rights for federal projects within compacted basins are obtained under state law.⁴⁷⁷

Nonetheless, there are troubling signs that the established structures of cooperative federalism in western water are falling out of balance, largely because the states' continued over-dependence on groundwater pumping has placed that balance under unprecedented stress. The federal role in compact litigation has become inconsistent and unpredictable, producing the legal equivalent of asymmetrical warfare. Consider the contrast between recent litigation over the Republican River Compact and the current litigation concerning the Rio Grande Compact. In the former, the Department of the Interior (Interior) played a minimal role. While it recommended that the Court accept Kansas's motion for leave, it did not intervene on behalf of its Reclamation projects in the Republican River Basin, which service irrigators in both Nebraska and Kansas from a common reservoir, Harlan County Lake. Far too late, Interior issued a comprehensive critique of Nebraska's excessive groundwater pumping and its deliberate hostility to surface water irrigation, in a demand letter that appears in retrospect to be more of a gesture than a commitment to defend Reclamation's own projects.⁴⁷⁸ By contrast, in the Rio Grande litigation,⁴⁷⁹ the United States has intervened and, in what appears to be an unprecedented decision, gone so far as to assert a cause of action against a state under an interstate compact to which it is not a signatory party, seeking injunctive relief against New Mexico to protect surface water irrigators in New Mexico and Texas who share a common dependence upon Elephant Butte Reservoir.⁴⁸⁰ In short, the United States of *Kansas v. Nebraska & Colorado* is unrecognizable to the United States of *Texas v. New Mexico & Colorado*. Outside of these different litigation arenas, the United States continues to make jurisdictional claims to western groundwater, provoking predictably reactionary responses from western legislators.⁴⁸⁰ There

476. *Idaho v. Oregon & Washington*, 444 U.S. 380, 386–91 (1980).

477. See, e.g., Republican River Compact, ch. 104, 57 Stat. 86 (1943) at art. X(a) (protecting the rights of the United States to acquire water rights at state law for Reclamation projects).

478. Griggs, *supra* note 76, at 62.

479. Exception of the United States and Brief for the United States in Support of Exception, at 32–48, *Texas v. New Mexico & Colorado*, No. 141 Orig. (June 2017).

480. In 2014, the United States Forest Service proposed a groundwater rule that would increase federal supervision of groundwater withdrawals from national forest lands, potentially at the expense of state jurisdiction. The Service withdrew the directive after a year of intensive criticism from western governors, congressmen, and state interests. United States Department of Agriculture, Forest Service, Notice of Withdrawal of Proposed Directive, 80 Fed. Reg. 35299 (*withdrawn* June 19, 2015). Western senators responded with “The Water Rights Protection Act of 2017,” which would prohibit the federal government from conditioning federal land use permits on the transfer of water rights to the United States, on the acquisition of water rights on behalf of the United States, or upon the limitation and modification of existing rights, including groundwater rights. S. 1230, 115th Cong. § 3 (2017). Notably, the bill would prohibit the Secretary of the Interior and the Secretary of Agriculture from asserting “any connection between surface and groundwater that is inconsistent with such a connection recognized by state law.” *Id.* at §

are even troubling signs from the Court itself: one Special Master has gone so far as to hold that the Court's power to interpret compacts "is so robust as to be almost indistinguishable from the act of rewriting."⁴⁸¹

In response to the unpredictability and inconsistency of federal actions and positions, there are similarly troubling signs of the states' withdrawal from these long-established structures. In the Republican River Basin, the RRCA has re-discovered interstate comity by way of a shared hostility to Reclamation.⁴⁸² Kansas has faced hydrological-political reality and grudgingly accepted Colorado's and Nebraska's augmentation plans; it has become clear that neither state will substantially reduce groundwater pumping to comply with the Republican River Compact. Frustrated by Reclamation's understandable concerns about augmentation, the RRCA has passed a series of resolutions that embrace augmentation and define compact compliance downwards, in apparent defiance of the compact, which requires the safeguarding of federal infrastructure.⁴⁸³ In the Republican River Basin at least, anti-federalism has replaced cooperative federalism. The United States remains reluctant to protect its own interests, as well as the irrigators who depend upon surface water stored in Reclamation reservoirs. In deference to groundwater irrigators, the RRCA may have engineered an efficient breach of its own.

What then, of the surface water irrigators within Reclamation projects whom their parent states have effectively abandoned? Here, the boundaries between compacting states may be yielding to the boundaries between surface and groundwater.⁴⁸⁴ In *Kansas v. Nebraska & Colorado*, surface water irrigators in Nebraska assisted Kansas, because they shared a common interest in seeking reductions in Nebraska's groundwater pumping. When the Court refused to consider, much less order, such reductions, they sought remedies within Nebraska with a similar lack of success.⁴⁸⁵ And in *Texas v. New Mexico & Colorado*, surface water irrigators in New Mexico who depend upon Reclamation's Rio Grande Project have aligned with Texas and the United States, in defiance of their own State Engineer, who asserts the sovereign right to allow continued groundwater pumping at their expense.⁴⁸⁶ In both basins, irrigators' dependence upon the source of water supply—whether surface or groundwater—is trumping allegiance to their parent states.

By contrast, eastern states have generally not entered into interstate compacts—and that has raised its own set of structural problems, even as upstream

4(2)(B).

481. *Kansas v. Nebraska & Colorado*, 2013 Report, *supra* note 214 at 40; *see also supra* note 250 (on the Court's amendment of the RRCA Accounting Procedures contained in the FSS).

482. For a detailed summary of the developments described in this paragraph, *see Griggs, supra* note 76, at 68–70.

483. Republican River Compact, ch. 104, 57 Stat. 86 (1943) at art. X (protecting the property of the United States).

484. *See Griggs, supra* note 76, for a detailed summary of the developments within the Republican River Basin.

485. *Hill v. State*, 894 N.W.2d 208 (Neb. 2017).

486. *See supra* text accompanying notes 180–87.

states have condoned levels of groundwater development that have clearly injured downstream states.⁴⁸⁷ Without a compact or decree in place, states claiming that they have been deprived of water supplies managed or regulated by federal entities have been forced to pursue separate and arguably redundant litigation avenues to obtain relief.⁴⁸⁸ At this writing, *Florida v. Georgia* provides a cautionary tale reminiscent of the Republican River litigation: without the active involvement of the relevant basin-wide federal agency—Reclamation for the Republican River Basin, the Corps for the ACF Basin—interstate litigation does not provide a satisfactory result. Conversely, *Mississippi v. Tennessee* reveals what is perhaps the limit case of that frustration: an attempt to avoid the doctrine (and the inevitable structures) of equitable apportionment altogether.⁴⁸⁹ The Court should probably not have accepted either case. *Florida v. Georgia* is premature before the Corps decides how to manage the ACF Basin, and in such a way that it can be bound by that decision. In *Mississippi v. Tennessee*, Mississippi has requested the Court to reject or just ignore over a century of its own consistent equitable apportionment jurisprudence.

These problems of balance in hydrology, jurisdiction, and federalism lead to a third observation, one concerning doctrine. Western water law was founded upon the original condition of permanent aridity. That condition justified the prior appropriation doctrine, which was intended to protect, clearly and quickly, those with the oldest and thus best water rights.⁴⁹⁰ Without priority administration in times of drought, shared beneficial use would be insufficient for all rights, diluting them all into waste.⁴⁹¹ Likewise, the principal purpose of interstate water compacts is to fix the equitable allocation of scarce water supplies among states that would rather not share them.⁴⁹² These compacts matter most in times of drought, when water is most valuable, and so the temptation to overuse is greatest. The Court's application of the prior appropriation doctrine at the interstate level motivated the first interstate water compact, the Colorado River Compact, and most interstate compacts stress the importance of maximizing beneficial uses of the allocated water.⁴⁹³

As long as most of the usable waters of the West ran above ground, western water law and interstate water compacts operated in a workable tandem. Before the groundwater revolution, prior appropriation and beneficial use were united indivisibly.⁴⁹⁴ In practice, however, the groundwater revolution led states to decouple them, to place the principle of beneficial use over that of priority, and

487. See *supra* text accompanying notes 341–47.

488. See *supra* text accompanying notes 335–40.

489. See *supra* text accompanying notes 366–72.

490. MEAD, *supra* note 32, at 65–66.

491. *Id.*; see, e.g., *Armstrong v. Latimer Cty. Ditch Co.*, 27 P. 235, 237 (Colo. App. 1891).

492. See HUNDLEY, *supra* note 66, at 53.

493. *Wyoming v. Colorado*, 259 U.S. 419, 467–68 (1922); HUNDLEY, *supra* note 66, at 169; see, e.g., *Republican River Compact*, ch. 104, 57 Stat. 86 (1943) at art. I (expressing a primary purpose of the compact to maximize beneficial use of basin waters). The Colorado River Compact was the first interstate water allocation compact to be negotiated by the states, and was signed in 1922, but it did not become effective until 1929. *Boulder Canyon Project Act*, sec. 4, ch. 42, 45 Stat. 1057 (1928). The first interstate compact to gain congressional consent was the *La Plata River Compact* (between Colorado and New Mexico). *La Plata River Compact*, ch. 110, 43 Stat. 796 (1925).

494. See, e.g., *Washington v. Oregon*, 297 U.S. 517, 545 (1936) (“The essence of the doctrine

to regulate groundwater less stringently than surface water.⁴⁹⁵ For a time, the delayed impact of groundwater pumping on streamflows, and the imperfect understanding of the relationship between groundwater pumping and streamflow depletions, enabled these policy decisions. But as depletions became more obvious and their causes better understood, these decisions destabilized the administration of interstate compacts and eventually made their violation inevitable. Over the past fifty years, litigation to enforce these compacts has clarified their meaning, their scope, their measure, and their power.

Yet in making the states' obligations clear, litigation has produced an unintended consequence. The states have been reluctant to reduce groundwater pumping, and the Court has been reluctant to order such reductions or otherwise to intrude upon state law.⁴⁹⁶ This shared reluctance has created a divergence between the means of compliance and some of the founding principles of western water law, most prominently the prior appropriation doctrine. The pressure of interstate litigation on the doctrine has largely gone unrecognized by legal scholars.⁴⁹⁷ But it has long been an open secret among those who must comply with a decree from the Court. As an engineer candidly declared in the wake of *Texas v. New Mexico*, "[a]dministration of priorities in the Pecos River Basin . . . is the only option currently available for meeting the delivery obligation under the Amended Decree. That option should be avoided at all costs."⁴⁹⁸

The Nebraska Supreme Court has recently reached a similar conclusion, albeit one resting on different jurisdictional and doctrinal foundations.⁴⁹⁹ In a decision denying surface irrigators' inverse condemnation claims, the court essentially held that prior appropriation rights to the surface waters of the Republican River in Nebraska—rights which date back to the nineteenth century and upon which Nebraska's Reclamation projects substantially depend—are essentially defenseless against junior groundwater permits, because Nebraska has made a political bargain with its groundwater irrigators. Nebraska has decided to delegate groundwater pumping to NRD's, which Nebraska DNR does not

of prior appropriation is beneficial use . . ." (internal citations omitted)).

495. See HALL, *supra* note 113, at 119–20 (for New Mexico); see also *supra* text accompanying notes 421–24 (for Colorado).

496. See *supra* text accompanying note 420.

497. Scholarly literature on the death, life, or irrelevance of the prior appropriation doctrine has generally been limited to discussing federal environmental law and innovations in state water law, such as the accommodation of instream flow rights. See, e.g., David H. Getches, *The Metamorphosis of Western Water Policy: Have Federal Laws and Local Decisions Eclipsed the States' Role?*, 20 STAN. ENVTL. L.J. 3 (2001) (focusing on federal environmental law and state law modifications to the doctrine); Justice Gregory J. Hobbs, *Priority: the Most Misunderstood Stick in the Bundle*, 32 ENVTL. L. 37 (2002) (defending the utility of the doctrine largely based on federal environmental law and Colorado state court decisions); Reed D. Benson, *Alive but Irrelevant: The Prior Appropriation Doctrine in Today's Western Water Law*, 83 U. COLO. L. REV. 675, 690–704 (2012) (discussing an assortment of state law cases); Michelle Bryan, *Valuing Sacred Tribal Waters Within Prior Appropriation*, 57 NAT. RESOURCES J. 139 (2017) (advocating for an evolution in state prior appropriation law regimes to provide yet unrecognized protections for tribal sacred waters).

498. HALL, *supra* note 113, at 205 (quoting John Whipple, engineer for the New Mexico Interstate Stream Commission).

499. *Hill v. State*, 894 N.W.2d 208 (Neb. 2017). For an astute summary of this decision, see Anthony Schutz, *Takings Litigation against Nebraska Department of Natural Resources*, ROCKY MTN. MINERAL L. FOUND. WATER LAW NEWSLETTER, vol. L, No. 2, 1–3 (2017).

control; but in meeting its compact obligations, it has chosen to administer surface water rights—which it does control—before entertaining the politically suicidal option of reducing groundwater pumping.⁵⁰⁰ Thus, claiming as universal the protections established in *Hinderlider*, Nebraska has pursued, so far successfully, a peculiar but effective compliance strategy. Nebraska DNR has exercised its regulatory power over surface water in water-short years by shutting off all prior appropriation surface rights in the Republican River Basin; but because it has no authority to curtail groundwater pumping, it is thus excused from curtailing groundwater pumping during those same years.⁵⁰¹ Despite their senior priorities, surface water users in the basin “are being singled out to bear the burden of water shortages for the benefit of the groundwater using majority.”⁵⁰² In both New Mexico and Nebraska, then, the means by which upstream states are fulfilling their compact obligations have raised fundamental questions about the efficacy of the prior appropriation doctrine in practice.

A final observation concerns interstate litigation itself. With all of these problems in mind—political, jurisdictional, and doctrinal, but always hydrological—we are left with a recurring question asked by risk-averse downstream governors, thoughtful journalists, and the often-weary Court: are interstate water conflicts best resolved or even resolvable by litigation? The answer, to conclude with lawyerly equivocation, depends upon the basin. Commentators have recently pointed to the agreements reached on the Colorado River as proof that negotiation is always superior to litigation.⁵⁰³ The Colorado River is the most important river in the West, but it is exceptional. Its “law of the river” combines decades of binding federal law and federal and state agreements into a unique jurisprudence.⁵⁰⁴ Moreover, federal law confers upon the United States a central management role in the Colorado River Basin from which it cannot shrink—a role that convinced the Court to issue its sole decision on congressional apportionment in 1963, and one that continues to this day.⁵⁰⁵ The Colorado’s importance to desert megalopolises such as Denver, Las Vegas, Phoenix, and Los Angeles, as well as its vast hydropower resources, make for considerably higher stakes compared to lesser and primarily agricultural theaters such as the Pecos, Arkansas, Republican, and Rio Grande Basins.

And most tellingly for this article, the parties to the Colorado River Compact have not confronted the problem of groundwater depletion—at least not yet.⁵⁰⁶ In other groundwater-dependent interstate river basins of the West, litigation has forced defendant states to own the consequences of their groundwater overuse, in the form of damages, remedies, legal reforms, and compliance

500. See *supra* text accompanying notes 107–09, 116.

501. *In re Cent. Neb. Pub. Power & Irrigation Dist.*, 699 N.W.2d 372, 378 (Neb. 2005).

502. Schutz, *supra* note 499, at 3; see also Aiken, *supra* note 115.

503. See, e.g., FLECK, *supra* note 327 (summarizing recent negotiated compromises within the Colorado River Basin).

504. See, e.g., Lochhead, *supra* note 49.

505. *Arizona v. California*, 373 U.S. 546, 560 (1963); see *supra* notes 12 and 24; see also Central Arizona Project Act, 82 Stat. 887 (1968), codified at 43 U.S.C. § 1521(b) (establishing a priority schedule within the lower Colorado River Basin).

506. One recent study reports that groundwater supplies in the Colorado River Basin have decreased by 41 million acre-feet between 2004 and 2013. Stephanie Castle *et al.*, *Groundwater Depletion during Drought Threatens Future Water Capacity of the Colorado River Basin*, *GEOPHYSICAL RESEARCH LETTERS* 41:16, 5904–11 (2014).

strategies. Without the weapon of litigation—without the guns of downstream states fixed upon the upstream “frontiers of their kingdoms”—it is certain that they never would have done so.⁵⁰⁷ Litigation has also forced states to enter into negotiated settlements and interstate compact resolutions whose endurance will certainly be tested over the next fifty years—at both the interstate and intrastate levels. In sum, litigation is not so much the answer to conflicts over interstate groundwater as it is their inevitable consequence—but one both ultimately necessary and the most effective in making the requisite “interstate adjustments” that the groundwater revolution has demanded.⁵⁰⁸

507. HOBBS, *supra* note 1; *see also* Transcript of Proceedings, Special Master William J. Kayatta, Jr., to John B. Draper, Counsel of Record for Kansas, at 1794, *Kansas v. Nebraska & Colorado*, No. 126 Orig. (Aug. 23, 2012) (“[P]art of the fundamental concern you had was that Nebraska had allocated its governmental power in a way that tied its own hands and effectively kept it from complying. And it seems to me you made a very good case that that’s precisely what happened in ‘05 and ‘06. The evidence then shows though that Kansas put a gun to Nebraska’s head. In fact, I may be talking to the gun right here.”).

508. Frankfurter & Landis, *supra* note 3.

REGULATING THE PACKAGED WATER INDUSTRY IN AFRICA: CHALLENGES AND RECOMMENDATIONS

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ABBREVIATIONS

ATWAP	Association of Table Water Producers (Nigeria)
CAC	Codex Alimentarius Commission
DFID	United Kingdom Department for International Development
DHS	Demographic and Health Survey
EHD	Environmental Health Directorate of the MoHS (Sierra Leone)
EPA	Environmental Protection Agency (Ghana)
FAO	United Nations Food and Agriculture Organization
FDA	Food and Drugs Authority (Ghana)
FDB	Food and Drugs Board (Sierra Leone)
FI	Factory Inspectorate (Sierra Leone)
GSA	Ghana Standards Authority
GSB	Ghana Standards Board
GWCL	Ghana Water Company Limited
GWVA	Guma Valley Water Company Act (Sierra Leone)
HACCP	Hazard Analysis and Critical Control Point
ISO	International Organization for Standardization
LGA-G	Local Government Act (Ghana)
LGA-SL	Local Government Act (Sierra Leone)
LMIC	Lower middle-income country
MDAs	Ministries, departments, and agencies
MDG	Millennium Development Goal
MoHS	Ministry of Health and Sanitation (Sierra Leone)
NAFDAC	National Food and Drugs Administration Control Agency (Nigeria)
NAFDACA	National Food and Drugs Administration Control Act (Nigeria)
NGO	Non-governmental organization
PB	Pharmacy Board (Sierra Leone)
PHA-G	Public Health Act (Ghana)
PHA-SL	Public Health Act (Sierra Leone)
POS	Point of sale
PWMF	Packaged water manufacturing facility
SLSB	Sierra Leone Standards Board
UNC	University of North Carolina
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WTO	World Trade Organization

PREFACE

The consumption of packaged drinking water in bottles and sachets has grown rapidly worldwide, particularly in arid and low and lower middle income countries ("LMICs"). This expansion has been particularly marked in many countries that lack the infrastructure to effectively monitor and regulate the manufacture and distribution of packaged drinking water products. In most cases, the legal framework is outdated and incomplete and there are gaps in institutional responsibilities among the various governmental actors regulating the sector. This lack of regulatory oversight has engendered governmental and public concern about the water quality of packaged water products sold in these countries and the health impacts for consumers of packaged water. The benefit of accessible low-cost water must be balanced against the stress on the municipal water systems providing the water for the packaging industry, the questionable quality of the water, and the environmental effects of the disposable plastic packages.

After selecting Sierra Leone as a locus of investigation, the United Kingdom Department for International Development ("DFID") funded a project to support the Government of Sierra Leone to study the phenomenon of packaged water and improve the regulation and quality of packaged water products sold in Sierra Leone. The project was jointly implemented by FOCUS 1000, a Sierra Leonean non-governmental organization ("NGO") and The Water Institute at the University of North Carolina at Chapel Hill ("UNC"). International legal expert Jessica Vapnek and international technical expert Ashley Williams were part of the advisory team, working in partnership with Sierra Leonean counterparts. This article arises from work carried out in Sierra Leone in 2013 and 2014, including the preparation of draft regulations to regulate the packaged water industry.

In Sierra Leone, as in most LMICs, packaged water is regulated by a patchwork of legislation and institutions covering different subject areas, including public health, environmental protection, water resources, and trade. In most countries, legal provisions have not been elaborated with packaged water in mind, creating inconsistencies, overlaps, and gaps in the system for inspection and control of the packaged water industry. In addition, in most countries, more than one institution may consider itself the lead ministry or agency to regulate packaged water (e.g., Ministry of Health, Ministry of Water Resources), which generates confusion, duplicative inspection regimes, or regulatory gaps. This can make the task of proposing revisions to the regulatory regime for packaged water a difficult one.

In preparing for the implementation of the project in Sierra Leone, the authors noted the absence of comprehensive guidance on regulation of packaged water. This article is intended to fill that gap, providing an overview of the packaged water industry and discussing the issues arising in its regulation. The hope is that this article will prove useful to government policy makers, NGOs, and researchers in countries concerned about the explosive growth and lack of effective regulation of the packaged water industry.

I. INTRODUCTION

As the middle class has expanded in many African countries and aging municipal water systems are not well maintained, sales of packaged water have ballooned.³ Business is booming, with new companies being established regularly and production and markets expanding into new areas. The Demographic and Health Survey in Ghana, for example, documented an increase in the percentage of households using sachet water as their primary drinking water source from 8% in 2008 to 29% in 2014.⁴ Less data is available on the number of packaged water manufacturers in other countries, although in Sierra Leone it is estimated that as of 2013 there were approximately 120 companies with distribution outlets covering the entire country.⁵

Although packaged water is now a significant source of drinking water⁶ for many families and individuals throughout the continent, there are many potential public health challenges associated with the packaged water industry. The most alarming challenge is that the industry is not appropriately regulated and monitored to ensure adherence to standards and requirements for quality, hygiene, packaging, and labeling. In most countries, there is an inadequate legislative framework, which means products on the market have variable quality. Even in countries where standards exist, there is often an insufficient legal basis for monitoring and enforcement. Unclear institutional responsibilities among the various implicated government ministries, departments, and agencies (“MDAs”) also undermine the government’s ability to enforce any laws or regulations regarding production, certification, and compliance monitoring of packaged water. Most of the MDAs have limited human resource and logistical capacity to perform their expected roles, further aggravating the problem.

Another challenge is that the volume of water ‘consumed’ by the producers puts a strain on piped water supplies and other water sources. This is often further exacerbated and enabled by low tariffs paid for the use of the ‘raw’ water. Also worrisome are the poor hygienic practices used during the production, storage, and distribution processes which create a potential for contamination.⁷ This is compounded by popular beliefs that packaged water is ‘pure’—even when studies have found packaged water to be contaminated⁸ and often not

3. *Africa Packaged Water Growth Outstrips Europe and US*, PROGRESSIVE DIGITAL MEDIA PACKAGING NEWS (Feb. 2014), available at <http://www.packagingtoday.co.uk/news/news-canadean-africa-packaged-water-growth-outstrips-europe-and-us-4178479>.

4. Ghana Statistical Service, *Demographic and Health Survey – Ghana* (2014).

5. Authors’ conversation with Mohamed F. Jalloh, July 2013.

6. The term ‘drinking water’ is often used interchangeably to describe water used for consumption as well as for domestic purposes such as cooking, cleaning, laundry, and bathing. However, as packaged water is usually produced in quantities of 20 liters or less, it is usually only used for consumption. Therefore, to avoid confusion, throughout this article we use the term ‘water for consumption’ rather than simply ‘drinking water.’

7. Michael B. Fisher, Ashley R. Williams, Mohamed F. Jalloh, George Saquee, Robert E.S. Bain & Jamie K. Bartram, *Microbiological and Chemical Quality of Packaged Sachet Water and Household Stored Drinking Water in Freetown, Sierra Leone* (2015), available at <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0131772>.

8. A. Christopher Dada, *Sachet water phenomenon in Nigeria: Assessment of the potential health impacts*. *Afr. J. Microbiol. Res* 3:1, 15–21 (2009).

certified by any governmental authority. It is concerning that the water is perceived as safe for baby feeding purposes, despite its questionable quality.⁹ Finally, the plastic sachets and bottles are single-use disposable commodities, and indiscriminate littering is widespread, contributing to a major waste problem as there is currently limited reuse and recycling of the used water packages in most countries. In light of these challenges, there is a need for comprehensive guidance for governments seeking to develop regulations or improve existing regulatory and institutional frameworks for the packaged water industry.

Through examining the context of several African countries and their regulatory experiences, we have sought to outline the complexities of regulating the packaged water industry and highlight issues for policy makers. We cover overall considerations in regulating packaged water and provide specific institutional and legislative recommendations. The purposes of this article are twofold: to paint a picture of the issues surrounding regulation of the packaged water industry, and to provide governments seeking to review, update, or design a system for the regulation of packaged water with up-to-date guidance. Although each country and context will vary, the information set out here provides the common threads that should be considered in developing an effective regulatory framework for packaged water.

This article consists of five parts. After a brief introduction, the second part outlines the context for the regulation of packaged water, including a short overview of the industry and packaged water products, a brief literature review, and some observations on the benefits of regulating packaged water. The third part identifies and discusses the many issues to be considered in designing an effective institutional and legislative framework to regulate packaged water. The fourth part focuses on general considerations inherent in making legislative change, while the fifth part offers a brief conclusion.

II. CONTEXT FOR REGULATION OF PACKAGED WATER

2.1. BACKGROUND

In early 2012, the World Health Organization (“WHO”) and the United Nations Children’s Fund (“UNICEF”) announced the achievement of goal 7c of the Millennium Development Goals (“MDGs”), which aimed to reduce the number of people without access to safe water supplies.¹⁰ Although the news demonstrates the progress achieved in the water, sanitation, and hygiene sector, more recent reports from WHO and UNICEF underscore the vast disparities in access to drinking water among regions. Of the nine geographic regions, sub-Saharan Africa and Oceania have the lowest overall national coverage, and the former saw only a 1% increase in the number of households with piped on-

9. Mohamed F. Jalloh, Mohammad B. Jalloh, Ashley R. Williams, Paul Sengeh & Jamic K. Bartram, *Consumer perceptions and purchasing of packaged water products: A Health Belief Model analysis in Sierra Leone* (draft).

10. WHO & UNICEF, *Millennium Development Goal Drinking Water Target Met* (2012), http://www.who.int/mediacentre/news/releases/2012/drinking_water_20120306/en (last visited 14 Jan 2017).

premises supplies in the twenty-five years between 1990 and 2015.¹¹ In 2015, only 16% of the population in sub-Saharan Africa had piped water on-plot.¹² Even for households that have access to piped supplies, there are growing reports of intermittent service and questionable water quality in existing municipal supplies, leading households to resort to alternative sources.¹³

The decrease in piped water on-plot for households in urban areas could be due to the severe problems associated with service delivery. Previous studies have reported issues of reliability of municipal piped systems in sub-Saharan Africa.¹⁴ As a result of the lack of accessible and reliable municipal piped supplies and overall lack of coverage by municipal suppliers, the role of water vendors and packaged water has expanded rapidly to fill the gap.¹⁵ The use of packaged water has gained momentum for other reasons, including a mobile urban middle class population. Packaged water has become a more appealing source of water for consumption due to its availability and the fact that it is perceived to be of higher quality than the water intermittently provided by municipal suppliers.¹⁶

In most African countries, sale of water for consumption was initially carried out by women, through small-scale home-based production known as 'tying cold water,' undertaken by housewives as part of their small trading and other income-generating activities to support their families. The production and distribution process was basic: transparent plastic bags were filled with water from the tap, tied at the top, and cooled in freezers. The sachets were then sold in the community, usually by migrant children from rural areas. Production and sale were unregulated by the authorities, as is the case with most informal sector activities in Africa.

With rapid increases in urban populations and concomitant deterioration in the service and quality of municipal piped water, demand increased exponentially for conveniently packaged, accessible, and affordable water for consumption. As a result, larger packaged water enterprises emerged, and there has been a substantial increase in local private sector production and sale of packaged water, both in sachets and bottles. Through attractive packaging and slogans, these producers have been able to persuade the public that their water is better than the water produced by the backyard women producers. However, no regulatory body generally verifies such claims. In Sierra Leone, for example, except for municipal water company officials who occasionally visit these enterprises to ensure that the water producers are paying commercial rather than domestic rates for their water supply, there is usually no official oversight and

11. WHO & UNICEF, *PROGRESS ON SANITATION AND DRINKING-WATER: 2015 UPDATE* (2015).

12. *Id.*

13. Marianne Kjellen, *Complementary Water Systems in Dar es Salaam, Tanzania: The Case of Water Vending*, *Int'l J. of Water Resources Dev.* 16:1, 143–54 (2000).

14. See, e.g., Justin Stoler, John R. Weeks & Günther Fink, *Sachet drinking water in Ghana's Accra-Tema metropolitan area: past, present, and future*, *J. of Water, Sanitation and Hygiene for Dev.* 2, at 223–40 (2012).

15. Kjellen, *supra* note 13, at 143–54.

16. Authors' conversation with Mohamed Jalloh, July 2013.

no guarantee that the water being sold is safe to drink. In several other countries including Ghana and Nigeria, the industry has expanded to include large industrial-scale producers whose much more visible operations do attract the attention of various governmental institutions—but most of them for revenue collection rather than for public safety and health controls.

Growing expressions of concern from the public in many countries over the purity and quality of packaged water and the hygienic conditions in which it was produced¹⁷ have attracted the attention of many governments to regulating this industry. As packaged water consumption continues to rise, many governments are increasingly concerned about the potential risk to public health from unregistered and unregulated packaged water products on the market. To improve the regulation of the quality and safety of packaged water produced and sold, governments must assess the current legal and institutional landscape to determine the weaknesses in the existing frameworks and then identify areas and strategies to improve the regulation of packaged water.

2.2. TYPES OF PACKAGED WATER

Two types of packaged water have emerged in sub-Saharan Africa: bottled water and sachet water. Bottled water is sold in hermetically sealed bottles ranging from smaller single-serving sizes of 0.5-2L to larger 18-20L bottles. The source of the water used in bottled water can be a spring, river, well, or municipal piped system, and there are several classifications of bottled water based on the raw water source.

Natural mineral water is defined as water from underground natural or drilled sources that are protected against the influence of surface water and possible pollution.¹⁸ The water has a distinct mineral content and trace elements, and it should be free from microbial contaminants. International guidelines require that natural mineral water be collected at the source, and they also prohibit certain kinds of water treatment processes.¹⁹ Water from water sources that does not meet the definition of natural mineral water may still be bottled, but this is simply referred to as ‘bottled water.’ In this article, the authors focus on bottled water, not natural mineral water.

Sachet water is a single serving of water (typically 300-500mL) contained in a sealed plastic bag.²⁰ As noted, originally sachets were filled with untreated water, hand tied, and hawked in the street.²¹ However, with the advent of imported automatic-filling machines, sachets are no longer crude commodities but

17. See, e.g., Rockson Adofo, “How safe is the Sachet ‘Pure Water?’” GhanaWeb, 10 December 2009, available at <http://www.ghanaweb.com/GhanaHomePage/features/How-safe-is-the-Sachet-Pure-Water-161867>.

18. CODEX STANDARD FOR NATURAL MINERAL WATERS, CODEX ALIMENTARIUS (1981).

19. *Id.*

20. Joseph A. Ampofo et al., *When Urban Taps Run Dry: Sachet Water Consumption and Health Effects in Low Income Neighborhoods of Accra, Ghana*, Health & Place 18, at 252 (2012).

21. Ashley R. Williams, Robert E.S. Bain, Michael B. Fisher, Ryan Cronk, Emma R. Kelly & Jamie K. Bartram, *A Systematic Review and Meta-Analysis of Fecal Contamination and Inadequate Treatment of Packaged Water* at 2-3 (2015).

are now machine-filled products packaged in heat-sealed plastic with printed labels and branding.²² Most producers claim that sachets undergo some form of treatment before packaging, although this is not generally verified, and in any case the production processes vary.²³ For machine-filled sachets, twenty to thirty individual bags are typically packaged together and sold in bundles by wholesalers or retail stores.²⁴ Street vendors usually sell sachets individually, often in coolers or pails with ice to cater to urban customers in need of refreshment.²⁵ Bottled water is often more expensive than sachets due to the increased cost associated with its production.²⁶ In comparing the water quality of bottled water and sachet water, a recent systematic review and meta-analysis found that sachet water was more likely to contain fecal indicator bacteria than small bottles of water.²⁷

Quantifying the extent and growth of packaged water is difficult since international monitoring organizations have only recently recognized the increase in the use of packaged water as a primary source of drinking water. In its 2012 report, the Joint Monitoring Program (an international monitoring agency instituted by WHO and UNICEF to track progress towards MDG 7c) acknowledged the increase in numbers of households relying on bottled water as their primary drinking water source.²⁸ National surveys and research studies from sub-Saharan Africa indicate packaged water is becoming a substantial source of water for consumption. In the most recent Demographic and Health survey from Ghana, the Ghana Statistical Service reported 0.8% and 29% of surveyed households indicated bottled or sachet water, respectively, as their primary drinking water source.²⁹ However, in urban areas, 1.3% and 43.1% of households reported bottled water or sachet water, respectively, as their primary drinking water source.³⁰ In Nigeria, a 2008 study reported 70% of adults drank at least one sachet daily during the dry season.³¹ In another Nigerian study of 500 people two years later, 80% of respondents reported drinking one to three sachets per day, with another 19% drinking four to six sachets daily.³²

22. *Id.* at 3.

23. Ashley R. Williams, Mohamed F. Jalloh, Mohammad B. Jalloh, George Saquec, Samuel Pratt, Michael B. Fisher, Jessica Vapnek & Yasmin Jusu-Sheriff, *Improving the Regulation, Monitoring, and Quality of the Packaged (Sachet and Bottled) Water Industry in Sierra Leone; and Sensitising the Consumer base*. Final Report, The University of North Carolina at Chapel Hill and FOCUS 1000 (2014).

24. Teshamulwa Okiooga, *Water Quality and Business Aspects of Sachet-Vended Water in Tamale, Ghana* [Masters thesis], Nairobi, Kenya: University of Nairobi, 81 (2007).

25. *Id.* at 30.

26. *Id.* at 109; Gabriel R. Kassenga, *The health-related microbiological quality of bottled drinking water sold in Dar es Salaam, Tanzania*, *J. Water and Health* 5:1, at 179-89 (2007).

27. Williams et al., *supra* note 21, at 1, 8.

28. WHO and UNICEF, *supra* note 11, at 36.

29. Ghana Statistical Service, *supra* note 4, at 13.

30. *Id.*

31. M.O. Edoga, L.I. Onyeji & O.O. Oguntosin, *Achieving Vision 20:2020 Through Waste Produce Candle*, *J. of Engineering and Applied Sciences* 3:8, 642, 642 (2008).

32. M. Adetunji Babatunde & M. Ilias Biala, *Externality Effects of Sachet Water Consumption and the Choice of Policy Instrument in Nigeria: Evidence from Kwara State*, *J. of Econ.* 1: 2, 113, 121-22 (2010).

2.3. LITERATURE REVIEW

The authors conducted an initial review of 158 publications³³ to understand the prevalence, safety, and health implications of packaged water. The results of the review suggest that packaged water use is extremely widespread in many LMICs and constitutes the primary drinking water source for millions of individuals worldwide. Furthermore, although contamination of packaged water products occurs on occasion, bottled water products were less frequently contaminated with microbial contaminants than sachet water products. Total coliforms, fecal coliforms, and *E. coli* were found in approximately 35%, 21%, and 8%, respectively, of all sachet water samples from included studies, while only 11%, 3%, and 3%, respectively, of all bottled water samples were positive for these organisms. Only a few studies reported levels of lead, arsenic, and fluoride exceeding international guideline values, although on rare occasions these parameters far exceeded guideline values. The full review is included in Appendix II.

The review was further substantiated by a more rigorous recent systematic review of 170 peer-reviewed articles on the microbial water quality of packaged water products.³⁴ The authors found that of the 141 included studies that tested for fecal indicator bacteria, a little over half (78) did not detect contamination. Small bottled water (<0.5 L) was less likely to be contaminated with fecal indicator bacteria than all other kinds of packaged water products (large bottles and sachets). The study also compared the water quality results of twenty articles that tested packaged water products (either sachet or bottled water) and other drinking water sources available to households. Across these studies, the article reported packaged water was less likely to contain fecal indicator bacteria than other drinking water sources.

Even in light of those findings, serious concerns remain regarding the vulnerability of packaged water to contamination from viruses and radioisotopes, since these have not been studied in detail, and contamination of the exterior surfaces of sachet water products is also a concern. Governments in LMICs face substantial challenges if they are to effectively monitor and regulate the fast-growing packaged water industry. To do so, governments must develop systems to identify and track manufacturers and must implement effective, low-cost registration, product monitoring, and facility inspection programs.

2.4. BENEFITS OF REGULATING PACKAGED WATER

Governments regulate packaged water to achieve various goals. One is to safeguard the public by ensuring that packaged water products will not cause harm to human health;³⁵ another is to prevent discarded packaging from harming the environment.³⁶

33. See Appendix II for a more detailed review of the literature.

34. Williams et al., *supra* note 21, at 1.

35. WHO, GUIDELINES FOR DRINKING-WATER QUALITY 1 (4th ed. 2011).

36. Ampofo et al., *supra* note 20, at 4.

As consumption of packaged water continues to increase, there is concern over the quality of the products and adequacy of the treatment processes that producers use. Contaminated drinking water can lead to water-borne diseases such as diarrhea, campylobacteriosis, cholera, typhoid, arsenicosis, fluorosis, and lead poisoning.³⁷ Drinking water contaminants can be classified into three major classes: microbial, chemical, and radiological.³⁸ Microbial pathogens that are transmitted by water include bacteria (*Escherichia coli*, *Salmonella*, *Shigella*, *Vibrio cholerae*), protozoa (*Cryptosporidium*, *Giardia*), and viruses (norovirus, rotavirus, Hepatitis A and E).³⁹ Microbial contaminants typically result in immediate health consequences, whereas negative health outcomes associated with chemical contaminants typically occur over an extended period of exposure.⁴⁰ Some chemicals occur naturally such as arsenic and fluoride, while others originate from agriculture or industrial practices.⁴¹ The doses of radiological contaminants contained in water are usually very low, but could affect health with extended exposure.

Households with access to on-plot water supplies have shown to have improved health outcomes, specifically less diarrheal disease and helminth infections and increased child height.⁴² As national governments continue to work towards universal coverage of water and sanitation services, packaged water can be a viable alternative for households without access to an uninterrupted supply of safe water for consumption. Recent studies have suggested that packaged water may be safer than household stored water or other alternative water sources.⁴³ By regulating packaged water products and ensuring their quality, national governments could realize the possible public health benefits of providing an interim alternative supply of safe water for consumption while coverage of municipal supplies continues to expand. At the same time, governments should simultaneously invest in piped water supplies, as packaged water has other environmental side effects (including the cost of transport) and is not a sustainable, long-term solution.

Since packaged water is a new arrival in many countries, most governments do not have laws that specifically address its regulation. There may be one or more existing laws or regulations that can be interpreted to cover packaged water, but this can be problematic. Among other problems, the various pieces of existing legislation (such as legislation on food or water) may have inconsistent definitions of water, food, or packaged water, which can undermine enforcement. In addition, several relevant laws may establish the same or overlapping mandates for different agencies that regulate various aspects of packaged water. This may result in burdensome and overlapping inspections of businesses

37. WHO, *supra* note 35, at 38-39, 238.

38. *Id.* at 4.

39. *Id.* at 119.

40. *Id.* at 6.

41. *Id.* at 178-79, 494.

42. Alycia Overbo, Ashley R. Williams, Barbara Evans, Paul Hunter & Jamie K. Bartram, *On-plot Drinking Water Supplies and Health: A Systematic Review*, *Int'l. J. Hyg. Env't. Health* 317, 319 (July 2016).

43. Fisher et al., *supra* note 7; Williams et al., *supra* note 21.

(which wastes financial resources), or gaps in monitoring and enforcement responsibilities allowing unregulated manufacture or distribution of packaged water.

The overlaps may have originated from different agencies having been created at different times, each with its own domain. For instance, regulatory power over packaged water may have originally resided with the ministry responsible for health, while the ministry responsible for water resources may also have been granted some authority in relation to packaged water. Equally, if the discarded packaging from sachet water has become a growing environmental problem, environmental protection agencies may have been given some control.

Reviewing and redesigning the legislative framework so that it provides consistent definitions, clearly identifies the products to which it applies, and rationalizes the institutional responsibilities is a key step to improving regulation of the packaged water industry. Unambiguous laws also prevent varying or conflicting judicial interpretations. This may require amending some legislative provisions to make them specifically applicable to packaged water. For instance, although a legal provision may provide that selling articles dangerous to human health attracts penalties, this may not provide sufficient notice that packaged water is included. Another example is general laws prohibiting misleading advertising: although the provisions may apply to packaged water, users might not appreciate this, and therefore more specific standards for advertising of packaged water products may be required.

Some national legislation may address the packaged water industry directly, but without effective enforcement and accountability, little progress will actually occur. For example, legislation may create a process to issue certificates to those wishing to produce packaged water, but the process may be largely ignored by industry if enforcement is weak. Redesigned national legislation, accompanied by outreach and training for government officials responsible for enforcement, can specifically address packaged water and therefore be effectively enforced. Changes to legislation will have to be accompanied by education and outreach campaigns—to the public, to producers, and to government officials—to foster compliance and enforcement and to sensitize the public to what they have a right to expect.

III. DESIGNING AN EFFECTIVE REGULATORY FRAMEWORK FOR PACKAGED WATER

3.1. ASSESSING THE CURRENT LEGISLATIVE AND INSTITUTIONAL LANDSCAPE

The first step in designing or redesigning an effective system to regulate the packaged water industry is to identify existing laws and regulations that either specifically address packaged water or could be interpreted to cover packaged water. Some countries have no legislation that can be interpreted to apply to packaged water, while others may have more than one piece of legislation, each

of which covers discrete activities linked to the production and sale of packaged water. The relevant legislation may include laws and regulations on human health, water, environment, or manufacturing. In most cases, because the existing legislation was elaborated without packaged water in mind, there will be inconsistencies, gaps, or overlaps in the legislative framework. And even where parent legislation (such as a public health law) exists, it usually does not outline specific requirements for the packaged water industry. For this reason, most governments will wish to prepare tailored legislation with clearly defined requirements and expectations for producers to facilitate compliance and enforcement. An assessment of the existing legislative framework will help to identify the following:

- 1) Existing pieces of legislation (if any) that could apply to packaged water;
- 2) Overlaps created by the existing legislation; and
- 3) Regulatory gaps in the current framework.

After the national legal experts identify the legislative landscape, including the gaps and overlaps, the next step is to conduct an institutional review to assess how institutions are implementing the existing laws and regulations in practice. This analysis is critical because the difference between what is written in the legislation and what is actually taking place (e.g., with respect to inspecting and monitoring the packaged water industry) can be quite large. An institutional review should identify the following:

- 1) The range of institutions purporting to regulate aspects of the packaged water industry;
- 2) Current regulatory practices within each institution;
- 3) Previous experience of each institution regulating packaged water or other similar industries;
- 4) Funding levels for each institution;
- 5) Institutional and staff capacity of each institution; and
- 6) Challenges for a particular institution to exercise its legal mandate.

By conducting these legislative and institutional reviews, governments can identify the gaps and overlaps and can determine which institution or institutions do have, should have, or could have the mandate and capacity to carry out specific regulatory roles with respect to packaged water. The results of the reviews will guide the formulation of recommended changes to the legislative and institutional frameworks to improve the overall regulatory system for packaged water.

3.2. LAWS OR REGULATIONS

If the results of the review indicate that new legislation is needed, the next task for policy makers will be to decide what form the new legislative provisions on packaged water should take. For example, the government may decide that

a new (parliamentary-level) law is needed, or it may determine that an existing law—such as a public health law or a food law—provides a solid legal basis under which to promulgate new subsidiary (ministerial-level) legislation such as regulations; or it may decide that both a new law and new implementing regulations are needed. Alternatively, the government may determine that strengthening the regulatory framework for packaged water only requires a few amendments to existing legislation.

A distinction should be made here between what is ideal and what is practical: even where there is consensus that the best solution is a new packaged water law, in the end, the government may decide for practical reasons that a few amendments or a set of new regulations is all that will be pursued. This could be because there is a lack of political will to shepherd a new parliamentary-level law through the enactment process; or it might be because there is a political stalemate that would prevent its enactment; or perhaps the process would take too long and the government wants a more rapid solution. In such circumstances, it may decide simply to promulgate regulations.

Where a parliamentary-level enactment is selected, policy makers should bear in mind that such legislation is generally kept as basic as possible, leaving details and specific requirements for the implementing regulations. This serves two purposes: First, it facilitates passage of the main law, because the more general it is, the less likely it is to be objectionable to other ministries and government authorities. Second, keeping the law basic ensures that any amendments that later become necessary because of scientific advancements or changing political circumstances can more quickly and easily be made. That is, instead of having to approach the legislature to amend any new packaged water law, the relevant minister would simply exercise his or her power to issue or amend ministerial regulations as needed.

The dividing line between what is to be included in the parliamentary-level legislation and what should be in the subsidiary instruments (e.g., regulations, rules, orders, schedules) depends on the legislative and other traditions in the country, but some general observations can be made. First, as already noted, any elements that are likely to change should not be included in the main law. This would include provisions based on the state of scientific or technological knowledge, as well as any provisions that depend on a particular set of empirical circumstances. For example, lists of approved packaged water producers should clearly not be in the main law as these will change over time.

Subsidiary instruments, including the definitions they use, should not conflict with the main law. Similarly, any procedures set out in the principal legislation—such as the system for issuance of permits to produce packaged water—should be the skeleton on which any more comprehensive procedures are fleshed out in the regulations. The regulations should, where possible, create a comprehensive whole in their own right. This is so that if at some future date the main law is repealed, the system established in the regulations can remain.

The next sections identify in more detail the specific issues that should be addressed in legislation on packaged water.

3.3. ISSUES ARISING IN THE REGULATION OF PACKAGED WATER

3.3.1. Legislative definitions

The legislative assessment should start with a review of the definitions of key terms in the legislation, as some definitions may be absent or there may be inconsistencies in terminology among pieces of legislation passed at different times. Legislation passed decades ago to cover water or food may not use language that would clearly include packaged water, since the product has only been developed in recent years. Consistent definitions can eliminate confusion and gaps in enforcement and facilitate judicial interpretation. Particularly important is a clear definition of 'packaged water,' since that definition will set the scope and outline the coverage of the legislation.

The definition of packaged water can present a challenge in that it is drinking water, which can often fall into the category of water resources, but since it is packaged it is also a product for consumption, and can thus be considered a food. As is shown in the Nigeria and Sierra Leone case studies (see Appendix I), if 'packaged water' is not explicitly included in the legal definition of 'food' or 'drinking water,' this may lead to overlapping responsibilities among regulatory agencies and weakened enforcement.

The definitions in the law or regulations should be internally consistent, and they should be drafted as clearly as possible, without archaic constructions like 'the said permit' and 'therein.' The list should only include those terms that actually appear in the legislation and that are likely to be a cause for confusion if not defined. There is often a temptation, especially among technical experts, to include in the legislation numerous definitions even for terms that do not appear in the text, and even of terms that are generally well understood. This is unnecessary.

3.3.2. Competent authority

A key task will be to identify overlapping responsibilities among regulatory agencies and name one competent authority to serve as the lead regulator of the packaged water industry. Through the legislative review, policy makers will be able to identify if and where there are overlapping legal mandates, while at the same time the institutional review can provide insight into which regulatory body is most capable and equipped to regulate the packaged water industry. Ideally, one institution, such as the Ministry of Health or the Food Inspection Agency, will be designated as the competent authority to regulate packaged water, although in some contexts, political and resource considerations may require that more than one institution exercise control over various aspects of packaged water regulation.⁴⁴

44. For example, the institutional and legislative review in Sierra Leone confirmed that the MoHS is the most appropriate government ministry to regulate packaged water based on existing legislation. However, although the MoHS has the legal basis to take the lead role in regulating the industry, for a variety of reasons it was decided that other institutions would continue to exercise specific and discrete roles. To minimize overlaps or gaps in responsibilities, the draft regulations call for the identification of a 'coordinating unit' to oversee the roles of the several entities involved

The role of local government in the regulation of packaged water will vary by country. In Nigeria, enforcement of the regulations is vested in an agency at the national level, the National Food and Drugs Control Agency ("NAFDAC"). By contrast, Ghana relies on the District/Metropolitan Assemblies to enforce regulations at local level, while in Sierra Leone, the Ministry of Health and Sanitation ("MoHS") has devolved its responsibility to provide and protect access to safe drinking water to the local councils established by the Local Government Act. Accordingly, the draft regulations prepared for Sierra Leone provide that local public health aides should be trained to carry out monitoring of the packaged water industry and enforce compliance with packaged water standards at the local level. Empowering local authorities to handle compliance could address the problems of ineffective enforcement in Nigeria as well, discussed in more detail in Appendix 1.

3.3.3. Regulatory responsibilities

Legislation should provide the competent authority with all powers necessary to carry out its duties, taking into account the circumstances and resources in the country. Some of the responsibilities may include the power to issue subordinate rules, such as regulations or guidelines for packaged water production. Another important power is the ability to charge fees for the services provided. Many variations are possible here, such as fees charged to apply for a certificate to produce packaged water or fees for registration of a packaged water product, approval of the package or label, or laboratory analysis. In some countries, the competent authority may be able to retain fees it collects. In other countries this is not legally possible, and instead all government-acquired fees are consigned to the consolidated fund administered by the ministry responsible for finance, which then allocates funding to the various ministries and agencies through the normal budgetary process.

The competent authority should have the power to enter premises to conduct inspections: some inspections should be scheduled and others unannounced, to optimize enforcement. In Sierra Leone, because more than one governmental authority is involved in the regulation of packaged water production, the draft regulations authorize the new coordinating unit to issue a comprehensive certificate to operate a packaged water facility after confirming that the requirements of the other authorities have been met (such as inspection of the equipment by the Factory Inspectorate ("FI")). The coordinating unit is responsible for verifying that the producer has submitted all necessary documentation in connection with the application for a certificate.

Another important duty of the competent authority is to collect and maintain information about the packaged water industry and packaged water products in the country. The authority should compile and report to relevant governmental and non-governmental bodies, as well as to the public, data on packaged water producers and the results of monitoring activities.

3.3.4. Inspections

Legislation should provide for the appointment of qualified persons to act as inspectors. In some countries the appointment of inspectors is not the responsibility of the relevant minister (e.g., the Minister of Health) but is the responsibility of a central government agency that appoints all public servants and officials. The details of inspectors' required qualifications are generally set out in subsidiary legislation.

In some cases, the competent authority may need the assistance of other administrative agencies and staff, if the authority itself has insufficient staff to carry out needed inspections in all places of business and regions of the country. For this reason, the legislation should permit the competent authority to use not only its own employees but also employees of other authorities, or even private contractors, for enforcement. For example, even where the ministry responsible for health is assigned overall regulatory authority for packaged water, it may wish to rely on customs officers at border points if there are not sufficient ministry employees to serve in those remote locations. The legislation should be phrased to permit this type of delegation.

Inspectors are the main point of contact between the government and the packaged water industry and between the government and consumers of packaged water products. Inspectors must have the power to enter a variety of locations, including production facilities and shops, and to stop and search vehicles, persons, and containers, to verify compliance with the legislative framework. Because these powers can be very similar to those of police and may therefore impinge upon personal liberties, the legislation should clearly outline the limits and exercise of the inspectors' powers.

The legislation should include other inspection powers such as the authority to take samples; to seize equipment, packaged water products, and documentation; to ask questions; to take photographs; to shut down operations; and possibly, to issue fines. Inspectors generally have to display their identification card when carrying out their duties, and can request the presence and assistance of the forces of public order (such as police) where needed. Subsidiary legislation may enumerate in more detail inspectors' duties and responsibilities, and may outline procedures for how inspectors should carry out inspections, take and mark samples, and submit them for analysis.

Inspections will cover a variety of activities at the packaged water production sites. The competent authority will have to ascertain compliance with legislative requirements in the following areas:

- Sanitary and hygienic condition of premises;
- Workers' sanitary and hygienic conduct/behavior;
- Workers' safety;
- State of machinery and equipment (including electrical wiring and fixtures);
- Calibration of measuring instruments;
- Water treatment methods;

- Water quality;
- Packaging;
- Labeling; and
- Storage of packaged water products.

In addition to the place of production, inspections should cover places where packaged water is sold, to ensure the sellers' compliance with legislation concerning the registration, packaging, storage, labeling, and sale of packaged water.

Often the inspections will need to be carried out by different regulatory agencies. For example, in Sierra Leone, both the MoHS and the FI are empowered to perform sanitary inspections of the manufacturing facility, while both the MoHS and the Sierra Leone Standards Board ("SLSB") are empowered to sample and analyze packaged water products.⁴⁵ In jurisdictions where multiple regulatory agencies have inspection responsibilities, ideally the legislative and institutional review will identify the overlaps. Where multiple authorities retain responsibilities, it is highly recommended that inspection visits be coordinated and harmonized. Joint training of inspectors will also facilitate uniformity of outlook and results.

Where there are overlapping mandates to carry out inspections, the authorities should collaborate and allocate specific responsibilities so as to conserve resources and reduce redundancy. Ideally, the authorities would select one institution's inspector to carry out the on-site inspection on behalf of all. Where this is not possible, on a joint inspection visit, one agency's representative might perform inspections of equipment, machinery, and electrical systems while another agency's representative would perform the sanitary inspection of the packaged water facilities. These responsibilities should be clarified in advance of the inspection visit. Similarly, to promote efficiency of on-site inspections and ease of data collection, authorities should harmonize their respective site inspection checklists and protocols. Inspectors should also be trained to collect packaged water samples at the time of inspection and then deliver them to an official laboratory.

3.3.5. Monitoring

An important role of the competent authority will be to carry out monitoring to ensure compliance of packaged water products and packaged water facilities with established standards. Regular site inspections and water quality testing of raw water sources and packaged water products should be incorporated into the certification process, as outlined below. The authority should also conduct regular surveillance, site inspections, and testing of water samples from producers and vendors. The frequency of surveillance testing should be based on the level of risk associated with the facility and the level of public exposure. The level of risk should be determined by:

45. Williams et al., *supra* note 23, at 10.

- Status as a current or new producer;
- Past history of cancelled certificates; and
- Frequency of consumer complaints and noncompliance.

Larger producers with high daily production volumes, and thus greater public exposure, should be examined more frequently. At production premises, the inspectors should conduct monitoring site visits (announced or unannounced) to ensure compliance with the established standards and regulations. These would cover:

- Sanitary and hygienic conditions of production sites, including workers' dress, behaviors, and medical fitness;
- Machinery and equipment (including electrical systems);
- Presence of illegal piping and interference/pollution/destruction of water supplies; and
- Raw water source inspection.

To create a more efficient monitoring system and reduce the burden on packaged water producers, the competent authority should coordinate unannounced surveillance visits of production facilities by the various regulatory agencies.

In addition to product testing at producers' facilities, monitoring should include market-based surveillance. Brands with higher volumes of distribution should be tested more frequently than brands with smaller production runs. Inspectors should gather samples from various distribution points and test the products for quality and compliance with regulations. They should then follow the established protocols for follow-up based on results from surveillance testing and inspections, and the competent authority then carries out the follow-up testing based on surveillance data. In addition, it is recommended that the competent authority create an avenue for consumers to report complaints. This is covered in more detail in Section 3.3.17. The authority should determine how many complaints within a given time period would warrant product testing and/or facility inspection.

3.3.6. Approved laboratories

The legislative framework should establish a system for identifying and approving the laboratories that will be authorized to analyze samples taken under the law. The legislation should set out criteria that a laboratory must meet to be certified as an approved laboratory after an external audit of its resources, equipment, staff capabilities, and other features.

In many countries there is an increasing need and desire to rely on private laboratories and their staff for some or all of these laboratory-related functions,⁴⁶ which the legislation should be drafted to permit. The legislation should also

46. *Id.* at 17.

set rules for the operation of the laboratories, as well as for how the laboratory staff should receive, mark, analyze, and maintain samples and communicate the results.

3.3.7. Certificate of operation

To ensure proper control over the packaged water industry, legislation should require that all persons or businesses seeking to produce and package water apply for a certificate of operation. Issuance of the certificate reflects formal written permission from the competent authority to produce packaged water. This may be an area of intersection with other national legislation governing general business operations but because of the public health risks involved, the authors recommend implementation of a specific system for packaged water, i.e., one that grants certificates to individuals and businesses seeking to produce packaged water.

The competent authority should receive, evaluate, approve, or deny applications for certificates to produce packaged water. Applications should be submitted in the form specified by the legislation, and will be approved or denied according to specified procedures and for specified reasons. The competent authority may be empowered to charge a fee, which should be publicly posted and based on cost recovery (see Section 3.3.10 for additional discussion). Where the application for a certificate is denied, the competent authority should provide the reasons for the denial in writing. The legislation should also establish the term of validity of the certificate and the procedures for reapplication and renewal.

In deciding whether to grant the certificate, the competent authority will evaluate the location, facilities, and equipment, as well as the competence and training of the producer's staff. More specifically, the competent authority should consider whether:

- The information in the application is complete and accurate;
- The location, land, facilities, and equipment are appropriate for the production of packaged water;
- The applicant's staff are technically competent to operate the packaged water business; and
- Adequate hygiene practices are in place.

The competent authority may impose additional requirements in connection with the issuance of a certificate. For example, a certificate may be granted subject to conditions, such as pre-treatment of the source water, mandatory staff training, or acquisition of special equipment.

Inspections are part of the system to oversee the issuance of certificates to packaged water producers. As set out above, inspectors should be given the power to enter premises, make inspections, take samples, and request documentation. The competent authority may suspend or revoke a certificate if inspections reveal a violation of any conditions on which the certificate was granted, or if new facts come to light which would have led to the denial of the

application at the time it was submitted. There should be an appeal procedure available for the denial, suspension, or revocation of a certificate for packaged water production.

The authors recommend that certificates be valid for one year, at which time producers will be required to renew their certification. The renewal process should include re-inspection and testing of packaged water products.

3.3.8. Standards

Because of the risk to human health, governments should develop and publish mandatory standards for packaged water. These will include requirements for the quality of the water, as well as for its packaging and labeling. National standards for water quality should specify the acceptable limits for microbial, chemical, and radiological parameters that pose a risk to human health. Each country may design its standards according to its needs, but the underlying requirement is that all packaged water products sold in the country must meet established mandatory standards.

The standards agencies in the three countries reviewed (Ghana, Nigeria, Sierra Leone) do not make packaged water standards publicly available. The typical practice in sub-Saharan Africa is for government standards boards to purchase access to the International Organization for Standardization ("ISO") standards for packaged water products, adapt them, and then charge manufacturers for access to the standards as a way of covering the government's own annual fee to use the ISO standards. This practice of charging producers for national standards creates a knowledge barrier that contributes to a lack of compliance, such as in Sierra Leone where the authors found that many packaged water producers were unaware that national standards existed. Therefore, the authors recommend that national governments evaluate this practice. Governments could also consider developing and disseminating alternative standards. The Codex Alimentarius Commission ("CAC"), for example, provides free product standard templates, which are meant to be adapted to suit each country's unique situation and needs. Similarly, the WHO publishes freely available Guidelines for Drinking-water Quality that can be used as a basis for packaged water standards. This would allow standards to be made available publicly for producers, as well as consumers.

3.3.9. Certification

Once in possession of a valid certificate of operation, a packaged water producer is then free to apply to the competent authority for certification of each packaged water product it intends to produce. The legislation should set out the required form and contents of the application and establish the standards with which the applicant must comply for the particular product in order to receive certification.

On receipt of the application, the competent authority tests the product and examines the proposed packaging and label and either approves or denies certification. When certification is granted, the competent authority assigns a certification number to the specific packaged water product, and the producer

must then include the certification number on the label. In some cases, a certification number may be integrated into a certification mark from the competent authority. A certification mark should be easily recognizable by consumers and to deter fraudulent use of the mark, it should be difficult to imitate and reproduce. The competent authority should mount awareness campaigns to sensitize the public to the importance of looking for the certification number/mark on packaged water products to ensure that they are officially certified as safe for human consumption.

The written notice from the competent authority that grants certification for a particular packaged water product will indicate the term of validity of the certification. No change may be made to the label as approved—except for the addition of the certification number/mark—without the permission of the competent authority. If the competent authority decides not to certify a particular packaged water product, the legislation should require the authority to provide a written explanation to the packaged water producer listing the reasons for the denial. The legislation should also afford the applicant an opportunity to appeal the denial and/or to resubmit the application for certification within a certain time period.

The legislation should empower the competent authority to cancel, amend, or suspend certification as new information becomes available. This might occur if the competent authority determines that certification was secured based on false information, if the applicant fails to report any relevant change (to the product or to the applicant's details), or if inspection reveals that the packaged water product no longer complies with the established standards.

3.3.10. Fees

Many of the activities reviewed in the preceding sections normally attract fees. For example, the competent authority should have the power to charge fees for services associated with certification and testing. To promote accountability and transparency, it is recommended that all fees associated with the regulation of the packaged water industry be standardized, published, and publicized widely through the media.

The authors also recommend that governments perform an economic analysis to determine the true cost of regulating the packaged water industry in their countries. The analysis should incorporate the personnel and resources required to implement the proposed regulatory framework while accounting for the estimated annual revenue generated by packaged water producers of varying sizes. The institutional review referred to in Section 3.1 can be used to evaluate funding available in the regulating institutions and help identify appropriate fees for cost recovery.

3.3.11. Labeling

Proper labeling of packaged water products is a key strategy to reduce environmental and health impacts in that the label conveys to the consumer the information needed to make decisions on whether consuming the water is safe and also on how to properly dispose of the used sachet. Country conditions

should be carefully considered when regulating labels. In lower income countries, consumers may be illiterate or literate only in a local language or dialect, or they may have other barriers to properly understanding the label.

Legislation, most likely subsidiary instruments such as regulations, should specify what information must be conveyed in a label, including at least:

- The brand name;
- The certification mark;
- The type of product (e.g., natural mineral water or packaged water);
- The name, address, and other contact information of the producer;
- The date of production and expiry date;
- The volume of the contents;
- Information about the chemical composition; and
- Instructions on proper disposal of the package.

To avoid running afoul of international trade rules, labeling requirements should apply equally to imported and domestically produced packaged water.

The legislation should dictate how the required information should be communicated. Depending on the national context, this may include the size of the label, the system of weights and measures to be used, the translations to be included (e.g., translation into local languages), and the need for pictorial representations. The legislation should also require that labels be resistant to normal wear and tear encountered in transport, storage, and use over the time period required for the packaged water products to reach the consumer and be used. Labels should be printed in non-fading ink colors and be firmly affixed to the packaging, or where imprinted directly on the plastic, should be printed in ink safe for human consumption—since in many cases consumers put their mouths directly onto the packaging of sachet water. In situations where individual packages are bundled for wholesale distribution, the legislation should require that both the primary and secondary packaging contain all required information.

As noted earlier, the certification of a packaged water product is generally contingent on the approval of a sample label submitted to the competent authority in conjunction with the application. The authority can therefore determine if all essential information is contained on the label, if the label is in the appropriate form, and if it uses the right means to communicate the information. The legislation should prohibit the sale of packaged water unless it bears a label that has been approved by the competent authority. The label should also comply with general requirements established in any other labeling legislation in force in the country, for example general legislation on food and drink.

3.3.12. Packaging

Because of the risk to human health, governments should put in place mandatory standards for the packaging of packaged water products. The standards should cover the types of materials that may be used and how long packaged

water may be stored and under what specific conditions (e.g., at what temperature). Because packaged water products are often sold informally on the streets in basins, for example, it is important that the packaging material not degrade in sunlight.

As policy makers seek to regulate packaged water, they should take into consideration all aspects of its impact on human health and the environment, including waste generated by the industry. This includes empty, used bags and waste from production processes. Consumer behavior and lack of solid waste management have exacerbated the effects of packaged water waste in many countries in sub-Saharan Africa. Once a consumer has finished with a sachet, he or she typically tosses the plastic sleeve on the ground since there are few, if any, public waste bins. The waste finds its way to ditches, leading to clogged storm drains and standing water. In tropical, humid regions, areas of standing water are ideal breeding grounds for mosquitos, resulting in an increased risk of transmission of malaria and other vector-borne diseases. Blocked drains also lead to flooding, with concomitant damage to property and risk to human health and life. In Ghana, public backlash against sachets due to the solid waste they produced was very strong and almost led to a ban on packaged water.⁴⁷

In tackling the problem of waste generated by packaged water products, policy makers have several options. Producers can be obliged to use recyclable or biodegradable materials, or to collect a deposit, which serves as an incentive for consumers to return the used plastic bags. Governments can also impose a product tax to pay for cleanup. If policy makers overlook this key issue in legislation, packaged water sachets will inevitably aggravate the problem of solid waste management that already exists in sub-Saharan Africa.

3.3.13. Import and export

In Africa, most packaged water is sold and consumed in the country where it is produced, but bottled water from Europe and North America is also imported into sub-Saharan African countries. In addition, some sub-Saharan African countries with more sophisticated production facilities export their packaged water products to neighboring countries that may have fewer producers or less industry. Where packaged water crosses international borders, the legislative and institutional framework must allow for the regulation of imported and exported packaged waters in addition to domestically produced products.

Government control over imports requires that importation of packaged water be prohibited unless the importer is in possession of an import permit from the appropriate authority. The legislation should elaborate the procedures for entities or individuals wishing to apply for an import permit for packaged water and also set out the criteria that the authority will use in deciding to grant or deny the permit.

47. See Stoler et al., *supra* note 14 (for Ghana); see also GNA, "AMA to Enforce Ban on Sachet Water if . . ." (July 8, 2007); cf. Ayokunle Christopher Dada, *Packaged Water: Optimizing Local Processes for Sustainable Water Delivery in Developing Nations*, 7 *Global Health* (2011), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3161851> (for Nigeria, the ban was more related to public concern over the water quality).

The legislation should establish that imported packaged water is subject to inspection at the port of entry to enable control of its quality, packaging, and labeling. For example, an inspection will ensure that the expiry date is not too imminent (to avoid the risk of the packaged water passing its use-by date soon after arriving in the country). Because the customs service is usually the first point of contact for imported commodities, it will have an important role to play in flagging imported packaged water that is not properly packaged or labeled. The legislation should also indicate whether there are exceptions for donations or for emergency use, for example during a drought or famine.

Countries may already have, or will wish to put in place, rules and procedures for the inspection of packaged water intended for export. For example, the law may provide that exporters must apply for a permit and that the competent authority will carry out a site visit at the applicant's plant, to check the facilities, equipment, and qualifications of staff. Because rejected exports affect a country's international reputation, the control of exports usually includes verification that exports meet the imported country's requirements, for example for packaging and labeling. This avoids the embarrassment of shipments being rejected at the receiving country's border, port, or airport on arrival.

3.3.14. Storage and transport

Because packaged water is usually transported and stored before being sold, the legislation should establish general requirements for both of these stages. For example, the rules should provide that the temperature not exceed a certain level, or that the products not be stored near hazardous materials. Since sachets in sub-Saharan Africa are typically bitten directly and consumed by consumers placing their mouths on the exterior of the sachet, the legislative provisions should require that during storage and transport, the packages must be kept free of dust, dirt, and other contaminants. For the same reason, the provisions might require that individual sachets be packaged in a secondary bag or container to reduce possible contamination of the exterior, since even when the water inside the sachet is safe for consumers, the contamination on the exterior of the sachet could result in negative health outcomes.

The law should also establish requirements for vehicles and containers used for transport of packaged water. For example, provisions may state that packaged water should not be transported without being covered or in the same vehicles as hazardous materials.

3.3.15. Sale

The sale of packaged water requires oversight to protect the consumers who will purchase and consume it. In most countries, regulation of larger supermarkets is usually already in place under existing legislation, whereas the informal sector is harder to regulate as packaged water is sold from tiny shops or individual sellers roaming through traffic with basins or coolers. As noted, street hawkers and vendors often display packaged water for sale, resulting in packaged water products being directly exposed to sunlight and high temperatures. Little research has been done to examine the effects of plastic leaching into the water,

but it has nonetheless raised consumer concerns. At this time, it is recommended that packaged water products be stored in cool, dry places.

Even where the packaged water sachets are sold to wholesalers in bundles, street vendors and hawkers typically remove secondary packing and sell individual packaged water products from coolers and buckets filled with ice. These practices create various mechanisms of possible contamination of the outside of the sachet, and some studies have shown an increase in microbial contamination on the exterior of sachets sold by street vendors.⁴⁸ Regulations could address the handling of individual packaged water products to ensure consumer safety, for example by requiring that sachets be kept in their secondary packaging during transport and storage—but given the manner of distribution and sale in sub-Saharan African countries, completely reducing potential contamination at the point of sale may not be feasible.

3.3.16. Advertising

Advertising can have a powerful effect on decisions to purchase a product, and thus, any effective system to manage packaged water must include restrictions on advertising. In many countries consumers have the impression—sometimes true, sometimes not—that packaged water is safer than tap water. More concerning is where advertising encourages consumers to choose packaged water (colloquially known as ‘pure water’ in many West African countries) when mixing baby formula.

Ideally the legislative framework will prohibit advertising packaged water in a deceptive manner. Legislation can also prohibit the use of specific words, phrases, or claims. Conversely, packaged water producers should refer to their certification prominently in advertising, so that consumers can begin to distinguish between those products that have been certified as meeting national standards and those that have not.

3.3.17. Information collection and dissemination

The competent authority carries out an important information collection and dissemination role that strengthens the system for the regulation of packaged water. Three types of communication are important: between regulatory agencies, between the competent authority and packaged water producers, and between the competent authority and the consuming public.

(1) Communication between regulatory agencies

To maximize government resources and facilitate data sharing, policy makers should consider developing a database of all current producers and products. This would aid regulators in tracking producers, coordinating inspections, scheduling monitoring activities, and identifying repeat offenders. Basic data on producers, as well as data on inspections and water quality testing, should be

48. E.O. Ejechi & B.O Ejechi, *Safe Drinking Water and Satisfaction With Environmental Quality of Life in Some Oil and Gas Industry Impacted Cities of Nigeria*, Soc. Indic. Res. 85, at 211-22, 219-20 (2008); Fisher et al., *supra* note 7, at 12.

entered into the database. To keep the database accurate, data entry should take place in a timely matter and on a regular basis.

The capacity of the competent authority, the state of local infrastructure, and the roles of inspectors as set out in the legislation may guide regulators in designing a database. Ideally, all MDAs involved in regulating the industry would have access to it. However, data security must also be considered, and access to sensitive information should be restricted to authorized personnel.

Inspectors serve an important information-gathering function as they collect vital information about production, storage, and labeling of packaged water. Inspectors also take samples of packaged water to evaluate the quality and types of packaged water on the market. If multiple MDAs are responsible for different regulatory activities, then policy makers should develop protocols for determining the chain of communication and the appropriate response when an instance of noncompliance occurs. To reduce overlap and miscommunication, these protocols should explicitly identify which MDA is responsible when specific circumstances occur. For example, protocols should identify the chain of communication if the water quality test results of sachet products show contamination. The protocol should clearly identify which institutions should be informed about the water quality testing results, and what official response is thereby triggered against the producer. In addition, the protocol should clearly identify which MDA should be alerted so that it can then communicate the health risks to consumers. Semi-annual or annual joint meetings of all MDAs associated with packaged water regulation are also recommended so that there is a regular forum to address any needed changes in existing communication protocols.

(2) Communication between the competent authority and producers

Once packaged water regulations are in place, the competent authority should clearly communicate to packaged water producers the content of the regulations and the established procedures for obtaining authorization to operate a packaged water production facility and produce specific packaged water products. This could include public training sessions in various locations throughout the country informing producers of new or revised registration processes and the requirements outlined in the regulations. These should include standards for water quality, labeling, and packaging, as outlined earlier.

The majority of smaller manufacturers in most developing countries have little understanding of water quality, water treatment processes, or hygiene. This lack of basic knowledge means that many producers do not use best manufacturing practices to ensure that the products are produced hygienically. Some producers may not use any treatment processes in producing packaged water, and even when producers do perform water treatment, they often do not test the quality of their products to ensure that treatment processes are effective and that the final product is safe for human consumption.

To facilitate dissemination of knowledge regarding best practices in the production of packaged water, it is advisable that either the competent authority or

some other identified body be charged with the responsibility for holding trainings for producers (or interested parties) regarding good manufacturing practices, hazard analysis and critical control point ("HACCP"), treatment options, water quality testing, and other topics as needed. In Sierra Leone, the DFID-funded project used a train-the-trainer process, i.e., it trained regulatory officials in the proposed registration process and regulations and these officials then trained packaged water producers. As part of the project, FOCUS 1000 and UNC also developed training manuals that provided detailed explanations of the regulations' requirements, to assist packaged water producers with compliance. Associations of packaged water producers, if they do not already exist, could be established and mentored to play a similar role to the Association of Table Water Producers in Nigeria, which publishes guidelines related to packaged water products and educates the general public.

(3) Communication between the competent authority and consumers

As outlined above, to assist consumers in reducing the risk of their exposure to low quality packaged water products, a certification mark should be designed to identify packaged water products that meet national standards. The competent authority should be charged with publicizing the certification mark so that consumers are aware of and are able to recognize the mark. In this way, they have the ability to make informed purchasing decisions. In addition, a list of the names of packaged water products that have failed national standards should be made available to the public on a quarterly or monthly basis. Regulations should also outline a feedback mechanism whereby consumers may contact the competent authority if they have a complaint or concern regarding a packaged water product. This could be in the form of a telephone number printed on product labels and advertised through national media, or some other means. The competent authority should monitor consumer complaints, establish a protocol for responding to them, and keep records of complaints. In addition, to promote accountability and transparency, it is recommended that all fees associated with the packaged water industry be standardized and published in national newspapers and publicized widely through the media. (See Section 3.3.10.)

3.3.18. Enforcement

The low entry barrier to production and the profitability of packaged water production and sale have resulted in a mushrooming of the number of packaged water producers throughout sub-Saharan Africa. As discussed, sachet water began as a simple, cottage industry where entrepreneurs hand-filled plastic bags and tied them off for individual sale. As the sachet industry has evolved, most producers have shifted to an automated filling and packaging process, and yet most facilities are still small operations housed in apartments or sheds. These smaller operations typically only include a few packaging machines, cartridge filters, ultraviolet light, and storage tanks, meaning that they can easily be relocated. As governments have sought to regulate the industry, they have encountered difficulty registering and tracking packaged water producers due to

this mobility. Producers identified as being in violation of existing regulations are easily able to shut down operations, relocate, and reopen under a different brand name.

As difficult as it is for regulatory bodies to track registered producers, there are hundreds more unregistered producers whose products are not registered. In Ghana, for example, one study reported there were an estimated several hundred unregistered producers in Accra alone.⁴⁹ Although registration is mandatory in Ghana, this is not widely enforced.⁵⁰ For these reasons, as noted above, the authors recommend that policy makers develop a packaged water database to identify producers and facilitate more effective monitoring. Limitations of government resources in terms of staff, transportation, and communications will nonetheless continue to hamper effective enforcement. This argues for governments and any funding partners to focus on strengthening the capacities of and providing essential resources to the bodies responsible for regulating packaged water.

3.3.19. Offenses

To ensure enforcement, the legislative framework should establish offenses, including actions not only by the general public and industry, but also by persons acting officially on behalf of the competent authority. Some of the possible offenses that can be committed by the public include:

- Selling or distributing a packaged water product that is not certified;
- Selling or distributing a packaged water product that does not meet the standards as stated when the product was certified;
- Violating the packaging, storage, or transport requirements;
- Distributing or selling a packaged water product that is not properly labeled;
- Advertising in a false or misleading way;
- Making false or misleading statements or providing false or misleading information in an application for certification or in required reports or records; and
- Hindering or impeding an inspection or assaulting an inspector.

Provisions governing the behavior of inspectors and other officials will guarantee the safety of information and propriety of actions taken by the competent authority and ensure that industry has appropriate confidence in the regulators. Potential offenses by officials could include:

- Knowingly disclosing any confidential information acquired in the course of official duties, except in limited circumstances (e.g., court proceedings);

49. See Stoler et al., *supra* note 14, at 6.

50. *Id.* at 9.

- Accepting, rejecting, or otherwise acting on any application for certification for any reasons other than those enumerated as applicable criteria in the packaged water legislation; and
- Participating in any administrative decision in which the individual has a personal interest including a familial relationship or financial stake.

After identifying the offenses, the legislation will next have to define which activities are criminal offenses and which are administrative ones. In some countries, the answer may already be provided for in the constitution (or in the criminal code), or the answer may be obvious due to the particular legal culture. For example, the Sierra Leone courts have tended to construe legislation strictly against the public entity and in favor of the private actor. For this reason, the draft regulations for Sierra Leone rely on administrative penalties rather than criminal offenses, as the latter would need to be adjudicated by the courts, which are a last resort.

Where the offenses are defined as administrative violations, the power to find violations is vested in the administrative agency, not a judicial body. In such systems, the competent authority has the power to punish certain kinds of violations. Because administrative penalties are imposed outside the judicial process, the evidentiary standards are lower and criminal court procedures do not apply. In some circumstances, where permitted, these types of penalty can be a viable alternative enforcement mechanism, as they can be more cost effective, timely, and practical than judicially imposed sanctions.

3.3.20. Penalties

Having defined the offenses, the legislation must then outline the applicable penalties, which may take different forms. These include fines, suspension or revocation of a certificate, forced closure of a production facility, and destruction of packaged water products not meeting standards.

It is important to ensure that the level of the penalties is high enough to be a deterrent while at the same time low enough not to be disproportionate to the offense committed. In many countries, fines and penalties in legislation are low or otherwise do not sufficiently deter due to the devaluation of the country's currency over time. Because the penalties are listed in the main law, they may remain at the same level for years or decades while their deterrent effect declines due to inflation. One solution, where legally possible, is to list the penalties in a regulation or other subsidiary legislation, as this can be more easily changed. Another option is to enact a separate law that introduces a multiplier, i.e., which states that all penalties listed in the parent law are multiplied by 100, 500, or 1,000, as the case may be. Another strategy is to avoid listing specific penalties in the law but instead to list a range, and to assign to the competent authority or judge the power to select the appropriate penalty within the listed range. So long as the upper level is sufficiently high, such a strategy can avoid the effects of inflation for a number of years, although it may still only be a temporary solution.

One innovative solution is to tie the penalties to a neutral economic parameter, for instance, the monthly salary of a civil servant of a particular grade. Thus, a minor offense might be defined as one quarter the monthly salary of a civil servant at a medium management level, while a serious offense might attract a penalty equivalent to ten times that same monthly salary. The advantage of this method is that it does not name particular amounts, and thus the penalties can be expected to rise over time—assuming that the government eventually raises its civil servants' salaries. Where this is not a valid assumption, tying the penalties to a reliable cost-of-living index may be a better solution. Any of these alternatives could be an improvement over listing a fixed amount in a law where the value of the country's currency declines over time.

3.3.21. Other provisions

Other provisions in the country's legislative framework for packaged water should address specific issues such as liability. For example, the provision could state that inspectors or officials are not liable for anything done in good faith in the performance of their official functions, such as the destruction of property. The law may also specify legal presumptions applicable under the law, although this will depend on the legislative practice of the country, since in some countries presumptions will be contained in a civil procedure or criminal procedure law applicable to all proceedings and all legislation. Typical presumptions include: the presumption that a certificate of analysis signed by the director or head of an official laboratory is evidence of the facts contained in it; the presumption that a packaged water product that bears the name and address of a producer was produced by that person or company; and the presumption that all the contents of a shipment from which a sample was taken are the same as the sample.

The legislation should include provisions allowing appeals against negative administrative decisions of the competent authority. For example, an applicant for certification of a packaged water product should be granted the right to appeal a negative decision. The law will have to indicate which party or body will hear the appeal (such as the head of the competent authority, the minister responsible for enforcement of the law, or a specially created appeals board). In some jurisdictions the appeals are channeled through the court system.

Another provision to include in packaged water legislation is one that explicitly refers to any existing legal provisions that are superseded by the new law. If earlier legislation is being replaced, then the new legislation will either state that the old legislation is repealed in its entirety, or it may list specific provisions that are being repealed. The new legislation may also include some transitional provisions that preserve the validity of certifications granted or regulations issued under the previous legislation, until a specific point in time. It is also routine to include a clause that renders anything inconsistent with the new law superseded.

Most parliamentary laws include a provision listing the many subject matters that the minister (or other person in whom the power has been vested, such

as the head of the competent authority) may address through regulations in order to carry out the purposes of the law. Depending on local practice, the list of regulations in the law may be extremely detailed or it may simply give broad outlines of the kinds of topics that may be addressed. In either case, the power to make regulations is rarely limited since the parent law usually contains a general statement that the minister or authority may make all regulations deemed necessary to achieve the purposes of the law.

Among the topics normally addressed in such subsidiary regulations are provisions on the organization and functioning of the competent authority established in the main law; detailed procedures for the issuance and repeal of certificates, including the criteria to be used by the competent authority in the decisions; and how inspectors should go about their work inspecting packaged water production facilities and taking samples. Regulations may also define the qualifications of inspectors operating under the packaged water law. Depending on the subject matter, the competent authority can be assisted in the preparation of regulations and other subsidiary instruments by technical committees or the various MDAs involved in regulation of the packaged water industry.

IV. CHANGING THE NATIONAL REGULATORY FRAMEWORK

4.1. REVIEWING EXISTING LAWS AND POLICIES

The preceding part provided general guidelines for what should be addressed in the national regulatory framework for packaged water. The next step is to tailor the legislation to national circumstances, as each country must take into account its legal system, resources, and existing legislation before enacting any new law or regulations. The format and contents of legislation to govern the packaged water industry that will be developed or revised in a particular country depend on a number of factors, explored below.

The first question is what is the fundamental legal text (usually a constitution) in the country that will underpin legislation governing the packaged water industry? The constitution, or other fundamental law, sets out the limits of public power and action, which will affect the provisions establishing the competent authority and giving powers to its officials. In nations with a federal governmental structure, the constitution may provide for a division of powers among the different levels of government. If some of the powers are granted solely to one level of government, this may affect the assignment of responsibilities within the legislation on packaged water.

Beyond the constitution, it is important to look carefully at existing legislation in force. Policy makers should analyze the existing legal provisions that can already be construed to apply to packaged water to identify what changes may or may not be needed. There may be an existing law that can be interpreted to cover packaged water, such as a general law on public health or food safety. There may be other provisions, for example in laws or regulations on environmental protection, food safety, or water resources, that directly or indirectly cover certain aspects of the packaged water industry. Customs and border protection legislation, as well as general legislation on import and export, may also

be relevant in the legislative review. The objective is to identify whether and what type of new or amended legislation is needed to properly and comprehensively regulate the packaged water industry.

In addition to legislation, a number of policies will guide the development or revision of a country's legal and institutional framework to regulate packaged water. For example, many countries have embraced a policy of decentralizing government responsibilities and devolving powers to provincial or lower levels of government. The purpose is to ensure public participation in decision-making and to promote more effective management of resources, since local authorities are generally more familiar with their regulatory needs and staffing and other resource constraints than is the central government. In practice, the existence of a decentralization policy in a particular country might mean that in any new legislation governing the packaged water industry, it is local authorities that should be given certain powers, such as the power to inspect, monitor, or issue certificates. In Sierra Leone, for example, the draft packaged water regulations assign enforcement powers to public health assistants exercising devolved power under the decentralization policy.

4.2. IMPLEMENTATION

The assessment of the existing legal and institutional framework should focus not only on the legislation and policies on the books: it is critical to look at the implementation of the laws and policies in practice. This is an important area of inquiry because if the reasons any current legislation governing packaged water is not enforced are not addressed, then any new laws and regulations are unlikely to work any better.

Several reasons may explain the gap between the legislation as written and as applied. In some cases, legislation may not be enforced simply because of a lack of resources. There are many examples of well-drafted pieces of legislation that have been enacted without sufficient attention to the country's resources and its level of development and thus are not enforced. Law makers should be realistic about the government's ability to fulfill its mandate, taking into account the fact that inspection services, both at the borders and within the territory, are often understaffed and lacking in basic infrastructure, such as buildings, equipment, and vehicles. In addition, where laboratories do exist, they may not have the appropriate equipment, supplies, or staffing to perform necessary analyses of packaged water. The effectiveness of legislation may also be compromised by corruption, a problem that governments may be unable or unwilling to combat. Consultations with governmental and non-governmental stakeholders during the legislative and institutional review will bring these issues to light and guide the discussions on the needs for any new or amended legislation to strengthen the regulation of the packaged water industry.

Both stakeholders and government officials should be regarded as key groups whose interests must be considered during the process of elaboration of the legal and institutional framework for packaged water. Building a consensus before presenting a draft bill to parliament or draft regulations to a minister can improve the chances of compliance with and enforcement of the new law. This

is because broad participation fosters a sense of ownership. Where the law reflects the perceptions and views of all stakeholders, this generally fosters acceptance of the law and active pressure for its enforcement, as opposed to indifference or passive resistance. By contrast, where legislation is formulated without consensus—for example due to undue pressure from the packaged water industry, or due to one particularly powerful minister pushing the legislation through—this may undermine implementation.

4.3. OTHER TOOLS FOR IMPLEMENTING CHANGE

Legislation uses a model of command and control, regulating behavior by establishing norms of conduct, monitoring compliance, and imposing penalties. The law provides the regulating authorities with adequate powers, allocates responsibilities, and establishes institutional mandates. A law for the packaged water industry establishes a system of certification of producers and products. But legislation can be complemented by other tools to regulate the industry, such as economic instruments and public-private partnerships.

Economic instruments, which seek to influence behavior through financial incentives and disincentives, can be used to influence demand and consumer behavior. Economic instruments achieve compliance by reliance on market mechanisms and pricing rather than through the imposition of penalties. These instruments include taxes and charges, subsidies, and fiscal incentives, such as a deposit on bottles or sachets of water to encourage consumers to return them to the point of sale, thereby reducing environmental contamination.

Other measures available to governments seeking to improve the regulation of the packaged water industry include public-private partnerships between government and research institutions, private companies, the packaged water industry, and NGOs. There are two primary ways to structure participation in such initiatives: co-regulation and self-regulation. Co-regulation is where the government provides the legislative framework but entrusts industry and other stakeholders with the responsibility for setting standards for the industry—within certain parameters. Such partnerships are usually established through a negotiated process and may consist of voluntary agreements between government and industry, or between government and other stakeholders.

Self-regulation refers to a system where industry drafts its own codes of conduct, which are approved directly by operators in the private sector; these codes of conduct have regulatory force without direct government involvement. For example, trade associations of packaged water manufacturers and NGOs may set up a voluntary scheme to regulate the industry. Sometimes self-regulation is promoted by government or arises out of negotiations between the government and private actors; elsewhere, the threat by government to establish a mandatory scheme—especially one that includes a compliance mechanism with sanctions—can be a sufficient incentive for a particular industry to establish a voluntary scheme. Voluntary industry initiatives can be a viable tool complementing government action and improving the regulation of packaged water.

The cross-sectoral nature of packaged water calls for a comprehensive approach. In countries with limited resources, governments often give serious

consideration to the adoption of some of these other implementation tools. However, these should only complement—and not be seen as an alternative to—the laws and regulations needed to manage the packaged water industry. Leaving packaged water to be governed solely by the market or by industry actors will lead to unacceptable risks to human health and the environment.

4.4. INTERNATIONAL GUIDANCE

As packaged water is becoming a prominent drinking water source in sub-Saharan Africa, there is a need to ensure that it is safe for human consumption. Several relevant US and international standards and guidelines exist that provide guidance on drinking water quality in general and packaged water quality in particular. Although international standards are not legally binding, they are often influential as guidance in the standard-setting process. Key international guidelines include the Guidelines for Drinking-water Quality,⁵¹ developed by WHO; packaged and bottled water standards set by the United Nations' CAC; the Code of Practice of the International Bottled Water Association;⁵² and regulations issued by the US Food and Drug Administration.⁵³

The CAC, a joint body of the United Nations Food and Agriculture Organization ("FAO") and WHO, elaborates harmonized food standards that are recognized by the World Trade Organization (WTO) through the Agreement on the Application of Sanitary and Phytosanitary Measures. Most relevant to the management of packaged water are:

- General standard for bottled/package drinking waters (other than natural mineral waters);⁵⁴
- General standard for the labeling of prepackaged food;⁵⁵
- General principles of food hygiene;⁵⁶ and
- Code of hygienic practice for the transport of food in bulk and semi-packed food.⁵⁷

For natural mineral waters, the relevant standards are:

- Codex standard for natural mineral waters;⁵⁸ and
- Code of hygienic practice for collecting, processing, and marketing of natural mineral waters.⁵⁹

51. WHO, *supra* note 35.

52. International Bottled Water Association, *Bottled Water Code of Practice* (2012).

53. 21 C.F.R. § 129.80 (2016).

54. GENERAL STANDARD FOR BOTTLED/PACKAGED WATERS (OTHER THAN NATURAL MINERAL WATERS), CODEX ALIMENTARIUS (2001).

55. GENERAL STANDARD FOR THE LABELLING OF PREPACKAGED FOODS (Codex STAN 1-1985).

56. GENERAL PRINCIPLES OF FOOD HYGIENE (CAC/RCP 1-1969).

57. CODE OF HYGIENIC PRACTICE FOR THE TRANSPORT OF FOOD IN BULK AND SEMI-PACKED FOOD (Codex/RCP 47-2001).

58. CODEX STANDARD FOR NATURAL MINERAL WATERS, *supra* note 18.

59. CODE OF HYGIENIC PRACTICE FOR COLLECTING, PROCESSING AND MARKETING OF NATURAL MINERAL WATERS (CAC/RCP 33-195).

As governments establish or revise packaged water regulations, they will need to adapt international and regional guidance for use in their countries based on what is practical and feasible given their financial resources and institutional capacity. Simply adopting international standards in their entirety may create problems as these may not be suitable to the local context and may or may not address issues in a given country. In addition, they may overburden national regulatory agencies that have little to no experience or resources to test packaged water products for all parameters outlined in the international guidelines.

V. CONCLUSION

As the prevalence of packaged water continues to expand across sub-Saharan Africa and to other LMICs, national governments will continue to face the issue of how to effectively regulate these products. Examples from countries already engaged in regulation can provide insight into the main challenges. As the three case studies set out in Appendix I demonstrate, effective regulation incorporates accessible, clear requirements and expectations for producers as well as distinct roles assigned to the various agencies associated with packaged water. Although packaged water products can have many negative implications, including possible low water quality and additional solid waste, the consensus is that the demand for them will only continue to grow. Therefore, national governments and policy makers should maximize the possible benefits of packaged water through effective monitoring and regulation.

Policy makers should undertake a legislative and institutional review to assess the existing legal framework and determine how to either create or revise legislation that will cover packaged water products. Regulating the packaged water industry should be about attaining the highest level of public health and safety rather than about maximizing government revenue. Collaboration among the implicated regulatory institutions will conserve resources and increase the effectiveness of regulation of the packaged water industry, to maximize protection of human health and the environment.

APPENDIX I. CASE STUDIES: GHANA, NIGERIA, SIERRA LEONE

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Focus 1000 and the authors conducted a legislative and institutional review in Sierra Leone, and national legal experts conducted legislative reviews in two other sub-Saharan West African countries, Ghana and Nigeria. After this brief overview, the results from the three country studies follow.

Nigeria has several sets of regulations covering the packaged water industry while Ghana and Sierra Leone do not. In Sierra Leone, the international and legal experts determined that the Public Health Act, 1960 (“PHA-SL”)¹ was the most appropriate piece of parliamentary-level legislation to cover the packaged water industry. Because no subsidiary regulatory instruments under the Act specifically address packaged water, the team recommended preparation of a comprehensive set of regulations to complete the legislative framework for the regulation of packaged water. In Nigeria, the ambiguity in the definition of “bottled water” in the National Food and Drugs Administration Control (“NAFDAC”) Act² has led to a weakness in the ability of NAFDAC to enforce the regulations with respect to sachet producers. Similar to Nigeria, in Sierra Leone “drinking water” is not included in the current definition of “food” in the PHA-SL.³ Since packaged water is not explicitly included, it has created confusion among regulatory agencies in Sierra Leone as to whose jurisdiction packaged water falls under.

In Ghana, the overlap in legal mandate between the Food and Drugs Authority (“FDA”) and Ghana Standards Authority (“GSA”) has led to duplicative efforts and wasted resources.⁴ The legislative and institutional review in Sierra

1. Public Health Ordinance 1960, Act No. 23 (Sierra Leone).

2. National Agency for Food and Drug Administration and Control Act (“NAFDACA”) (2010), Cap (N1) (Nigeria).

3. See Public Health Ordinance 1960, Act No. 23, § 2 (Sierra Leone).

4. Teshamulwa Okioga, *Water Quality and Business Aspects of Sachet-Vended Water in*

Leone revealed similar types of overlap in mandates among the Ministry of Health and Sanitation (“MoHS”), the Sierra Leone Standards Bureau (“SLSB”), and the Factory Inspectorate (“FI”), with little collaboration among them.⁵ The regulatory institutions in Sierra Leone perform their roles in parallel, which has resulted in burdensome and duplicative inspections (and inspection fees) for packaged water producers.⁶ Unauthorized institutions are also participating in certification and regulation, leading to “over-regulation” and disorder in the sector.⁷

The team in Sierra Leone used information collected from the legislative review and key informant interviews to prepare draft regulations for review by MoHS. The draft regulations drew upon existing or draft standards, regulations, guidelines, and tools developed by the Environmental Health Directorate (“EHD”), the Pharmacy Board (“PB”), and the SLSB, as well as international best practices. For the latter, the team incorporated guidance from the International Bottled Water Association, the United States Food and Drug Administration, and the Codex Alimentarius (“Codex”) into the draft regulations and recommended that MoHS adopt these comprehensive regulations for packaged water products in Sierra Leone. Enforcement of the regulations would be carried out by the local councils which exercise delegated authority for public health through the Local Government Act 2004.⁸

The three case studies exposed common issues governments face in regulating the packaged water industry, and these inform the recommendations contained in this article. Because the results of the legislative and institutional assessment will vary by country, the article does not make specific recommendations for what type of legislation should be developed. As noted in section 3.2 of the article, some countries may wish to and may have the political wherewithal to enact a new parliamentary-level law; others will choose to elaborate and implement comprehensive regulations to be issued at ministerial level, as in Sierra Leone. Still other countries may only need to make minor amendments to existing laws or regulations to ensure that the overall legislative framework addresses all the key issues arising in the regulation of packaged water. The next sections outline, in detail, the issues that came to light in the review of the regulatory situation in Ghana, Nigeria, and Sierra Leone.

GHANA⁹

STUDY AREA

With an area of 92,100 square miles and a population of about 25 million, Ghana is well endowed with water resources, through rainfall, river basins, and

Tamale, Ghana [Masters thesis], Nairobi, Kenya: University of Nairobi, 81 (2007).

5. Ashley R. Williams, Mohamed F. Jalloh, Mohammad B. Jalloh, George Saquee, Samuel Pratt, Michael B. Fisher, Jessica Vapnek & Yasmin Jusu-Sheriff, *Improving the Regulation, Monitoring, and Quality of the Packaged (Sachet and Bottled) Water Industry in Sierra Leone; and Sensitising the Consumer base*. Final Report, The University of North Carolina at Chapel Hill and FOCUS 1000 (2014).

6. *See id.* at 18-19.

7. *Id.* at 15.

8. Local Government Act 2004, Act No. 1, §20 (Sierra Leone).

9. This case study was prepared by George Sarpong.

groundwater.¹⁰ However, the abundant water resources in the country stand in stark contrast to the level of access to drinking water and sanitation.¹¹ It is estimated that 88.7% of Ghanaians have access to improved water supplies and only 18.9% of the population have access to piped, on-plot water supplies.¹² Lack of adequate infrastructure and problems with service delivery by the water supply company have provided fertile ground for water vendors and packaged water.¹³ Generally, the large packaged water producers are located in cities and major urban centers where the municipal water supply (provided by Ghana Water Company Limited, GWCL) tends to be more reliable.¹⁴

REGULATORY STRUCTURE

Regulation of sachet water in Ghana primarily rests with the Food and Drugs Authority (“FDA”) and the Ghana Standards Authority (“GSA”), although the Environmental Protection Agency (“EPA”) and the District and Metropolitan Assemblies also play a role in regulating the industry.¹⁵

The FDA, formerly the Food and Drugs Board, was established through the Food and Drugs Act, 1992¹⁶ to control the manufacture, importation, exportation, distribution, use, and advertisement of foods. The Public Health Act, 2012¹⁷ (“PHA-G”) establishes the FDA as a corporate body whose object is to provide and enforce standards for the sale of food. The FDA is responsible for creating standards for food, drugs, and other products, monitoring compliance with the Act through the District Assemblies and other agencies, and advising the Minister of Health on the measures to protect public health including the preparation of regulations.¹⁸

The FDA operates from a public health perspective and has several primary concerns related to sachet water: quality of the plastic packaging, quality of the ink printed on the sachet, and the quality of the water itself.¹⁹ Authorized officers of the FDA have wide enforcement powers under the Act to enter premises where “food” is prepared, preserved, packed, stocked, stored, or conveyed where they may open and examine food receptacles and books and seize

10. AFRICAN DEVELOPMENT BANK GROUP, <https://www.afdb.org/en/countries/west-africa/ghana/> (last visited Feb. 27, 2017); WATER RESOURCES COMMISSION, <http://www.wrc-gh.org/basins/> (last visited Mar. 3, 2017).

11. WHO/UNICEF Joint Monitoring Programme 2017, <https://www.wssinfo.org/data-estimates/> (last visited Mar. 3, 2017).

12. *Id.*

13. See Justin Stoler, John R. Weeks & Günther Fink, *Sachet drinking water in Ghana’s Accra-Tema metropolitan area: past, present, and future*, 22 J. Water Sanit. Hyg. Dev. 223, 223-40 (2012); see also Okioga, *supra* note 4.

14. Stoler, *supra* note 13, at 6.

15. See Public Health Act 2012, Act No. 851, §§ 80-2 (Ghana); Ghana Standards Authority Act 1973, Act No. 19731, §§ 1-3; Environmental Protection Agency Act 1994, Act 490, § 1 (Ghana); Local Government Act 1993, Act No. 462, §10 (Ghana); see also Stoler, *supra* note 13, at 10-12.

16. Food and Drugs Act 1992, Act No. 199, § 27 (Ghana).

17. Public Health Act 2012, Act No. 851, pt. 7 (Ghana).

18. *Id.* § 82 at 43.

19. *Id.* §§ 82, 97, 99-100, 103, 105, 127, 132, 149 (“food” includes water).

and destroy unwholesome, poisonous, and/or adulterated foods.²⁰ The constraints of the FDA in terms of personnel and logistics are such that it cannot cover the entire country in the exercise of its functions.

Amendments²¹ to the previous Standards Decree, 1973²² were incorporated into the revised Ghana Standards Authority Act, 1973 ("GSA Act").²³ The Act established the GSA, whose responsibilities include establishing and promulgating standards, examining and testing goods and commodities, prohibiting the sale or manufacture of goods in the national interest, and providing for the registration and regulation of the use of standard marks.²⁴

Under the former Ghana Standards Board, two sets of regulations, the Ghana Standards [Certification Mark] Rules, 1970 [LI 662]²⁵ and the Ghana Standards [Certification Mark] [Amendment] Rules, 1970 [LI 664],²⁶ were enacted to prescribe standard certification marks with respect to goods for which standards have been established. The Ghana Standards [Certification Mark] Rules, 1970, require any person intending to sell, distribute, or export goods manufactured in Ghana to have a valid license to use the standard mark, and the rules also outline requirements for product labeling.²⁷ Licenses to use the standard mark are issued after the premises and manufactured goods are inspected to ensure they conform to established standards and after payment of the required annual license fee.²⁸ The GSA Act provides that every statutory instrument made under predecessor laws remains in force and therefore, perpetuates the powers enacted in LI 662 and 664.²⁹

According to the FDA, a mandatory certification mark may only be enacted for a product if it could cause harm to public health.³⁰ Packaged water products, therefore, do not meet this requirement because GWCL water, which meets national water quality standards, is used as the raw water for most packaged water products in Ghana.³¹ Therefore, while a certification mark exists in Ghana for packaged water, the certification process remains predominantly voluntary.³²

Sachet water falls within the scope of "food" in the law inasmuch as it is for human consumption and therefore covered by the PHA-G, which defines food as "water, a food product, a live animal or a live plant, and a substance or a thing of a kind used, capable of being used or represented as being for use, for human or animal consumption."³³ The definition of goods as contained in the various

20. *Id.* § 135.

21. Standards (Amendment) Decree 1979, A.F.R.C.D. 44 (Ghana).

22. Standards Decree 1973, N.R.C.D. 173 (Ghana).

23. Ghana Standards Authority Act 1973, N.R.C.D. 173.

24. *Id.* §§ 1, 3.

25. Ghana Standards (Certification Mark) Rules 1970, LI 662, 1-2.

26. Ghana Standards (Certification Mark) (Amendment) Rules 1970, LI 664, 1-2.

27. Ghana Standards (Certification Mark) Rules 1970, LI 662, 1; *see also* Ghana Standards Board (Food, Drugs and other Goods) General Labeling Rules 1992, LI 154, 1.

28. Ghana Standards Authority Act 1973, N.R.C.D. 173, § 12.

29. *Id.* § 26 n. 5.

30. *See generally* Public Health Act 2012, Act No. 851, pt. 7 (Ghana) (products subject to mandatory compliance with standards and needing a certification mark are those that can cause public harm).

31. Stoler, *supra* note 13, at 6.

32. *Id.* at 10.

33. Public Health Act 2012, Act 851, § 149 (Ghana).

GSA enactments is also wide enough to cover food.³⁴ Thus, both the GSA and the FDA have statutory functions in the area of sale, manufacture, exportation, and importation of foods, including sachet water. It is these provisions that have become a source of overlap and conflict between the GSA and the FDA.

The Environmental Protection Agency Act, 1994,³⁵ established Ghana's EPA. Amongst its functions is the issuance of environmental permits and notices for controlling the volume, types, constituents, and effects of waste discharges, prescription of standards and guidelines relating to water pollution, and enforcement of environmental standards.³⁶ Officers of the EPA conduct periodic inspections of sachet manufacturing plants and factories to ensure compliance with the EPA Act, in particular, that they are operating with environmental permits and their activities pose no threat to the environment.³⁷

The Local Government Act, 1993³⁸ ("LGA-G") establishes the District and Metropolitan Assemblies and empowers Medical Officers and Sanitary Inspectors to enforce by-laws relating to public health made by the District/Metropolitan Assemblies. Under the regulations made under the LGA-G, District/Metropolitan Assemblies are responsible for inspecting and controlling the manufacture of "foodstuffs intended for human consumption."³⁹

In exercising their power to regulate street food vendors, District/Metropolitan Assemblies also required sachet water vendors to obtain and pay for a license to operate.⁴⁰ The emphasis has thus shifted from the public health and food safety aspects of regulation to the revenue-generation aspects.

In response to the problem of plastic waste from discarded sachets, numerous solutions have been put forth by both the private and public sectors. In Accra, Blowplast Industries Limited has initiated a recycling program that pays for used sachets and black bags.⁴¹ Other solutions, such as a tax on sachets or requiring the use of biodegradable plastic materials, have been proposed.⁴² However, none of these have been implemented at the national level.

NIGERIA⁴³

STUDY AREA

With rich oil resources and a booming economy, Nigeria has seen rapid growth in recent years.⁴⁴ However, only 58% of Nigeria's 160 million people have access to potable water.⁴⁵ Even where there is access, there is no guarantee

34. See Ghana Standards Authority Act 1973, N.R.C.D. 173, § 25.

35. Environmental Protection Agency Act 1994, § 1 (Ghana).

36. *Id.* § 2.

37. *Id.* § 15.

38. Local Government Act 1993, Act No. 462, §§ 1, 3-5 (Ghana).

39. See Local Government Instrument 2009, LI 1961, § 4(aa) & (bb) (Ghana).

40. See Local Government Act 1993, Act No. 462, § 86(3) (Ghana).

41. Stoler et al., *supra* note 13, at 1, 4, & 12.

42. *Id.* at 12.

43. This case study was prepared by Akeem Bello.

44. Deborah Neves, *Nigeria GDP Annual Growth Rate*, TRADING ECONOMICS (Feb. 28, 2017), <http://wwtradingeconomics.com/nigeria/gdp-growth-annual>.

45. Ameto Akpe Abuja, *Nigeria: President Promises Water, Slashes Budget*, PULITZER CENTER (March 31, 2012), <http://pulitzercenter.org/reporting/nigeria-president-promises-water->

of an uninterrupted supply.⁴⁶ Consequently, having recognized the importance of a low-cost alternative source of drinking water, the Nigerian Government has allowed the packaged water industry to flourish while endeavoring to regulate it to protect both public health and the environment.⁴⁷

REGULATORY STRUCTURE

The National Agency for Food and Drug Administration and Control Act (“NAFDACA”),⁴⁸ 2001, established NAFDAC.⁴⁹ NAFDAC is housed within the Ministry of Health and is vested with general regulatory powers to control the importation, exportation, manufacture, and sale of “bottled water.”⁵⁰ These powers extend to conducting tests and ensuring compliance with standard specifications for bottled water.⁵¹ Additional provisions of NAFDACA empower an officer of NAFDAC to enter any premises where any article regulated by NAFDACA is manufactured, prepared, packaged, stored, or sold.⁵²

NAFDAC promulgated three regulations pursuant to the provisions of NAFDACA to provide further details for the regulation of bottled water. These are the Bottled Water Registration Regulations (“Regulations 1”),⁵³ the Bottled Water Labeling Regulations (“Regulations 2”),⁵⁴ and the Bottled Water Advertisement Regulations (“Regulations 3”).⁵⁵ Regulations 1 require registration of all bottled water manufactured, imported, exported, advertised, sold, and distributed in Nigeria.⁵⁶ Regulations 1 also govern registration applications, forms, issuance of certificate, validity of certificate, invalidity of certificate of registration, and demand for the certificate of registration.⁵⁷ The Regulations empower NAFDAC to prohibit any person from carrying out any of the activities regulated by the Act and to impose a fine. In addition, it is an offense under Section 25 of NAFDACA to contravene the provision of any regulations made under the Act.⁵⁸

While it appears that Regulations 1 create an administrative penalty,⁵⁹ Section 25 of NAFDACA creates an offence for infraction of the provisions of any

slashes-budget; see also WATER AID NIGERIA, <http://www.wateraid.org/ng> (last visited Feb. 28, 2017) (reporting similar numbers).

46. See *Africa’s River Run to 2030: Making Universal Access to Water and Sanitation a Reality*, WATER AID NIGERIA, (July 22, 2016) <http://www.wateraid.org/ng/news/africas-river-run-to-2030> (last visited Feb. 28, 2017).

47. See M. Adetunji Babatunde & M. Ilias Biala, *Externality Effects of Sachet Water Consumption and the Choice of Policy Instrument in Nigeria: Evidence from Kwara State*, J. of Econ. 1: 2, 113, 121-22 (2010).

48. NAFDACA, *supra* note 2.

49. *Id.* § 1.

50. *Id.*

51. *Id.* § 5.

52. *Id.* § 24(1)(a).

53. Bottled Water Registration Regulations (“BWRR”) (1996) S.1.18 (Nigeria), <http://www.placng.org/new/laws/N1.pdf>.

54. *Id.*

55. *Id.*

56. BWRR § 1(1).

57. *Id.* §§ 2-7.

58. NAFDACA § 25.

59. BWRR § 8

regulation made pursuant to the Act.⁶⁰ This is an inconsistency in the regulatory framework, because it is doubtful whether a provision of Regulations can impose civil liability for what the Act provides should be an offense.⁶¹ If the statute creates an offense, liability can only arise after an offender has been tried in a court of competent jurisdiction, thereby precluding NAFDAC from imposing an administrative fine, although the Regulations so provide.⁶²

NAFDACA regulates “bottled water,” although it does not contain an exact definition of the term within its interpretation provisions.⁶³ This is a significant gap in the provisions that may be used to challenge the regulatory powers of NAFDAC, especially in the context of criminal prosecution for violating the provisions of any of the Regulations. Generally, provisions of statute imposing criminal liabilities are construed strictly and any ambiguity is resolved against the State.⁶⁴

The interpretation sections of Regulations 2 and 3 made under NAFDACA define “bottled water” to mean “any form of processed water packaged for drinking purposes enclosed in any container.”⁶⁵ “Processed” is defined as “prepared or converted from a natural state by subjecting to a special process.”⁶⁶ Arguably, sachet water qualifies as something processed because water has been prepared or converted from a natural state by subjecting it to a special process. The word “container” is generally understood to mean a receptacle designed to contain goods or substances.⁶⁷ The sachet used to package water would therefore qualify as a container and, consequently, sachet water should be included under “bottled water” in Regulations 2 and 3. This construction cannot, however, be used to fill the gap created by the omission to define “bottled water” in the Act itself.

In addition to NAFDACA, other laws may regulate activities connected with the production of packaged water. An example is the provision of Section 115 (2) of the Lagos State Water Sector Law 2004,⁶⁸ which requires a license from Lagos State Water Corporation to abstract groundwater for non-domestic use. Therefore, the Lagos State Water Corporation is responsible for licensing packaged water producers that use groundwater to manufacture packaged water products.⁶⁹

In addition to Nigerian federal laws, state laws may govern packaged water

60. NAFDACA § 25.

61. Compare NAFDACA § 25, with BWRR § 8.

62. See NAFDACA § 26 (citing Administration of Criminal Justice Act (2015) pt. 36 (Nigeria), <http://www.lawnigeria.com/LawsOfTheFederation/Administration-Of-Justice-Commission-Act.html>).

63. NAFDACA § 31.

64. See *e.g.*, *id.* § 25.

65. Bottled Water Labelling Regulations (1996) S.1.8, § 17 (Nigeria), <http://www.placng.org/new/laws/N1.pdf>; Bottled Water (Advertisement) Regulations (1995) S.1.17 § 15 (Nigeria), <http://www.placng.org/new/laws/N1.pdf>.

66. THE FREE DICTIONARY, <http://www.thefreedictionary.com/processed> (last visited Feb. 25, 2017).

67. MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/container> (last visited Feb. 25, 2017).

68. Lagos State Water Sector Law (2004) No.14, § 115(2) (Nigeria), <https://www.lagoshouseofassembly.gov.ng/download/water-sector-law-vol-6/>.

69. See *id.*

premises. For example, local authorities may have power to inspect the cleanliness and hygienic condition of packaged water premises under State Public Health Laws.⁷⁰

Item 62 (d) on the Exclusive Legislative List in Part 1 of the Second Schedule to the Constitution of Nigeria, 1999, conferred on the federal government (not the states) the power to make laws to regulate the “establishment of a body to prescribe and enforce standards of goods and commodities offered for sale.”⁷¹ However, due to the large land area and population of Nigeria, as well as funding and manpower constraints, the ability of NAFDAC through its zonal state offices to effectively carry out its regulatory functions is doubtful.

In Nigeria, the cost of registration for a license to produce sachet water is 30,000 Nigerian Naira, roughly \$98 US Dollars.⁷² The cost of registration is not prohibitive and is therefore not likely to constitute a disincentive to register. The total cost of registration for a license to produce bottled water is 50,000 Nigerian Naira.⁷³

Public frustration over the plastic waste associated with sachets has resulted in numerous threats to ban the product.⁷⁴ However, to date there is no such legislation. A recent news article reported that the Ministry of Environment put forth a draft action plan to ban the use of non-biodegradable plastics within Nigeria.⁷⁵ To deal with the waste, the plastic is sometimes burned, resulting in the release of toxic chemicals into the air.⁷⁶

SIERRA LEONE⁷⁷

STUDY AREA

Similar to Ghana, Sierra Leone has an abundance of water resources with 160 km³ annual renewable water resources.⁷⁸ However, the country is still rebuilding after a ten-year civil war, and 52.9% of the population was below the

70. *See e.g., id.* §122.

71. Constitution of Nigeria (1999), Second Schedule, pt. 1, EXCLUSIVE LEGIS. LIST, <http://www.nigeria-law.org/ConstitutionOfTheFederalRepublicOfNigeria.htm#ExclusiveLegislativeList>.

72. National Agency for Food and Drug Administration and Control (NAFDAC), Guidelines for Registration of Food and Water Manufactured in Nigeria (“Guidelines”) § F(2) (Nigeria), http://www.nafdac.gov.ng/images/PDF_DOCS/Guidelines/FOOD_MANUFACTURERS/GUIDE30_GUIDELINES%20FOR%20REGISTRATION%20OF%20FOOD%20AND%20WATER.pdf; CENTRAL BANK OF NIGERIA <https://www.cbn.gov.ng/rates/ExchRateByCurrency.asp> (last visited Feb. 26, 2017) (reporting that the exchange rate between the Nigerian Naira and the US Dollar 305 as of Feb. 24, 2017).

73. Guidelines, *supra* note 72 § F(3).

74. Stoler et al., *supra* note 13.

75. Temi Banjo, *FG to Ban Pure-Water Sachets, Other Plastics*, NIGERIAN MONITOR, Jan. 30, 2014, <http://www.nigerianmonitor.com/fg-to-ban-pure-water-sachets-other-plastics/> (last visited Feb. 25, 2017).

76. *See generally* Babatunde and Biala, *supra* note 47, at 113 (discussing the prevalence of burning the plastic waste and the corresponding environmental effects including the release of toxic chemicals into the air).

77. This case study was prepared by Yasmin Jusu-Sheriff.

78. United Nations Food and Agriculture Organization, AQUASTAT, *Sierra Leone*, available at http://www.fao.org/nr/water/aquastat/countries_regions/SLE/ (last visited 4 June 2017).

national poverty line in 2011.⁷⁹ While both Ghana and Nigeria are classified as lower middle-income economies, Sierra Leone is still considered low-income.⁸⁰ In the wake of the war, infrastructures such as municipal water systems are yet to be restored and fully repaired.⁸¹ Compounded by the deterioration of existing systems, the increase in urban population has provided a ripe market for packaged water products.⁸² As in other countries, the packaged water business began with simple cottage industries and has grown in recent years to large corporations that produce numerous packaged water products alongside other flavored drinks.⁸³

REGULATORY STRUCTURE

In Sierra Leone, matters of public health fall under the MoHS.⁸⁴ To protect the public from unsafe water, the PHA-SL gives the MoHS power to inspect, sample, and analyze any water that is used, or is likely to be used, in preparation of food or drink for human consumption.⁸⁵ This section is the primary legal basis for regulating packaged water producers as the water is “used in preparation of food or drink for human consumption.”⁸⁶ Because the PHA-SL currently excludes “water” from the definition of “food,”⁸⁷ it should be amended to eliminate any doubt as to coverage. Section 107(2)(n) of the PHA-SL empowers the MoHS to make rules relating to the selection, protection, and maintenance of water supplies to protect public health across the country.⁸⁸

By virtue of the Local Government (Assumption of Functions) Regulations, 2004,⁸⁹ the MoHS has devolved its responsibility to provide and protect access to safe drinking water to the local councils established by the Local Government Act, 2004 (“LGA-SL”).⁹⁰ These local councils also have powers under the LGA-SL to make and enforce by-laws to carry out their functions and responsibilities.⁹¹

79. *Poverty headcount ratio at national poverty lines*, THE WORLD BANK, <http://data.worldbank.org/indicator/SI.POV.NAHC?locations=SL> (last visited 14 Jan. 2017).

80. *World Bank Country and Lending Groups*, THE WORLD BANK, <http://data.worldbank.org/about/country-and-lending-groups> (last visited 14 Jan. 2017).

81. *Water Supply and Sanitation in Sierra Leone: Turning Finance into Services for 2015 and Beyond*, WATER AND SANITATION PROGRAM (2011), <http://www.wsp.org/sites/wsp.org/files/publications/CSO-sierra-leone.pdf>.

82. See Michael B. Fisher, Ashley R. Williams, Mohamed F. Jalloh, George Saquee, Robert E.S. Bain & Jamie K. Bartram, *Microbiological and Chemical Quality of Packaged Sachet Water and Household Stored Drinking Water in Freetown, Sierra Leone* (2015), available at <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0131772>.

83. See Williams et al., *supra* note 5, at 15.

84. MINISTRY OF HEALTH AND SANITATION (Sierra Leone), http://health.gov.sl/?page_id=2 (last visited Mar. 6, 2017).

85. See Public Health Ordinance 1960, Act No. 23, . § 93(1) (Sierra Leone).

86. *Id.*

87. *Id.* § 2.

88. *Id.* § 107(2)(n).

89. See Local Government Act 2004, Act No. 1, §§ 20-30 (Sierra Leone).

90. *Id.* § 20 at 17; *Water and Sanitation Program*, WATER SUPPLY AND SANITATION IN SIERRA LEONE: TURNING FINANCE INTO SERVICES FOR 2015 AND BEYOND, 1, 2 (2011), <http://www.wsp.org/sites/wsp.org/files/publications/CSO-sierra-leone.pdf>.

91. Local Government Act 2004, Act No. 1, § 90 (Sierra Leone).

The Standards Decree, 1996,⁹² establishes and mandates the SLSB and the Standards Council to establish, elaborate, and approve standards in respect of materials and products in Sierra Leone (which includes packaged water). It also empowers them to conduct tests on materials and products with a view to ensuring compliance with established national standards.⁹³ To carry out its statutory functions, the SLSB may enter any premises to obtain samples and information and is given power to appoint inspectors for these purposes.⁹⁴ The Standards Decree does not require inspectors to be directly employed by the SLSB.⁹⁵

In accordance with Section 16, the Secretary of State may, on recommendation of the Standards Council, impose mandatory standards in respect of any commodity or product;⁹⁶ such mandatory standards have been imposed in respect of water for human consumption by three existing mandatory standards in Sierra Leone.⁹⁷ Although SLSB has passed four standards related to labeling and water quality, SLS 4:2010,⁹⁸ SLS 21:2010,⁹⁹ SLS 22:2010,¹⁰⁰ and SLS 28:2010,¹⁰¹ none of them addresses the quality of the ink and packaging used in the production of packaged water products.

Section 14 empowers the Secretary of State to create a certification mark for any specific product and to require producers to submit products for certification testing to receive a license to print the mark.¹⁰² SLSB has yet to enact this power with regards to packaged water products, although at the time of publication, the Bureau was in the process of creating and approving such a mark.¹⁰³ Environmental Health Assistants, on behalf of the MoHS/local councils and under the authority of the PHA-SL, carry out inspections of the premises of packaged water producers to ensure that the premises, storage tanks, equipment, and machinery used to store, treat, and package are in a clean, wholesome, and sanitary condition.¹⁰⁴ Despite the directive in the National Environmental Health Policy¹⁰⁵ that Environmental Health Officers be provided with water testing kits (which implies that they should use them), Environmental Health Officers and Assistants who visit the premises of packaged water producers do not concern themselves with the quality of the water collected, stored, and used by the producers. They do not use the procedures set out in Section 93 of the PHA-SL to sample, analyze, or stop cases of suspected polluted water supply.

92. See Standards Decree 1996 (Sierra Leone).

93. *Id.* §§ 3-6.

94. *Id.* § 19.

95. *Id.*

96. *Id.* § 16.

97. *SLSB Standards Database*, SIERRA LEONE STANDARDS BUREAU, <http://standards-sl.org/index.php/catalogue> (last visited Mar. 8, 2017).

98. *Id.*

99. *Id.*

100. *Id.*

101. *Id.*

102. Standards Decree 1996, § 14 (Sierra Leone).

103. Authors' conversation with Mohamed F. Jalloh, June 2017.

104. Public Health Ordinance 1960, Act No. 23, § 93 (Sierra Leone).

105. National Environmental Health Care Policy 2000, § 5 (Sierra Leone) (supplementing the National Health Policy 1993) (Sierra Leone).

Some packaged water producers have their water analyzed and certified by the SLSB on a voluntary basis¹⁰⁶ and at their own expense. There are now published approved minimum mandatory standards for packaged water issued by the Standards Council and enforced by the SLSB;¹⁰⁷ however, these minimum standards that are applicable to imported as well as locally produced water for human consumption are not well publicized either within the packaged water industry or to the wider public.¹⁰⁸ The SLSB states that it “licenses” the standards to producers at a cost, but since this requirement is not stated anywhere in legislation and since only fifteen to twenty producers have become “licensed” in this manner, it does not appear that this licensing requirement has a legal basis. It may, in fact, be having the opposite effect of what public policy would otherwise dictate: the fact that SLSB guards the standards and only issues them upon payment means that the standards are not widely known.

Previously, the PB, established under the Pharmacy and Drugs Act, 2001,¹⁰⁹ was performing water quality testing and certifying the quality of packaged water; however, there is no statutory authority for this and there does not appear to be any official policy directive from any ministry conferring such powers on the PB.¹¹⁰ Regardless, some packaged water producers continue to pay for this quality testing and certification, and the PB is reluctant to give up this assumed power to regulate packaged water products despite having no legal basis for exercising it.¹¹¹

Section 58 of the Guma Valley Water Company Act¹¹² gives Guma Valley Water Company the authority to carry out inspection visits of packaged water producers’ premises to prevent the use of water fittings that could result in contamination of the water supply. It also authorizes the company to make sure producers are paying for water at commercial rates.¹¹³ Although the Ministry of Water Resources has a laboratory, it does not appear that any testing is actually taking place for “fittings” or for any potential contamination.

Section 29 of the Sierra Leone Electricity and Water Regulatory Commission Act, 2011,¹¹⁴ prohibits any person from engaging in the “business of water production and distribution” unless that person holds a license granted by the Commission. “Distribution” is not defined in this Act while “water production” is stated simply as meaning “the harnessing and treatment of water.”¹¹⁵ As the law currently stands, the Electricity and Water Regulatory Commission could also assert a right to license packaged water producers although it has not done so to date.¹¹⁶

106. See Fisher et al., *supra* note 82, at 2.

107. See *id.* at 3; see also Williams et al., *supra* note 5, at 12.

108. Williams et al., *supra* note 5, at 18-19.

109. Pharmacy and Drugs Act 2001, § 2 (Sierra Leone).

110. See *id.*

111. *Id.* § 55; See Pharmacy Board of Sierra Leone, Guidelines for the Registration and Sachet of Bottled Water in Sierra Leone (July 16, 2014), <http://pharmacyboard.gov/sl/site/Downloads/Guidelines/tabid/316/Itemid/474/Default.aspx>.

112. Guma Valley Water Company Act 1961, Act No. 3, § 58 (Sierra Leone).

113. *Id.*

114. Electricity and Water Regulatory Commission Act 2011, § 29 (Sierra Leone).

115. *Id.* § 1.

116. See *id.* § 29.

OVERLAPS AND GAPS

The main challenges facing Sierra Leone as it seeks to regulate the packaged water industry are the lack of comprehensive regulations for the industry, overlapping legal mandates leading to confusion in roles and responsibilities, and duplicated efforts. One principal legislative gap is the absence of “drinking water” or “water for human consumption” in the definition of “food” under the PHA-SL.¹¹⁷ This is most likely due to the fact that when the PHA-SL was enacted in 1963, there was no packaged water industry in existence nor was it even anticipated that one would emerge.¹¹⁸ There are no comprehensive regulations by statutory instrument under the PHA-SL covering the modern packaged water industry in Sierra Leone. Therefore, while guidelines for producers exist, there are no tailored requirements for packaged water manufacturers. Comprehensive regulations for the packaged water industry would fill the gap in the current legislative framework.

Under the Standards Decree, SLSB may create national standards and enforce compliance with them, although the rules and regulations of other agencies do not necessarily refer to the obligation to comply with these standards.¹¹⁹ For example, the PHA-SL, Section 107 empowers the MoHS to create rules related to sanitary conditions within facilities, hygiene behaviors, processing, packaging, and labeling of goods for human consumption, but it does not reference which standards apply.¹²⁰ However, the existing site inspections and codes are not consistent with the standards created by the SLSB. Additionally, water quality standards between the two institutions are inconsistent.¹²¹

There are also multiple overlaps related to inspections and sample collection. The PHA-SL empowers the MoHS to inspect the sanitary and hygienic conditions of facilities involved in the production of food for human consumption.¹²² The Factories Act¹²³ grants power to inspectors of the FI to assess the sanitary conditions of factories within Sierra Leone.¹²⁴ Packaged water manufacturing facilities meet the definition of “factory” defined by the Factories Act, meaning both MoHS and FI are legally mandated to regulate the condition of packaged water facilities.¹²⁵ Similarly, both the MoHS and SLSB are empowered to collect and analyze samples of products under Sections 33, 93, 111, 112, 113, and 121 of the PHA-SL and Section 4 the Standards Decree, respectively.¹²⁶

117. See Williams et al., *supra* note 5, at 14–15.

118. See *id.*

119. See Standards Decree 1996 (Sierra Leone).

120. Public Health Ordinance 1960, Act No. 23, § 107 (Sierra Leone).

121. See Fisher et al., *supra* note 82, at 3.

122. Public Health Ordinance 1960, Act No. 23, § 93 (Sierra Leone).

123. Factories Act 1974 (Sierra Leone).

124. *Id.* § 24.

125. *Id.* § 3.

126. Public Health Ordinance 1960, Act No. 23, §§ 33, 93, 111, 112, 113, 121 (Sierra Leone); Standards Decree 1996, § 4.

APPENDIX II. A REVIEW OF PACKAGED DRINKING WATER: PREVALENCE, SAFETY, AND HEALTH IMPLICATIONS¹

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1. This review was prepared by Ashley R. Williams, see footnote 2 of the main text, and Michael B. Fisher of The Water Institute at UNC.

Access to sufficient quantities of water that is chemically and microbiologically safe is critical to human health and development.² Nevertheless, in many developing country settings, families struggle to obtain enough safe drinking water.³ In addition to using water from piped systems, manual and mechanized pumps, and surface water sources, an increasing number of individuals in developing countries are turning to packaged water to meet their basic drinking water needs.⁴ Packaged water is drinking water that can be sold in shops, hawked on the street, or delivered to users' homes, and that can be packaged in plastic bottles, sachets, or bags in a range of sizes.⁵ While some packaged water manufacturers may adhere to stringent standards of quality, safety, and hygiene, many lower middle-income countries (LMICs) have little or nothing in the way of regulatory and monitoring frameworks to ensure the safety of packaged drinking water products.⁶

These gaps in the legal and regulatory landscape are a source of significant concern among national and international organizations dedicated to promoting human health and development. Although national regulations may be lacking in many countries, several relevant US and international regulations and standards exist that provide guidance on drinking water quality in general and packaged water quality in particular. (Although US standards have no international force, they are often influential in the process of setting standards in other countries.) These include drinking water standards set by the World Health Organization (WHO),⁸ the European Union,⁹ and the US Environmental Protection Agency,¹⁰ as well as packaged and bottled water standards set by the UN's Codex Alimentarius Commission,¹¹ the International Bottled Water Association,¹² the EU,¹³ and the US Food and Drug Administration.¹⁴ A few relevant standards

2. WHO, GUIDELINES FOR DRINKING-WATER QUALITY 1 (4th ed. 2011).

3. Justin Stoler, Günther Fink, John R. Weeks, Richard A. Otoo, Joseph A. Ampofo & Allan G. Hill, *When urban taps run dry: sachet water consumption and health effects in low income neighborhoods of Accra, Ghana*, 18 Health Place 250–62 (2012).

4. Annette Prüss, David Kay, Lorna Fewtrell & Jamie Bartram, *Estimating the burden of disease from water, sanitation, and hygiene at a global level*, 110 Env. Health Perspect. 537, 537–42 (2002).

5. Ayokunle Christopher Dada, *Packaged Water: Optimizing Local Processes for Sustainable Water Delivery in Developing Nations*, 7 Global Health (2011), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3161851/>.

6. Benjamin Spears Nngmekpele Cheabu & James Hawkins Ephraim, *Sachet Water Quality in Obuasi, Ashanti Region, Ghana*, 4 J. Biology, Agriculture and Healthcare 37, 38 (2014); A.A. Ajayi, M.K.C. Sridhar, L.V. Adekunle & P. Oluwande, *Quality of Packaged Waters Sold in Ibadan, Nigeria*, 11 African J. Biomed. Research 251, 253 (2008).

7. WHO, *supra* note 2, at xix.

8. *Id.*

9. Council Directive 98/83, 1998 O.J. (L 330) (EC).

10. National Primary Drinking Water Regulations, 40 C.F.R. § 141 (2001).

11. *General Standard for Bottled/Packaged Waters (Other than Natural Mineral Waters)*, Codex Alimentarius (2001); *Codex Standard for Natural Mineral Waters*, Codex Alimentarius (1981).

12. International Bottled Water Association, *Bottled Water Code of Practice* (2012).

13. International Water Association, *Compendium of Water Quality Regulatory Frameworks: Which Water for Which Use* (2016), available at http://www.iwa-network.org/filemanager/uploads/WQ_Compendium/Narrative_by_sections/02_Part%20I.pdf.

14. Processing and Bottling of Bottled Drinking Water, 21 C.F.R. § 129 (1977).

and guidelines are summarized in Table 1. Of particular interest are microbiological safety standards. This is because although contamination by harmful chemicals can pose significant health risks, severe chemical contamination of packaged water tends to occur infrequently, while microbiological contamination is a higher-frequency occurrence (see Tables 3 and 4 below).

Table 1. Selected national and international standards and guidelines for drinking water and packaged water products

Parameter	Drinking Water			Bottled Water			
	WHO	EU	USEPA MCL	Codex Alimentarius Bottled Water	Codex Alimentarius Mineral Water	IBWA SOQ	US FDA Bottled Water
<i>E. coli</i> (CFU/100 mL)	<1	0	<1	Same as WHO	Same as WHO	<1	<2.2
<i>Enterococci</i> (CFU/100 mL)	N/A	0	N/A	N/A	N/A	N/A	N/A
Arsenic (mg/L)	0.010	0.010	0.010	Same as WHO	0.010	0.010	0.010
Chlorine (mg/L)	N/A	N/A	4.0	Same as WHO	N/A	0.10	4.0
Fluoride (mg/L)	1.5	1.5	4.0	Same as WHO	1.5**	1.4-2.4*	1.4-2.4*
Iron (mg/L)	N/A	0.20 [†]	N/A	Same as WHO	N/A	0.3 [†]	0.3 [†]
Lead (mg/L)	0.010	0.010	0.015	Same as WHO	0.010	0.005	0.005
Manganese (mg/L)	0.4	0.050 [†]	N/A	Same as WHO	0.4	0.05 [†]	0.05 [†]
Nitrate-N (mg/L)	50	50	10	Same as WHO	0.050	10	10
TDS (mg/L)	N/A	N/A	N/A	Same as WHO	N/A	500 [†]	500 [†]
Reference	[1]	[2]	[3]	[4]	[5]	[6]	[7]

* Depending on local temperatures. ** Warning label required if this concentration is exceeded. Aesthetically-based standards not related to health concerns

N/A: This parameter is not regulated under the applicable standards or guidelines

Due to the rapid growth of the packaged water industry worldwide, there is limited information available on the prevalence and safety of packaged drinking water products in developing countries. However, the available research, as well as firsthand observations and correspondence, suggests that the use of packaged drinking water is prevalent and growing rapidly. Given the significant health impacts that the quantity and quality of available drinking water can have,

it is therefore reasonable to assume that the widespread consumption of packaged drinking water has the potential to dramatically affect human health; however, the nature and extent of these effects are unknown. The use of a quantitative risk assessment framework may prove helpful in determining the impact of packaged water. The health risks associated with consumption of packaged water depend on the level of exposure that an individual has to packaged water, as well as the risk associated with a given exposure event. Moreover, we can reasonably assume that the consumption of packaged water displaces the consumption of drinking water from other sources. Thus, any risks associated with consuming packaged water must be interpreted in the contexts of risks from the user's alternative drinking water source(s).

To date, few studies have taken a rigorous and quantitative approach to understanding the prevalence, safety, and health impacts of packaged water products in developing countries. In this review, we summarize findings from selected quantitative and qualitative packaged water studies to date, and discuss both the major trends observed in these studies and the significant remaining gaps in the current literature.

I. METHODS

The authors performed a literature search in four major health sciences databases for terms related to packaged drinking water and potential health outcomes associated with the consumption of contaminated drinking water. The search was limited to peer-reviewed publications written in English. The search was conducted in spring 2013. A total of 8,854 results were obtained from this search (Table 2). In addition, references obtained from the bibliographies of search results, or recommended by colleagues, were also included. From this set of results, a sample of relevant articles was selected at the authors' convenience. Articles were selected on the basis of relevance, location (with preference given to studies conducted in LMICs), sample size (for quantitative studies), and publication date, since the packaged water industry has grown and changed dramatically in the past ten to twenty years, particularly in developing countries. Additional relevant articles were added from searches of the bibliographies of included papers and from previous knowledge. Limited data extraction and analysis was performed using Microsoft Excel (Microsoft, Redmond, WA). Only studies that tested ten or more packaged water samples were included in the basic meta-analysis. Studies only reported results by brand rather than by samples, and two studies that collected samples from households were excluded from meta-analysis.¹⁵

15. Shelley Holt, *A Survey of Water Storage Practices and Beliefs in Households in Bonao, Dominican Republic in 2005* [Thesis], Georgia State University (2009); Samira Ibrahim Korfali & Mei Jurdi, *Provision of safe domestic water for the promotion and protection of public health: A case study of the city of Beirut, Lebanon*, *Env. Geochem. Health* 31:2, at 283-95 (2009).

Table 2. Search results from health databases reviewed for this study

Database	Records
Biosis Citation Index	4,139
Global Health Library	916
Pubmed	1,904
Web of Science	1,895
Total Records Systematic Search	8,854
Included Records	158

II. RESULTS

2.1. PREVALENCE OF PACKAGED WATER

Several studies underline the importance of packaged water as a drinking water source in developing countries. While bottled water has long been available worldwide, the phenomenon of sachet water, i.e., drinking water sold in sealed plastic bags or pouches usually in servings of 300-500 mL, is a recent and rapidly growing phenomenon, with particularly rapid growth in West Africa.¹⁶ By all accounts, packaged drinking water consumption rates have increased at a staggering rate over the past decade, particularly in urban developing country settings. A study of Demographic and Health Survey (DHS) data in the Greater Accra metropolitan area of Ghana found that the percentage of people using sachet water as their primary drinking water source increased from 5% in 2003 to 35% in 2008.¹⁷ Another recent study by the same group found that 47% of respondents in Accra, Ghana, reported using sachet water as their primary drinking water source, and that sachet water use was highest among the poorest families in the city.¹⁸ While the DHS survey does not yet contain a question specifically mentioning sachet water, it shows rapid growth of bottled water consumption in arid countries. Jordan's use of bottled water as a primary drinking water source grew from 0.3% in 1997 to over 31% in 2009.¹⁹ (See Figure 1.) Similarly, 57% of Dominicans reported using bottled water as their main drinking water source in 2007.²⁰

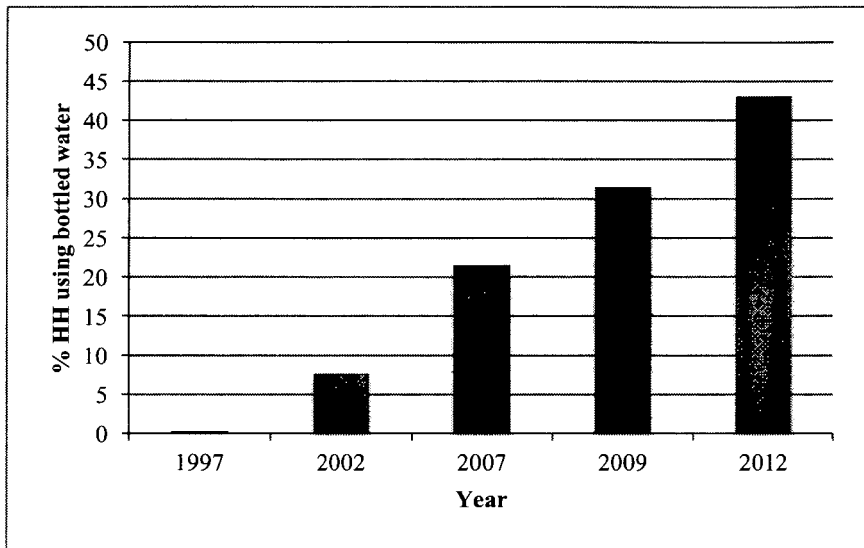
16. Justin Stoler, John R. Weeks & Günther Fink, *Sachet drinking water in Ghana's Accra-Tema metropolitan area: past, present, and future*, 2 J. Water Sanit. Hyg. Dev. 332 (2012).

17. *Id.* at 4.

18. *Id.*

19. Macro International Inc., *Jordan: Population and Family Health Survey 1997* (1997); ORC Macro, *Jordan: Population and Family Health Survey 2002* (2002); Macro International Inc., *Jordan: Population and Family Health Survey 2007* (2007); ICF Macro, *Jordan: Population and Family Health Survey 2009* (2009); Macro International, Inc., *Jordan: Population and Family Health Survey 2012* (2012).

20. Macro International Inc., *República Dominicana: Encuesta Demográfica y de Salud*, 2007 (2007).

Figure 1. Growth of Bottled Water Consumption in Jordan

Data from DHS surveys 1997-2012.

Other academic studies have documented high prevalences of packaged water, as well as high per-capita consumption rates. A recent study of poor urban communities in Lebanon and Jordan reported 26% and 53% of households, respectively, used bottled water as their primary drinking water source with an average consumption of 0.31 and 5.5 L/capita/day, respectively.²¹ In a survey of 200 bottled water consumers in Dar es Salaam, Tanzania, the average consumption rate was 0.25 to 1.5 L/capita/day.²²

In a survey of 137 sachet water consumers in Nigeria, 58% of respondents drank 2-4 sachets (1-2 L) per day while 28.2% drank five or more sachets (>2.5 L) daily.²³ These consumption rates represent 25%-85% of the daily quantity of drinking water recommended by the WHO to maintain proper hydration for adults (2.0-2.9 L for adult females and males, respectively).²⁴

2.2. LABELLING OF PACKAGED WATER

In some countries, national standards or regulations require packaged water producers to display certain information on their products' labels. The manda-

21. M.A. Massoud, R. Maroun, H. Abdelnabi, I. I. Jamali & M. El-Fadel, *Public perception and economic implications of bottled water consumption in underprivileged urban areas*, *Environ. Monit. Assess.* 185:4, at 3093-102 (2013).

22. Gabriel R. Kassenga, *The health-related microbiological quality of bottled drinking water sold in Dar es Salaam, Tanzania*, *J. Water and Health* 5:1, at 179 (2007).

23. Olufemi Opatunji & Francis Odhiambo, "35th WEDC International Conference, Loughborough, UK, 2011 The Future of Water, Sanitation and Hygiene: Innovation, Adaptation and Engagement in A Changing World," *Consumption practices and user perception of an emerging alternative drinking water option (sachet water) in Ibadan, Nigeria*, at 1-8 (2011).

24. Guy Howard & Jamie Bartram, *Domestic Water Quantity, Service Level and Health*, World Health Organization (2003), available at http://www.who.int/water_sanitation_health/diseases/WSH03.02.pdf

tory information varies from country to country, but most require sufficient information to inform the consumer about the legitimacy of the product and how to contact the manufacturer with concerns or complaints. Table 3 shows the different packaged water product labelling requirements from Nigeria, Ghana, and Lebanon.

Multiple Nigerian studies have demonstrated wide noncompliance with regard to product labelling, specifically manufacture and expiration dates and batch numbers.²⁵ One Nigerian study of 20 brands found only two had a NAFDAC number and three displayed a manufacturer's name and address.²⁶ Similarly, a study of sachet water products in Accra, Odumase-Krobo, and Nsawam, Ghana, found none of the labels contained manufacture dates, expiration dates, or batch numbers, although slightly more than half of the labels included a Ghana Food and Drugs Board number (56%).²⁷ A study of packaged water sold in Lebanon revealed that only 31% of the 32 brands examined were licensed by the Ministry of Health and none of these contained batch numbers.²⁸ The study also reported some products were labeled incorrectly as 'mineral' or 'natural' even though they did not meet the definitions set by the national regulatory agency. In contrast, one study in Sri Lanka reported a high percentage (87%) of bottled water labels contained a registration number from a national authority, while 73% of product labels displayed the required certification from the Sri Lanka Standards Institution on their label.²⁹ In addition to the problem of product labels not containing the required information, some studies found product composition labels were not consistent or were incorrect with regard to the actual mineral/chemical content.³⁰

25. A. Christopher Dada, *Sachet water phenomenon in Nigeria: Assessment of the potential health impacts*, Afr. J. Microbiol. Res 3:1, 15-21 (2009); Olusegun A. Olaoye & A.A. Onilude, *Assessment of microbiological quality of sachet-packaged drinking water in Western Nigeria and its public health significance*, Public Health 123:11, at 729-34 (2009); Jameel Muazu, A. Muhammad-Biu & G.T. Mohammed, *Microbial Quality of Packaged Sachet Water Marketed in Maiduguri Metropolis, North Eastern Nigeria*, British J. of Pharmacology & Toxicology 3:1, at 33-38 (2012).

26. Jones Ndubuisi Nwosu & Chika Ogueke, *Evaluation of sachet water samples in Owerri metropolis*, Niger. Food J. 22, at 164-70 (2004).

27. M. Ackah, A.K. Anim, E.T. Gyamfi, J. Acquah, E.S. Nyarko, L. Kpattah, S.E. Brown, J.E.K. Hanson, J.R. Fianko & N. Zakaria, *Assessment of the quality of sachet water consumed in urban townships of Ghana using physico-chemical indicators: A preliminary study*, Advances in Applied Science Research 3:4, at 2120-27 (2012).

28. L.A. Semerjian, *Quality assessment of various bottled waters marketed in Lebanon*, Environ. Monit. Assess. 172:1-4, at 275-85 (2011).

29. A.T. Herath, C.L. Abayasekara, R. Chandrajith & N.K.B. Adikaram, *Temporal variation of microbiological and chemical quality of noncarbonated bottled drinking water sold in Sri Lanka*, J. Food Sci. 77:3, at 160-64 (2012).

30. Semerjian, *supra* note 28, at 275-85; S.N. Mahmood, I.U. Siddiqui, L. Sultana & F.A. Khan, *Evaluation of Chemical and bacteriological quality of locally produced bottled water*, J. Chem. Soc. Pak. 26:2, at 185-90 (2004).

Table 3. National requirements for information contained in packaged water (PW) product labeling from different countries

	Nigeria	Ghana	Lebanon
Brand name	X		
PW type (mineral, natural or table)			X
Water source			X
Producer location	X		X
Producer contact information		X	
Country of origin			X
Batch number	X	X	X
Manufacture date	X	X	X
Expiration date	X	X	X
Volume	X		X
Nutritional information		X	
Composition			X
Treatment method (if table water)			X
Licensed medicinal and therapeutic characteristics			X
NADFAC registration	X		
G-FDB registration		X	
References	[8]	[9]	[10]

2.3. SAFETY OF PACKAGED WATER

Given the widespread use of packaged drinking water in developing countries, there is significant concern about its safety for human consumption. Many studies have sought to characterize the bacteriological, chemical, and radiological safety of bottled water and sachet water, although relatively few have investigated the safety of packaged water products with respect to contamination from viruses, parasites, and radioisotopes. Likewise, the effects of packaged water on the quantity of water used for drinking and other purposes have not, to our knowledge, been studied.

2.3.1. Microbiological safety

2.3.1.1. Bacteria

2.3.1.1.1. Sachet water

Most of the studies examining the microbial quality of sachet water products were from Ghana and Nigeria, although studies were also identified from Colombia, India, and Tanzania.³¹ Table 4 contains the percentage of positive sachet samples reported from studies for total coliforms, fecal coliforms, and *E. coli*. A brief meta-analysis of the studies shows that, across all study locations, 35% of sachet water samples tested for total coliforms were found to be positive, while fecal coliforms and *E. coli* were found in 21% and 8% of all samples, respectively.

31. Kassenga, *supra* note 22, at 179; Jhon Vidal D., Adolfo Consuegra S., Luty Gomescaseres P. & Jose Marrugo N., *Assessment of the Microbiological Quality of Water Packed in Bags Manufactured in Sincelejo - Colombia*, *Revista MVZ Córdoba* 14:2, at 1736-44 (2009); S. Sumathy, R. Gowrisankar & S. Ramesh, *Bacteriological evaluation of marketed mineral water*, in *WATER POLLUTION - ASSESSMENT AND MANAGEMENT* 224-27 (2004).

Table 4. Percentage of samples positive for various microbiological contaminants in sachet water samples

Country	PW type	Sample location	Number of samples	Percentage of samples >1 CFU/100mL			Reference
				Total coli-forms	Fecal coli-forms	<i>E. coli</i>	
Ghana	SH	N/A	48	100%	100%		[11]
Ghana	SH	PWMF	15	100%		7%	[12]
Ghana	SH	POS	40	43%	23%		[13]
Nigeria	SH	POS	30	30%		20%	[14]
Nigeria	SH	POS	48	98%	71%	17%	[15]
Nigeria	SH	POS	70	100%	71%		[16]
Nigeria	SH	POS	29	100%	97%	97%	[17]
Colombia	S	PWMF/POS	39	10%			[18]
Nigeria	S	PWMF/POS	15	0%	0%		[19]
Nigeria	S	PWMF/POS	100	22%		0%	[20]
Ghana	S	PWMF	30	83%	20%	7%	[21]
Ghana	S	PWMF	15	47%		7%	[22]
Nigeria	S	PWMF	300		29%		[23]
Nigeria	S	PWMF	250			4%	[24]
Nigeria	S	PWMF	92			2%	[25]
Ghana	S	POS	60	0%	0%	0%	[26]
Ghana	S	POS	153	0%	0%		[27]
Ghana	S	POS	88	5%	2%		[28]
Ghana	S	POS	60	12%	0%	0%	[29]
Ghana	S	POS	33			18%	[30]
Nigeria	S	POS	20	40%	0%		[31]
Nigeria	S	POS	15	60%	7%		[32]
Nigeria	S	POS	78	5%		0%	[33]
Nigeria	S	POS	60	100%			[34]
Nigeria	S	POS	12	83%	0%	0%	[35]
Nigeria	S	POS	50			0%	[36]
Nigeria	S	POS	96	28%		0%	[37]
Nigeria	S	POS	500	22%	5%		[38]
Nigeria	S	POS	18			17%	[39]
Nigeria	S	POS	18	6%		6%	[40]
Nigeria	S	POS	24	100%	100%	0%	[41]
Nigeria	S	POS	15	100%	87%	87%	[42]

Nigeria	S	POS	60	100%		5%	[43]
Nigeria	S	POS	15	20%		0%	[44]
Nigeria	S	POS	80			16%	[45]
Nigeria	S	N/A	10	20%		10%	[46]
Tanzania	S	POS	50	18%	8%		[47]
India	S	N/A	10	0%	0%		[48]
Total samples				1823	1587	1238	
Total positive				644	333	99	
% positive				35%	21%	8%	

In the reviewed studies, hand-tied sachets were more frequently contaminated than machine-filled sachets. Studies of hand-tied sachet water products frequently reported high percentages of positive samples for total coliforms, with four studies reporting 100% of samples contained total coliforms.³² The lowest percentage of hand-tied sachet water samples (30%) with total coliforms was reported by a Nigerian study.³³ For fecal coliforms, four out of five studies reported >75% of hand-tied sachet samples were positive,³⁴ while one reported that 23% of samples were positive.³⁵ For *E. coli*, the percentage of positive samples ranged widely from 7% to 97%.³⁶

Overall, for machine-filled sachets, the percentage of positive samples for total coliforms, fecal coliforms, and *E. coli* varied widely. The median reported percentages of positive samples for total coliforms, fecal coliforms, and *E. coli* were 21%, 2%, and 3%, respectively. Four studies did not detect total or fecal coliforms in any sachet water samples, with one of the three also reporting no detectable *E. coli* in any of the samples.³⁷ In contrast, four other studies, all

32. Emmanuel O. Oyelude & Solomon Ahenkorah, *Quality of Sachet Water and Bottled Water in Bolgatanga Municipality of Ghana*, Research J. of Applied Sciences, Engineering and Technology 4:9, at 1094-98 (2012); Teshamulwa Okioga, *Water Quality and Business Aspects of Sachet-Vended Water in Tamale, Ghana* [Masters thesis], Nairobi, Kenya: University of Nairobi, 81 (2007); A.B. Olayemi, *Microbial potability of bottled and packaged drinking waters hawked in Ilorin metropolis*, Int. J. Environ. Health Res. 9, at 245-48 (1999); J.K. Oloke, *Microbiological analysis of hawked water*, African J. Sci. 1:1, at 22-28 (1997).

33. Ajayi et al., *supra* note 6, at 251-58.

34. Oyelude & Ahenkorah, *supra* note 32, at 1094-98; Olayemi, *supra* note 32, at 245-48; Oloke, *supra* note 32, at 22-28; C.C. Anunobi, A.T. Onajole & B.E. Ogunnowo, *Assessment of the quality of packaged water on sale in Onitsha Metropolis*, Nig. Quarterly J. Hosp. Med. 16:2, at 56-59 (2006).

35. K. Obiri-Danso, A. Okore-Hanson & K. Jones, *The microbiological quality of drinking water sold on the streets in Kumasi, Ghana*, Lett. Appl. Microbiol. 37:4, at 334-39 (2003).

36. Okioga, *supra* note 32; Oloke, *supra* note 32, at 22-28.

37. Sumathy et al., *supra* note 31, at 224-27; Irwin A. Akpoborie & Ayo Ehwarimo, *Quality of packaged drinking water produced in Warri Metropolis and potential implications for public health*, J. Environ. Chem. Ecotoxicol. 4:11, at 195-202 (2012); Eric Danso-Boateng & Isaac K. Frimpong, *Quality analysis of plastic sachet and bottled water brands produced or sold in Kumasi, Ghana*, Int. J. Dev. Sustain. 2:4 (2013); J.K. Ahimah & S.A. Ofosu, *Evaluation of the quality of sachet water vended in the New Juaben municipality of Ghana*, Int. J. Water Resour. Environ. Eng. 4:5, at 134-38 (2012).

from Nigeria, found 100% of samples were positive for total coliforms.³⁸ The majority of studies reported 10% or less of samples were positive for *E. coli*, although three studies reported 16%-18% of samples contained *E. coli*.³⁹ There was one outlier study from Nigeria that reported 87% of samples were positive for *E. coli*.⁴⁰

With regards to aerobic bacteria (via heterotrophic plate count, HPC), numerous studies reported high percentages of positive samples. Two studies of sachet water, one in Ghana and another in Nigeria, found all 180 samples to be positive for HPC.⁴¹ Two other Nigerian studies, one from Amassoma and another from Ibadan and Ile-Ife, detected HPC in all brands tested.⁴² Another study of sachet water in Sincelejo, Colombia, found 59% of samples to be positive for HPC.⁴³

Numerous studies detected enterococci in sachet water samples, although it was typically detected less frequently than total coliforms. One study in Ogun State, Nigeria, reported 13% of 90 samples were positive for enterococci; however, a higher percentage of samples were positive for *Staphylococcus albus* (42%), *Klebsiella* spp. (31%), and *Micrococcus* spp. (31%).⁴⁴ A study by Egwari, et al. (2005) in Lagos, Nigeria, and another study by Tagoe, et al. (2011) in Cape Coast, Ghana, reported 11% and 20% of samples were positive for enterococci, respectively.⁴⁵ One study from Nigeria detected enterococci in two out of 20 brands.⁴⁶ In contrast, a study from Kumasi, Ghana, did not detect enterococci in any of the 88 sachet water samples.⁴⁷

38. Oloke, *supra* note 32, at 22-28; V. Ante, A. Shehu & K. Musa, *Microbial and chemical potability of packaged drinking water sold in Kaduna, Nigeria*, Eur. J. Sci. Res. 18:2, at 201-09 (2005); Yakubu B. Ngwai, Adebukola A. Sounyo, Siyeofori M. Fiabema, Geoffrey A. Agadah & Tamunobelema O. Ibeakuzie, *Bacteriological safety of plastic-bagged sachet drinking water sold in Amassoma, Nigeria*, Asian Pac. J. Trop. Med. 3:7, at 555-59 (2010); A.K. Onifade & R.M. Hori, *Microbiological analysis of sachet water vended in Ondo State, Nigeria*, Environ. Res. J. 2:3, at 107-10 (2008).

39. Mudasiru Iyanda Omowale Raji, Yke Ibrahim & Jo Ehinmidu, *Bacteriological quality of public water sources in Shuni, Tambuwal and Sokoto towns in North-Western Nigeria*, J. Pharmacy and Bioresources 7:2, at 55-64 (2010); Maimuna Waziri, *Assessment of the microbial quality of sachet water in Damaturu-Yobe State, Nigeria*, J. Asian Sci. Res. 2:2, at 76-80 (2012); Daniel Nii Aryee Tagoe, Hubert Danquah Nyarko, S.A. Arthur & E.A. Birikorang, *A Study of antibiotic susceptibility pattern of bacteria isolates in sachet drinking water sold in the Cape Coast metropolis of Ghana*, Res. J. Microbiol. 6:2, at 153-58 (2011).

40. Oloke, *supra* note 32, at 22-28.

41. Olaoye & Onilude, *supra* note 25, at 729-34; Obiri-Danso et al., *supra* note 35, at 334-39.

42. Ngwai et al., *supra* note 38, at 555-59; Olaoluwa Oyedeji, P.O. Olutiola & M.A. Moninuola, *Microbiological quality of packaged drinking water brands marketed in Ibadan metropolis and Ile-Ife city in South Western Nigeria*, African J. Microbiology Research 4:1, at 96-102 (2010).

43. Jhon Vidal et al., *supra* note 31, at 1736-44.

44. F.A. Olajubu & D.A. Mope, *Bacteriological assessment of 'pure water' samples in Ogun State of Nigeria*, Niger. J. Heal. Biomed. Sci. 6:2, at 45-48 (2007).

45. Tagoe et al., *supra* note 39, at 153-58; L.O. Egwari, S. Iwuanyanwu, C.I. Ojelabi, O. Uzochukwu & W.W. Effiok, *Bacteriology of sachet water sold in Lagos, Nigeria*, East Afr. Med. J. 82:5, at 235-40 (2005).

46. Oyedeji et al., *supra* note 42, at 96-102.

47. Obiri-Danso et al., *supra* note 35, at 334-39.

2.3.1.1.2. Bottled water

Overall, bottled water samples tended to have lower rates of microbiological contamination than sachet water samples. Table 5 contains the percentage of positive samples reported from studies for total coliforms, fecal coliforms, and *E. coli*. A brief meta-analysis of studies showed total coliforms, fecal coliforms, and *E. coli* were found in 9.5%, 3.5%, and 3.0% of all samples, respectively.

Table 5. Percentage of samples positive for various microbiological contaminants in bottled water

Country	PW type	Sample location	Number of samples	Percentage of samples >1 CFU/100mL			Reference
				Total coliforms	Fecal coliforms	<i>E. coli</i>	
Brazil	Bottle (20-L)	N/A	26	0%		0%	[49]
Brazil	Bottle (20-L)	N/A	15	0%	0%		[50]
Brazil	Bottle (20-L)	POS	60	0%		0%	[51]
Brazil	Bottle (20-L)	POS	47	15%	0%		[52]
Brazil	Bottle (20-L)	POS	84	15%		2%	[53]
Iraq	Bottle (20-L)	POS	12	25%			[54]
Mexico	Bottle (20-L)	N/A	185	34%	3%		[55]
Argentina	Bottle	PWMF	90	0%		0%	[56]
Bangladesh	Bottle	POS	10	60%	60%		[57]
Bangladesh	Bottle	POS	46	54%		41%	[58]
Bangladesh	Bottle	POS	18	100%			[59]
Bangladesh	Bottle	POS	16	100%			[60]
Bangladesh	Bottle	POS	45	31%	29%		[61]
Brazil	Bottle	N/A	43	5%	0%	0%	[62]
Brazil	Bottle	N/A	20	0%	0%	0%	[63]
Brazil	Bottle	N/A	44	25%		20%	[64]
Brazil	Bottle	N/A	80	11%	11%		[65]
Brazil	Bottle	N/A	27	4%		0%	[66]
Brazil	Bottle	PWMF	15	0%	0%		[67]
Brazil	Bottle	POS	15	27%	0%	0%	[68]
Brazil	Bottle	POS	69	3%		0%	[69]
Brazil	Bottle	POS	110	0%		0%	[70]
Brazil	Bottle	POS	100	7%		3%	[71]
Brazil	Bottle	POS	18	6%	0%		[72]
Brazil	Bottle	POS	45	0%	0%		[73]

Brazil	Bottle	POS	20	5%	0%		[74]
Brazil	Bottle	POS	70	0%	0%		[75]
Brazil	Bottle	POS	50	0%	0%		[76]
Brazil	Bottle	POS	120	38%	10%		[77]
Brazil	Bottle	POS	108	6%	5%		[78]
Brazil	Bottle	POS	10	10%			[79]
Brazil	Bottle	POS	74	8%			[80]
Brazil	Bottle	POS	264	0%		0%	[81]
Brazil	Bottle	POS	179	1%		0%	[82]
Egypt	Bottle	N/A	22	9%	9%		[83]
Egypt	Bottle	POS	25	0%			[84]
Egypt	Bottle	POS	84	29%	0%	0%	[85]
Ethiopia	Bottle	PWME/P OS	108	7%	0%		[86]
Fiji	Bottle	POS	100		7%		[87]
Ghana	Bottle	N/A	96		0%		[88]
Ghana	Bottle	POS	70	0%	0%		[89]
Ghana	Bottle	POS	45	0%	0%		[90]
India	Bottle	N/A	23	4%		4%	[91]
India	Bottle	N/A	26	0%		0%	[92]
India	Bottle	N/A	11	0%	0%		[93]
India	Bottle	POS	10	10%		10%	[94]
India	Bottle	POS	105	10%			[95]
India	Bottle	POS	90	3%		3%	[96]
India	Bottle	POS	15	27%		13%	[97]
Iran	Bottle	PWMEF	304			3%	[98]
Iran	Bottle	POS	90	0%		0%	[99]
Iran	Bottle	POS	35	14%	0%	0%	[100]
Iran	Bottle	POS	68	0%	0%		[101]
Iran	Bottle	POS	75	0%	0%		[102]
Iran	Bottle	POS	21	0%	0%		[103]
Iraq	Bottle	POS	30	3%			[104]
Lebanon	Bottle	POS	65		0%		[105]
Mexico	Bottle	N/A	80	3%	1%		[106]
Nepal	Bottle	N/A	30	63%			[107]
Nigeria	Bottle	PWME/P OS	12	0%	0%		[108]
Nigeria	Bottle	POS	10	0%		0%	[109]
Nigeria	Bottle	POS	21	0%			[110]
Nigeria	Bottle	POS	90		0%		[111]

Pakistan	Bottle	N/A	20	20%	10%		[112]
Pakistan	Bottle	N/A	24	8%			[113]
Pakistan	Bottle	POS	187	11%	0%	6%	[114]
Pakistan	Bottle	POS	23	35%	4%		[115]
South Africa	Bottle	POS	10	0%	0%		[116]
Sri Lanka	Bottle	N/A	27	19%	15%		[117]
Sri Lanka	Bottle	POS	66	6%	5%		[118]
Sri Lanka	Bottle	POS	34	53%	15%		[119]
Taiwan	Bottle	POS	136	0%			[120]
Tanzania	Bottle	POS	80	4%	0%		[121]
Turkey	Bottle	N/A	26	15%		0%	[122]
Zimbabwe	Bottle	POS	60	12%	8%		[123]
Total number of samples				3934	2395	2077	
Total number of positive samples				419	80	59	
Percentage of samples (total)				11%	3%	3%	

The percentage of samples testing positive for total coliforms ranged from 0-100%, with a median of 5%. Of the 70 reviewed studies that tested bottled water for total coliforms, 66% of studies reported less than 10% of samples were contaminated with total coliforms. The ranges of samples positive for fecal coliforms and *E. coli* were 0-60% and 0-41%, respectively. The majority of studies (64%) did not detect fecal coliforms in bottled water samples, and similarly 63% of studies did not detect *E. coli* in bottled water samples. Studies of bottled water products from Bangladesh reported high percentages of samples positive for total coliforms, fecal coliforms, and *E. coli* compared to studies from other locations.⁴⁸

Only seven included studies tested larger bottled water (20-L, re-useable bottles), five of which were from Brazil.⁴⁹ Larger bottled water samples were

48. Saiful Islam, Housne A. Begum & Nilufar Ycasmin Nili, *Bacteriological Safety Assessment of Municipal Tap Water and Quality of Bottle Water in Dhaka City: Health Hazard Analysis*, Bangladesh J. Med. Microbiol. 4:1, at 9-13 (2010); M.R. Khan, M.L. Saha & A.H. Kibria, *A bacteriological profile of bottled water sold in Bangladesh*, World J. Microbiol. Biotechnol. 8:5, at 544-45 (1992); W. Ahmed, R. Yusuf, I. Hasan, W. Ashraf, A. Goonetilleke, S. Toze & T. Gardner, *Fecal indicators and bacterial pathogens in bottled water from Dhaka, Bangladesh*, Brazilian J. Microbiol. 44:1, at 97-103 (2013).

49. Maria Fernanda Falcone-Dias & Adalberto Farache Filho, *Quantitative variations in heterotrophic plate count and in the presence of indicator microorganisms in bottled mineral water*, Food Control 31:1, at 90-96 (2013); Maria Fernanda Falcone-Dias, Guilherme L. Emerick & Adalberto Farache-Filho, *Mineral water: a microbiological approach*, Water Sci. Technol. Water Supply 12:5, at 556 (2012); R.M.B. Franco & R. Cantusio Neto, *Occurrence of cryptosporidial oocysts and giardia cysts in bottled mineral water commercialized in the city of Campinas, State of São Paulo, Brazil*, Mem. Inst. Oswaldo Cruz 97:2, at 205-07 (2002); André Venturini Pontara, Christianne Dezuani Dias de Oliveira, Amir Horiquni Barbosa, Rafael Aparecido dos Santos, Regina Helena Pires & Carlos Henrique Gomes Martins, *Microbiological monitoring of mineral water commercialized in Brazil*, Brazilian J. Microbiol. 42:2, at 554-59

more frequently positive for total coliforms (20% of samples), but less frequently contaminated with fecal coliforms (2% of samples) and *E. coli* (1% of samples) compared to smaller bottled water. However, there were very few studies of larger bottles with only three that measured fecal coliforms,⁵⁰ and three other studies measured *E. coli*.⁵¹

Aerobic bacteria (via HPC) were detected in bottled water more often than other microbial contaminants. Studies by Obiri-Danso, et al. (2003) in Ghana, Ehlers, et al. (2004) in South Africa, and Ogan (1992) in Nigeria all found high frequencies of contamination of bottled water with aerobic bacteria (via HPC), but did not detect total coliform or fecal coliform bacteria in any samples.⁵² Additional studies from Tanzania, Lebanon, and Nigeria reported high percentages of positive samples (or brands) for HPC.⁵³

Enterococci was not frequently tested in studies reviewed, however in studies where it was tested, it was rarely detected in bottled water samples. In a study of bottled mineral water in Brazil, only 6 out of 324 samples were positive for enterococci,⁵⁴ and in a study in Sri Lanka, only one brand out of 22 was positive.⁵⁵ No samples were positive for enterococci in studies from Brazil (Campinas), South Africa, Sri Lanka (Jaffna Peninsula), Pakistan (Karachi), and Egypt.⁵⁶ One exception was a study from Dhaka, Bangladesh, where 22% of bottled water samples were positive for enterococci.⁵⁷

2.3.1.1.3. Along the supply chain

The microbial quality of packaged water products tended to deteriorate along the supply chain. A study by Dada (2009) found that, of more than 100 samples of sachet products collected in Nigeria, 0% contained detectable *E.*

(2011); Denise de Oliveira Scoaris, Fernando Bizerra, Sueli Fumie Yamada-Ogatta & Celso Vataru Nakamura, *The Occurrence of Aeromonas spp. in the Bottled Mineral Water, Well Water and Tap Water from the Municipal Supplies*, Brazilian Archives of Biology and Technology 51:5, at 1049–55 (2008).

50. Pontara et al., *supra* note 49, at 554–59; Scoaris et al., *supra* note 49, at 1049–55; Esperanza Robles, Pedro Ramírez, Elena González, de Guadalupe Sáinz, Blanca Martínez, Angel Durán & Elena Martínez, *Bottled-water quality in Metropolitan Mexico City*, Water, Air and Soil Pollution 113:1, at 217–26 (1999).

51. Falcone-Dias & Farache Filho, *supra* note 49, at 90–96; Falcone-Dias et al., *supra* note 49, at 556; Franco et al., *supra* note 49, at 205–07.

52. Obiri-Danso et al., *supra* note 35, at 334–39; Marthie M. Ehlers, Walda B. Van Zyl, Dobromir N. Pavlov & Etienne E. Müller, *Random survey of the microbial quality of bottled water in South Africa*, Water SA 30:2, at 203–10 (2004); M.T. Ogan, *Microbiological quality of bottled water sold in retail outlets in Nigeria*, J. Appl. Bacteriol. 73:2, at 175–81 (1992).

53. Kassenga, *supra* note 22, at 179; Semerjian, *supra* note 28, at 275–85; Oyedeji et al., *supra* note 42, at 96–102.

54. Falcone-Dias & Farache Filho, *supra* note 49, at 90–96.

55. S. Sasikaran, K. Sritharan, Balakumar Sandrasegarampillai & Vasanthy Arasaratnam, *Physical, chemical and microbial analysis of bottled drinking water*, Ceylon Med. J. 57:3, at 111–16 (2012).

56. Franco et al., *supra* note 49, at 205–07; Ehlers et al., *supra* note 52, at 203–10; Sasikaran et al., *supra* note 55, at 111–16; Amna Khatoon & Zaid Ahmed Pirzada, *Bacteriological quality of bottled water brands in Karachi, Pakistan*, Biologia (Bratisl.) 56:1&2, at 137–43 (2010); Aly E. Abo-Amer, El-Sayed M. Soltan & Magdy A. Abu-Gharbia, *Molecular approach and bacterial quality of drinking water of urban and rural communities in Egypt*, Acta microbiologica et immunologica Hungarica 55:3, at 311–26 (2008).

57. Ahmed et al., *supra* note 48, at 97–103.

coli, but this figure rose to 40% of samples testing positive for total coliforms at the distribution point and 45% at the point of sale.⁵⁸ However, two studies that collected samples from the packaged water manufacturing facility reported high percentages of samples positive for total coliforms – 47% and 83%, respectively⁵⁹, although they did not compare to sachet samples from the point of sale. A study by Biadlegne in Amhara State, Ethiopia, found that total coliforms were detected more frequently in samples obtained from retailers than from manufacturers or distributors.⁶⁰

2.3.1.2. Protozoa

Protozoa, such as *Giardia* and *Cryptosporidium*, are more resilient against traditional water treatment processes and are responsible for many diseases and infections.⁶¹ In countries with regulations in place, monitoring of protozoa in packaged water is often not included in required parameters. Only a few studies have examined the microbial quality of sachet water with respect to protozoa, and there is a wide variation in their results. One Nigerian study did not detect helminth eggs or protozoan cysts in any of the 500 sachet water samples examined from Aliero and Kebbi States.⁶² Similarly, Ekwunife, et al. (2010) did not detect parasites in any of 108 sachet water samples examined in southeastern Nigeria.⁶³ In contrast, three studies reported 22%, 52%, and 77% of samples were positive for protozoa.⁶⁴ In regards to *Cryptosporidium*, two studies detected it in low frequencies (1 and 2 samples, respectively) in sachet water samples.⁶⁵ However, a study in Accra, Ghana, reported 63% of sachet samples were positive for *Cryptosporidium*.⁶⁶

Most studies examining bottled water reported a low to undetectable incidence of protozoan cysts. A study of bottled mineral water in Campinas, Brazil, revealed none of the 13 brands was positive for *Giardia* cysts, but two brands

58. Dada, *supra* note 25, at 15–21.

59. Okioga, *supra* note 32; Kennedy Addo, G.I. Mensah, B. Donkor, Christian Mensah & Moses L. Akyeh, *Bacteriological Quality of Sachet Water Produced and Sold on the Ghanaian Market*, African Journal of Food, Agriculture, Nutrition and Dev. 9:6 (2009).

60. Fantahun Biadlegne, Belay Tessema, Mulugeta Kibret, Baych Abera, Kabsay Huruy, Belay Anagaw & Andargachew Mulu, *Physicochemical and bacteriological quality of bottled drinking water*, Ethiop. Med. J. 47:4, at 277–84 (2009).

61. WHO, *supra* note 2.

62. Kalpana Sultan, S. Bagudo & Adamu Almustapha Aliero, *Microbiological analysis of sachet drinking water marketed at two sites in Aliero, Kebbi State, Nigeria*, Cont. J. Microbiol. 5:1, at 29–36 (2011).

63. Chinyelu A. Ekwunife, Samuel O. Okafor, Chinyere N. Ukaga, Nwora A. Ozumba & Christine I. Eneanya, *Parasites Associated with Sachet Drinking Water (Pure Water) in Awka, South-Eastern, Nigeria*, Sierra Leone J. Biomedical Research 2:1, at 23–27 (2010).

64. J.A. Alli, I.O. Okonko, O.A. Alabi, N.N. Odu, A.F. Kolade, J.C. Nwanze, C. Onoh & C. Mgbakor, *Parasitological evaluation of some vended sachet water in Southwestern Nigeria*, New York Sci. J. 4:10, at 84–92 (2011); Abena Safoa Osei, Mercy J. Newman, J.A.A. Mingle, P.F. Ayeih-Kumi & Mubarak Osei Kwasi, *Microbiological quality of packaged water sold in Accra, Ghana*, Food Control 31:1, at 172–75 (2013); G. Kwakye-Nuako, P. Borketey, Israel Mensah-Attipoe, R. Asmah & P. Ayeih-Kumi, *Sachet drinking water in accra: the potential threats of transmission of enteric pathogenic protozoan organisms*, Ghana Med. J. 41:2, at 62–67 (2007).

65. Alli et al., *supra* note 64, at 84–92; Osei et al., *supra* note 64, at 172–75.

66. Kwakye-Nuako et al., *supra* note 64, at 62–67.

were positive for *Cryptosporidium* oocysts.⁶⁷ In a study of the water quality of various sources in Uttar Pradesh, India, Shekhar, et al. (2011) found that all 26 bottled water samples studied were free from parasitic eggs.⁶⁸ A study of 84 samples of bottled mineral water sold in Alexandria and Cairo, Egypt, did not detect *Cryptosporidium* in any of the samples, but 2.4% of samples were positive for *Giardia* cysts.⁶⁹

2.3.1.3. Viruses

Similar to protozoa, viruses are more resistant to chlorine treatment and have been found in waters free from coliform contamination.⁷⁰ A South African study examined 10 bottled water products for calicivirus, enterovirus, and rotavirus. The selected viruses were not detected in any of the tested brands.⁷¹ Similarly, using molecular methods, Lamothe, et al. (2003) did not detect Norovirus in 36 bottled water brands from various countries.⁷² In contrast, in a year-long virus surveillance study of three European bottled mineral water brands, 53 of 159 samples tested positive for a Norwalk-like virus sequence.⁷³ Each of the three brands had roughly the same percentage (30-36%) of positive samples.⁷⁴ No studies were found examining the presence of viruses in sachet water.

2.3.1.4. Fungi

Most countries do not require regular monitoring of fungal species, since these pose little public health risk; however, fungi can cause issues related to taste and smell and have been known to cause diseases in immuno-compromised populations.⁷⁵ One study in rural southwestern Nigeria reported 40-80% of sachet samples tested monthly were contaminated with fungi,⁷⁶ while two other Nigerian studies reported three out of four brands and three out of five brands, respectively, were contaminated with fungi.⁷⁷ Fungi has been reported

67. Franco, *supra* note 49, at 205-07.

68. C. Shekhar, N. Joshi & Amardeep Singh, *Physicochemical and microbiological analysis of drinking water*, J. Vet. Public Heal. 9:2, at 123-26 (2011).

69. Magda M. Abd El-Salam, Engy M. Al-Ghitany & Mohamed Abd El-Hady Kassem, *Quality of Bottled Water Brands in Egypt Part II: Biological Water Examination*, J. Egypt. Public Health Assoc. 83: 5-6, at 468-86 (2008).

70. P. Payment, M. Trudel & R. Plante, *Elimination of viruses and indicator bacteria at each step of treatment during preparation of drinking water at seven water treatment plants*, Appl. Environ. Microbiol. 49:6, at 1418-428 (1985).

71. Ehlers et al., *supra* note 52, at 203-10.

72. Gilbert Thierry Lamothe, Thierry Putallaz, Han Joosten & Joey D. Marugg, *Reverse Transcription-PCR Analysis of Bottled and Natural Mineral Waters for the Presence of Noroviruses*, Applied and Environ. Microbiology 69:11 (2003).

73. Christian Beuret, Dorothe Kohler, Andreas Baumgartner & Thomas M. Lüthi, *Norwalk-Like Virus Sequences in Mineral Waters: One-Year Monitoring of Three Brands*, Applied and Environ. Microbiology 68:4 (2002).

74. *Id.*

75. Gunhild Hageskal, Nelson Lima & Ida Skaar, *The study of fungi in drinking water*, Mycol. Res. 113:2, at 165-72 (2009).

76. Anthony I. Okoh, Mufutau K. Bakare, Omobola O. Okoh & Emmanuel Odjare, *The culturable microbial and chemical qualities of some waters used for drinking and domestic purposes in a typical rural setting of Southwestern Nigeria*, J. Appl. Sci. 5:6, at 1041-48 (2005).

77. E.C. Okpako, A.N. Osuagwu, A.E. Duke & Valentine O. Ntui, *Prevalence and significance of fungi in sachet and borehole drinking water in Calabar, Nigeria*, African J.

in studies of bottled water in Sri Lanka ranging from 14-57% of samples,⁷⁸ in 33% of samples in Argentina,⁷⁹ and in 35% of samples from Maringá City, Brazil.⁸⁰ *Penicillium*, which has been known to produce mycotoxins, was detected in sachet and bottled samples in two different studies.⁸¹

2.3.1.5. Exterior surfaces of packaged water containers

Even when the contents of packaged water samples are free from pathogens, contaminated exterior surfaces may present significant health risks.⁸² This is particularly true for sachet water packages, which users typically open with their teeth and then drink by placing the corner of the opened package in their mouth.⁸³ One study by Egwari, et al. found that, while the contents of drinking water sachets collected in Lagos, Nigeria, were free from *E. coli* and enteric pathogens, their surfaces were heavily contaminated.⁸⁴ Similarly, Ejechi and Ejechi (2008) found that while only 27% and 6% of sachet water packages purchased from street vendors contained total and fecal coliform contamination in their contents, respectively, these figures rose to 100% and 47%, respectively, for the exterior of the sachets.⁸⁵ As already mentioned, Ekwunife, et al. (2008) did not detect any protozoa in the sampled sachet water, however they detected *Ascaris lumbricoides*, *Entamoeba histolytica*, and *Giardia* cysts on the surfaces of 5.6%, 4.6%, and 1.9% of samples.⁸⁶

2.3.2. Chemical safety

Several studies performed chemical analyses of packaged water samples. Although there are numerous chemical contaminants that can be present in drinking water, this review highlights selected common contaminants, with particular emphasis on those of particular concern with respect to packaged water. Table 6 contains results for selected parameters from included studies. In multiple studies, the pH values of some sachet and bottled water samples were lower than the WHO-recommended range of 6.5-8.5. The pH values reported in studies are not low enough to cause concern for public health, although they could impact the effectiveness of treatment processes. Low values of pH can also result in the corrosion of metal pipes and plumbing fixtures, which can lead

Microbiology Research 3:2, at 56-61 (2009); Martin E. Ohanu, Iniekong P. Udoh & Clara I. Eleazar, *Microbiological Analysis of Sachet and Tap Water in Enugu State of Nigeria*, *Advances in Microbiology* 2:4, at 547-51 (2012).

78. Herath et al., *supra* note 29, at 160-64; Sasikaran et al., *supra* note 55, at 111-16.

79. Daniel Cabral & Virginia E. Fernández Pinto, *Fungal spoilage of bottled mineral water*, *Int. J. Food Microbiol.* 72:1-2, at 73-76 (2002).

80. Mirian U. Yamaguchi, Rita De Cássia Pontello Rampazzo, Sueli Fumie Yamada, Celso Vataru Nakamura, Tânia Ueda-Nakamura & Benedito Prado Dias Filho, *Yeasts and Filamentous Fungi in Bottled Mineral Water and Tap Water from Municipal Supplies*, *Brazilian Archives of Biology and Technology* 50:1, at 1-9 (2007).

81. Ohanu et al., *supra* note 77, at 547-51; Cabral & Fernández, *supra* note 79, at 73-76.

82. Egwari et al., *supra* note 45, at 240.

83. *Id.*

84. *Id.* at 239.

85. E.O. Ejechi & B.O. Ejechi, *Safe drinking water and satisfaction with environmental quality of life in some oil and gas industry impacted cities of Nigeria*, *Soc. Indicators Res.* 85, at 211, 216-17 (2008).

86. Ekwunife et al., *supra* note 63, at 23-27.

to leaching of heavy metals in piped distribution systems.⁸⁷ Although this is not specifically relevant to packaged water, it may be of concern as many producers use piped water as a raw water source for manufacturing packaged water products.

Table 6. Selected chemical parameters of PW from included studies

Country	N	PW Type	Sample Location	pH 6.5-8.5	TDS 500 mg/L	NO ₃ 50 mg/L	F 1.5 mg/L	Fe mg/L	Mn 0.4 mg/L	Ar 10 ug/L	Cd 3 ug/L	Cr 50 ug/L	Co ug/L	Cu 2000 ug/L	Pb 10 ug/L	Ref
Nigeria	30	SH	POS	5.6-8.0	23.0-376.0	0.0-40.0	0.0-0.35	0.01-1.35				0-28.0				[124]
Ghana	10	H	POS					0.01-0.20	ND						ND	[125]
Nigeria	41	S	N/A	5.20-7.5	20	0.0267-1.477					ND-36			ND-1400	ND-3.6	[126]
Nigeria	24	S	PWMF					0.03-0.23	0.12-0.23					10-60	ND	[127]
Nigeria	20	S	PWMF								0-1.0				ND-4.5	[128]
Nigeria	78	S	POS	6.6-9.7	39.0-362.0	0.01-6.60	0.01-1.87	0-0.26				0-42.0				[129]
Nigeria	18	S	POS	7.35-7.5	2.66-15.03	ND		ND								[130]
Nigeria	15	S	POS	6.5-7.8	4.7-22.6	0-0.2		0-0.45			0.5-1.0		0	0		[131]
Nigeria	60	S	POS	4.56-7.63				0-16.6		0-1200					0-50	[132]
Nigeria	12	S	POS			0.46-7.64										[133]
Nigeria	20	S	POS					0.02-0.1	ND						ND	[134]
Ghana	50	S	POS	5.99-7.22	6.30-410.0							ND		ND	20-150	[135]
Ghana	10	S	POS					0.01-0.10	ND						ND	[136]
Ghana	12	Both	PWMF	5.5-7.7	31-86	0.1-3.1	<0.01-0.01	<0.01-0.01	<0.01	<1	ND	<10-30			<1-1	[137]
Jordan	8	B	N/A	7.58'	262.63'	8.14'	0.16'	0.02'	ND							[138]
Ethiopia	36	B	PWMF	5.3-7.7	162-2190	0.7-7.9		0.01-0.03								[139]
Ethiopia	36	B	Distr.	5.5-7.6	162-244	0.7-8.1		0.02-0.03								[140]
Egypt	84	B	POS	7.22-7.78	198-438	0.18-4.05	0.18-3.4	0.118-0.912	0.02-0.60						ND-49	[141]
Nigeria	10	B	POS	6.3-7.8	78.0-180.0	0.0-1.5	0.0-0.08	0.03-0.88				3-43.0				[142]
Turkey	15	B	POS	5.5-6.73				<1 x 10 ⁻⁴ -6.4 x 10 ⁻³		0.1-0.4	<0.1-1.3	0.7-1.1	<1-41	<0.1-9.2		[143]
Turkey	70	B	POS	6.07-9.16	0.9-14.2		0-0.69	0.00012-0.0488	0.00001-0.04796	0.12-30.63	0.29-1.34	0.14-6.4	0.22-0.57	0.02-6.78	0.21-0.32	[144]
Ethiopia	36	B	POS	5.3-7.6	163-247	0.7-8.1		0.01-0.03								[145]
Sri Lanka	30	B	POS	4.58-7.2		0.7-3.9	ND-0.44	ND-0.1	ND-0.04							[146]

87. WHO, *supra* note 2.

Pakistan	23	B	POS	7.4-8.2	113-529			0.000 02- 0.000 04	0.000 28- 0.005 58		0.18- 0.56	0.05- 5.23	0.21 - 1.25	4.6- 43.65	1.02- 7.57	[147]
Iran	75	B	POS								ND- 2.41	ND-1.6		ND- 2.41	ND- 3.5	[148]
Ghana	10	B	POS					ND- 0.001	ND						ND	[149]
Sri Lanka	66	B	POS	4.1-7.6	11-123.7	0.22- 4.19										[150]
Lebanon	64	B	POS	5.58- 8.35	47.3-200	4-38.2	<0.02 -0.60	<0.00 02	<0.0 01- 0.002 1	<2.5	140- 1.04	<1.0- 4.0	<2.0	<1.0- 2.3	<1.0	[151]
Lebanon	100	B	HH	7.7'	196	12'		0.05'								[152]

ND= nondetect. Parameters left blank were not reported in the study.

SH= hand-tied sachet, S= sachet, B= bottled average value rather than range

PWMF= packaged water manufacturing facility, Distr.= distributor or wholesaler, POS= point of sale, HH= households, N/A= location not reported

2.3.2.1. Sachet water

Few studies have reported levels of chemical contaminants higher than WHO standards. One of the two studies that measured arsenic concentration reported 35% of samples exceeded the WHO guideline of 0.01 mg/L, with concentrations of 0.90 mg/L to 1.20 mg/L in four brands.⁸⁸ However, the other study reported all samples to have <0.001 mg/L. Three studies found 68%, 20%, and 12% of samples with lead concentrations higher than the WHO guideline (0.10 mg/L).⁸⁹ Only one study reported fluoride concentrations of sachet water samples above the WHO guideline of 1.5 mg/L, although the mean concentration was 0.97 mg/L.⁹⁰ The same study measured concentrations of aluminum, cadmium, and cyanide above the WHO guideline as well (ibid). Orisakwe, et al. (2006) also reported 19.5% of samples exceeded the WHO guideline for cadmium.⁹¹

Other studies have reported packaged water to have chemical concentrations within international guidelines. Obiri-Danso, et al. (2003) found no significant chemical contamination of bottled or sachet water in Kumasi, Ghana, while Biadlegne, et al. (2009) found similar results in Ethiopia.⁹² Nsonwu, et al. (2005) in Nigeria found all 20 packaged water samples were within the WHO limits for lead and cadmium levels, and another Nigerian study did not detect lead or manganese in 92 sachet samples.⁹³ Similarly, all sachet water samples were within the WHO guidelines for lead and the recommended aesthetic limit

88. M. Ogunlesi, W. Okiei, S.J. Adjogri & O.M. Oshinnuga, *Physico-chemical and microbial studies on sachet water consumed in Lagos Metropolis, Nigeria*, Niger. J. Heal. Biomed. Sci. 8:1, at 53-57 (2009).

89. Ackah et al., *supra* note 27, at 2120-27; Ogunlesi et al., *supra* note 88, at 53-57; Orish E. Orisakwe, Innocent Igwilo, Johnson Afonne, John Moses Maduabuchi, Ejeatuluchukwu Obi & John C. Nduka, *Heavy metal hazards of sachet water in Nigeria*, Arch. Environ. Occup. Health 61:5, at 209-13 (2006).

90. Ajayi et al., *supra* note 6, at 251-58.

91. Orisakwe et al., *supra* note 89, at 209-13.

92. Obiri-Danso et al., *supra* note 35, at 334-39; Biadlegne et al., *supra* note 60, at 277-84.

93. Olaoye & Onilude, *supra* note 25, at 729-34; A.C. Nsonwu, C.A.O. Usoro, M.H. Etukudo & I.N. Usoro, *Cadmium and lead content of packaged water and water boreholes in Calabar metropolis*, Mary Slessor J. Med. 5:1 (2005).

(0.3 mg/L) for iron in a longitudinal study in Cape Coast, Ghana.⁹⁴ Nwosu and Ogueke (2004) found 15 sachet samples from Owerri metropolis, Nigeria, to be within WHO limits for lead, magnesium, copper, and mercury.⁹⁵

One Nigerian study that examined the level of lead along the sachet production chain found higher levels of lead in finished products compared to the source, revealing possible contamination occurring through the piping system. However, all samples had lead levels lower than the WHO guideline value of 0.010 mg/L.⁹⁶

2.3.2.2. Bottled water

In a study of Egyptian bottled water, Abd-El Salam, et al. (2008) found 65.5% of the 84 samples contained concentrations of one or more chemical parameters higher than Egyptian standards.⁹⁷ Mean fluoride concentrations were above WHO guidelines in two brands, and all mean lead concentrations were above WHO guidelines, with a range of 0.020-0.049 mg/L. In a Turkish study of 70 bottled water samples, only one sample exceeded the WHO guideline value, but the concentration of arsenic was found to be three times the guideline value.⁹⁸ Other studies have found all examined bottled water samples to be within WHO guidelines for trace metals.⁹⁹

Additional studies have demonstrated the presence of other chemical contaminants including polychlorinated biphenyls (PCBs), disinfection by-products, volatile organic compounds (VOCs), and pesticides in bottled water, although most have found these contaminants to be within national and/or WHO guidelines.¹⁰⁰ However, one study by Alomran, et al. (2013) found 18% of samples exceeded WHO guidelines for bromate, a disinfection byproduct of ozone.¹⁰¹

In Kuwait, Al-Mudhaf, et al. (2009) examined 113 bottled water samples

94. David Kwesi Dodoo, Emmanuel Kobina Quagraine, Frank Okai-Sam, Dorsa J. Kambo & John Headley, *Quality of 'sachet' waters in the Cape Coast municipality of Ghana*, J. Environ. Sci. Health Part A 41:3, at 329-42 (2006).

95. Nwosu & Ogueke, *supra* note 26, at 164-70.

96. E.E. Ildigwe, C.E. Ojukwu, C.A. Agbata, I.S. Mbagwu & D. Ajaghaku, *Analysis of lead in sachet water production from three senatorial zones of Anambra State, Nigeria*, Advances in Applied Science Research 4:1, at 82-85 (2013).

97. Abd El-Salam et al., *supra* note 69, at 369-88.

98. Cüneyt Güler & Musa Alpaslan, *Mineral content of 70 bottled water brands sold on the Turkish market: Assessment of their compliance with current regulations*, J. Food Compos. Anal. 22:7-8, at 728-37 (2009).

99. Mahmood et al., *supra* note 30, at 185-190; Dimitrios Karamanis, Kostas Stamoulis & K.G. Ioannides, *Natural radionuclides and heavy metals in bottled water in Greece*, Desalination 213:1-3, at 90-97 (2007).

100. R.O. Salinas, B.S. Bermudez, R.G. Tolentino, G.D. Gonzalez & S. Vega y León, *Presence of polychlorinated biphenyls (PCBs) in bottled drinking water in Mexico City*, Bull. Environ. Contam. Toxicol. 85:4, at 372-76 (2010); Maqbool Ahmad & Ahmad S. Bajahlan, *Quality comparison of tap water vs. bottled water in the industrial city of Yanbu (Saudi Arabia)*, Environ. Monit. Assess. 159:1-4, at 1-14 (2009); Rey Gutiérrez, Salvador Vega, Rutilio Ortiz & Beatriz Schettino, *Presence of organochlorine contaminants in bottled drinking water from Mexico City*, Water Sci. Technol. Water Supply 12:4, at 470 (2012).

101. Abdulsoul Alomran, Salem E. El-Maghraby, Anwar Aly, Mohammad I. Al-Wabel, Zafer A. Al-Asmari & Mahmoud Elsayed Ali Nadim, *Quality assessment of various bottled waters marketed in Saudi Arabia*, Environ. Monit. Assess. 185:8, at 6397-406 (2013).

representing 71 brands for 54 different VOCs including trihalomethanes (THMs).¹⁰² VOCs and THMs were detected in 93% of bottled water brands, however all levels of VOCs and THMs were below the WHO recommended limits with the exception of styrene. VOCs were found more frequently in water samples packaged in polystyrene containers and increased in concentration during storage. Higher temperatures were found to have little to no effect on the level of contamination.

2.3.3. Radiological safety

2.3.3.1. Sachet water

The literature search identified only one paper examining the radiological quality of sachets. Ajayi and Adesida (2009) measured the activity of 40K, 226Ra, and 228Ra in duplicate samples of 15 different brands of sachet water in Nigeria.¹⁰³ All samples exceeded the WHO guidance limit for 226Ra (1.0 Bq/L), and 93% of samples exceeded the WHO guidance limit for 228Ra (0.1 Bq/L) (ibid). The average estimated annual effective dose for all samples for both 226Ra and 228Ra was above the WHO recommended limit of 0.1 mSv/year.¹⁰⁴

2.3.3.2. Bottled water

Our search found only a few radiological studies of bottled water from LMICs, none from Sub-Saharan Africa. Studies examined gross alpha activity, gross beta activity, 226Ra, 228Ra, 40K, 232Th, 234U, and 238U. Two studies examining gross alpha and beta activities reported all samples to be below the WHO limit of 0.5 Bq/L and 1.0 Bq/L for alpha and beta activities, respectively.¹⁰⁵ One study of 40 samples from Turkey reported 5% and 18% of samples exceeded the WHO limit for gross alpha and gross beta activity, respectively.¹⁰⁶ The same study reported an average estimated annual effective dose of 0.31 mSv/yr, which was higher than the WHO guideline of 0.1 mSv/yr (ibid).

Fatima, et al. (2006) examined the concentration of 226Ra, 232Th, and 40K in 11 brands of bottled water in Islamabad and Rawalpindi city, Pakistan.¹⁰⁷

102. Humood F. Al-Mudhaf, Faisal A. Alsharifi & Abdel-Sattar Abu-Shady, *A survey of organic contaminants in household and bottled drinking waters in Kuwait*, *Sci. Total Environ.* 407:5, at 1658–68 (2009).

103. O.S. Ajayi & G. Adesida, *Radioactivity in some sachet drinking water samples produced in Nigeria*, *Iran. J. Radiat. Res.* 7:3, at 151–58 (2009).

104. WHO, *supra* note 2.

105. C.A. Silva Filho, E.J. França, E.M. Souza, F.C.A. Ribeiro, T.O. Santos, E.E.G. Farias, G.N. Arruda, J.A. Souza Neto, E.V. Honorato & C.A. Hazin, *Radioactive risk evaluation of mineral water in the Metropolitan Region of Recife, Northeastern Brazil*, *J. Radioanal. Nucl. Chem.* 295: 2, at 1215–20 (2012); Ignacio Dávila Rangel, Hugo López del Río, Fernando Mireles García, L.L. Quirino Torres, Lourdes Villalba, Luis Colmenero Sujo & Maria Elena Montero Cabrera, *Radioactivity in bottled waters sold in Mexico*, *Appl. Radiat. Isot.* 56:6, at 931–36 (2002).

106. Halim Taskin, Hizir Asliyukse, Ahmet Bozkurt & Erol Kam, *Natural radioactivity in bottled mineral and thermal spring waters of Turkey*, *Radiat. Prot. Dosimetry* 157:4, at 575–78 (2013).

107. I. Fatima, J. H. Zaidi, M. Arif & S.N.A. Tahir, *Measurement of natural radioactivity in bottled drinking water in Pakistan and consequent dose estimates*, *Radiat. Prot. Dosimetry* 123:2,

For all brands, the average activity concentrations for ^{226}Ra were well below the recommended level of 1.0 Bq/L, with the highest brand average concentration being 0.015 Bq/L (ibid). Similarly, Godoy, et al. (2001) found the average weighted values for ^{226}Ra , ^{228}Ra , and ^{210}Po to be within WHO guidelines, however five and four samples exceeded the limit for ^{228}Ra and ^{210}Po , respectively.¹⁰⁸ In Egypt, Lasheen, et al. (2007) reported three out of ten brands had average activity concentrations of ^{226}Ra above 1.0 Bq/L, and eight brands had an estimated annual effective dose greater than the WHO recommended limit of 0.1 mSv/yr.¹⁰⁹ However, all estimated annual doses were within the 0.2–0.8 Bq/L range for ingested food and water recommended by the United Nations Scientific Community on the Effects of Atomic Radiation (UNSCEAR).¹¹⁰

In Kuwait, Alrefae (2011) examined ^{238}U activity in 41 bottled water samples from 16 different countries.¹¹¹ ^{238}U was detected in 23 out of 41 bottled water brands examined, but none of the activity levels exceeded the WHO guideline of 10 Bq/L for ^{238}U (ibid). In addition, all estimated annual effective doses from the samples were below the WHO guidance limit of 0.1 mSv/yr (ibid). The study found ^{238}U levels to be higher in bottled water from Europe compared to bottled water from the Middle East, which highlights the importance of regional geology in concentration of radiological parameters (ibid). A study of ^{234}U and ^{238}U activities in 10 bottled water samples from Tunisia found all uranium activities to be below the WHO guidance levels as well as the estimated annual effective dose for all samples.¹¹²

2.3.4. Safety of packaging materials

Several researchers have reviewed the materials used to package drinking water. Few studies have examined polyethylene (polyethylene) plastic, which is widely used for sachet production. One study in Southwestern Nigeria found that 65% of packaged water sachets purchased in that region were not made from food-grade polymers.¹¹³ While toxic chemicals are used in the production of high-density polyethylene (HDPE) and low-density polyethylene (LDPE) plastics, a study by Fordham, et al. (1994) showed chemical residue migration from plastic packaging into food stimulants to be below the limits recommended by the European Community Council Directive.¹¹⁴ A Chinese study

at 234–40 (2007).

108. Jose Marcus Godoy, Eliana C. da S. Amaral & Maria Luiza D.P. Godoy, *Natural radionuclides in Brazilian mineral water and consequent doses to the population*, J. Environ. Radioact. 53:2, at 175–82 (2001).

109. Yasser F. Lasheen, Ayman F. Seliman & A.A. Abdel-Rassoul, *Simultaneous measurement of Ra-226 and Ra-228 in natural water by liquid scintillation counting*, J. Environ. Radioact. 95:2–3, at 86–97 (2007).

110. UNSCEAR, SOURCES, EFFECTS AND RISKS OF IONIZING RADIATION (2012).

111. T. Alrefae, *Investigation of ^{238}U content in bottled water consumed in Kuwait and estimates of annual effective doses*, Health Phys. 102:1, at 85–89 (2012).

112. F. Gharbi, Souad Baccouche, Wahid Abdelli, Mohamed Samaali, Mansour Oueslati & Adel Trabelsi, *Uranium isotopes in Tunisian bottled mineral waters*, J. Environ. Radioact. 101:8, at 589–90 (2010).

113. M.O. Edema, A.O. Atayese & M.O. Bankole, *Pure water syndrome: Bacteriological quality of Sachet-packed drinking water sold in Nigeria*, Afr. J. Food Agric. Nutr. Dev. 11:1, at 4595, 4600 (2011).

114. Peter J. Fordham, John W. Gramshaw, Helen M. Crews & Laurence Castle, *Element*

found that bottles of water made from polystyrene (rather than PET, the polymer most commonly used for bottled water containers worldwide) frequently leached styrene and other organic contaminants into the drinking water.¹¹⁵ A study of packaged water stored in PET bottles in Lebanon did not detect organic contaminants at levels exceeding WHO guidelines.¹¹⁶ However, an Italian study of 12 mineral water bottled in PET found contamination of genotoxic and carcinogenic compounds as the water was stored over a 9-month period.¹¹⁷

2.3.5. Safety relative to alternative sources

Although much of the literature focuses on the risk to consumers from potential contamination of packaged water, other researchers note that the use of one source of drinking water typically displaces another alternative sources, and that relative health outcomes are dependent on the risks associated with both sources, not simply with packaged water. Results from studies that compared the water quality of various drinking water sources including packaged water were compiled and are set out in Table 7.

Table 7. Comparison of microbial quality of drinking water sources to packaged water (PW) from included studies

Location	Source type (N)	Results	PW sample type (N)	Results	Reference
Brazil	Tap water (96)	3% TC 3% FC 0% <i>E. coli</i>	New 20-L bottles (22)	23% TC 5% FC 0% <i>E. coli</i>	[153]
Brazil	Tap water (60)	5% TC 0% FC	Installed 20-L bottles (77) 20-L bottles (60)	40% TC 10% FC 6% <i>E. coli</i> 20% TC 0% FC	[154]
Brazil	Tap water (167)	9% TC 2% FC	20-L bottles (47)	15% TC 0% FC	[155]
Egypt	Well (24)	42% TC 17% FC			
Egypt	Tap water (35)	0% FC 0% <i>E. coli</i>	Bottled (25)	0% FC 0% <i>E. coli</i>	[156]
	Hand pumps (15)	1.2×10^3 - 3.2×10^2 MPN/100 mL FC			

residues in food contact plastics and their migration into food simulants, measured by inductively-coupled plasma-mass spectrometry, Food Addit. Contam. 12:5, at 651-69.

115. Ahmad & Bajahlan, *supra* note 100.

116. Loyal Al Rayes, C.O. Saliba, Aline Ghanem & J. Randon, *BTES and aldehydes analysis in PET-bottled water in Lebanon*, 5 Food Additives and Contaminants Part B: Surveillance, 5:3, at 221, 224 (2012).

117. D. Biscardi, Silvano Monarca, R. De Fusco, F. Senatore, P. Poli, Annamaria Buschini, C. Rossi & Claudia Zani, *Evaluation of the migration of mutagens/carcinogens from PET bottles into mineral water by Tradescantia/micronuclei test, Comet assay on leukocytes and GC/MS*, Sci. Total Environ. 302:1-3, at 101-08 (2003).

		1.2×10^3 - 3.2×10^2 MPN/100 mL <i>E. coli</i>			
Iran	Tap water (144)	23% <i>E. coli</i> 4% Salmonella 2% <i>Vibrio cholerae</i>	Bottled (304)	3% <i>E. coli</i> 0% Salmonella 0% <i>Vibrio cholerae</i>	[157]
Iran	Tap water (100)	14% TC 7% <i>E. coli</i>	Bottled (90)	0% TC 0% <i>E. coli</i>	[158]
Turkey	Public piped (50)	4% TC 0% <i>E. coli</i> 33% TC 7% <i>E. coli</i>	Bottled (26)	4% TC 0% <i>E. coli</i>	[159]
	Wells (with pumps) (15)				
	Springs (7)	86% TC 43% <i>E. coli</i>			
Egypt	Treatment plants (30)	0% TC	Bottled (22)	9% TC	[160]
	Storage tanks (58)	0% TC			
Lebanon	Wells (37)	3-11% TC ¹			
	Municipal supply (25)	0% FC	Bottled (20)	80% TC 0% FC	[161]
Lebanon	Municipal supply, (76)	25% TC 4% FC 1% TC 0% FC	Bottled (18) Bottled (6)	39% TC 11% FC 0% TC 0% FC	[162]
Jordan	Municipal supply, storage tanks, wells (3,455)				
India	Water purifiers (10)	1.4×10^2 CFU/mL TC 1.9×10 CFU/mL <i>E. coli</i> 4.8 CFU/mL TC	Bottled (26)	0 CFU/mL TC 0 CFU/mL <i>E. coli</i>	[163]
	Hand pumps (10)	2.2 CFU/mL <i>E. coli</i>			
	Municipal supply (12)	7.3×10^2 CFU/mL TC 3.8×10 CFU/mL <i>E. coli</i>			
Pakistan	Borehole (42)	52% FC	Bottled (20)	10% FC	[164]
	Tap water (25)	64% FC			
Sri Lanka	Filter water (21)	14% FC			
	Well (20)	100% TC 100% FC 100% TC	Bottled (27)	19% TC 15% FC	[165]

	Rivers / streams / lakes (27)	100% FC			
Brazil	Municipal system (495)	3% TC 0.4% <i>E. coli</i>	Bottled (27)	4% TC 0% <i>E. coli</i>	[166]
	Artesian wells (65)	22% TC 6% <i>E. coli</i>			
	Shallow wells (69)	57% TC 10% <i>E. coli</i>			
	Springs (74)	55% TC 16% <i>E. coli</i>			
Tanzania	Tap water (30)	49% TC 26% FC	Bottled (80) Sachet (50)	4% TC 0.0% FC 18% TC 8% FC	[167]
Ghana	Tap water (5)	40% Protozoa	Bottled (10) Sachet (60)	0% Protozoa 52% Protozoa	[168]
Ghana	Communal taps (17)	0.5 <i>E. coli</i> CFU/100M 1	Sachet (20)	0.1 Mean <i>E. coli</i> CFU/100mL	[169]
	Household storage containers (120)	13 <i>E. coli</i> CFU/100m L			
	Communal wells (16)				
		38 <i>E. coli</i> CFU/100mL			
Nigeria	Tap water (6)	100% TC 100% <i>E. coli</i>	Sachet (100)	80% TC ³ 100% <i>E. coli</i> ³	[170]
Nigeria	Tap water (56)	14% <i>E. coli</i> 13% <i>Salmonella</i> 14% <i>Shigella</i>	Sachet (80)	16% <i>E. coli</i> 9% <i>Salmonella</i> 13% <i>Shigella</i>	[171]
	Borehole (24)	29% <i>E. coli</i> 8% <i>Salmonella</i> 17% <i>Shigella</i>			
	Well (120)	14% <i>E. coli</i> 12% <i>Salmonella</i> 8% <i>Shigella</i>			

Nigeria	Private	28% TC	Sachet (500)	22% TC	[172]
	borehole-taken at tap(100)	6% FC		5% FC	
	Public tap (100)	62% TC 18% FC			

TC = Total coliforms, FC = Fecal coliforms

MPN = Most probable number

¹ range reflects results from two analytical methods used in paper

² range represents results from two different sample locations

³ results given for brands, not samples

The results from comparative studies revealed bottled water was of better microbial quality than other available drinking water sources (municipal supplies, wells, or handpumps) in 11 of the included studies.¹¹⁸ There were a handful of studies that found bottled water to be more contaminated than other sources, but interestingly the majority of these studies were from Lebanon.¹¹⁹ With regard to large 20-L bottled water, three studies reported a higher proportion of 20-L bottles contaminated with total coliforms and/or *E. coli* compared to tap water, but all of those studies were from Brazil.¹²⁰

Results for sachets were mixed, with four of six studies showing sachet water to be of higher microbial quality compared to alternative sources. In most of these studies, however, the proportion of contaminated samples was high for all water sources. In one study from Ghana, sachets had the highest proportion of samples positive for protozoa compared to tap water and bottled water.¹²¹

With respect to health outcomes, Stoler, et al. (2012a) found that families in Accra, Ghana, using packaged water as their primary drinking water source reported lower levels of childhood diarrhea than those using other water

118. Massoud et al., *supra* note 21, at 3093-102; Kassenga, *supra* note 22, at 179; Abo-Amer et al., *supra* note 56, at 311-26; Osei, et al., *supra* note 64, at 172-75; Shekhar et al., *supra* note 68, at 123-26; Hassan Momtaz, Farhad Safarpour Dehkordi, Ebrahim Rahimi & Amin Asgarifar, *Detection of Escherichia coli, Salmonella species, and Vibrio cholerae in tap water and bottled drinking water in Isfahan, Iran*, BMC Public Health 13:1, at 556 (2013); Hamdollah Moshtaghi & M. Boniadian, *Microbial Quality of Drinking Water in Shahrekord (Iran)*, Res. J. Microbiol. 2:3, at 299-302 (2007); Serpil Gönül & Mehmet Karapinar, *The microbiological quality of drinking water supplies of Izmir City: the incidence of Yersinia enterocolitica*, Int. J. Food Microbiol. 13:1, at 69-73 (1991); Nusrat Yasin, Noreen Shah, Jafar Khan, Noor Us Saba & Zia Khan, *Bacteriological status of drinking water in the peri-urban areas of Rawalpindi and Islamabad-Pakistan*, African J. Microbiol. Res. 6:1, at 169-75 (2012); W.M.G.C.K. Mannapperuma, C.L. Abayasekara, G.B.B. Herath & D.R.I.B. Werellagama, *Potentially pathogenic bacteria isolated from different tropical waters in Sri Lanka*, Water Sci. Technol. Water Supply 13:6, at 1463 (2013); Terumi Oyama Fuzihara, Beatriz Pisani, Marise Simoes, Berenice Mandel Brigido, Christina Leopoldo e Silva, Lúcia Vannucci & Kioka Arioshi, *The occurrence of Aeromonas in drinking water*, Rev Inst Adolfo Lutz 64:1, at 122-27 (2005).

119. Massoud et al., *supra* note 21, at 3093-102; Shiraz Hassan Basma, *Complementary Water Sources in a Selected Urban Area in Beirut, Lebanon: Public Perceptions, Regulations and Quality*, Thesis (Masters), American University of Beirut (2004).

120. Scoaris et al., *supra* note 49, at 1049-55; Yamaguchi et al., *supra* note 80, at 1-9; Marie Eliza Zamberlan da Silva, Rosangela Getirana Santana, Marcio Guilhermetti, Ivens Camargo Filho, Eliana Harue Endo, Tânia Ueda-Nakamura, Celso Vataru Nakamura & Benedito Prado Dias Filho, *Comparison of the bacteriological quality of tap water and bottled mineral water*, Int. J. Hyg. Environ. Health 211:5-6, at 504-09 (2008).

121. Osei et al., *supra* note 64, at 172-75.

sources.¹²² The authors associated this finding with packaged water use disrupting disease transmission via contamination of unsafely stored drinking water in the home.

III. DISCUSSION

3.1. PREVALENCE OF PACKAGED WATER CONSUMPTION

Given the widespread use of packaged water in developing countries, the importance of quantifying health risks from this source is extremely high. In order to accurately understand the health implications of this exposure, it will be important to gain additional information about the distribution of packaged water users among and within countries, the frequency with which users consume packaged water versus water from other sources (while also examining variations among users as a function of age, socioeconomic status, and other factors), as well as the extent to which users consume water from a single brand versus many brands. In addition, further research is needed to determine the extent to which users consume water from a single brand vs. multiple brands. As the scale and prevalence of packaged water consumption, particularly the use of sachet water, continue to grow, it may become an increasingly important factor in modulating the exposure of populations to waterborne diseases.

3.2. HETEROGENEITY OF WATER QUALITY FINDINGS

The findings of studies investigating the quality of packaged drinking water samples depict a complex landscape. Many studies found aerobic bacteria (via HPC) and total coliforms at high frequencies in samples, while *E. coli* and fecal coliforms were detected infrequently in most studies. Some of the variability in findings may be explained by the diverse range of methods used to detect contamination in packaged water samples, particularly in the case of bacterial contaminants. Methods varied in terms of the media used, the method of incubation (spread plate, pour plate, membrane filtration, MPN (most probable number)-based liquid culture methods, etc.), and the volume of each sample processed. Furthermore, many studies did not adequately report their methods, making it impossible to determine how results were obtained. In addition, few studies reported proper handling and transportation of samples or the use of quality assurance, quality control (QA/QC) methods such as duplicates, field blanks, and laboratory blanks. The lack of proper handling, transport, and QA/QC methods means the results of included studies may have overestimated the percentage of samples positive for microbial contaminants. Other studies aggregated their results by brand, making it impossible to determine the fraction of samples that were contaminated. These factors likely contribute substantially to the variability of findings. In addition, studies performed in different geographic regions, settings (urban/rural) and different years are liable to capture different packaged water quality conditions.

Of the chemical contaminants examined in this review, the results tended to show that packaged water products had concentrations within international

122. Stoler et al., *supra* note 16, at 250-62.

guidelines, although there were some studies that reported levels of arsenic, fluoride, and heavy metals including lead that far exceeded WHO guidelines. However, overall there were few studies that reported very high concentrations of these parameters. Other chemical contaminants such as PCBs, VOCs, and pesticides have been detected in packaged water, but these were typically not at concentrations exceeding WHO guidelines. The variation in the level of chemical contaminants may be a result of geographic region, since some geogenic chemicals are naturally occurring. Similarly, the mixed results of radiological contaminants can also be attributed to the differences in geographic regions.

Despite the many sources of variability among and within studies, some conclusions can be drawn. Taken as a whole, the results of the included studies seem to suggest:

- Significant contamination of packaged drinking water with heterotrophic bacteria and total coliforms occurs in developing country settings.
- Microbial contamination with respect to total coliforms, fecal coliforms, *E. coli*, and enterococci appear to be greater for sachet water than bottled water. Larger bottled water products were more frequently contaminated with total coliforms than smaller bottled water, which could be due to manufacturers conducting insufficient cleaning and disinfecting of re-usable bottles.
- Contamination of packaged water by fecal indicator bacteria such as *E. coli* and fecal coliforms is much less widespread than contamination with bacteria of unknown origin.
- Microbiological quality of packaged drinking water tends to deteriorate along the supply chain between the point of manufacture and the POS.
- While there is wide variation in the results of studies examining protozoan cysts and helminth eggs in sachet water, the high incidence of parasites in some studies supports the need to include testing for protozoa and helminths in monitoring schemes. Small protozoan stages that are resistant to disinfection and filtration are of particular concern.
- Little research has been done to assess the presence of viruses in sachet water, while bottled water has been shown to be contaminated with viruses on occasion.
- The exteriors of drinking water sachets sold in developing countries are frequently contaminated with fecal indicator bacteria.
- Chemical contamination of packaged drinking water occurs in LMICs, but this is not a common problem in all regions. Although only a few chemical contaminants were reviewed, concentrations of arsenic, fluoride, and lead were higher than WHO guidelines in some studies, and on rare occasions at very high levels.
- Source water used in production of packaged water should be tested

regularly to determine if chemical contamination is of particular concern and if specific treatment methods should be employed. In addition, end line testing should be performed regularly to determine if treatment processes are effective and to ensure that additional chemicals are not entering the water through production processes.

- The extent of radionuclides in sachet water has not been widely studied and remains an unknown risk. Radionuclides have been detected in bottled waters from low income/LMICs, however these levels vary across geographic areas and should therefore be examined locally to determine if they are present at levels threatening public health.
- The impact of packaging material on the quality of packaged water remains unknown. While additional studies are needed to determine the possibility of chemicals leaching into product water during storage and in various environmental settings, priority should be given to examining the quality of packaged water in regards to parasites and heavy metals (such as lead).
- Relative to other drinking water sources, some forms of packaged water may be safer with respect to microbial contamination.

3.3. HEALTH IMPLICATIONS

The results of the included studies suggest that although packaged water may present significant health risks, it is likely safer than alternative drinking water sources in many LMIC settings. However, countries should still be concerned about health risks from pathogens, particularly organisms such as parasites that are rarely detected in routine water quality testing. Even though only a few studies reported concentrations of arsenic, fluoride, and lead exceeding international guidelines, exposure to high levels of these contaminants over long periods can lead to detrimental health effects such as various hypertension neurodevelopmental effects, fluorosis, skin lesions, and cancer.¹²³ Therefore, these contaminants should be monitored on an annual basis to determine if they are present at levels that could cause health problems. Furthermore, radiological contamination may be a concern in settings where contamination of water supplies by radioisotopes can occur. Finally, the effects of packaged water use on the volumes of water used by families for drinking, washing, and bathing may have important health implications, and these should also be considered.

3.4. REGULATORY IMPLICATIONS

Governments seeking to regulate new and existing packaged water manufacturers will face significant challenges. With the advent of affordable turnkey packaged water production plants that can easily be purchased by any individual, it may be difficult to track the large number of producers manufacturing water in bottles and sachets. Furthermore, developing country governments may not currently have infrastructure in place to regularly monitor the water quality of packaged water products. Since the cost of such monitoring is high, governments may wish to focus on those contaminants that pose the greatest

123. WHO, *supra* note 2.

health risk in terms of likelihood of exposure and severity of outcomes. Policy makers may therefore opt to focus on microbial contamination, which seems to occur with greater frequency than chemical contamination, and with fecal bacteria such as *E. coli*, which are more closely linked with human fecal contamination than other indicators such as HPC and total coliforms. In monitoring the chemical safety of drinking water, governments may choose to monitor a few key parameters, such as arsenic, fluoride, and lead, for which high concentrations could trigger follow-up testing for a wider range of contaminants. Similarly, baseline testing for radiological parameters should be done to ascertain if regular testing of key parameters should be required.

In addition, regulators will need to consider some framework for enforcing the registration of manufacturers, the proper labeling of packaged water products, and the regular inspection of facilities. Compliance with labelling requirements has been shown to be a problem in a number of countries. Clear communication of labelling requirements and producer training could help improve compliance.

Although there are concerns over microbial, chemical, and radiological quality, packaged water continues to provide drinking water to households that are often unable to obtain water through municipal supplies due to service interruptions or lack of an at-home connection. As studies have shown, other available drinking water sources can often be more contaminated than packaged water. Therefore, as regulators strive to safeguard public health, it is advised that packaged water products be seen as an important source of drinking water to disadvantaged households—and one that has the potential to provide health benefits where other sources are frequently contaminated—rather than an industry to be suppressed or condemned. Progressive improvement in the regulation, monitoring, and safety of both packaged water and other drinking water sources remains critical in many LMICs. As Fewtrell and Bartram (2001) acknowledge, in many LMICs many consumers do not have access to many water sources that meet WHO standards.¹²⁴ For that reason, these experts recommend policy makers set progressive intermediate goals rather than employ strict enforcement of regulations that could condemn relatively good sources, thereby forcing consumers to resort to even worse drinking water sources.

IV. CONCLUSION

The packaged water industry is growing rapidly throughout the world, particularly in developing countries. In many such countries, this expansion is occurring in the absence of meaningful regulation and monitoring. Nevertheless, the overall chemical and microbiological quality of packaged water products appears to be relatively good, and in many cases may be better than the quality of drinking water available from other sources. In addition, where continuous supply from an improved source is not available, households consuming packaged water as their primary drinking water source may experience improved health outcomes relative to households drinking water from other sources.

124. Lorna Fewtrell & Jamie Bartram, *WATER QUALITY: GUIDELINES, STANDARDS AND HEALTH: ASSESSMENT OF RISK AND RISK MANAGEMENT FOR WATER-RELATED INFECTIOUS DISEASE* (2001).

However, the high frequency of microbial contamination in sachet water products suggests the need for improvements in production processes to ensure that packaged water is safe for human consumption.

In addition, contamination with microbial, chemical, and radiological contaminants remains a serious concern, and additional efforts are needed to ensure consumer safety. New research should consider the safety of packaged water with respect to viral and protozoan pathogens and radionuclides, as well as typical bacterial and chemical contaminants and indicators. Future regulatory efforts may be hampered by the low barriers to entry for packaged water producers, but should focus on regular monitoring of fecal indicators such as *E. coli*, in addition to any other microbial, chemical, and radiological indicators of concern.

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DEFERENCE, DUE PROCESS, AND THE DEFINITION OF WATER: DREDGING THE CLEAN WATER ACT

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“If the race of government bullying were a contest between different agencies, the EPA would take the crown.”² - U.S. Senator Rand Paul

I. INTRODUCTION

The U.S. Environmental Protection Agency (“EPA”) was established by executive action in 1970 under the Nixon administration “to make a coordinated attack on the pollutants which debase the air we breathe, the water we drink, and the land that grows our food.”³ Despite more humble beginnings,

1. Hunter S. Higgins is a recent graduate of the Pepperdine University School of Law. Thanks to Dean Shelley Saxer for her patience, guidance, and comments throughout this process.

2. RAND PAUL, GOVERNMENT BULLIES 5 (2012); See PACIFIC LEGAL FOUNDATION, *PLF sues over EPA's illegal compliance order against Wyoming farmer's environmentally friendly stock pond*, <https://www.pacificlegal.org/Cases/Case-johnson-1-1494> (last visited Mar. 26, 2017) (summarizing *Andy Johnson v. EPA* where the EPA threatened fines nearing \$16 million for Mr. Johnson's damming of a small creek on his front yard creating a “stock pond” to provide water for his livestock. The EPA argued the pond constituted “navigable waters” and his conduct violated the Clean Water Act. The case eventually settled wherein the EPA allowed him to keep his pond and pay no fine.).

3. See Richard Nixon, *Special Message to the Congress About Reorganization Plans To Establish the Environmental Protection Agency and the National Oceanic and Atmospheric Administration* (July 9, 1970), THE AMERICAN PRESIDENCY PROJECT (Mar. 26, 2017), <http://www.presidency.ucsb.edu/ws/index.php?pid=2575>.

the EPA has since quadrupled in staff to become an administrative behemoth,⁴ with more than 15,000 employees and an annual budget nearing \$8.2 billion.⁵ Alongside the Agency's rapid growth has emerged a similarly large bodywork of regulations, many of which have ripened into unnecessarily complicated rules⁶ and, at times, proven unconstitutional in their application.⁷

Nowhere has this problem manifested itself more than in the Clean Water Act ("CWA").⁸ Passed in 1972, the CWA authorizes the Army Corps of Engineers ("Corps") to issue permits⁹ and generally regulate the discharge of pollutants into "navigable waters."¹⁰ Understanding how the EPA and Corps determine if a given property contains such "navigable waters,"¹¹ however, has become "notoriously unclear."¹² This, in large part, is because the Act ambiguously self-defines the term as any "waters of the United States."¹³ Yet, when Congress passed the CWA, the phrase "waters of the United States" was "not a term of art with a known meaning; and the words themselves are hopelessly indeterminate."¹⁴ To make matters worse, courts are generally unable to resolve the language as precedent dictates and must defer to an agency's discretion in reasonably interpreting statutory ambiguities.¹⁵

Thus, with a reticent Congress and a seemingly powerless Court, the phrases "navigable waters" and "waters of the United States" potentially subject

4. RAND PAUL, GOVERNMENT BULLIES 5 (2012) (finding the EPA's regulations cost an amount equal to the combined costs of defense and homeland security).

5. See *EPA's Budget and Spending*, EPA, <https://www.epa.gov/planandbudget/budget> (last updated Oct. 4, 2016); see also, Nancy Madsen, *Rep. Morgan Griffith says EPA job growth outstips [sic] that of U.S. government*, POLITIFACT (Apr. 14, 2014) (finding "from 1972 until 2011, the number of EPA employees increased by 107 percent while the number of total federal personnel decreased by 15 percent."), <http://www.politifact.com/virginia/statements/2014/apr/14/morgan-griffith/rep-morgan-griffith-says-epa-job-growth-outstips-u/>.

6. See CHAMBERS ASSOCIATE, ENVIRONMENTAL LAW (2016), <http://www.chambersassociate.com/practiceareas/environment> (last visited Mar. 26, 2017) ("The Clean Air Act - 'one of the most complex pieces of legislation on the books' according to Hunton & Williams partner Bill Brownell.").

7. This article will discuss the various ways in which the EPA and Corps operate outside the boundaries of traditional administrative agency power. This may occur through courts lending too much deference to the agency, Congress failing to resolve poorly worded legislation, or improper agency rulemaking. Recent indications from the Bench have indicated the possibility that the CWA may be unconstitutionally void; see e.g., *Michigan v. EPA*, 135 S. Ct. 2699, 2712 (2015) (holding the EPA improperly considered the costs to utilities and others in the energy industry when it set standards for regulating hazardous air pollutants emitted by power plants).

8. 33 U.S.C. § 1251 (1972) (the CWA is the United States' primary federal law governing pollution of the nation's waters).

9. See *Section 404 of the Clean Water Act*, EPA, <https://www.epa.gov/cwa-404/clean-water-act-section-404> (last visited Mar. 26, 2017) (authorizing the U.S. Army Corps of Engineers to issue permits).

10. 33 U.S.C. § 1344(a); see generally 33 C.F.R. §§ 320–332 (2017); §§ 40 C.F.R. 230–232 (2017).

11. 33 U.S.C. § 1362(7) (2014) (defining navigable waters as "the waters of the United States, including territorial seas.").

12. *Sackett v. EPA*, 132 S. Ct. 1367, 1375 (2012) (Alito, J., concurring).

13. 33 U.S.C. § 1362(7) (2014).

14. *Sackett v. EPA*, 132 S. Ct. 1367, 1375 (2012) (Alito, J., concurring).

15. See *infra* Part III (referring to *Chevron, U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837 (1984), which sets out a two-pronged for judicial review of agency interpretations of law whereby agency interpretations get deference.).

“the entire land area of the United States” to EPA and Corps jurisdiction.¹⁶ Despite the Court’s many attempts¹⁷ to curtail the scope of the CWA, the EPA and Corps have empowered themselves with “an essentially limitless grant of authority” for more than four decades.¹⁸ From protecting “obviously navigable and important waterways like the Mississippi River” to adjudicating “ephemeral drainages that will only hold water . . . during significant storms,”¹⁹ the CWA presents a stark illustration of how a seemingly limitless scope of authority can often lead to an abuse of power.²⁰

This Article will focus primarily on the distortion of the Clean Water Act and the subsequent fostering of the administrative state. Part II will provide a contextual background of the evolving interpretation of “navigable waters” and “waters of the United States,” both inside and outside the courtroom. Looking to the interpretation of “navigable waters” inside the Supreme Court, Part II will analyze several cases, two of which occurred in 2016 and deal directly with the ambiguity.²¹ Part II will then provide a background of the EPA’s recent promulgation of the highly controversial “waters of the United States” (“WOTUS”) rule currently stayed by the Sixth Circuit.²² The discussion will juxtapose the Court’s attempt to narrow the definition of “navigable waters” against the EPA and Corps’ steps taken, both informally and formally, to avoid Court holdings. Part III will look at the EPA’s prominent role in the rise of the modern administrative state. It will analyze whether the Agency’s repudiation of the Court’s intent, taken in the totality, should preclude the Court from granting such generous deference to the EPA and Corps in interpreting the CWA. Lastly, the

16. *Rapanos v. United States*, 547 U.S. 715, 722 (2006) (“In the last three decades, the Corps and the Environmental Protection Agency (EPA) have interpreted their jurisdiction over ‘the waters of the United States’ to cover 270-to-300 million acres of swampy lands in the United States—including half of Alaska and an area the size of California in the lower 48 States. And that was just the beginning. The Corps has also asserted jurisdiction over virtually any parcel of land containing a channel or conduit—whether man-made or natural, broad or narrow, permanent or ephemeral—through which rainwater or drainage may occasionally or intermittently flow. On this view, the federally regulated ‘waters of the United States’ include storm drains, roadside ditches, ripples of sand in the desert that may contain water once a year, and lands that are covered by floodwaters once every 100 years. Because they include the land containing storm sewers and desert washes, the statutory ‘waters of the United States’ engulf entire cities and immense arid wastelands. In fact, the entire land area of the United States lies in some drainage basin, and an endless network of visible channels furrows the entire surface, containing water ephemerally wherever the rain falls. Any plot of land containing such a channel may potentially be regulated as a ‘water of the United States.’”).

17. *Id.* at 732–739; *Sackett*, 132 S. Ct. at 1375; *Solid Waste Agency of N. Cook Cty. v. Army Corps of Eng’rs*, 531 U.S. 159, 167–174 (2001).

18. *See Sackett* 132 S. Ct. at 1375.

19. David Bailey, *Q&A: Pacific Legal Foundation’s Francois questions U.S. waters rule*, REUTERS LEGAL (Oct. 25, 2016), <http://www.pacificlegal.org/file/Reuters-Tony-Francois-Q-and-A.pdf>.

20. *See Letter from John Emerich Edward Dalberg, Lord Acton, to Bishop Mandell Creighton*, ONLINE LIBRARY OF LIBERTY (Apr. 5, 1887), <http://oll.libertyfund.org/title/2201/203934>.

21. *See Rapanos*, 547 U.S. 715; *see also Solid Waste Agency*, 531 U.S. 159 (upholding regulation construing navigable waters to include freshwater wetlands adjacent to navigable waters, though not themselves actually navigable).

22. *See In re EPA*, 803 F.3d 804 (6th Cir. 2015).

analysis will provide a caution to the reader of the burgeoning administrative state currently permissible under the CWA, which has put the EPA and Corps in a potentially unconstitutional position in which they may effectively enact, enforce, and interpret their own regulations without accountability to an electorate or judicial review. Part IV will provide a summary while simultaneously looking forward to the implications of the most recent Court holdings and President Donald Trump's policy positions.

II. BACKGROUND

The Clean Water Act's primary flaw lies in its unclear language and amorphous application of the term "navigable waters," which is circularly self-defined in the statute as "waters of the United States." The construal of these two phrases, often applied interchangeably, has required the Court to revisit the phrase four times in the last fifteen years²³ and the Corps and EPA to promulgate, albeit unsuccessfully, a formal "waters of the United States" rule. To understand the complex interplay between these two evolutionary branches, this Article will address each in turn.

A. LEGAL BACKGROUND

The first time the United States Supreme Court considered "navigable waters," in 1870, was to resolve an apparent gap in English common law wherein Congress found itself without authority over the interstate commerce of a steamer transporting goods.²⁴ The inherited definition of "navigable waters" from English common law centered on whether a given waterway was affected by the "ebb and flow of the tide."²⁵ The Court distinguished American rivers from those in England as "navigable in fact" by virtue of supporting large vessels for hundreds of miles.²⁶ The Court soundly rejected the common law definition as having "no application in this country."²⁷ Instead, the Court developed a new legal definition with a more straightforward reading of the term: "navigable waters" encompassed those bodies of water that were navigable in fact and could support trade and travel.²⁸

23. See *U.S. Army Corps of Eng'rs v. Hawkes Co.*, 136 S. Ct. 1807 (2016); *Sackett*, 132 S. Ct. 1367; *Rapanos*, 547 U.S. 715; *Solid Waste Agency*, 531 U.S. 159.

24. See *The Daniel Ball*, 77 U.S. 557, 562-64 (1870).

25. *Id.* at 563.

26. *Id.* (noting differences in American rivers from English: "There, no waters are navigable in fact, or at least to any considerable extent, which are not subject to the tide, and from this circumstance tide water and navigable water there signify substantially the same thing. But in this country the case is widely different. Some of our rivers are as navigable for many hundreds of miles above as they are below the limits of tide water, and some of them are navigable for great distances by large vessels, which are not even affected by the tide at any point during their entire length.").

27. *Id.*

28. *Id.* ("A different test must therefore be applied to determine the navigability of our rivers, and that is found in their navigable capacity. Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.").

It was not until some 115 years later that the Court would again find itself tasked with interpreting navigable waters, but now it would be against the backdrop of the Clean Water Act. In *United States v. Riverside Bayview Homes, Inc.*, the Court upheld the Corps' interpretation that the Act covered not only waters navigable in fact, but also "all 'freshwater wetlands' that were adjacent to other covered waters."²⁹ Citing congressional intent,³⁰ the Court unanimously upheld the Corps' construction of the CWA capturing adjacent wetlands under the "waters of the United States" language.³¹ As a result, the Court's first challenge to the CWA led to an expansion of Corps authority under the Act over wetlands neighboring jurisdictional waters to even those waters not inundated or frequently flooded by the navigable water.³² This analysis would later become known as the "significant nexus" test;³³ the consequences of which allowed the EPA and Corps to continue to rely on *Riverside Bayview* in legal arguments generally justifying authority over non-navigable water features, even though those attempts have mostly failed.³⁴ To date, *Riverside Bayview* remains the only Supreme Court decision to uphold an agency's attempt to expand their jurisdiction under the CWA. To that end, it may be instructive today as having set a reasonable outer limit in answering how the Agencies should ultimately interpret "waters of the United States" under the Act.³⁵

A case in 2001 presented the Court with another opportunity to clarify the "waters of the United States" ambiguity, known as *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* ("SWANCC").³⁶ In *SWANCC*, the Court declined to extend the definition of "navigable waters" under the CWA to include "an abandoned sand and gravel pit in northern Illinois" as a habitat for migratory birds.³⁷ And while the Court rejected the Corps' migratory bird jurisdiction argument, it ultimately affirmed *Riverside Bayview's* conclusion that adjacent wetlands could fall within the scope of the CWA.³⁸

29. *United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121, 124 (1985).

30. *Id.* at 133 ("Congress evidently intended to repudiate limits that had been placed on federal regulation by earlier water pollution control statutes and to exercise its powers under the Commerce Clause to regulate at least some waters that would not be deemed 'navigable' under the classical understanding of that term.").

31. *Id.* at 131.

32. *See id.* at 129-131 (the Court unanimously held the Corps had acted reasonably in interpreting the CWA to require permits for the discharge of fill material into wetlands adjacent to the "waters of the United States.").

33. *See Solid Waste Agency of N. Cook Cty. v. U.S. Army Corps of Eng'rs*, 531 U.S. 159, 167 (2001) ("It was the significant nexus between the wetlands and 'navigable waters' that informed our reading of the CWA in *Riverside Bayview Homes*.").

34. *Id.* at 171 ("We thus decline respondents' invitation to take what they see as the next ineluctable step after *Riverside Bayview Homes*: holding that isolated ponds, some only seasonal, wholly located within two Illinois counties, fall under § 404(a)'s definition of 'navigable waters'").

35. *See Rapanos v. United States*, 547 U.S. 715, 735 (2006) (citing *Riverside Bayview* which "repeatedly described the 'navigable waters' covered by the Act as 'open water' and 'open waters.' Under no rational interpretation are typically dry channels described as 'open waters.'").

36. *Solid Waste Agency*, 531 U.S. at 162-67.

37. *See id.* at 162.

38. *See Rapanos*, 547 U.S. at 716 (finding *Riverside Bayview* and *SWANCC* to have found the "meaning of 'navigable waters' in the CWA as broader than the traditional definition.").

Even still, the *SWANCC* Court made efforts to narrow the potentially far-reaching effects of the *Riverside Bayview* holding, clarifying that the “statute’s text will not allow extension of the Corps’ jurisdiction” to “regulate wetlands *not* adjacent to open water.”³⁹ In doing so, *SWANCC* became the first of five post-*Riverside Bayview* decisions to ultimately reject the government’s interpretation of its jurisdiction under the CWA. The ensuing years, however, saw both agencies and lower courts effectively side-stepping *SWANCC* by claiming the holding applied narrowly to “isolated” waters.⁴⁰ To get around *SWANCC*, the EPA and Corps needed only to show some modicum of a connection to a covered water to prove non-isolation, effectively granting limitless authority since “as a matter of basic science, all water is connected to all other water through the hydrological cycle.”⁴¹ This allowed the agencies to reclassify previously non-jurisdictional isolated waters like roadside ditches⁴² or dry desert sites saturated only during heavy periods of rain⁴³ as “tributaries”⁴⁴ adjacent to navigable waters elsewhere.⁴⁵ Additionally, lower courts began eroding the common sense integrity of the “significant nexus” test by upholding arguments from the agencies that “a molecule of water” and a “drop of rainwater” provided a significant enough hydrological connection to warrant jurisdiction.⁴⁶

With lower courts skirting the *SWANCC* decision, the Court did not allow another 16 years to lapse to further muddy the Act’s interpretation. Instead, just five years after *SWANCC*, the Court again rejected EPA and Corps’ construal of “waters of the United States” as unreasonable in the seminal case of *Rapanos*

39. See *Solid Waste Agency*, 531 U.S. at 160 (emphasis added).

40. Brief of American Petroleum Institute et al., at 8–9, *Sackett v. EPA*, 132 S. Ct. 1367 (2012) (No. 10-1062), 2011 WL 4872035, at *9–10.

41. *Id.* at 8.

42. *United States v. Deaton*, 332 F.3d 698, 702 (4th Cir. 2003) (finding a roadside ditch whose water took a winding, thirty-two mile path to the Chesapeake Bay subject to the CWA).

43. *Save Our Sonoran, Inc. v. Flowers*, 408 F.3d 1113, 1118 (9th Cir. 2005) (finding “washes and arroyos” of an “arid development site,” located in the middle of the desert, through which “water courses . . . during periods of heavy rain,” was subject to CWA).

44. See *Rapanos v. United States*, 547 U.S. 715, 726–27 (2006) (finding “jurisdictional ‘tributaries’ include the ‘intermittent flow of surface water through approximately 2.4 miles of natural streams and manmade ditches (paralleling and crossing under I-64),’ a ‘roadside ditch’ whose water took ‘a winding, thirty-two-mile path to the Chesapeake Bay,’ irrigation ditches and drains that intermittently connect to covered waters, and (most implausibly of all) the ‘washes and arroyos’ of an ‘arid development site,’ located in the middle of the desert, through which ‘water courses . . . during periods of heavy rain’ (citations omitted).).

45. Brief of American Petroleum Institute et al., at 9, *Sackett v. EPA*, 132 S. Ct. 1367 (2012) (No. 10-1062), 2011 WL 4872035, at *10–11. (“In California’s Central Valley, for example, the Corps had determined prior to *SWANCC* that two cattle waste ponds were waters of the United States because they were used by migratory birds, and that a nearby farm ditch was non-jurisdictional. After *SWANCC*, the property owner asked the Corps to disclaim jurisdiction over the ponds, only to be told that the ditch was now a tributary subject to jurisdiction, and, thus, the waste ponds remained jurisdictional – this time because they were ‘adjacent’ to a tributary.”).

46. *Rapanos*, 547 U.S. at 728–29 (“One court distinguished *SWANCC* on the ground that ‘a molecule of water residing in one of these pits or ponds [in *SWANCC*] could not mix with molecules from other bodies of water’—whereas, in the case before it, ‘water molecules currently present in the wetlands will inevitably flow towards and mix with water from connecting bodies,’ and ‘[a] drop of rainwater landing in the Site is certain to intermingle with water from the [nearby river].’ *United States v. Rueth Development Co.*, 189 F.Supp.2d 874, 877–78 (N.D. Ind. 2002).”).

v. United States.⁴⁷ In *Rapanos*, a plurality of the Court held that a wetland that was not adjacent to navigable-in-fact waters did not fall under the reach of the CWA.⁴⁸ The plurality opinion, penned by Justice Scalia, admonished the lower courts' refusal to follow *SWANCC* more narrowly⁴⁹ and attempted to conclusively set forth a precise boundary to the CWA's scope:

[T]he phrase "the waters of the United States" includes only those relatively permanent, standing or continuously flowing bodies of water "forming geographic features" that are described in ordinary parlance as "streams[,] . . . oceans, rivers, [and] lakes."⁵⁰ . . . The phrase does not include channels through which water flows intermittently or ephemerally, or channels that periodically provide drainage for rainfall.⁵¹

To date, *Rapanos* remains the Court's most current definition for the "navigable waters" and "waters of the United States"⁵² debate. Yet, perhaps more influentially, *Rapanos* also marked the first meaningful discussion of the "significant nexus" test, with the plurality arguing strongly against reading a "significant nexus" test into the statute and an oft-cited concurrence from Justice Kennedy advocating its use.⁵³ In his concurrence, Justice Kennedy focused on the Act's "text, structure, and purpose" to articulate a concrete "significant nexus" test only previously suggested in *SWANCC* and *Riverside Bayview*.⁵⁴ In sum, Justice Kennedy asserted that a "significant nexus" existed over any water feature so long as it could "either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'"⁵⁵ The plurality, on the other hand, held Justice Kennedy's approach to not only mischaracterize the Court's prior holdings,⁵⁶ but to go far beyond the *Riverside Bayview*

47. See *Rapanos*, 547 U.S. 715.

48. *Id.*

49. *Id.* at 726, 728 (finding "lower courts have continued to uphold the Corps' sweeping assertions of jurisdiction over ephemeral channels and drains as 'tributaries'" and "have also continued to define 'adjacent' wetlands broadly after *SWANCC*").

50. *Id.* at 739; see also *id.* n.5 (defining "relatively permanent" to not "necessarily exclude seasonal rivers, which contain continuous flow during some months of the year but no flow during dry months . . . Common sense and common usage distinguish between a wash and seasonal river.").

51. *Id.*; see also *id.* at 742 ("[O]nly those wetlands with a continuous surface connection to bodies that are 'waters of the United States' in their own right, so that there is no clear demarcation between 'waters' and wetlands, are 'adjacent' to such waters and covered by the Act.").

52. Brief for Respondents at 4, *U.S. Army Corps of Eng'rs v. Hawkes Co.*, 136 S. Ct. 1807 (2016) (No. 15-290), 2016 WL 750545, at *1.

53. *Rapanos*, 547 U.S. at 755 (finding any wetland to "bear the 'significant nexus' of physical connection, which makes them as a practical matter *indistinguishable* from waters of the United States.").

54. See *id.* at 775-76 (Kennedy, J. concurring).

55. *Id.* at 780 (Kennedy, J. concurring).

56. See *id.* at 754 (finding Justice Kennedy's approach "misreads *SWANCC*'s 'significant nexus' statement as mischaracterizing *Riverside Bayview* to adopt a case-by-case test of ecological significance[.]").

holding⁵⁷ by rewriting the “gimmick of ‘significant nexus’”⁵⁸ into the CWA.⁵⁹ In caustic fashion, the *Rapanos* plurality strongly distanced itself from Justice Kennedy, questioning the logic of a test that states “whatever (alone or in combination) affects waters of the United States is waters of the United States[.]”⁶⁰ Perhaps unsurprisingly, following the *Rapanos* holding, the EPA and Corps declined to follow the plurality’s definition and instead began citing to Justice Kennedy’s concurrence.⁶¹

Five years after *Rapanos*’ attempt to significantly rein in jurisdictional reach under the CWA, the EPA and Corps issued an informal memorandum of guidance on how the agencies would identify “waters of the United States” under the CWA.⁶² “Far from providing clarity and predictability, the agency’s latest informal guidance”⁶³ ignored the previous three Court holdings and instead stated “the extent of waters over which the agencies assert jurisdiction under the CWA will *increase* compared to the extent of waters over which jurisdiction has been asserted under existing guidance.”⁶⁴ This guidance, coupled with the more than 120 lower courts citing *Rapanos* yet reaching contrary conclusions, prompted the Court to again try to clarify the ambiguity in *Sackett v. EPA*.⁶⁵

In *Sackett*, Mr. and Mrs. Sackett filled in approximately one-half acre of their residential property with dirt and rock in preparation for building a home.⁶⁶ Months later, the EPA determined the property contained wetlands adjacent to a nearby lake and issued a compliance order telling them to remove the fill, plant wetlands vegetation, wait three years, and then apply for an after-the-fact permit to regularize the allegedly illegal fill (which would have been removed).⁶⁷ If they failed to comply, they would face fines of up to \$75,000 per day.⁶⁸ In other words, after the EPA had made a jurisdictional determination, private

57. See *id.* at 753–54.

58. *Id.* at 756 (“More fundamentally, however, the test simply rewrites the statute, using for that purpose the gimmick of ‘significant nexus.’ It would have been an easy matter for Congress to give the Corps jurisdiction over all wetlands (or, for that matter, all dry lands) that ‘significantly affect the chemical, physical, and biological integrity of’ waters of the United States. It did not do that, but instead explicitly limited jurisdiction to ‘waters of the United States.’”)

59. See *id.* at 754–55.

60. *Id.* at 755.

61. See Lawrence R. Liebesman et al., *Rapanos v. United States: Searching for a Significant Nexus Using Proximate Causation and Foreseeability Principles*, 40 ENVTL. L. REP. NEWS & ANALYSIS 11242, 11250 (2010) (discussing that in 2008, the Agencies released a guidance memo to EPA regions and Corps which largely hewed to the plurality opinion in *Rapanos* requiring the EPA and Corps to establish a “significant nexus” between navigable waters and wetlands in order to regulate under CWA).

62. EPA, DRAFT GUIDANCE ON IDENTIFYING WATERS PROTECTED BY THE CLEAN WATER ACT (2011), <https://www.regulations.gov/document?D=EPA-HQ-OW-2011-0409-0002>.

63. *Sackett v. EPA*, 132 S. Ct. 1367, 1375 (2012) (Alito, J. concurring).

64. EPA, DRAFT GUIDANCE ON IDENTIFYING WATERS PROTECTED BY THE CLEAN WATER ACT (2011), <https://www.regulations.gov/document?D=EPA-HQ-OW-2011-0409-0002>.

65. See Jeff Kray, *Five Years After Rapanos - EPA Prepares New Clean Water Act Jurisdictional Guidance*, MARTEN LAW: NEWSLETTER (Feb. 3, 2011), <http://www.martenlaw.com/newsletter/20110203-epa-prepares-new-cwa-guidance>.

66. *Sackett*, 132 S. Ct. at 1370.

67. See *id.* at 1370–71.

68. James S. Burling, *Final Agency Actions and Judicial Review: United States Army Corps of Engineers v. Hawkes Co.*, 17 FEDERALIST SOC’Y REV. 28, 28–29 (2016).

property owners like the Sacketts were faced with the following choices: 1) forego the planned use of the land; 2) begin the “arduous, expensive and long” permitting process;⁶⁹ or 3) go forward and risk fines of up to \$75,000 a day and imprisonment for proceeding without a permit.⁷⁰ Yet, when the EPA denied the Sacketts a hearing to contest its jurisdictional determination, the Sacketts found themselves without an adequate remedy. Thus, they brought an action in court alleging the compliance order was “arbitrary and capricious” under the Administrative Procedure Act and its legally binding effect adjudicated property rights in violation of the Fifth Amendment.⁷¹ The Court unanimously rejected the EPA’s practice and held landowners “need not assume such risks while waiting for the EPA to ‘drop the hammer’ in order to have their day in court.”⁷²

Though the unanimous *Sackett* Court decision centered more on providing landowners some judicial relief in challenging EPA compliance orders than on resolving the “navigable waters” ambiguity, it marked the first time the Court was able to, at least indirectly, provide a tangible remedy to property owners improperly targeted under the CWA.⁷³ In Justice Alito’s concurring opinion, however, he chided the Court for merely providing a “modest measure of relief” stating, “[a]llowing aggrieved property owners to sue under the Administrative Procedure Act is better than nothing, but only clarification of the reach of the Clean Water Act can rectify the underlying problem.”⁷⁴ He further cited the failure of “Congress [which] has done nothing to resolve this critical ambiguity,” and the EPA’s refusal to promulgate a clear and predictable rule defining the phrase as reasons that could ultimately render *Sackett* unsuccessful like *Rapanos* and *SWANCC* before it.⁷⁵ Justice Alito’s prediction was correct. Lower courts applied *Sackett* narrowly, citing the decision primarily during analogous circumstances when the EPA issued a “compliance order” alleging a violation, rather than as a springboard to more broadly curtail the CWA’s scope.⁷⁶

69. *U.S. Army Corps of Engineers v. Hawkes Co.*, 136 S. Ct. 1807, 1815–16 (2016) (“[T]he Corps demanded that they undertake, among other things, a ‘hydrogeologic assessment of the rich fen system including the mineral/nutrient composition and pH of the groundwater; ground-water flow spatially and vertically; discharge and recharge areas’; a ‘functional/resource assessment of the site including a vegetation survey and identification of native fen plant communities across the site’; an ‘inventory of similar wetlands in the general area (watershed), including some analysis of their quality’; and an ‘inventory of rich fen plant communities that are within sites of High and Outstanding Biodiversity Significance in the area. Respondents estimate the undertaking these analyses would cost more than \$100,000.’”).

70. *See id.* at 1815.

71. *Sackett*, 132 S. Ct. at 1371.

72. *Hawkes*, 136 S. Ct. at 1815; *Sackett*, 132 S. Ct. at 1372.

73. *See Sackett*, 132 S. Ct. at 1375–76 (2012) (Alito, J. concurring).

74. *Id.*

75. *See id.* at 1375 (Alito, J. concurring).

76. *Belle Co. v. U.S. Army Corps of Engineers*, 761 F.3d 383, 391 (5th Cir. 2014), *cert. denied sub nom. Kent Recycling Servs., LLC v. U.S. Army Corps of Engineers*, 135 S. Ct. 1548, (2015), *reh’g granted, order vacated*, 136 S. Ct. 2427, (2016) (“Prior to *Sackett*, all of the courts, including ours, that had considered the question held that a JD does not determine rights or obligations or have legal consequences and thus is not final agency action. Since *Sackett*, the few courts, including the district court below, that have considered the question have reasoned to the same conclusion. *See Hawkes Co., Inc. v. U.S. Army Corps of Eng’rs*, 963 F.Supp.2d 868, 873–78 (D. Minn. 2013) (holding that a Corps JD is not final agency action); Nat’l Ass’n of Home

In 2016, however, the applicability of *Sackett* was broadened under *United States Army Corps of Engineers v. Hawkes, Co., Inc.* (“*Hawkes*”) to entitle a party to immediate judicial review, not only in the context of “compliance orders,” but in response to an official Corps “Jurisdictional Determination” (“JD”).⁷⁷ In *Hawkes*, a Minnesota peat miner seeking to expand his operations to an adjacent property was issued a JD by the Corps asserting jurisdiction due to a “significant nexus” between his property and a river located 120 miles away “through a series of culverts and unnamed streams.”⁷⁸ *Hawkes* hired an independent wetland consultant to conduct an impartial review of its property, ultimately identifying several errors in the JD and concluding that no significant connection existed from the property’s wetland to the river.⁷⁹ *Hawkes* thereafter successfully appealed the JD within the Corps,⁸⁰ with the reviewing officer finding the Corps lacked “sufficient documentation/analysis to support a finding of Clean Water Act Jurisdiction.”⁸¹ Notwithstanding the appeal’s conclusion, two months later the Corps issued a revised JD, which not only failed to “contain additional data” and “correct the deficiencies,” but ultimately upheld the Corps’ initial assertion of jurisdiction on the same generalized basis of Justice Kennedy’s “significant nexus” test.⁸²

Hawkes subsequently filed suit challenging the JD, arguing that under the Administrative Procedure Act, JDs, like the compliance orders in *Sackett*, had binding legal consequences and, as evidenced by the mishandled internal appellate procedure, potentially left landowners without an alternative venue to challenge a Corps determination.⁸³ Though the issue before the Court, like in *Sackett*, centered again on whether an individual was entitled to judicial review before agency enforcement, nearly every point of discussion surrounding the underlying CWA ambiguity was adversarial, if not hostile. At oral arguments, Justice Kennedy seemed to retract his former support of the “significant nexus” test, suggesting the CWA is “arguably *unconstitutionally* vague, and certainly harsh in the civil and criminal sanctions it puts into practice.”⁸⁴ Justice Breyer seemed wary of the EPA’s position in a “vast Federal Government,” focusing

Builders v. EPA, 956 F.Supp.2d 198, 209–212 (D.D.C. 2013) (explaining that a Corps determination that a property contains traditional navigable waters is practically indistinguishable from a JD and thus is not final agency action) (citations omitted)).

77. See *Hawkes*, 136 S. Ct. at 1813–14; see also 33 C.F.R. § 331.2 (defining a “jurisdictional determination” as a “written Corps determination that a wetland . . . is subject to regulatory jurisdiction.”).

78. Brief for Respondents at 8, *U.S. Army Corps of Eng’rs v. Hawkes Co.*, 136 S. Ct. 1807 (2016) (No. 15-290), 2016 WL 750545, at *11–12.

79. *Id.*

80. *Hawkes*, 136 S. Ct. at 1813; Brief for Respondents at 5, *United States Army Corps of Eng’rs v. Hawkes Co.*, 136 S. Ct. 1807 (2016) (No. 15-290), 2016 WL 750545, at *4 (citing 33 C.F.R. § 331.2 (timely appeal of a JD to dispute a “waters of the United States” finding is permissible under regulation)).

81. Brief for Respondents at 8, *U.S. Army Corps of Eng’rs v. Hawkes Co.*, 136 S. Ct. 1807 (2016) (No. 15-290), 2016 WL 750545, at *12–13.

82. *Id.* at 9.

83. Transcript of Oral Argument at 44–46, *U.S. Army Corps of Eng’rs v. Hawkes Co.*, 136 U.S. 1807 (2016) (No. 15-290).

84. *Id.* at 18.

on the public policy implications of any agency determination not subject to judicial review “on penalty of going to jail [or paying exorbitant civil penalties] if they don’t just follow it.”⁸⁵ When the Court unanimously decided in favor of *Hawkes*, Justices Kennedy, Thomas, and Alito penned a concurring opinion to discuss the “waters of the United States” ambiguity where the Court’s opinion was otherwise silent, stating “the reach and systemic consequences of the [Act] remain a cause for concern.”⁸⁶ The three further questioned “whether the [CWA] comports with due process” and ultimately concluded that it “continues to raise troubling questions regarding the Government’s power to cast doubt on the full use and enjoyment of private property throughout the Nation.”⁸⁷

To that end, the back-to-back unanimous decisions from *Sackett* and *Hawkes* underscored the Court’s newfound, unified agreement in restricting the legal consequences flowing from the “waters of the United States” ambiguity, rather than attempting to explicitly redefine its scope directly as it had in *Rapanos*, *SWANNC*, and *Riverside Bayview*. And, thus far, unlike the historical tendency for lower courts to construe these CWA decisions narrowly, post-*Hawkes* cases have proven remarkably wide-ranging; even going so far as establishing precedent for agency actions in wholly unrelated fields.⁸⁸ In fact, just one week after *Hawkes*, the Court remanded another challenge to the scope of Corps jurisdiction under the CWA “for further consideration in light of” *Hawkes*.⁸⁹

85. *Id.* at 22–23.

86. *Hawkes*, 136 S. Ct. at 1816–17 (Kennedy, J., Thomas, J., Alito, J., concurring).

87. *Id.* at 1817.

88. See Russell Prugh, *The Legacy of Sackett v. EPA: Supreme Court Allows Challenges to Wetland Jurisdictional Determinations Under the Clean Water Act in U.S. Army Corps of Engineers v. Hawkes Co.*, MARTEN LAW: NEWSLETTER (Nov. 28, 2016), http://www.martenlaw.com/newsletter/20161128-wetland-jurisdictional-determination-cwa#_edn9.

89. See *Belle Co., LLC v. U.S. Army Corps of Engineers*, 761 F.3d 383 (5th Cir. 2014) vacated, cert. granted, sub nom. *Kent Recycling Servs., LLC v. U.S. Army Corps of Engineers*, 136 S. Ct. 2427 (2016). In *Kent Recycling*, a company attempted to purchase property in Louisiana to build a waste disposal facility. Incumbent to its decision to purchase this particular parcel was the fact that the Corps had already deemed this property exempt under the agricultural exemption of the CWA. Petitioner argues the Corps changed its longstanding rule in response to learning of Kent Recycling’s plans and in order to demand a permit before the company could proceed with its intended project. Kent Recycling was able to administratively appeal the Corps determination, but even after a superior officer at the Corps reviewed the case finding insufficient evidence the parcel had waters of the United States, the lower level District Engineer overruled the appeal. Seeking judicial review, Kent Recycling was told by the Fifth Circuit that landowners did not have the right to contest federal jurisdiction under the CWA. But following the *Hawkes* decision, which now preempts the Fifth Circuit holding, the case was remanded.

B. THE BACKGROUND AND BACKROOM DEALINGS OF THE WOTUS RULE⁹⁰

When Congress first passed the Clean Water Act in 1972, it was intended only to cover “navigable waters.”⁹¹ As noted by the body of case law above, determining where these waters existed was, at minimum, tenuous, as individuals having “never seen a ship or other vessel cross their yard” somehow found themselves and their property subject to EPA jurisdiction.⁹² Thus far, the Court has failed to resolve the ambiguity, in part because of its inability to form a consensus around a definition. Without clear direction from the Court, determining where “waters of the United States” exist has been left to the EPA and Corps’ discretion on a “case-by-case basis.”⁹³ The agencies failed to promulgate a rule clarifying the ambiguity until 2015, requiring the public to rely on informal guidance memoranda published periodically to determine their interpretation of the CWA’s scope.

Following the *SWANCC* Court’s attempt to curtail jurisdiction under the CWA, the Corps notified its staff that it would interpret the Court’s ruling narrowly. The Corps reasoned that because the decision did not directly address “tributaries” nor overrule *Riverside Bayview*, which expanded their reach beyond traditionally navigable waters, they “should continue to assert jurisdiction over . . . tributary systems (and adjacent wetlands)” as well as “neighboring” navigable waters and tributaries.⁹⁴ Two years after the Court’s more significant attempt to limit CWA reach in *Rapanos*, the EPA and Corps promulgated a memorandum to provide an updated guidance on their interpretation of CWA jurisdiction.⁹⁵ In it, the Agencies disregarded the Court’s holding in favor of

90. As an administrative agency under direction of the executive branch, the EPA finds itself inherently politicized. Regardless of a president’s ideological leaning, the EPA derives its expansive power through interpretations of its own regulations. Indeed, while the EPA was established under Republican Richard Nixon, challenges to EPA power largely began at the turn of the millennium under the Bush administration ripening significantly under the Obama administration; See Elizabeth Slattery, *Who Will Regulate the Regulators? Administrative Agencies, the Separation of Powers, and Chevron Deference*, THE HERITAGE FOUNDATION (May 7, 2015), <http://www.heritage.org/courts/report/who-will-regulate-the-regulators-administrative-agencies-the-separation-powers-and>.

91. *United States v. Riverside Bayview Homes*, 474 U.S. 121, 133 (1985) (“[C]ongress evidently intended to repudiate limits that had been placed on federal regulation by earlier water pollution control statutes and to exercise its powers under the Commerce Clause to regulate at least some waters that would not be deemed ‘navigable’ under the classical understanding of that term.”).

92. See Mark Sherman, *Court sides with property owners over EPA*, SAN DIEGO UNION TRIBUNE (Mar. 21, 2012), <http://www.sandiegouniontribune.com/sdut-court-sides-with-property-owners-over-epa-2012mar21-story.html>.

93. *Sackett v. EPA*, 132 S. Ct. 1367, 1370 (2012).

94. Advance Notice of Proposed Rulemaking on the Clean Water Act Regulatory Definition of “Waters of the United States”, 68 Fed. Reg. 1991–98 (proposed Jan. 15, 2003).

95. EPA, CLEAN WATER ACT JURISDICTION FOLLOWING THE U.S. SUPREME COURT’S DECISION IN *RAPANOS V. UNITED STATES & CARABELL V. UNITED STATES* (2007), available at https://www.epa.gov/sites/production/files/2016-02/documents/cwa_jurisdiction_following_rapanos120208.pdf [hereinafter GUIDANCE MEMO].

Justice Kennedy's concurrence⁹⁶ and adopted a modified version of his "significant nexus" test in repudiation of Justice Scalia and a plurality of the Court.⁹⁷ Nevertheless, even though the Agencies failed to adhere to the Court's more stringent plurality interpretation, the adoption of the significant nexus test still underscored a slight concession and willingness to reduce their own jurisdictional reach of CWA authority with the burden of establishing a connection.

Approximately one month after President Obama took office, the EPA held its first principal meeting to announce its intention to pursue a formal "waters of the United States rule" ("WOTUS" rule).⁹⁸ Under the new administration, the EPA and Corps released a revised guidance to replace the former guidance under President Bush, stating "the extent of waters over which the agencies assert jurisdiction under the CWA will *increase* compared to the extent of waters over which jurisdiction has been asserted under [the 2008] guidance."⁹⁹ Public response argued the revised guidance had misconstrued the holdings in *Rapanos* and *SWANCC* and urged the Agencies to replace this non-binding guidance with a formal regulation to define "waters of the United States" subject to full notice-and-comment rulemaking procedures.¹⁰⁰

The EPA agreed, but to promulgate its new WOTUS rule the agency needed evidentiary support to form its scientific basis. So, in July 2013, the EPA assembled a Scientific Advisory Board to provide an expert scientific peer review of its own study determining when a significant nexus existed to undergird the scientific reasoning behind the WOTUS rule.¹⁰¹ Yet before the connectivity report was reviewed, the EPA and Corps sent a draft WOTUS rule, essentially a repackaged version of the 2011 guidance, to the Office of Information and Regulatory Affairs ("OIRA").¹⁰² The EPA's Scientific Advisory

96. See *id.*; see also *Rapanos v. United States*, 547 U.S. 715, 739-42 (2006) (the plurality concluded jurisdiction extended only to "relatively permanent, standing or continuously flowing bodies of water" and to "wetlands with a continuous surface connection" to same.).

97. See *Rapanos*, 547 U.S. at 757, 787 (the plurality remanded to determine "whether the ditches and drains near each wetland are 'waters'" and "whether the wetlands in question are 'adjacent' to these 'waters' in the sense of possessing a continuous surface connection" and Justice Kennedy's basis for remand focused on "whether the specific wetlands at issue possess a significant nexus with navigable waters"); see also GUIDANCE MEMO, *supra* note 95 (the Agency expanded [Justice Kennedy's] "significant nexus" analysis by incorporating "considerations of hydrologic and ecologic factors" into the test.).

98. COMM. ON OVERSIGHT AND GOV'T REFORM, 114TH CONG., MAJORITY STAFF REP. ON POLITICIZATION OF THE WATERS OF THE UNITED STATES RULEMAKING 14 (Oct. 27, 2016), available at <https://oversight.house.gov/wp-content/uploads/2016/10/WOTUS-OGR-Report-final-for-release-1814-Logo-1.pdf>.

99. *Id.* at 14-15 (citing EPA, DRAFT GUIDANCE ON IDENTIFYING WATERS PROTECTED BY THE CLEAN WATER ACT 3 (2011), <https://www.regulations.gov/document?D=EPA-HQ-OW-2011-0409-0002> (emphasis added)).

100. COMM. ON OVERSIGHT AND GOV'T REFORM REP., *supra* note 98, at 15.

101. *Id.* at 16-17 (The Report discusses the current scientific understanding of the connections or isolation of streams and wetlands relative to large bodies of water. Worth noting, on November 6, 2013, Chairman Lamar Smith of the House Committee on Science, Space and Technology requested that the SAB provide explanations as to why it had failed to address the "significance of these connections to the health and integrity of downstream waters" in its review of the Connectivity Report.).

102. *Id.* at 1 (OIRA is the executive branch agency which reviews all significant draft regulations).

Board failed to complete its peer review of the report until five months after the agency published the WOTUS rule in the *Federal Register*.¹⁰³ In other words, “the scientific understanding behind the rule was completed *after* the rule was published.”¹⁰⁴ Moreover, the EPA unlawfully used social media to generate public support for the WOTUS rule just prior to and throughout the comment period.¹⁰⁵ Relying solely on its own science, the final rule enumerated eight covered water bodies, some of which¹⁰⁶ were deemed jurisdictional by rule without further analysis “because the science confirm[ed] that they have a significant nexus” to other jurisdictional water features.¹⁰⁷ Thus, the science used to undergird the rule is codified in the final rule, which validates the agency’s jurisdictional reach to interpret more ambiguous waters.

In spite of new concerns from the Court that the rule could “put the property rights of ordinary Americans entirely at the mercy of EPA employees,”¹⁰⁸ on May 26, 2015, OIRA finished its review of the WOTUS rule merely 50 days after receiving the final draft.¹⁰⁹ The final WOTUS rule was soon published in the *Federal Register*, taking legal effect on August 28, 2015.¹¹⁰ The final rule enumerates eight water bodies under CWA jurisdiction: (1) traditional navigable waters; (2) interstate waters; (3) territorial seas; (4) impoundments of jurisdictional waters; (5) tributaries; (6) adjacent waters; (7) waters found after a case-specific analysis to have a significant nexus to the first three; and (8) waters found to have a significant nexus in combination with similarly situated waters in the region.¹¹¹ The first six are “jurisdictional by rule” for which “no additional analysis is required.”¹¹² The EPA further claimed that “fewer waters will be defined as ‘waters of the United States’” despite the increasing jurisdiction over some 117 million *more* landowners.¹¹³

A U.S. House of Representatives Committee on Oversight and Government Reform published a scathing report of the WOTUS rule highlighting where the EPA took legal shortcuts, implemented predetermined conclusions, and advanced the rule based on political, rather than scientific, motivations.¹¹⁴ In one instance, it found that the government’s clarified definition of “waters of the United States” imposed an “arbitrary standard whereby waters within 4,000

103. *Id.* at 17–18.

104. *Id.* at 18.

105. *Id.* at 17 (The Government Accountability Office concluded that the EPA’s use of social media to create a viral #Ditchthemyth campaign violated law during FYs 2014 and 2015.).

106. Examples include “tributaries” and “adjacent” waters.

107. See Clean Water Rule: Definition of “Waters of the United States,” Reg. Identifier No. 2040-AF30, Docket ID: EPA-HQ-OW-2011-0880-20862, <https://www.regulations.gov/docket?D=EPA-HQ-OW-2011-0880> [hereinafter Final Rule].

108. *Sackett v. EPA*, 132 S. Ct. 1367, 375 (2012) (Alito, J., concurring) (further stating that under the rule “any piece of land that is wet at least part of the year is in danger of being classified by EPA employees as wetlands covered by the Act.”).

109. COMM. ON OVERSIGHT AND GOV’T REFORM, *supra* note 98, at 21.

110. *Id.* at 22.

111. Final Rule, *supra* note 107, at 37058.

112. *Id.*

113. COMM. ON OVERSIGHT AND GOV’T REFORM, *supra* note 98, at 2.

114. *Id.* at 1, 3.

feet from any jurisdictional water would be covered.”¹¹⁵ The Committee found that the “vast majority of the nation’s water features are located within 4,000 feet of a jurisdictional water and blamed the rulemaking on “ideological policy agenda” used to “override regulatory safeguards put in place by Congress.”¹¹⁶ The judiciary seemed to agree, questioning the constitutionality of the WOTUS rule in *Hawkes*.¹¹⁷ On October 9, 2015, the U.S. Court of Appeals for the Sixth Circuit issued a nationwide stay of the WOTUS rule “pending resolution of claims that the rule is arbitrary, capricious, and contrary to law.”¹¹⁸ Two months later, the U.S. Government Accountability Office released another report finding impropriety at the EPA regarding the WOTUS rule, this time finding that it had violated the anti-lobbying provision of the Financial Services and General Government Appropriations Act when it used appropriated funds for pro-WOTUS lobbying activities.¹¹⁹

By issuing a preliminary injunction staying enforcement of the WOTUS rule nationwide, the Sixth Circuit demonstrated that it was “skeptical of the bright-line distance limitations associated with terms like ‘adjacent waters’ and ‘significant nexus’” that the rule adopted.¹²⁰ The Sixth Circuit appeared shocked by the “sheer breadth of the ripple effects caused by the Rule’s definitional changes” and found “the rulemaking process” with its questionable scientific basis was “facially suspect.”¹²¹ Lastly, the WOTUS rule conflicts with *Rapanos*, in that rather than the EPA making case-by-case determinations, it categorically confers jurisdiction.¹²²

III. ANALYSIS

A. THE ABUSE OF CHEVRON DEFERENCE

One of the primary faults with the Clean Water Act is procedural; where a statutory ambiguity exists, a court applies the two-pronged *Chevron* deference analysis to determine whether an agency’s interpretation is reasonable.¹²³ First, a court must determine whether an ambiguity exists or if Congress has already adequately or expressly addressed the particular issue.¹²⁴ If Congress was either

115. *Id.* at 2, 28.

116. *Id.* at 3.

117. *Hawkes*, 136 S. Ct. at 1816-1817 (Kennedy, J., Thomas, J., Alito, J. concurring).

118. *Id.* at 1812 n.1; *See In re EPA*, 803 F.3d 804, 807-09 (6th Cir. 2015).

119. Letter from Susan A. Poling, Gen. Counsel, Gov’t Accountability Office, to the Honorable James M. Inhofe, Chairman, Comm’n on Env’t and Pub. Works, U.S. Senate (Dec. 14, 2015), <http://www.gao.gov/assets/680/674163.pdf>.

120. *In re EPA*, 803 F.3d at 804-08; Respondents’ Brief in Support of Certiorari at 3, Nat’l Ass’n of Mfrs. v. DOD, 137 S.Ct. 811 (2016) (No. 16-299), 2016 WL 5900123 at *3.

121. *In re EPA*, 803 F.3d at 807-08.

122. Respondents’ Brief in Support of Certiorari at 3, 5, Nat’l Ass’n of Mfrs. v. DOD, 137 S.Ct. 811 (2016) (No. 16-299), 2016 WL 5900123 at *3, *5.

123. *See Chevron, U.S.A., Inc. v. NRDC, Inc.*, 467 U.S. 837 (1984) (concept of *Chevron* deference borne out of a challenge to the EPA’s interpretation of “stationary sources” in the Clean Air Act).

124. Elizabeth Slattery, *Who Will Regulate the Regulators? Administrative Agencies, the Separation of Powers, and Chevron Deference*, HERITAGE FOUND., May 7, 2015, at 4, <http://www.heritage.org/research/reports/2015/05/who-will-regulate-the-regulators-administrative-agencies->

silent or ambiguous, a court turns to the second prong to decide whether an agency's interpretation is reasonable under the circumstances.¹²⁵ It is well established that agencies delegated rulemaking authority under a statute are "afforded generous leeway by the courts in interpreting the statute they are entrusted to administer."¹²⁶

Decided just one year prior to the first CWA challenge in *Riverside Bayview*, *Chevron* deference has conferred considerable latitude to agency discretion over its own regulations.¹²⁷ And while the broad implications of *Chevron* deference are worthy of weighty analysis on their own, the CWA stands tall among the minority of legal challenges which may actually fail the historically generous leeway courts give to construing what an agency considers reasonable.

Since its initial holding in 1984, however, *Chevron* deference was expanded recently in 2013 under *City of Arlington v. Federal Communications Commission* from upholding agency interpretations of ambiguous statutory language to now permitting agency interpretations of the scope of its authority.¹²⁸ And while this recent expansion has been subject to dissent,¹²⁹ its lawful standing may have laid the foundation to justify the unchecked growth of CWA jurisdiction it sought to curtail in *Rapanos* and *Sackett*. To that end, the latest iteration of *Chevron* deference may prove unworkable in narrowing the CWA's scope.¹³⁰

Instead, perhaps future courts should heed Chief Justice Roberts' dissent in *Federal Communications Commission*, abide by the original *Chevron* deference standards as applied to CWA challenges, and focus solely on whether the EPA's or Corps' interpretation of "navigable waters" or "waters of the United States" is reasonable under the circumstances. Under this traditional analysis, future challenges brought before the Court can easily affirm the *Rapanos* holding that the Agencies' "expansive interpretation of the 'waters of the United States' is thus not 'based on a permissible construction of the statute.'"¹³¹ In *Rapanos*, Chief Justice Roberts furthered the majority's discussion of *Chevron* deference in a concurrence, finding that Congress had indeed employed sufficient limiting terms in the CWA language and the Agencies' incompetence signaled "another defeat for the agency."¹³² Under *Chevron* deference, he asserted that the EPA and Corps "would have enjoyed plenty of room to operate in developing *some* notion of an outer bound to the reach of their authority,"¹³³

the-separation-of-powers-and-chevron-deference#_ftn24.

125. *Id.*

126. *Rapanos*, 547 U.S. at 758 (citing *Chevron*, 467 U.S. at 842-845).

127. See Slattery, *supra* note 124, at 3, 4.

128. See *City of Arlington v. FCC*, 133 S. Ct. 1863 (2013).

129. *Id.* at 1883 (Roberts, C.J., dissenting) (finding "whether Congress wants us to [interpret an ambiguous provision] is a question that courts, not agencies, must decide.").

130. See Transcript of Oral Argument at 42, *U.S. Army Corps of Engineers v. Hawkes Co., Inc.*, 136 S. Ct. 1807 (2016) (No. 15-290). There, Justice Kagan questioned the soundness of applying *Chevron* deference to the quasi-binding jurisdictional determinations, uncertain of whether they were "final" and subject to *Chevron* deference, or whether they are "the kinds of advisory-type rulings that are not final" and thus not subject to *Chevron* deference.

131. *Rapanos*, 547 U.S. at 739 (citing *Chevron*, 467 U.S. at 843).

132. *Id.* at 758 (Roberts, C.J., concurring).

133. *Id.*

but instead of “refining its view of its authority in light of our decision in *SWANCC* . . . the Corps chose to adhere to its essentially boundless view of the scope of its power.”¹³⁴

B. DAMNED IF YOU DO, DAMNED IF YOU DON’T: THE PROBLEM WITH GIVING THE EPA THE BENEFIT OF THE DOUBT AND THE RISE OF THE ADMINISTRATIVE STATE¹³⁵

The evolution of *Chevron* deference, alongside the “waters of the United States” debate, begs the obvious question: why would the EPA voluntarily undertake more work asserting jurisdiction over such trivial matters? It would be overly simplistic to dismiss the more absurd cases¹³⁶ as anomalies or occasional oversights inherent to a bureaucracy of its size. Instead, even an ideologically divided Court seems unified in skepticism of the EPA’s true motives. Most recently, Chief Justice Roberts during oral arguments in *Hawkes* attempted to articulate a possible incentive:

[B]y issuing the determinations, they are able to exercise extraordinary leverage without going through the formal enforcement process. . . . [I]t is a way for them to exercise their authority without effective judicial review. And that’s a significant enforcement tool for them. So they might be unwilling to give it up if they had the option.¹³⁷

Justice Alito went even further, suggesting the Corps was not merely acting “out of the goodness of its heart,” but rather the requisite permitting process was driven by a significant profit motive.¹³⁸ He claimed the notion of providing a landowner with a jurisdictional determination was not a product of “just want[ing] to be nice to landowners,” but rather that the determinations are self-serving:

[T]hey do this for their own purposes because . . . it expands their enforcement power, because landowners who have a question about the status of their land have strong incentive to ask for a jurisdictional determination. And if—so that alerts the Corps to the fact that this is a property that might be subject to their jurisdiction.¹³⁹

These comments seem to undergird the Court’s skepticism of EPA motives and a wariness about handing over unchecked power to an agency willing to abuse *Chevron* deference.

134. *Id.*

135. See Ilan Wurman, *Constitutional Administration*, 69 STAN. L. REV. 359, 361 (2017). The administrative state refers, most commonly, to when a government agency circumvents the separation of powers by effectively creating, enforcing, and interpreting their own rules.

136. See *supra* Part II and discussion.

137. Transcript of Oral Argument at 48, *U.S. Army Corps of Engineers v. Hawkes Co., Inc.*, 136 S. Ct. 1807 (2016) (No. 15-290).

138. *Id.* at 39.

139. *Id.*

To that end, Justice Alito's comments may speak to the heart of EPA motive, underscoring the EPA's efficient business model: one where the Corps need not seek out jurisdictional water bodies on a case-by-case basis as previously articulated in *Sackett*, but rather rely on incoming applications to create a built-in presumption of a likely violative water feature. In 2015 alone, the Corps issued an estimated 54,000 nationwide permits and 3,100 individual permits.¹⁴⁰ These numbers, when coupled with the *Rapanos* Court's finding that the average applicant obtaining a permit "spends 788 days and \$271,596 in completing the process,"¹⁴¹ result in EPA annual revenues averaging more than \$15,000,000 purely from landowners attempting to comply with a vague statute. The costs of noncompliance are similarly unreasonable, as just four years earlier the *Sackett* Court demonstrated failure to receive a permit subjected landowners to fines of up to \$75,000 per day.¹⁴² Until *Sackett* and *Hawkes*, these noncompliant landowners had no relief from these fines while attempting to dispute a determination; in one such case, fines reached nearly \$20 million before the EPA conceded its own failure to identify a stock pond as a valid exemption to the CWA.¹⁴³

Setting aside the issues of attaching presumptive guilt to landowners merely seeking compliance, at least under the scheme in *Hawkes*, subsequent determinations were conducted on a "case-by-case basis by EPA field staff."¹⁴⁴ Yet a new decision pending certiorari, *Foster v. Vilsack*, centers on the latest practice

140. *The Scope of PLF's Hawkes Co. Case Could Have Implications for Millions of Landowners*, *Courting Liberty*, PAC. LEGAL FOUND. (Mar. 9, 2016), <http://blog.pacificlegal.org/the-scope-of-plfs-hawkes-co-supreme-court-case-could-have-implications-for-millions-of-landowners/>.

141. *See Hawkes*, 136 S. Ct. at 1812 (finding "[e]ven more readily available 'general' permits took applicants, on average, 313 days and \$28,915 to complete."). General permits are limited to activities that "cause only minimal individual and cumulative environmental impacts." 33 C.F.R. § 323.2(h)(1).

142. *See Sackett*, 132 S. Ct. at 1375 ("The EPA may issue a compliance order demanding that the owners cease construction, engage in expensive remedial measures, and abandon any use of the property. If the owners do not do the EPA's bidding, they may be fined up to \$75,000 per day (\$37,500 for violating the Act and another \$37,500 for violating the compliance order).").

143. *See Andy Johnson v. United States Environmental Protection Agency* (2015), COMPLAINT FOR DECL. & INJ. RELIEF available at <http://www.pacificlegal.org/document.doc?id=2036>.

144. *Sackett*, 132 S. Ct. at 1375 (Alito, J., concurring) ("But far from providing clarity and predictability, the agency's latest informal guidance advises property owners that many jurisdictional determinations concerning wetlands can only be made on a case-by-case basis by EPA field staff.").

undertaken by the Corps wherein a determination is adjudged from a pre-designated wetland.¹⁴⁵ At issue in *Foster* is whether an agency can establish jurisdictional wetlands solely by comparison to a preselected violative site.¹⁴⁶ Instead of acting on a case-by-case basis, the Corps in *Foster* applied a 10,835 square mile region as a proxy to determine whether a wetland was in violation of the CWA.¹⁴⁷ Rather than looking at the farm itself or even an adjacent or otherwise comparable comparison site, *Foster* demonstrates at least one example where the Corps uses a comparison site found in violation sixteen years prior any time it investigates a water feature in the surrounding 10,835 square miles.¹⁴⁸ The Fosters argued that this “wetlands by proxy” determination violated due process in two ways. First, the Fosters were not entitled to notice or an opportunity to hold a hearing on the selection of the reference site despite the government’s adjudication of their property rights. Second, “that the [U.S. Court of Appeals for the Eighth Circuit] showed too much deference when it declined to second-guess the bureaucrats’ unfair process.”¹⁴⁹ To that end, should the U.S. Supreme Court decide to rule on *Foster*, it should do so in a deliberately broad manner discussing the Agency’s interpretation of “wetlands” to encompass the CWA and not just the Food Security Act in question. *Foster* has the potential to be instructive to future courts adjudicating CWA challenges so long as it includes a robust analysis of *Chevron* deference in the context of the EPA. It must do so in light of the implications of the recently expanded construction of *Chevron* deference permitting the EPA and Corps to interpret their own authority if it desires to resolve the ambiguity in a meaningful way.¹⁵⁰ Should the Court find the EPA’s interpretation of “wetlands” unreasonable under *Chevron* deference in *Foster*,

145. *Foster v. Vilsack*, PETITION FOR WRIT OF CERTIORARI, <http://www.pacificlegal.org/file/documents/Foster-1-1523-Cert-Petition.pdf> (last visited Apr. 5, 2017) (Arlen and Cindy Foster are a Midwest farming couple who inherited a family property which had been in their family since 1900. As farmers raising cattle on the property, they attempted to comply with a federal law administered by the Department of Agriculture that limits farming in wetlands. The wetlands in question were a small, shallow depression. The Act at issue was not the CWA, but instead a provision of the Food Security Act of 1985. Under the Act, wetlands were defined as “having three characteristics: wetland soils, wetland hydrology, and wetland plants.” At issue in *Foster* was whether their removal of vegetation had tampered with the wetland plants. In rendering this determination, the Department, through the National Resources Conservation Service, is required to conduct farm inspections. If a determination cannot be made from an inspection, the National Resources Conservation Service then looks to whether “a prevalence of hydrophytic vegetation typically exists in the local area on the same hydric soil map under non-altered hydrologic conditions.”); see also 7 C.F.R. 12.31(b)(2)(ii).

146. Anthony Francois, *High Court asked to hear suit over feds’ rigged scheme for “discovering” wetlands*, PAC. LEGAL FOUND. (Aug. 10, 2016), <https://www.pacificlegal.org/releases/release-8-10-16-foster-1-1523> (“The comparison site, which was employed in a lazy and arbitrary way to label their property as wetlands, is used for the same purpose throughout much of eastern South Dakota. This comparison site was preselected 16 years ago with the knowledge that it supports wetland plants. Now federal officials use it anytime they are investigating a possible wetland with similar soils and disturbed vegetation, anywhere in the surrounding 10,835 square miles.”).

147. *Foster v. Vilsack*, *supra* note 145, at 11.

148. See Francois, *supra* note 146.

149. *Id.*

150. *PLF Challenges the Feds’ Rigged Scheme For “Discovering” Wetlands, Courting Liberty*, PAC. LEGAL FOUND. (Aug. 10, 2016), <http://www.pacificlegal.org/8-10-16-Podcast>.

subsequent courts may be able to more uniformly apply *Chevron* deference in challenges under the CWA.

C. THE EPA DRIVES THE MODERN ADMINISTRATIVE STATE

Integral to our Constitution is the articulation of the separation of powers.¹⁵¹ The founders contemplated a three-tiered government wherein specific powers were designated to each branch with the understanding that their susceptibility to the election process would overcome any inequities.¹⁵² Today, the term “administrative state” refers to the accumulation of legislative, executive, and judicial powers inside of an administrative agency.¹⁵³ In sum, “[t]oo many important decisions of the Federal Government are made nowadays by unelected agency officials . . . rather than by the people’s representatives in Congress.”¹⁵⁴

In 2011, Justice Stephen Breyer penned a law review article articulating the rise of the administrative state and flaws therein:

Political appointees, often not experts, are normally responsible for managing agencies and determining policy. And policy often reflects political, not simply “scientific,” considerations. Agency decisions will also occasionally reflect “tunnel vision,” an agency’s supreme confidence in the importance of its own mission to the point where it leaves common sense aside. At the same time, courts no longer seem particularly hostile to regulation as a matter of principle. Hence, the public now relies more heavily on courts to ensure the fairness and rationality of agency decisions.¹⁵⁵

Recent unanimous decisions may indicate that the Court, at least with respect to the CWA, remains stalwart in its narrowing of the Act’s regulatory reach. Whereas the WOTUS rule, with its questionable scientific basis, reflects the agency myopia against which Justice Breyer cautioned. To that end, as Breyer notes, private landowners, farmers, and businesses now rely on the Court to roll back the reach of the CWA and the EPA’s operation outside of our three-tiers of government, or otherwise risk an accumulation of power the likes of which James Madison labeled the “very definition of tyranny.”¹⁵⁶

In the executive branch, the separation of powers is intended to ameliorate “agency slack by reducing the possibility that a biased or parochial interest group

151. See THE FEDERALIST NO. 47, at 354 (James Madison) (Floating Press ed., 2011) (writing that “[T]he combination of all powers legislative, executive, and judiciary in the same hands . . . may justly be pronounced the very definition of tyranny.”).

152. See Jide O. Nzelibe & Matthew C. Stephenson, *Complementary Constraints: Separation of Powers, Rational Voting, and Constitutional Design*, 123 HARV. L. REV. 617, 619 (2010) (finding “[e]lectorate accountability ameliorates agency slack by punishing poorly performing incumbents and rewarding successful ones.”).

153. See Wurman, *supra* note 135, at 361.

154. EPA v. EME Homer City Generation, L.P., 134 S. Ct. 1584, 1610 (2014) (Scalia, J., dissenting).

155. Stephen Breyer, *The Executive Branch, Administrative Action, and Comparative Expertise*, 32 CARDOZO L. REV. 2189, 2195 (2011).

156. *Id.* at 2193; see James Madison, *supra* note 151, at 354.

will be able to use the power of the state for its own ends.”¹⁵⁷ This intent and exposure to electoral accountability, however, is noticeably attenuated in the context of administrative agencies such as the EPA.¹⁵⁸ For the moment, it appears as though the holdings from *Sackett* and *Hawkes*, at minimum, have helped to mitigate these issues by drawing attention to potential due process violations under the CWA as well as relief through judicial review,¹⁵⁹ but there still exists a presumption and strong deference under administrative law that the federal agency’s ruling is both reasonable and final.¹⁶⁰ The EPA appears to be the poster child for federal agencies exercising all three powers in violation of our constitution.

“Though typically categorized as part of the executive branch, administrative agencies perform legislative, executive, and judicial functions by issuing, enforcing, and settling disputes involving regulations that have the force of law.”¹⁶¹ In that regard, the EPA’s intended purpose, as an agency of the executive branch, primarily rests with a power to enact and enforce regulations in furtherance of its stated environmental purpose. Under *Chevron* deference, however, the Corps has enforced and now promulgated a rule so broadly construed that most of the country can plausibly fit under its jurisdiction.¹⁶² This rulemaking ability, in turn, has led to circumvention of the traditional separation of powers wherein the EPA finds itself insulated from misconduct accountability.¹⁶³ Moreover, under the current administrative state regime, landowners who disagree with the EPA or Corps have little relief and even less influence in ousting the decision makers therein.¹⁶⁴

157. See Nzelibe & Stephenson, *supra* note 152, at 619.

158. Under Democrat and Republican administrations alike, as reflected in the 2003, 2008, and 2011 guidance memoranda, the EPA continued to expand its jurisdictional reach largely removed from judicial limitations and Chief executive ideology. Consider the following process: Congress may pass a law that an administrative agency finds inadequately detailed to enforce. In such circumstances, Congress may delegate authority to the agency to engage in finalizing the rulemaking, which, in turn, is given the force of law. More troublesome still, the administrative agencies have come to interpret their own regulations, calling individuals before the administrative agency to determine whether someone is in violation. These rulings, in turn, may then become binding on those individuals.

159. See *Hawkes*, 136 S. Ct. at 1817 (finding that, in many instances, a jurisdictional determination “will have a significant bearing on whether the Clean Water Act comports with due process.”).

160. See *U.S. v. Riverside Bayview Homes, Inc.*, 474 U.S. 121, 131 (1985) (citing *Chevron*, 467 U.S. at 842–45).

161. See Slattery, *supra* note 124, at 2.

162. *Taking Dead Aim at The Growth of the Administrative State, Courting Liberty*, PAC. LEGAL FOUND. (Nov. 16, 2016), <https://www.pacificlegal.org/11-16-16-podcast>.

163. See THE FEDERALIST NO. 52, at 388–89 (James Madison) (Floating Press ed., 2011) (writing that “it is particularly essential that [Congress] should have an immediate dependence on, and an intimate sympathy with the people. Frequent elections are unquestionably the only policy by which this dependence and sympathy can be secured.”) (emphasis added); see also Joseph Postell, *From Administrative State to Constitutional Government*, HERITAGE FOUND., Dec. 7, 2012, at 15, <http://www.heritage.org/political-process/report/administrative-state-constitutional-government> (finding the “only way to ensure that representatives have a common interest with the people to whom they are supposed to be responsible is the establishment of regular elections, and it is particularly essential that the legislature be subject to regular elections.”) (internal quotation marks omitted).

164. Postell, *supra* note 163, at 16.

In addition to writing and enforcing its own rules, federal agencies under the direction of the EPA have taken on a role traditionally held by the courts by establishing tribunals whose determinations can have a legally binding effect.¹⁶⁵ The jurisdictional determinations at issue in both *Hawkes* and *Sackett*, were shown to have a legally binding effect without being subject to judicial review or scrutiny.¹⁶⁶ In turn, the Corps is authorized with determining violations under the CWA, either by way of failing to get a permit or by violating the permit.¹⁶⁷ Further, after the determination that a violation has occurred, the individual is not entitled to a hearing.¹⁶⁸ The agency is not required to take you to court to establish you violated the law.¹⁶⁹ You are not entitled to a hearing before or after the agency decides you have broken the law.¹⁷⁰ Instead of an objective magistrate, oftentimes a junior official at the local Army Corps of Engineers will interpret your case.¹⁷¹

IV. CONCLUSION

For the first time since its creation, it now seems as though the Court, Congress,¹⁷² and the current President¹⁷³ are unified in their stance on curtailing the CWA's reach under the vague "waters of the United States" language. To that end, both the WOTUS rule and ever-expanding jurisdiction of the EPA and Corps under the CWA may be coming to an end. Irrespective of its ability to address legitimate climate and environmental concerns, the agencies have unequivocally abused their powers beyond their once legitimate reach, which now threatens our founding principles.

Yet while Congress and President Trump appear eager to weigh in on the "waters of the United States" conversation, it would be unwise to presume the demise of the "waters of the United States" ambiguity simply from campaign promises and a Republican Congress. Instead, if history is instructive, the ambiguity will more likely remain unresolved within the court system until the Supreme Court has an opportunity to hear the agencies' new WOTUS rule. In that respect, subsequent Court discussions should reflect more specifically on

165. *Taking Dead Aim at The Growth of the Administrative State*, *supra* note 162.

166. *Id.*

167. *Id.*

168. *Id.*

169. *Id.*

170. *Taking Dead Aim at The Growth of the Administrative State*, *supra* note 162.

171. *Id.*

172. Tiffany Stecker, *Clean Water Rule: WOTUS 'Ultimately doomed.' What happens next?*, E&E NEWS, Nov. 16, 2016, at 2, <http://www.eenews.net/stories/1060045861> (suggesting that the new Republican Congress may attack the CWA directly via legislation or by defunding EPA activities in spending bills as they have indicated.).

173. See *Clinton, Trump split over WOTUS*, CAPITAL PRESS, Sep. 29, 2016, <http://www.capitalpress.com/20160929/clinton-trump-split-over-wotus> (quoting President Trump "I will eliminate the unconstitutional Waters of the U.S. rule, and will direct the Army Corps of Engineers and EPA to no longer use this unlawful rule and related guidance documents in making jurisdictional determinations."); see also *Clinton in Favor of WOTUS, Trump Against*, HOOSIER AG TODAY, Sep. 22, 2016, <https://www.hoosieragtoday.com/clinton-in-favor-of-wotus-trump-against/> (quoting President Trump as finding the WOTUS rule "so extreme that it gives federal agencies control over creeks, small streams, and even puddles.").

the evolution of case law on the topic to construct a more sensible outer framework for interpreting “waters of the United States.”

To start, the Court should look to *Riverside Bayview*, understanding how the Corps’ argument of jurisdiction over “adjacent wetlands” was compelling at the time, but divorced from the confusing “significant nexus” analysis that is retroactively attributed to the case today. Furthermore, understanding the origins of “adjacent wetlands” outside of a “significant nexus” conversation will be useful in analyzing the phrase’s validity inside the WOTUS rule should it rise from the Sixth Circuit to the High Court. Outside of *Riverside Bayview*, courts can reflect on *SWANCC* and *Rapanos* taken together for instruction on when the EPA and Corps failed *Chevron* deference and unreasonably interpreted the Act. In particular, the Court should revisit the plurality’s definition of “waters of the United States” in *Rapanos* against the WOTUS rule. Perhaps in revisiting *Rapanos*, the Court can definitively reject Justice Kennedy’s “significant nexus” concurrence, an oft-cited analysis that even he no longer finds workable. Finally, if unable to resolve the patent ambiguity, the Court can build upon the precedent in *Sackett* and *Hawkes* to indirectly curtail the CWA’s reach by ameliorating the improper legal consequences that flow from the language.

Despite an otherwise ideologically divided bench, the back-to-back unanimous holdings in *Sackett* and *Hawkes* signal a unified criticism of the EPA’s reach of authority under the CWA. With Justice Scalia’s hard-hitting voice noticeably missing from the bench in *Hawkes*, it will be incumbent upon the Court to find a timbre capable of sending a strong message to the EPA if confronted with adjudicating the WOTUS rule. The time has come for the Court to end the linguistic back and forth and afford landowners more opportunities to challenge the agencies. The EPA and Corps will be the ones inevitably waiting for the Court to drop the hammer on their unreasonable “waters of the United States” interpretations.

WATER EXCHANGE 201

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I. INTRODUCTION

For the twentieth anniversary, *DU Water Law Review* asked us to provide an update to the article titled “*Basic Exchange 101*” published in 1998.² In that article, we introduced the reader to the concept of water exchanges, identified the basics of an exchange (including the four critical elements of an exchange), and then addressed a pressing issue at that point in time—whether the Water Quality Control Commission’s (“WQCC”) standards preempted review and determination by the water court as to the suitability of the quality of water provided as a substitute supply. After twenty years, we take another look. Since 1998, numerous decrees have been entered confirming and adjudicating more than 2000 cubic feet per second (“cfs”) of additional conditional exchange potential.³ This article discusses the evolution of water exchanges since *Basic Exchange 101*, and offers suggestions on possible revisions to the four critical elements of an exchange based on more recent court decisions and issues emerging in Colorado water law today.

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2. Casey S. Funk & Amy M. Cavanaugh, *Basic Exchange 101*, 1 U. DENV. WATER L. REV. 206 (1998).

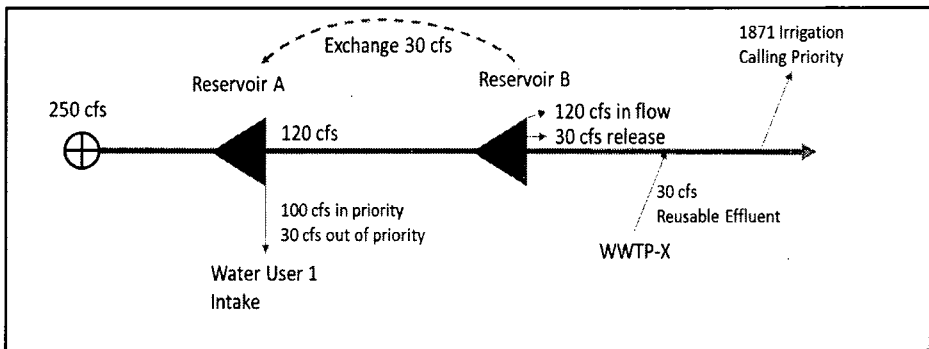
3. *Division of Water Resources Water Right Net Amounts*, COLO. INFO. MARKETPLACE, <https://data.colorado.gov/Information-Sharing/DWR-Water-Right-Net-Amounts/acsg-f33s/data> (last visited Apr. 12, 2017).

II. BASIC REFRESHER

An exchange is a trade of water between structures or users.⁴ An exchange operates by diverting water upstream and then introducing an equivalent amount of water from a different source to a downstream water user.⁵ There are four critical elements to the operation of an exchange:

(1) the source of substitute supply must be above the calling water right; (2) the substitute supply must be equivalent in amount and of suitable quality to the downstream senior appropriator; (3) there must be available natural flow in the exchange reach; and (4) the rights of others cannot be injured when implementing the exchange.⁶

As the concept of an exchange is always most understandable through illustration, we've also reprinted here our diagram of a simple exchange from *Basic Exchange 101*, along with the supporting explanation:



In this diagram, the 1871 Irrigation Priority is the calling senior water right. Reservoir A has a storage right senior to the 1871 priority that allows it to store 100 cfs, but also a junior storage right that is out-of-priority; and Reservoir B has a junior storage water right that is called out by the senior 1871 water right and must bypass the 120 cfs of inflow. By operating an exchange, Water User 1 can divert more than the 100 cfs available to it under its priority. Water User 1 can divert an additional 30 cfs out of priority by either operating an exchange using reusable effluent or releasing 30 cfs from Reservoir B as a substitute supply above the senior calling water right located at the 1871 water user's headgate.

4. Funk & Cavanaugh, *supra* note 2, at 207; Colo. Water Conservation Bd. v. City of Central, 125 P.3d 424, 435-36 (Colo. 2005).

5. See Colo. Water Conservation Bd., 125 P.3d at 435-36.

6. Empire Lodge Homeowners' Ass'n v. Moyer, 39 P.3d 1139, 1155 (Colo. 2001), *modified*, Centennial Water & Sanitation Dist. v. City & Cty. of Broomfield, 256 P.3d 677, 686 (Colo. 2011).

III. POST-1998 COLORADO LAW GOVERNING EXCHANGES

A. STATUTES

As to exchanges, little has changed by the General Assembly since 1998. Exchanges are still governed statutorily by Colorado Revised Statutes sections 37-83-101-104 (1897),⁷ 37-80-120 (1969),⁸ 37-92-302(1)(a) (1981),⁹ 37-92-305(5) (1969),¹⁰ and 37-92-305(10) (1981).¹¹

B. CASE LAW

When we wrote *Basic Exchange 101* in 1998, there was little case law regarding exchanges, but the explosion of decreed exchanges brought litigation and new case law. Since 1998, the Supreme Court decided numerous cases concerning the scope, effect, and operation of exchanges and substitute supplies, albeit often within the context of plans for augmentation. In 2001, the Supreme Court distinguished between augmentation plans and exchanges and adopted the critical elements of an exchange suggested in *Basic Exchange 101*.¹² In 2002, the Supreme Court refused to follow our argument in *Basic Exchange 101* that the WQCC preempted review by the water court as to the suitability of substitute supplies.¹³ In 2005, the Supreme Court determined that terms and conditions were proper to protect an intervening instream flow appropriation from injury by augmentation plan including an exchange.¹⁴ In 2010, the Supreme Court touched upon the scope of “natural water” under the first critical element that could be available to exchange upon.¹⁵ In 2011, the Supreme Court distinguished augmentation plans from appropriative rights of exchange (again) and modified the third critical element of exchange by referencing the exchange reach instead of the upstream point of diversion.¹⁶ Further, the water

7. Ch. 58, § 1, 1897 Colo. Sess. Laws 176, 176-77 (codified at COLO. REV. STAT. §§ 37-83-101-104 (2017)).

8. Ch. 370, § 8, 1969 Colo. Sess. Laws 1192, 1196-97 (codified at COLO. REV. STAT. § 37-80-120 (2017)).

9. Ch. 432, § 1, 1981 Colo. Sess. Laws 1786, 1786-87 (codified at COLO. REV. STAT. § 37-92-302(1)(a) (2017)).

10. Ch. 373, § 1, 1969 Colo. Sess. Laws 1200, 1200-24 (codified at COLO. REV. STAT. § 37-92-305(5) (2017)).

11. Ch. 432, § 2, 1981 Colo. Sess. Laws 1786, 1786-87 (codified at COLO. REV. STAT. § 37-92-305(10) (2017)).

12. *Empire Lodge Homeowners' Ass'n v. Moyer*, 39 P.3d 1139 (Colo. 2001), as modified by *Centennial Water & Sanitation Dist. v. City & Cty. of Broomfield*, 256 P.3d 677, 686 (Colo. 2011).

13. See *City of Thornton v. City & Cty. of Denver*, 44 P.3d 1019, 1029-30 (Colo. 2002).

14. See *Colo. Water Conservation Bd. v. City of Central*, 125 P.3d 424, 441 (Colo. 2005).

15. See *City of Aurora v. Northern Colo. Water Conservancy Dist.*, 236 P.3d 1222, 1226 (Colo. 2010).

16. *Centennial Water & Sanitation Dist. v. City & Cty. of Broomfield*, 256 P.3d 677, 684 (Colo. 2011).

courts have addressed applications concerning substitutions,¹⁷ the “character” of substitute supply,¹⁸ and overlapping exchanges.¹⁹

Although *Empire Lodge Homeowners’ Ass’n v. Moyer* is—at its heart—a case about plans for augmentation, standing, and the State Engineers’ authority, the Supreme Court touched on issues related to exchanges as well.²⁰ The Homeowners’ Association filled two ponds in its subdivision using out-of-priority diversions with the State Engineer’s conditional approval, pending a court-approved augmentation plan, despite repeated calls from the Moyers’ downstream rights.²¹ Eventually, the Moyers sued in District Court.²² The Homeowners’ Association responded by suing in water court, claiming, among other things, that the Moyers had unlawfully enlarged the use of their water rights.²³

The Court admonished the State Engineer for approving temporary substitute supply plans without any authority to do so and reviewed the authority provided by the General Assembly to the State Engineer.²⁴ In part, the court reviewed the State Engineer’s authority under augmentation plans versus exchange plans, and pointed out that the General Assembly intended to differentiate exchanges from augmentation plans.²⁵ The court concluded that the General Assembly required court approval of augmentation and substitute supply plans²⁶ but did not require court approval over exchanges,²⁷ which the State Engineer has authority to administer. The Supreme Court provided its view of an exchange:

[A]n exchange is a water management practice the State Engineer administers between decreed points of diversion. When a junior appropriator makes a sufficient substitute supply of water available to a senior appropriator, the junior may divert at its previously decreed point of diversion water that is otherwise bound for the senior’s decreed point of diversion.

Further, the Court clarified that substitute supply and replacement water are substantially equivalent because “[t]hey refer to the water supplied to decreed water rights holders under an exchange or augmentation plan.”²⁸

17. See generally *In re Application for Multi-Purpose Water Rights, Storage, Exchange, and Substitution*, No. 11CW152, at *22–31 (Colo. Water Ct. Div. No. 5 2016).

18. *In re Denver Water’s Motion for Determination of Question of Law*, No. 12CW05, at *7 (Colo. Water Ct. Div. No. 1 2016).

19. *In re Application for Finding of Diligence and to Make Absolute, Exchange Within Denver’s Water System*, No. 08CW159, at *2–3 (Colo. Water Ct. Div. No. 1 2008).

20. See *Empire Lodge Homeowners’ Ass’n v. Moyer*, 39 P.3d 1139, 1149–50 (Colo. 2001).

21. *Id.* at 1144–45.

22. *Id.* at 1145.

23. *Id.* at 1143, 1145.

24. *Id.* at 1151–53.

25. *Id.* at 1155 (citing *City of Florence v. Bd. of Waterworks*, 793 P.2d 148, 151 (Colo. 1990)).

26. *Empire Lodge Homeowners Ass’n*, 39 P.3d at 1153 (quoting COLO. REV. STAT. § 37-92-302(1)(a) (2017)); See COLO. REV. STAT. § 37-92-305(8) (2017).

27. *Empire Lodge Homeowners Ass’n*, 39 P.3d at 1155; see COLO. REV. STAT. § 37-83-101 (2017); COLO. REV. STAT. § 37-80-120 (2017).

28. *Id.* at 1154.

In its discussion of the issues, the Court adopted the four critical elements of an exchange identified in *Basic Exchange 101*: (1) the source of substitute supply must be above the calling water right; (2) the substitute supply must be equivalent in amount and of suitable quality to the downstream senior appropriator; (3) there must be available natural flow at the point of upstream diversion; and (4) the rights of others cannot be injured when implementing the exchange.²⁹ *Empire Lodge* also confirmed that the State Engineer continues to have the authority to regulate and administer undecreed exchanges under Colorado Revised Statutes sections § 37-83-101 *et seq.* and sections 37-80-120(2)-(4).³⁰

In *City of Thornton v. City & County of Denver*, the City of Thornton petitioned the water court to (1) extend the period of retained jurisdiction agreed to in a stipulated decree between Thornton and Denver and (2) reconsider a determination of non-injury in light of the actual operation of Denver's augmentation plan for out-of-priority diversions from the South Platte River, including the use of effluent as a source of substitute supply.³¹ The water court denied the petition without a hearing.³² The Supreme Court reversed.³³ It found that the 1969 Water Right Determination and Administration Act³⁴ and the 1981 Water Quality Control Act ("WQCA")³⁵ preserved the common law standard that the introduction of pollutants into a water supply constitutes injury to senior appropriators if the water is no longer suitable for the senior appropriator's normal use because of the substitute supply.³⁶ Further, the Supreme Court found that the General Assembly did not intend the WQCA to interfere with the water court's ability to protect senior water appropriators under section 25-8-104.³⁷ While the Court limited this holding to review of substitute supplies provided in an augmentation plan under section 37-92-305(5), it is likely this holding would apply to substitute supplies provided in an exchange plan under section 37-80-120(3), which provides: "Any substituted water shall be of a quality and continuity to meet the requirements of use to which the senior appropriation has normally been put."³⁸ Sadly, this holding is directly contrary to the argument the authors made in *Basic Exchange 101*: that the WQCA standards preempted any further review by the water court because the standards adopted by the WQCC for all uses ensured that all downstream users are protected by unreasonable discharges that are used as a substitute supply.³⁹

In *City of Aurora v. Northern Colorado Water Conservancy District* ("Aurora"), the City of Aurora ("Aurora") sought an appropriative right of exchange,

29. *Id.* at 1155 (citing Funk & Cavanaugh, *supra* note 2, at 207).

30. *See id.* at 1142, 1153-55.

31. *City of Thornton v. City & Cty. of Denver*, 44 P.3d 1019, 1021-23 (Colo. 2002).

32. *Id.* at 1022.

33. *Id.*

34. COLO. REV. STAT. §37-92-101 *et seq.*

35. COLO. REV. STAT. §25-8-101 *et seq.*

36. *Thornton*, 44 P.3d at 1130.

37. *Id.* at 1029.

38. COLO. REV. STAT. § 37-80-120(3) (2012).

39. *See* Funk & Cavanaugh, *supra* note 2, at 225-26.

claiming exchange potential based partially upon the presence of Colorado-Big Thompson ("C-BT") water in the exchange reach.⁴⁰ Northern Colorado Water Conservancy District ("Northern") is a water conservancy district with the authority to distribute trans-mountain water generated by the C-BT Project.⁴¹ Some amount of C-BT water accrued to the stream through Aurora's proposed exchange reach.⁴² Northern objected to Aurora's application, arguing that Aurora was unlawfully benefitting from the presence of C-BT water in the exchange reach, and asking the Court to discount any C-BT water in the exchange reach when calculating exchange potential.⁴³ Northern did not claim injury to its water rights from Aurora's proposed exchange; rather, Northern argued that its rules and contracts prohibited extra-district indirect benefits based on the presence of the non-native C-BT water.⁴⁴ The Court concluded that because Aurora was not a party to any allotment contract it was not subject to the restriction of use of C-BT water.⁴⁵ Therefore, because Northern did not claim injury to its water rights and the prohibition under the allotment contracts to extra-district indirect benefits pertains only to parties to that contract, the Supreme Court held it was improper to impose a condition excluding any possible C-BT flows in the exchange reach when Aurora calculated its exchange potential.⁴⁶

This case is relevant to the makeup of available natural flow in the third critical element of an exchange, which provides: "There must be available natural flow in the exchange reach."⁴⁷ Even though C-BT water is not native to the South Platte River it is considered part of the natural flow—absent a contract to the contrary.

In *Centennial Water and Sanitation District v. City and County of Broomfield*, the Supreme Court reviewed Broomfield's application for appropriative right of exchange for two claimed exchange reaches on the South Platte River and Big Dry Creek.⁴⁸ The Centennial Water and Sanitation District ("Opposers") argued that the application should be treated as a proposed augmentation plan.⁴⁹ Treating the proposed exchange as a plan for augmentation rather than an appropriative right of exchange would have had the practical effect of requiring Broomfield to own or control all proposed sources of substitute supply, a

40. *City of Aurora v. N. Colo. Water Conservancy Dist.*, 236 P.3d 1222, 1224–25 (Colo. 2010). C-BT is water and return flows imported from the Colorado River through the Adams Tunnel from Colorado Big Thompson Project.

41. *Id.* at 1224.

42. *See id.* at 1225.

43. *Id.* at 1224–25.

44. *Id.* at 1225.

45. *Id.* at 1226.

46. *Id.*

47. *Empire Lodge Homeowners' Ass'n v. Moyer*, 39 P.3d 1139, 1155 (Colo. 2001), *modified*, *Centennial Water & Sanitation Dist. v. City & Cty. of Broomfield*, 256 P.3d 677, 686 (Colo. 2011).

48. *Centennial Water*, 256 P.3d. at 680.

49. *Id.*

standard Broomfield admittedly could not meet.⁵⁰ The Supreme Court disagreed with the Opposers, concluding that Broomfield's application for conditional appropriative right of exchange should be treated as an application for a conditional water right, thus, subjecting the claim to the "can and will" test and the "first step" requirements.⁵¹ In distinguishing an augmentation plan from an appropriative right of exchange, the Supreme Court pointed out the differences between an exchange and an augmentation plan.⁵² An augmentation plan operates outside the priority system to replace depletions with substitute water supply in an amount necessary to prevent injury to other rights.⁵³ Conversely, an appropriative right of exchange operates within the priority system and allows a strict one-to-one diversion of upstream water in exchange for providing continuity with a source of substitute supply at a point downstream in an amount and of a quality suitable to what would have been available to water users in that location.⁵⁴

The Court further held that the first step requirement and the can and will test should be applied to each source of substitute supply.⁵⁵ The Court held that each source of substitute supply should be analyzed separately because "exchanges involve a delivery of substitute supply water to the stream and continuity with an upstream diversion, a non-injurious diversion at the upstream point must take on the character of the water right used as a source of downstream substitute supply."⁵⁶

Intentionally or not, the *Centennial Water* Court also changed the third element of the four critical elements of an exchange presented in *Basic Exchange 101* and adopted by the Supreme Court in *Empire Lodge*. When addressing Broomfield's argument that a general project-wide analysis would be sufficient, the Supreme Court rephrased the third critical element of an exchange to read: [there must be] "available natural flow in the exchange reach"⁵⁷ as opposed to "there must be available natural flow at the point of upstream diversion."⁵⁸ This revision had the practical effect of restricting the operation of exchange to the exchange potential, but omitted, in our opinion, the still necessary element of establishing that sufficient water was available to divert at the upstream location.

50. *See id.* at 680-81.

51. *Id.* at 684-85 ("To obtain a conditional water right, an applicant must demonstrate that it has taken a first step toward appropriation of a certain amount of water, that its intent to appropriate is not based on the speculative, sale or transfer of the appropriative right, and that there is a substantial probability that the applicant can and will complete the appropriation with diligence." (citing *City of Thornton v. Bijou Irrigation Co.*, 926 P.2d 1, 31 (Colo. 1996)).

52. *See id.* at 683-84.

53. *Id.* at 684.

54. *Id.* The Supreme Court also made a troubling aside that raised more questions than it answered: the Court stated "the diversions at the upstream point take on the character of the water right used as a source of downstream substitute supply," without any explanation of what was meant by the "character" of the water right. *Id.* (citing *Empire Lodge Homeowners Ass'n v. Moyer*, 39 P.3d 1139, 1155 (Colo. 2001)).

55. *Centennial Water*, 256 P.3d at 685.

56. *Id.* at 686 (citing *Empire Lodge*, 39 P.3d at 1155).

57. *Id.*

58. *Empire Lodge*, 39 P.3d at 1155.

In *City and County of Denver v. City of Englewood* (“Englewood II”), the City of Englewood again challenged Denver’s senior exchange decree, this time as it related to Denver’s use of lawn irrigation return flows (“LIRFs”) as a source of substitute supply.⁵⁹ In *Basic Exchange 101*, we cited *City and County of Denver v. City of Englewood* (“Englewood I”) for the statement, “effectuating an exchange or transfer of water by the use of any public stream or its water. . .” was sufficient to put interested parties on inquiry notice that sources other than the South Platte might be introduced as a substitute supply.⁶⁰ In 2004, Denver Water claimed that its LIRFs either directly or stored could be used to effectuate exchanges under its senior decree in C.A. 3635.⁶¹ Even though LIRFs were not expressly identified as a source of substitute supply in the decree, the Supreme Court held that properly quantified trans-mountain LIRFs are legally indistinguishable from reusable trans-mountain effluent; and, therefore, the water court correctly determined that Denver may use its properly quantified trans-mountain LIRFs as substitute supply for the appropriative rights of exchange decreed in C.A. 3635.⁶² The Supreme Court stated that “the [*Englewood I*] decision definitively established that Denver intended to use and reuse Colorado River water as substitute supply for the exchanges decreed in C.A. 3635.”⁶³ It also recognized the inherent right to reuse and successive use in their imported water, as described by this Court in *City and County of Denver v. Fulton Irrigating Ditch Co.* (“Fulton”), and *City of Thornton v. Bijou Irrigation Co.* (“Bijou”), and as codified at section 37-82-106(1).⁶⁴

In *Colorado Water Conservation Board v. City of Central*, 125 P.3d 424, the City of Central sought approval of an augmentation plan to replace depletions from water rights senior to the Colorado Water Conservation Board’s (“CWCB”) instream flow rights.⁶⁵ The CWCB’s instream flow right existed prior to the filing of the augmentation plan.⁶⁶ The Supreme Court held that the augmentation plan operated as an exchange, which reduced the amount of water for beneficial use within the affected stream reach.⁶⁷ Further, the Supreme Court held that adjudicated instream flow rights entitle the CWCB “to maintain the stream conditions existing at the time of its appropriation and to resist proposed developments through changes of water rights or augmentation plans, regardless of the means, that in any way materially injure instream flow rights.”⁶⁸

59. See *City & Cty. of Denver v. City of Englewood (Englewood II)*, 304 P.3d 1160, 1160-62 (Colo. 2013).

60. Funk & Cavanaugh, *supra* note 2, at 219 (citing *City & Cty. of Denver v. City of Englewood (Englewood I)*, 826 P.2d 1266, 1269 (Colo. 1992)).

61. *Englewood II*, 304 P.3d at 1163.

62. *Id.* at 1162.

63. *Id.* at 1165.

64. COLO. REV. STAT. § 37-82-106(1); *Englewood II*, 304 P.3d at 1162-63; *City of Thornton v. Bijou Irrigation Co.*, 926 P.2d 1, 66-70 (Colo. 1996); *City & Cty. of Denver v. Fulton Irrigating Ditch Co.*, 506 P.2d 144, 147 (Colo. 1972).

65. *Colo. Water Conservation Bd. v. City of Central*, 125 P.3d 424, 427 (Colo. 2005).

66. *Id.* at 427-29.

67. *Id.* at 436.

68. *Id.* at 440.

The Court agreed with the position espoused in *Basic Exchange 101*,⁶⁹ that the reach of an exchange extends from the point of introduction of the substitute supply to the upstream point of withdrawal.⁷⁰

Unfortunately, again, we did not get it all right. In *Basic Exchange 101*, we argued that under section 37-80-120, a water user may adjudicate a priority date for an exchange, but as a practical matter exchange priorities apply only against other exchanges.⁷¹ Further, we stated that “[i]f there is a senior downstream call, it calls out all upstream juniors, including juniors that may be senior to the exchange right. Even if the exchange is junior to downstream users, the exchange may be run, so long as the calling senior is satisfied.”⁷² By footnote, the Supreme Court gave short shrift to this view, noting that “certain amici” maintain that water exchanges obtain priority dates vis-à-vis only other exchanges, rather than vis-à-vis the stream system.⁷³ Those certain amici would be Denver Water. In response to Denver’s argument, the Court pointed out that the plain language of section 37-92-305(10) assigns exchanges a priority date vis-à-vis the stream system like any other right of appropriation citing *City of Florence v. Board of Waterworks of Pueblo* at n. 4.⁷⁴

Despite being chastised by the Supreme Court, we are not ready to concede this point entirely. We remain convinced that water exchanges obtain priority dates vis-à-vis other exchanges and, as this case points out, in-stream flow rights. We continue to point out that, by definition, exchanges can operate against “legitimate call[s] of water rights senior to the priority of rights of . . . exchange and substitution”⁷⁵ when a substitute supply of water equivalent to the amount diverted is provided to the “legitimate call[s] of water rights senior to the priority of . . . exchange and substitution.”⁷⁶ It remains unclear to these authors how an exchange priority is able to call out storage or direct flow water rights⁷⁷ junior to the priority of the exchange when these junior rights are already curtailed by the downstream senior call. Unless, of course, it is a *junior exchange* that is reducing the exchange potential to the senior exchange, then the junior exchange

69. Funk & Cavanaugh, *supra* note 2, at 208.

70. *Colo. Water Conservation Bd.*, 125 P.3d at 436 (describing stream reach of an exchange) (citing *City of Florence v. Bd. of Waterworks of Pueblo*, 793 P.2d 148, 149 (Colo. 1990)). See also *In re Water Rights of City & Cty. of Broomfield*, No. 04CW310, at *16, ¶53 (Colo. Water Ct. Div. No. 1 2009) (“The exchange reach is the stretch of a stream between the upstream exchange-to point and the downstream exchange-from point.”).

71. See Funk & Cavanaugh, *supra* note 2, at 213.

72. *Id.* at 214. The authors acknowledge that this argument is not effective if the junior water right is an instream flow right appropriated by the CWCB. In that case, by virtue of the General Assembly’s declaration that the CWCB’s instream flow rights reasonably protect the natural environment and cannot be curtailed, those rights are treated differently than other water rights.

73. *Colo. Water Conservation Bd.*, 125 P.3d at 442 n.4.

74. *Id.*

75. *City of Florence v. Bd. of Waterworks of Pueblo*, 793 P.2d 148, 150 n.4 (Colo. 1990).

76. *Id.*

77. For purposes of this article, “storage or direct flow water rights” are defined as water rights that divert water out of the stream directly for immediate beneficial use or for storage of water for subsequent use and both are capable of being curtailed.

must be curtailed.⁷⁸ Storage or direct flow water rights that are curtailed by the senior downstream call cannot be injured by the operation of a junior exchange. To the contrary, an instream flow right that cannot be curtailed, *can* be injured by operation of junior exchanges that reduce the flow to the instream flow reach by the nature of the type or right it is: a water right to protect the environment to a reasonable degree. Maybe someday the Supreme Court will come around to our theory and decide that exchange priorities are special; in the meantime, please consider exchange priority rights to be assigned vis-à-vis the stream system, just like all the other water rights.

IV. EMERGING ISSUES RELATED TO EXCHANGES

A. EXCHANGE POTENTIAL

The “amount of water available in the exchange reach prior to operation of the exchange is called the exchange potential.”⁷⁹ To satisfy the third critical element of an exchange, the proposed exchange must not divert more water than is available in the exchange reach.⁸⁰ Essentially, the lowest flow in the river between the proposed upstream diversion and the downstream introduction of the substitute supply must be determined. Otherwise, the exchange may dry up the river,⁸¹ trigger a senior call within the reach that would curtail the exchange, or injure senior in-stream flow rights within the reach.⁸² Evidence of the exchange potential is an element of proof in the adjudication of an exchange.⁸³

For example, Water User A wants to perform an exchange in reach A1 - A2. Water User A has the ability to introduce up to 100 cfs of a substitute supply. Water User B and C are water rights in the exchange reach that are senior to the downstream calling senior and the exchange. What is Water User A’s maximum exchange potential?

78. *City of Florence*, 793 P.2d at 150 n.4 (Colo. 1990) (finding that “Pueblo’s rights of exchange and substitution are appropriative water rights . . . and like other appropriative water rights will be exercised within the priority system, so that Pueblo’s rights of exchange and substitution are subject to the legitimate call of water rights senior to the priority of Pueblo’s rights of exchange and substitution, and are able to call out water rights junior to the priority of Pueblo’s rights of exchange and substitution all as decreed herein.”).

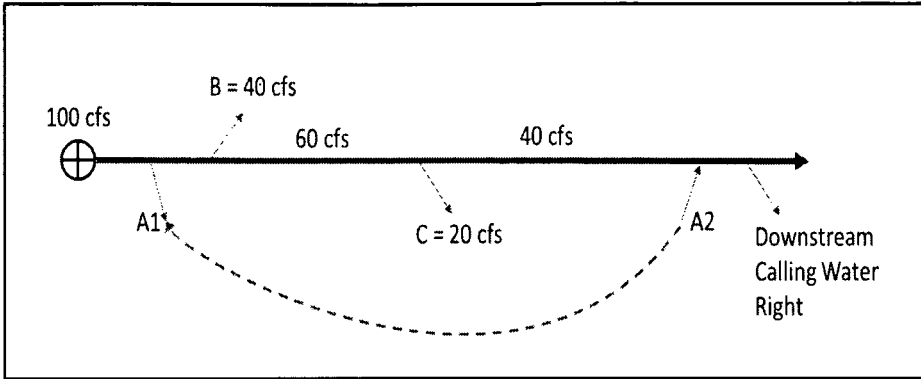
79. *In re Water Rights of City & Cty. of Broomfield*, No. 04CW310, at *16, ¶ 53 (Colo. Water Ct. Div. No. 1 2009).

80. *Id.* See also *Centennial Water & Sanitation Dist. v. City & Cty. of Broomfield*, 256 P.3d 677, 686 (Colo. 2011).

81. *Colo. Water Conservation Bd. v. City of Central*, 125 P.3d 424, 440 (Colo. 2005).

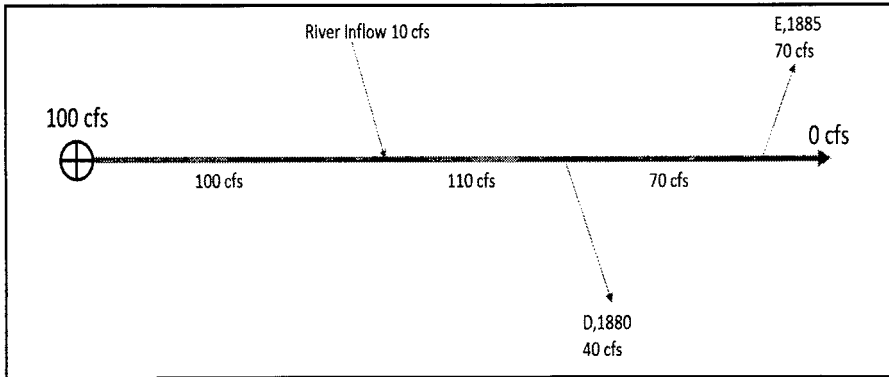
82. *Id.*

83. An element of proof of an appropriation is that water must be physically available to divert. *Bd. of Cty. Comm’rs of Arapahoe v. United States*, 891 P.2d 952, 962 (Colo. 1995) (“The applicant must prove, as a threshold requirement that water is available based upon river conditions existing at the time of the application, in priority, in sufficient quantities and on sufficiently frequent occasions, to enable the applicant to complete the appropriation with diligence and within a reasonable time.”).



In this example, the maximum amount Water User A may divert by exchange is 40 cfs. This would result in zero flow in the reach of the stream between Water User C and the point of introduction of the substitute supply at A2. However, if the decree, an in-stream flow right, or the state engineer requires a live stream in the reach to offset well pumping depletions, then some additional water must be left in the river.⁸⁴ The exchange potential is identified by the least amount of water in the river within the exchange reach on any given point in time. For our example, we will assume that there are no in-stream flow rights and no live stream is required. If Water User A diverted 45 cfs then only 15 cfs would be available for Water User C to divert. If Water User C is senior to the downstream calling water right and the exchange, Water User C would be injured and Water User A could not operate the exchange. If Water User C is junior to the downstream calling water right or the exchange then it is curtailed and is not injured under the operation of the priority system.

Okay, let's get more complicated:

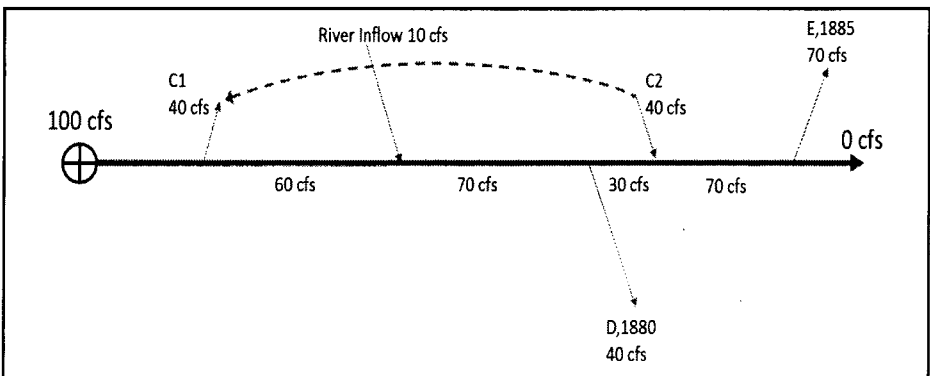


84. *In re Water Rights of City & Cty. of Broomfield*, No. 04CW310, at *17, ¶ 61 (Colo. Water Ct. Div. No. 1 2009) (“[A] dry-up point in the exchange reach can result in de-watering of the aquifer. When the aquifer is de-watered, more water than originally necessary to maintain a live stream may be necessary to recharge and create a live stream.”).

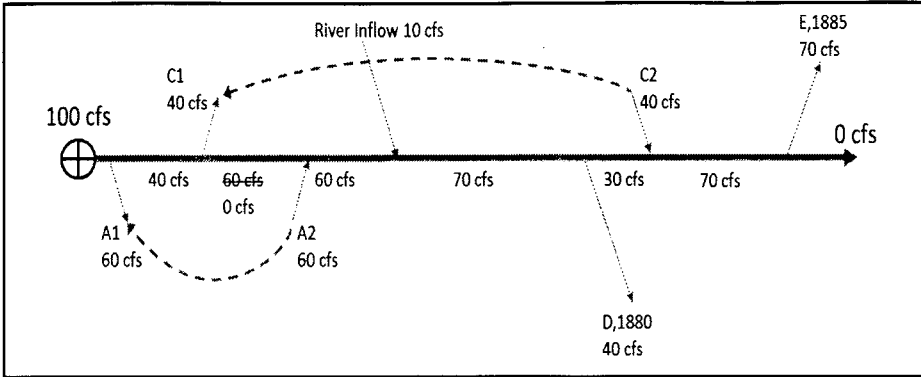
In this example, 100 cfs is the natural flow measured at the head of the stream reach. Ten cfs flows into the stream reach. Water User D is in priority and diverts 40 cfs. Water User E is the unsatisfied calling senior right with an 1885 priority and diverts 70 cfs leaving a dry up point below the headgate of Water User E. Before any exchanges are operated, the exchange potential in the stream reach above Water User E is 70 cfs.

Like direct flow and storage water rights, the ability to exchange is based upon its priority. For the following examples, let's assume that there are three water users that would like to make exchanges. Water User C has a 1970 priority for 40 cfs. Water User A has a 1984 priority for 70 cfs, and Water User B has a 2000 priority for 50 cfs.

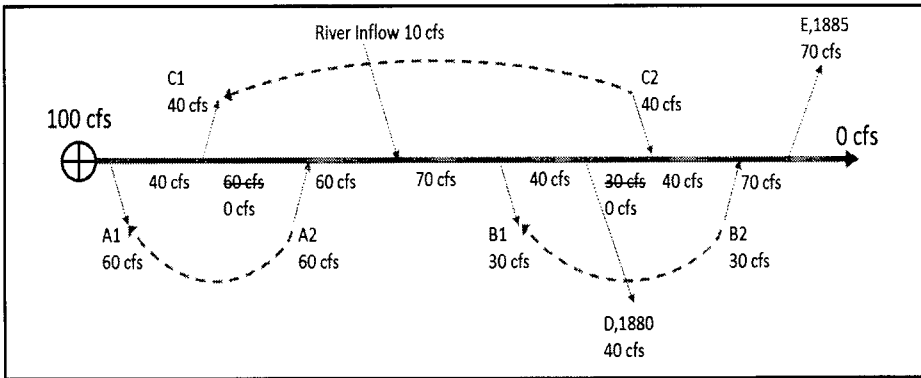
The State Engineer's Office would then administer the exchanges in order of their priorities. Water User C diverts 40 cfs upstream of the tributary inflow. The senior direct flow water right, Water User D, requires 40 cfs and the downstream calling water right, Water User E, requires 40 cfs. The senior direct flow water right is satisfied by a combination of tributary inflow and the natural flow that bypasses the headgate of Water User C. Water User C must provide a substitute supply of water upstream of the calling right.



Now Water User A wishes to operate an exchange under a 1984 priority from A2 - A1 at the rate of 70 cfs. However, the right of Water User C reduces the exchange potential available to Water User A to 60 cfs because insufficient inflow is available to meet the needs of both users. Further, Water User A must also place at least 30 cfs of substitute supplies upstream of the headgate of Water User D so that the combination of tributary inflow and the substitute supply satisfy the senior user. The remaining amount must be placed upstream of the headgate of Water User E. For simplicity, Water User A is assumed to have placed all substitute supplies upstream of the tributary inflow.



Finally, Water User B wishes to operate its exchange under a 2000 priority from B2 to B1. The decreed exchange rate is 50 cfs. However, inflow to this reach is 70 cfs and there is a demand for 40 cfs with the exchange reach by Water User D. Therefore, the exchange potential is reduced to 30 cfs. Water User B can exchange up to 30 cfs so long as the substitute supply is provided upstream of the headgate of Water User E. This illustrates how exchanges operate within the priority system and marks this issue as a potential area of conflict as exchangers seek to optimize their exchanges.



B. SUBSTITUTIONS

I Say Substitution - You Say Exchange - Let's call the whole thing off.⁸⁵ In 1969, the General Assembly enacted C.R.S. § 37-80-120.⁸⁶ In the legislation,

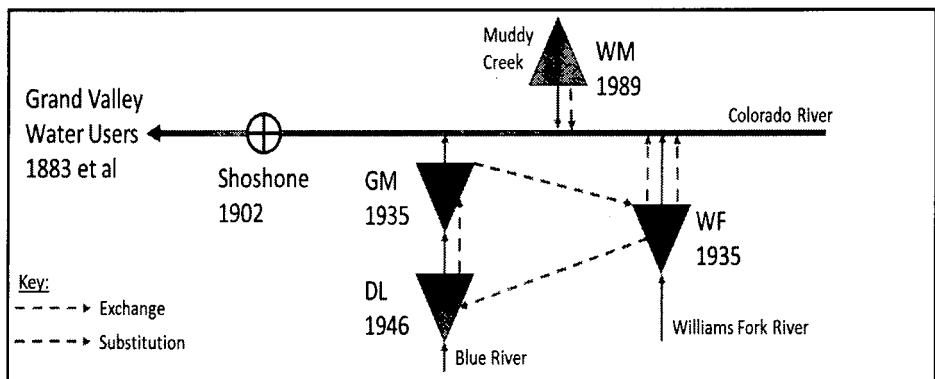
85. GEORGE GERSHWIN & IRA GERSHWIN, *Let's Call the Whole Thing Off, on SHALL WE DANCE & SWING TIME 1936-1937, VOL. 2* (Soundtrack 1976).

86. Act Concerning Water, and providing for the Administration and Regulation Thereof, ch 370, § 8, 1969 Colo. Sess. Laws 1192, 1196-97 (1969) (codified at COLO. REV. STAT. § 37-80-120(4) (2017)) ("Whenever substitute water is supplied to a senior ditch, the supplier or his assignee may take an equivalent amount for beneficial use from water of the state of Colorado to the fullest extent possible without impairing the availability of water lawfully divertible by others. A practice of substitution or exchange pursuant to law may constitute an appropriative right and may be adjudicated or otherwise evidenced as any other right of appropriation.").

Section 1 dealt with upstream out of priority storage.⁸⁷ Sections 2-4 dealt with substitution.⁸⁸ But what exactly is a substitution? Is it different than an exchange? Webster's defines an exchange as "the act or process of substituting one thing for another."⁸⁹ As a verb, "to exchange" means "to part with, give, or transfer to another in consideration of something received as an equivalent."⁹⁰ Webster's defines substitution as "the act, process, or result of substituting one thing for another."⁹¹ However, use of the same word to define that word is not particularly helpful. "Substitute" means "to put or use (someone or something) in place of someone or something else; to replace (one person or thing) with another," with "exchange" listed as one of the main synonyms.⁹² So according to Webster's, exchange can mean the act of substituting, and to substitute can mean to exchange. Tomato or Tomato.

Except as to quality, "water is fungible or is to be treated the same as a fungible article. The particles of water do not have to be identified as coming from Western Colorado, but rather water, whether or not contained in effluent, can be divided volumetrically."⁹³ Thus, like grain in a grain elevator, water can be substituted volumetrically through accounting procedures without tracking actual particles of water from one place to another.⁹⁴ This principle applies to substitutions.⁹⁵

The following diagram depicts an existing decreed substitution.⁹⁶



87. See COLO. REV. STAT. § 37-80-120(1) (2017).

88. See COLO. REV. STAT. § 37-80-120(2)-(4) (2017).

89. *Exchange*, Merriam-Webster, <https://www.merriam-webster.com/dictionary/exchange> (last visited Apr. 11, 2017).

90. *Id.*

91. *Substitution*, Merriam-Webster, <https://www.merriam-webster.com/dictionary/substitution> (last visited Apr. 11, 2017).

92. *Synonyms and Antonyms of Substitute*, Merriam-Webster, <https://www.merriam-webster.com/thesaurus/substitute> (last visited Apr. 30, 2017).

93. *City & Cty. of Denver v. Fulton Irrigating Ditch Co.*, 506 P.2d 144, 150 (Colo. 1972).

94. *Id.*

95. *Id.*

96. *In re Water Rights of Colo. River Water Conservation Dist. & City & Cty. of Denver*, No. 91CW252, at *2-7 (Colo. Water Ct. Div. No. 5 1996).

In this example, Dillon (“DL”) diverted 10,000 acre-feet out of priority against Green Mountain (“GM”) under the Blue River Decree.⁹⁷ GM does not physically fill by more than 10,000 acre-feet; thus, DL being junior to GM owes GM 10,000 acre-feet. Rather than release 10,000 acre-ft from DL to pay back GM, Denver Water releases water from Williams Fork Reservoir (“WF”) in substitution for the amount of water owed to GM, in times and amounts that GM would have made releases to the Grand Valley Water Users. Denver Water could also release water from Wolford Mountain Reservoir (“WM”) in substitution for the amount owed to Green Mountain Reservoir, or a combination of both WM and WF. Under section 37-92-120(3), the substitution received by the Grand Valley Water Users from either WF or WM must be in an equivalent amount and of suitable quality for the Grand Valley Water Users.⁹⁸

Generally, exchanges operate instantaneously.⁹⁹ Even though delivery of replacement water need not be simultaneous with the diversion of water in order to effectuate an exchange,¹⁰⁰ normally the replacement water is provided promptly in accordance with the state water official authority. In a substitution, the substitution can operate at any time—it does not need to operate in the same fashion as an exchange.¹⁰¹ Denver Water can also operate an ordinary exchange from WF to DL when GM is satisfied or out of priority from a senior call originating below the confluence of the Blue River with the Colorado River. Like augmentation plans, substitutions do not need a priority date; but under section 37-80-120(4) a substitution may be adjudicated as an appropriative right.¹⁰²

C. OXYMORON: FREE RIVER EXCHANGES

In the first element of an exchange, “the source of substitute supply must be introduced above the calling water right.”¹⁰³ The clear implication is that a call must be placed to trigger the operation of an exchange. However, in 2007, state water officials published an Administrative Protocol acknowledging the opportunity to operate exchanges during a time of no calls—a free river condition.¹⁰⁴ The Protocol was designed to address exchanges associated with plans for augmentation, but may also be used as a general guideline for the administration of all exchanges on the South Platte River.¹⁰⁵

97. See COLO. REV. STAT. §37-80-120(1) (2017). The state water officials also have authority to approve out-of-priority storage.

98. COLO. REV. STAT. § 37-80-120(3) (2017).

99. Centennial Water & Sanitation Dist. v. City & Cty. of Broomfield, 256 P.3d 677, 684 (Colo. 2011); but see *Englewood I*, 826 P.2d 1266, 1273 (Colo. 1992).

100. *Englewood I*, 826 P.2d at 1273.

101. See generally COLO. REV. STAT. § 37-80-120 (2017).

102. COLO. REV. STAT. § 37-80-120(4) (2017).

103. Empire Lodge Homeowners’ Ass’n v. Moyer, 39 P.3d 1139, 1155 (Colo. 2001).

104. COLO. DIV. OF WATER RES., ADMINISTRATION PROTOCOL: AUGMENTATION PLAN EXCHANGES DIVISION 1 – SOUTH PLATTE RIVER (revised December 1, 2007), http://water.state.co.us/DWRIPub/Documents/div1protocol_exchanges.pdf [hereinafter *Administration Protocol*].

105. *Id.*

A free river condition occurs when there is sufficient natural supply to satisfy all water uses, whether decreed or undecreed, and State Engineer administration is unnecessary for the protection of decreed water rights.¹⁰⁶ In the Administrative Protocol, the state water officials described the limitations applicable to operating an exchange during a free river using an exchange of reusable sources for use upstream:

[In the instance of no call or a free river below the exchange]:

No exchange may operate unless:

F1. The water commissioner has been given at least 48 hours and not more than 7 days advance notice of the intent to operate the exchange.

F2. The water commissioner determines there is sufficient exchange potential to operate the exchange.

F3. The water commissioner has current accounting and is able to verify that there are excess return flows reporting to the river.¹⁰⁷

The necessity of a downstream call was touched upon in Basic Exchange 101,¹⁰⁸ but now the state water officials have published a guideline acknowledging this oxymoronic operation.¹⁰⁹ If the Supreme Court adopts the water officials' position in this regard, the Court would also need to modify the first element of an exchange to remove the need for a calling right. Until that happens, we'll continue to consider a downstream call as a necessary part of an exchange.

D. EXCHANGE UNDER A BYPASS CALL

The concept of an exchange under a bypass call also implicates the first element of an exchange: the source of substitute supply must be above the calling water right.¹¹⁰ The issue here is: "What is the 'calling water right'?"

Administrative calls are the administrative mechanism by which the state water officials administer the river under the authority granted in section 37-92-502(2).¹¹¹ In discussing a "call," it is important to distinguish a water user calling for water from the "call" placed on the river for purposes of administering the river. A water user's request to the local state water official to provide it with more water than it is currently diverting is commonly referred to in local, Colorado water parlance as a "calling for water."¹¹² In such a situation, the water user

106. COLO. DIV. OF WATER RES., WRITTEN INSTRUCTION 2015-02: INSTRUCTION CONCERNING THE ADMINISTRATION OF DIVERSIONS OF WATER DURING FREE RIVER (Nov. 4, 2015), <http://dwrweblink.state.co.us/dwrweblink/ElectronicFile.aspx?docid=2815455&searchid=-0f42a537-14c3-430d-ba1c-fd9f5b390b19&&dbid=0> (last visited May 4, 2017).

107. *Administration Protocol*, *supra* note 104.

108. Funk & Cavanaugh, *supra* note 2, at 208.

109. *Administration Protocol*, *supra* note 104.

110. Funk & Cavanaugh, *supra* note 2, at 207; *Empire Lodge*, 39 P.3d at 1155.

111. See COLO. REV. STAT. § 37-92-502(2) (2017).

112. GUIDE TO COLORADO WELL PERMITS, WATER RIGHTS, AND WATER

asks state water officials to administer river diversions pursuant to the priority system and curtail upstream diversions junior in priority to the calling water user.¹¹³

On any given day, especially during times when stream flow is dropping, the state water official charged with administering a particular stream may receive several requests from water rights holders seeking to place a call on the river.¹¹⁴ Due to the physical water supply of the river, and the decreed diversion rates of the calling water rights, it may be challenging at times to administer the river in such a way as to deliver to each calling water right the amount of water they are requesting.¹¹⁵

The actual “call” placed on the river is an administrative decision by the state water official as to which senior water right is in priority and for whose benefit the river will be administered.¹¹⁶ For clarity of discussion in this section, the actual call on the river will be referred to as the “Call.” A Call has a several component parts – location, priority, time, and reach – all of which communicate to the general public and water users in real time the manner in which the river is being administered.¹¹⁷

The location of the Call communicates two vital pieces of information – the structure (headgate, reservoir, etc.) for which the state water official is administering the river and the most downstream point of the call reach.¹¹⁸ The priority of the Call identifies the priority date the state water officials use to administer the Call at the downstream location of the Call.¹¹⁹ A Call, once placed by the state water official, is effective upstream of the Call location immediately until it is released.¹²⁰ In real-time operations, the duration of the call is often unknown due to the fact that future day-to-day river conditions are constantly changing and the amount of time needed to fulfill the demand for water of the calling water right is also often unknown. The Call’s release date is recorded at the time the state water official stops administering that Call—either the Call is replaced by a different Call or the downstream senior can divert its desired amount of water without curtailing upstream junior water rights.¹²¹ Thus, at the time the Call is recorded, all water users upstream of the Call location and junior to the priority being administered must fully curtail their diversions unless they

ADMINISTRATION, COLO. DIV. OF WATER RES. 17, 18 (2012), <http://water.state.co.us/DWRI/Pub/Documents/wellpermitguide.pdf> [hereinafter COLORADO GUIDE].

113. *Id.* at 13, 18.

114. *Id.* at 17, 18.

115. *See id.* at 15.

116. *City of Englewood v. Burlington Ditch, Reservoir & Land Co.*, 235 P.3d 1061, 1069 (Colo. 2010) (A “call is placed on a river when a senior appropriator forces upstream juniors to let sufficient water flow to meet the requirements of the senior priority.”) (quoting *USI Props. E., Inc. v. Simpson*, 938 P.2d 168, 171 n.2 (Colo. 1997)).

117. *Colorado Decision Support Systems: Administrative Calls*, COLO. WATER CONSERVATION BD. & COLO. DIV. OF WATER RES., <http://www.dwr.state.co.us/CDSS/>. (last visited on Apr. 11, 2017) [hereinafter *CDSS Hydrobase*].

118. *Id.*

119. *Id.*

120. *See Funk & Cavanaugh*, *supra* note 2, at 214.

121. *See CDSS Hydrobase*, *supra* note 117.

are above the bounding structure, if any.¹²² The bounding structure is the most upstream point for which the call is administered; thus, the Call reach, or the stretch of the river affected by the Call, stretches from the Call location upstream to the bounding structure.¹²³ Often the Call is unbounded meaning there is no identified bounding structure in the Call record. In such situations, the Call's upstream terminus is the headwaters of the stream being administered, including the headwaters of any tributaries to the stream upstream of the Call location.¹²⁴

One type of Call is a bypass call – a discretionary, administrative mechanism used by state water administration officials to efficiently administer the river to ensure sufficient water is delivered to a senior call at a downstream location to meet its demand while allowing an upstream structure with a junior water right to divert some portion of its right.¹²⁵ As explained by the water court:

The division engineer uses bypass calls as an administrative tool to maximize diversions. A call may produce more water than the senior calling right requires. In such a situation, the division engineer employs a bypass call by which a water right junior to the senior calling right is selected. This is the bypass calling right. All upstream rights junior to the bypass calling right are curtailed. The bypass calling right is permitted to make some diversions while bypassing some water to the senior calling right that is fully satisfied. However, sometimes the bypass calling right receives no water. For administrative purposes, the location of the call is the downstream senior needing the water and the date of the call is that of the upstream junior.¹²⁶

To avoid waste and to maximize the use of water, state water officials apply a bypass call by taking the priority of an upstream junior ditch, which in effect gets moved to the headgate of the downstream senior diversion point for which the river is being administered.¹²⁷ This allows state water officials to provide the senior water right the water for which it is calling and allows the junior to partially divert, when the junior would otherwise be fully curtailed. This administration also causes the burden of curtailing diversions to be imposed on all users junior to and upstream of the structure where the call is being administered from, rather than just the upstream-junior. A bypass call is recorded in the call records as described above in the following way: The downstream senior diversion point is recorded as the location of the Call and the upstream junior's priority date is used to administer the Call.¹²⁸ However, the question remains: Is the location of the "calling water right" under the first critical element the structure associated with the upstream junior water right or the senior downstream structure at

122. See Funk & Cavanaugh, *supra* note 2, at 214.

123. *Calls History Data Dictionary*, Colo. DIV. OF WATER RES., https://www.dwr.state.co.us/CDSS/Documents?CIM_Dataset_CallHistory.pdf (last visited Apr. 11, 2017).

124. *Id.*

125. See *In re Well Augmentation Subdist. of the Cent. Colo. Water Conservancy Dist. & South Platte Well Users Ass'n*, No. 03CW99, at *64 (Colo. Water Ct. Div. No. 1 2007).

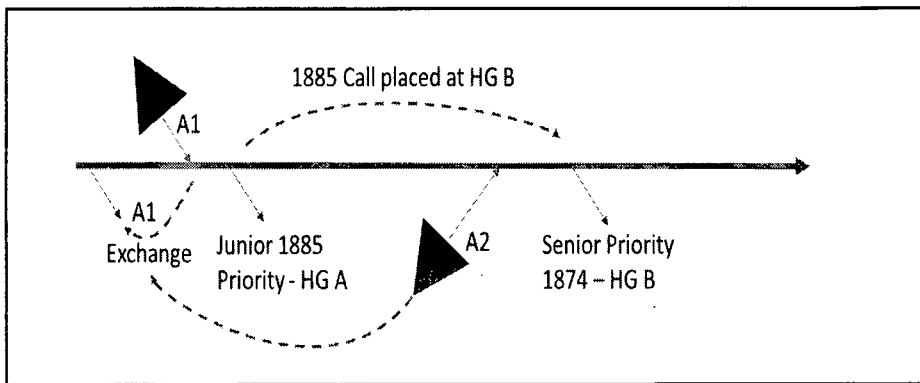
126. *Id.*

127. See *id.* at 40.

128. See *CDSS Hydrobase*, *supra* note 117.

the bottom of the call reach from which the junior water right’s priority is being administered?

For example, in the illustration below, if the 1874 water right is calling for water and the state water officials decide to administer a bypass call by putting the 1885 call on at Headgate B, where should the substitute supply be introduced: above Headgate A or Headgate B? In this example, the state water officials move the 1885 call down to Headgate B in order to pull down enough water to satisfy the 1874 priority. By placing the 1885 call down at Headgate B, the state water officials partially curtail Headgate A. While Headgate A may still divert a portion of the flow, it is required to bypass water in an amount as determined by state water officials in order to meet the water demands of Headgate B.



Although there is currently no precedential case law that “answers” this question, these authors rely on both historic practice by the State Engineer’s office and recent water court decisions to support the position that the substitute supply must be introduced above the location where the call is placed and not the bypassing structure. The operation of a bypass call does not alter the fundamentals of Colorado water law and no injury occurs to any other water users. It is the senior diverter’s call, and the senior diverter’s right that is at issue for the introduction of the substitute supply. The bypass call is simply an administrative tool used to minimize the curtailment of upstream junior rights when possible. This interpretation is also consistent with applicable statutes, including section 37-92-502(2)¹²⁹ and section 37-92-305(8)(c).¹³⁰

129. COLO. REV. STAT. § 37-92-502(2) (2017) (“Each division engineer . . . shall also order the total or partial discontinuance of any diversion in his division to the extent that the water being diverted is required by persons entitled to use water under water rights having senior priorities, but no such discontinuance shall be ordered unless the diversion is causing or will cause material injury to such water rights having senior priorities.”).

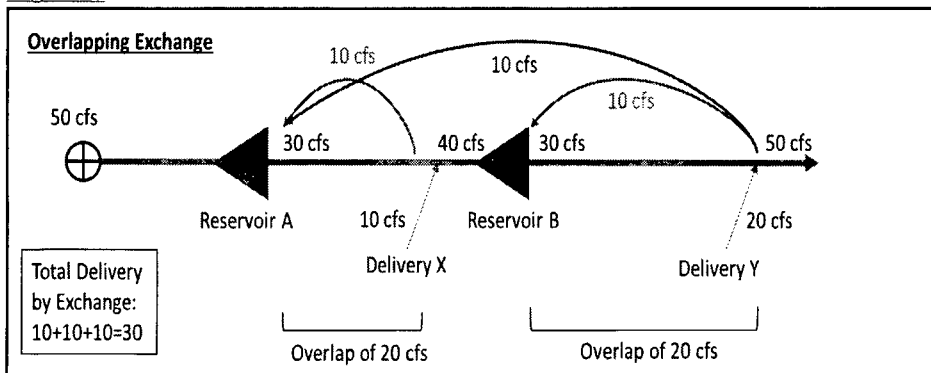
130. COLO. REV. STAT. § 37-92-305(8)(c) (2017) (requiring an applicant for a plan for augmentation to “provide replacement water necessary to meet the lawful requirements of a senior diverter at the time and location and to the extent the senior would be deprived of his or her lawful entitlement by the applicant’s diversion.”).

The authors' position was recently approved in a Water Division 1 decision,¹³¹ which analyzed the impact of several scenarios before concluding that in the case of a bypass call, water officials were appropriately administering the senior call from the place of diversion of the senior upstream water right.¹³² The State Engineer's office testified during trial that the "Division Engineer considers the amount of flow in the river where the call is made, and if a bypass call is necessary, the Division Engineer will determine the amount of water to be bypassed accordingly."¹³³ By administering the rights in this manner, "if there is less water flowing at the point of diversion of the senior calling right, more water must be bypassed upstream to meet the senior water user's needs. Conversely, if the stream flow is higher at the senior user's diversion point, less water needs to be bypassed to meet the senior user's right."¹³⁴ Therefore, the court concluded that there was no injury to the opposer's water rights caused by administering the senior call from the place of diversion of the senior upstream water right.¹³⁵

E. OVERLAPPING EXCHANGES

In a case involving Denver Water's senior exchange right decreed in C.A. 3635, Denver sought to make absolute exchanges within the same exchange reach, or an "overlapping" exchange reach.¹³⁶ An overlapping exchange reach occurs where multiple exchanges from different locations overlap the same portion of the river as shown in the example depicted in Figure 1 below. In this example, a total of 20 cfs is exchanged to Reservoir A from delivery points X and Y, and a total of 10 cfs is exchanged to Reservoir B from delivery point Y, with an overlap occurring in the reach below Reservoir A and above Delivery Point X, and in the reach between Reservoir B and Delivery Point Y.

Figure 1:



131. See Order, No. 08CW226 (Colo. Water Ct. Div. No. 1 2017)

132. *Id.* at *13.

133. *Id.*

134. *Id.*

135. *Id.* at *14.

136. *In re Water Rights of the City & Cty. Of Denver*, No. 08CW159, at *5 (Colo. Water Ct. Div. No. 1 2014)

In comparison, in Figure 2 below, there are no overlapping exchange reaches. An amount of 20 cfs is exchanged from Delivery Point Y to Reservoir B, and 20 cfs from Delivery Point X to Reservoir A.

Figure 2:

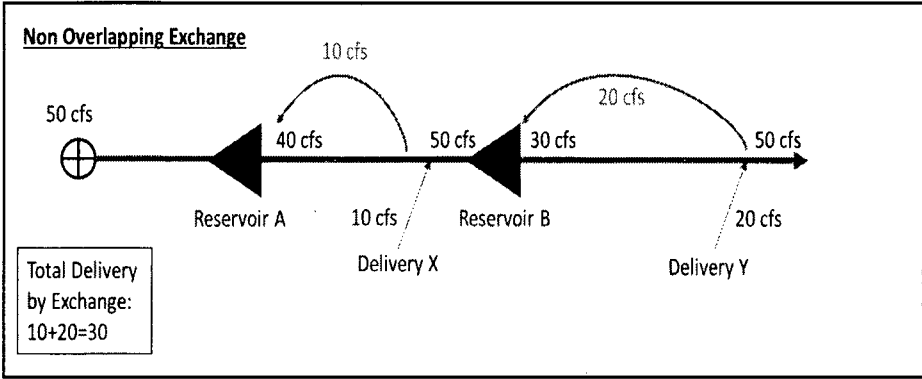
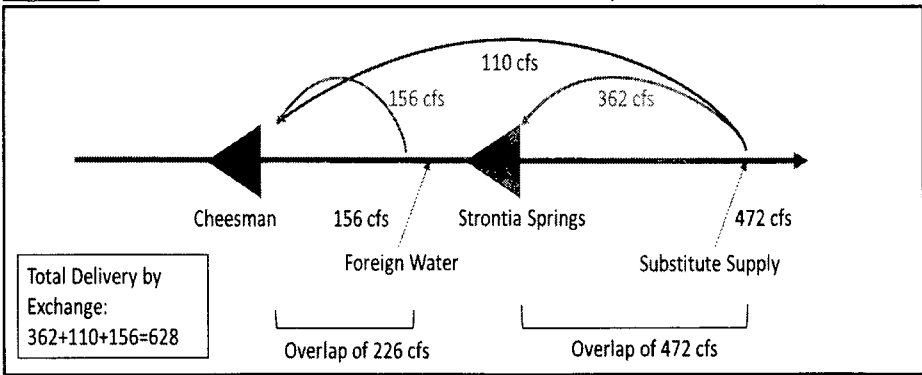


Figure 3 generally depicts the exchanges claimed absolute by Denver Water, which involved an overlapping exchange reach between the point of introduction of Roberts Tunnel water at the confluence of the North Fork and Cheesman Reservoir, and between Chatfield Reservoir and Strontia Springs Reservoir.

Figure 3:



The water court evaluated whether Denver Water, under the decree in C.A. 3635 could aggregate the amount of water exchanged from multiple points along the river, regardless of whether the exchanges overlap each other.¹³⁷ Denver Water argued that the entire stretch of river from Cheesman Reservoir down to the last location where substitute water was placed into the river was the exchange reach.¹³⁸ The opposing parties argued that two distinct exchanges

137. *Id.* at *3.
138. *Id.*

were operated and that Denver was limited to the exchange potential for each exchange reach.¹³⁹ Based upon language in the decree, the water court concluded that Denver Water was entitled to make the full amount claimed absolute based upon the aggregate amount exchanged.¹⁴⁰ As to Opposers' concern that Denver Water could claim 628 cfs at a single point of diversion in the future, the court said:

[T]he exchange potential of the river and the Applicant's ability to provide suitable substitute water above the calling right will undoubtedly determine whether the Applicant is able to exchange the full absolute amount from a single point of diversion. And [further] the administration of Applicant's exchange plan is tasked to the state and division engineers, who will be responsible for monitoring the exchange potential of the river and confirm the Applicant's ability to provide an equivalent substitute supply of water to ensure the downstream calling senior appropriators water right is not injured.¹⁴¹

Based on this decision, overlapping exchange reaches are an acceptable manner to make an exchange absolute.¹⁴²

F. EXCHANGE PROJECTIONS¹⁴³

A developing area in the adjudication of augmentation plans and exchanges is projection of a water user's ability to operate an exchange.¹⁴⁴ Projections of future available replacement water supplies are often part of augmentation plans decreed to cover the effects of delayed depletions to a stream, e.g., well pumping.¹⁴⁵ Well pumping of groundwater causes depletions to the stream that is hydraulically connected to the aquifer being pumped.¹⁴⁶ However, these depletions may not accrue to the river for months or years after the start of pumping.¹⁴⁷ Such lagged or delayed depletions present water users with a vexing problem – how much water they must have on hand at the start of pumping to meet future

139. *Id.* at *4.

140. *Id.* at *1, 6.

141. *Id.* at *6.

142. *See id.* at *1-2, 6.

143. Reprinted and adapted from CASEY S. FUNK, DANIEL J. ARNOLD, & JAMES M. WITTLER, COLORADO WATER LAW BENCHMARK ch.13 (2d ed. 2016).

144. *See, e.g., Findings of Fact, Conclusions of Law, Order and Judgment of the Water Court*, No. 12CW73 (Colo. Water Ct. Div. No. 1 2016) [hereinafter *Case No. 12CW73 Ruling*]; *Findings of Fact, Conclusions of Law, Judgment and Decree of the Water Court*, No. 12CW73 (Colo. Water Ct. Div. No. 1 2016) [hereinafter *Case No. 12CW73 Decree*]; *see also Findings of Fact, Conclusions of Law, Order and Judgment of the Water Court*, Nos. 02CW404 & 03CW442, at *71, ¶ 68.3.1 (Colo. Water Ct. Div. No. 1 2011).

145. *See, e.g., Findings of Fact, Conclusions of Law and Order of Court, in re Water Rights of Groves Farms & Riverview Farms, LLC*, No. 04CW81, at *40-44 (Colo. Water Ct. Div. No. 1 2014) [hereinafter *Groves Farm Order*]; *see also Findings of Fact, Conclusions of Law, Judgment and Decree of the Water Court*, No. 11CW306, at *49, ¶ 45.1 (Colo. Water Ct. Div. No. 1 2014) [hereinafter *10CW306 Decree*].

146. *See* PAUL M. BARLOW & STANLEY A. LEAKE, U.S. GEOLOGICAL SURVEY GROUNDWATER RES. PROGRAM, STREAMFLOW DEPLETION BY WELLS—UNDERSTANDING AND MANAGING THE EFFECTS OF GROUNDWATER PUMPING ON STREAMFLOW 11 (Circular 1376, 2012).

147. *See id.*

replacement obligations, and depending on this requirement, the size of the water storage facility needed to store the water. Projections of future replacement water supplies are presented to the water court or state engineer in the form of a projection tool to support the amount of water the applicant must keep on hand to cover delayed depletions.¹⁴⁸ “The purpose of a projection tool is to look at a worst-case scenario for water deliveries to ensure that the Applicants have sufficient replacement supplies to cover well depletions.”¹⁴⁹ Complexities in these projections arise when the augmentation plan’s source of replacement water is reliant on an exchange of water from a downstream exchange-from location to an upstream exchange-to location.¹⁵⁰ Consider the example of delivery by exchange of changed downstream agricultural water rights for replacement water use in an augmentation plan requiring delivery of replacement water above the historical diversion point of the changed water rights.¹⁵¹ In such a case, the projection tool’s projection of future replacement water quantities is subject to the water user’s future ability to operate its appropriative right of exchange.¹⁵² Thus, a water user is faced with two basic options: (1) project the amount of water that can be exchanged, or (2) wait to include the replacement supplies in the projection tool until the water has actually been exchanged above the historical diversion point of the changed rights and the augmentation plan’s decreed point of depletion.

Projecting the amount of water that can reliably be exchanged requires projecting the four elements of an exchange.¹⁵³ These elements take the form identified in the table below and lead to numerous interrelated considerations.¹⁵⁴ Because projection tools are designed to conservatively estimate future replacement supplies, the projected amount of exchangeable water must also be conservatively estimated.¹⁵⁵ This means that a water court may require a water user to quantify both the firm yield of the substitute supply and the exchange potential of the exchange reach.¹⁵⁶ Firm yield and exchange potential quantification necessitate identification of representative study periods for each.¹⁵⁷ While the two representative study periods may be identical, they also may not, depending on the substitute supply’s period of use, exchange’s period of use, exchange reach, history of administration for the exchange reach, etc.¹⁵⁸ Finally, a model, such as a point flow model, is necessary to assist in quantifying historical stream flow and accounting for calls, intervening rights, dry up points, etc.¹⁵⁹

148. *10CW306 Decree*, *supra* note 145, at *49, ¶ 45.1.

149. *Groves Farms Order*, *supra* note 145, at *42.

150. *See, e.g., 12CW73 Ruling*, *supra* note 144, at *3, 13-16.

151. *See id.*

152. *See id.*

153. *See id.* at *16-19; *Case No. 12CW73 Decree*, *supra* note 144 at *16, 19-23, 35, 38-42.

154. *See* Exchange Element Projection Table *infra* note 160.

155. *See Case No. 12CW73 Ruling*, *supra* note 144, at *16-18.

156. *See id.*

157. *See id.* at *7, 16.

158. *See id.* (The study period for quantification of the change irrigation water was 1950-2010. The period used in the point flow model to project stream flow was 1970-2014.).

159. *See id.* at *16.

Exchange Element Projection Table¹⁶⁰

Exchange Element	Projection Element	General Considerations
The source of substitute supply must be above the calling water right.	Project the calling right(s).	Identify the period of the call(s).
The substitute supply must be equivalent in amount and of suitable quality to the downstream senior appropriator.	Project the substitute supply's firm yield.	Identify a representative period of use of the substitute supply; Definition of the firm yield (identified by a dry year or some other measure of low yield); Possibility of firm yield reduction by some other physical or legal constraint (outlet capacity, augmentation station capacity, etc.).

160. See generally *Case No. 12CW73 Ruling*, *supra* note 144, at *16-19; *Case No. 12CW73 Decree*, *supra* note 144 at *16, 19-23, 35, 38-42.

<p>There must be available natural flow at the point of the upstream diversion.</p>	<p>Project available natural flow and exchange potential within the exchange reach.</p>	<p>Identify a representative period for the exchange reach; Availability and quality of the call record; Need for a hydrologic model (e.g., point flow model); Stream flow attributable to third party water deliveries, reusable water, or other non-appropriable flow; Intervening senior rights; Dry up points; Stream hydrology such as gaining and losing reaches.</p>
<p>The rights of others cannot be injured when implementing the exchange.</p>	<p>Project legal and physical constraints of operating the exchange.</p>	<p>Time, place, and amount limitations of source of substitute supply; Capacity in water structures at the exchange-to and exchange-from locations, including physical and legal limitations; Third party rights in water structures, including amount and time of use; Return flow obligations, if any, of the substitute supply; Relevant terms and conditions in the source of supply's underlying decree.</p>

V. CONCLUSION

Exchanges are still an integral part of Colorado water law, and they remain an important tool to maximize the beneficial use of water. Twenty intervening years have provided firm case law on some of the issues raised in *Basic Exchange 101*, but new issues take their place. As long as water users try to wrest more water out of over-appropriated water systems through exchange, we will continue to see new and creative arguments impacting exchange rights. Based upon the decisions since *Basic Exchange 101* was published, and to take into

account the emerging issues identified in this article, we suggest the following revisions to the critical elements of an exchange:

- (1) the source of substitute supply must be above the LOCATION FROM WHICH THE calling water right IS BEING ADMINISTERED;
- (2) the substitute supply must be equivalent in amount and of suitable quality to the downstream senior appropriator;
- (3) there must be available natural flow at the point of upstream diversion AND IN THE EXCHANGE REACH; and
- (4) the rights of others cannot be injured when implementing the exchange.

The change in the first element is to cover circumstances where the state water officials are administering a bypass call. The change in the third element is to recognize that the exchange potential includes available natural flow within the exchange reach and to acknowledge the change made by the Supreme Court in *Centennial Water*. With these modifications, we believe the critical elements of exchange are ready to withstand another twenty years.

UPDATE TO A SURVEY OF STATE INSTREAM FLOW PROGRAMS IN THE WESTERN UNITED STATES

CYNTHIA F. COVELL, WHITNEY PHILLIPS, AND ALYSON SCOTT

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I. INTRODUCTION

In 1998, when the *Survey of State Instream Flow Programs in the Western United States* was published in this journal, instream flow rights in most western states were fairly timid newcomers to the family of “beneficial uses” for which protectable water rights could be obtained. The concept of an enforceable right to maintain specified amounts of water in streams had been hard to accept: the West’s prior appropriation systems typically required diversion of water out of a stream, and its application to a long-accepted beneficial use, such as irrigation, mining, domestic or industrial. Instream flow programs were viewed with suspicion, if not downright hostility: they were perceived as constraining development and also as not easily quantified and subject to abuse. Instream flow water rights were therefore typically subject to more restrictions and limitations than other water rights, including other non-consumptive rights such as hydroelectric rights. Out of fear of losing instream flow programs entirely, many holders of instream flow rights were reluctant to enforce them. By 1998, therefore, most western states were just beginning to integrate instream water rights into their traditional priority systems in a meaningful way, even though some instream rights had been on the books for many

years.

In the past twenty years, states have gained more experience with instream flows. Some programs have matured considerably as instream water rights have taken their place in states' priority systems. Although instream flow rights have indeed influenced the development and change of traditional water rights, new consumptive rights continue to be developed, water rights changed, and the western states themselves continue to grow and develop. Instream flow rights for a variety of uses are now an accepted type of water right in most western states, and have been integrated into water administration. This survey update again looks at the instream flow programs in western states, and the developments in these programs during the past two decades.

A. IDAHO

In 1925 and 1927, Idaho's legislature declared that leaving water in lakes and streams for the purposes of scenic beauty, health, and recreation is a beneficial use of water.¹ The first minimum stream flows were appropriated in 1971.² The state developed its first Water Plan in 1976, which called for the establishment of minimum stream flows at three points on the Snake River, a significant river in its own right and the largest tributary to the Columbia River.³ In 1978, the legislature established a statutory program under which the Idaho Water Resources Board (the "Board") may file applications for minimum stream flows.⁴ In order to obtain a minimum stream flow right, the Board must prove that the right: 1) "is in the public interest," 2) "does not adversely affect senior water rights," 3) "represent[s] the minimum flow and not the desirable flow," and 4) can be maintained.⁵

While the Board is the entity that has statutory authority to request minimum flows and lake levels, other parties may petition the Board to make that request.⁶ The Board submits a request to the legislature, which then approves the submitted application by resolution. If the legislature fails to take action on an application before the end of that lawmaking session, the request is granted.⁷ Petitions requesting the Board to file applications for minimum flows or lake levels were submitted to the Board by the Idaho Fish and Game and Idaho Parks and Recreation, individual counties, a power company, and a fly fishing group.⁸ As of 2013, out of nearly three hundred applications submitted by the Board to the legislature, only four applications were denied or rejected — one requested by the Board, one requested by the Idaho Department of Fish and Game, another requested by a county, and one requested by a

1. IDAHO WATER RES. BD., IDAHO STATE WATER PLAN 27 (2012), <https://www.idwr.idaho.gov/files/board/2012-State-Water-Plan.pdf>

2. *Id.*

3. NAT'L WILD AND SCENIC RIVERS SYS., *Snake River*, <https://www.rivers.gov/rivers/snake.php> (last visited Mar. 25, 2017).

4. IDAHO CODE § 42-1503 (2016).

5. IDAHO WATER RES. BD., *Minimum Streamflows*, https://www.idwr.idaho.gov/water-board/WaterPlanning/Minimum%20Stream%20Flow/minimum_stream_flow.htm (last visited March 26, 2017).

6. IDAHO CODE § 42-1504.

7. *Id.* § 42-1503.

8. IDAHO WATER RES. BD., *supra* note 5.

private lake association.⁹

As of 2013, the Board held 294 minimum stream flow and minimum lake level rights, protecting about 994 miles of streams — about two percent of the total stream miles in the state.¹⁰ The legislature itself also established a minimum stream flow right for 7.5 miles on the Lemhi River through a bill passed in 2001.¹¹ However, the majority of minimum flow rights, 205 to be exact, were established through an agreement between the United States and the Nez Perce Tribe as part of the Snake River Basin Adjudication.¹² That agreement provides for the Board to establish and hold instream flow rights for “streams of importance to the Nez Pearce Tribe.”¹³ The Board will also hold decrees for minimum flows on the Snake River.¹⁴

Idaho’s water rights allocation regime does not allow water rights holders to permanently transfer their rights to minimum stream flow.¹⁵ However, the state is experimenting with alternative transfer mechanisms in certain watersheds to allow water rights holders to temporarily dedicate their right to the stream, without being penalized for doing so. The state’s most recent Water Plan, promulgated in 2012, outlines “a suite of water supply acquisition tools [for instream flow protection] including short and long-term leases, permanent purchases, partial season leases, diversion reduction agreements, and water use efficiency measures, all of which are market-based and voluntary.”¹⁶

B. OREGON

Oregon’s history of protecting its streams dates back to the 1920s, when the state protected certain scenic streams from further appropriation.¹⁷ In 1955, the state enacted legislation to maintain minimum stream flows through

9. Idaho Water Res. Bd., *Minimum Stream Flow and Minimum Lake Level Summary 2013* 11 (2013), <https://www.idwr.idaho.gov/files/iwr/b/2013/2013-minimum-stream-flow-and-minimum-lake-level-summary.pdf>

10. Idaho Water Res. Bd., *Idaho Minimum Stream Flow Program 1* (2013), https://www.idwr.idaho.gov/waterboard/WaterPlanning/Minimum%20Stream%20Flow/PDFs/MSF_Brochure.pdf.

11. *Id.* at 3.

12. Idaho Dep’t of Water Res., *Agreement Summary 1*, 3 (2004), http://www.idwr.idaho.gov/waterboard/WaterPlanning/nezperce/pdf_files/agreement_summary.pdf

13. STATE OF IDAHO, *AGREEMENT SUMMARY* (2004), http://www.idwr.idaho.gov/waterboard/WaterPlanning/nezperce/pdf_files/agreement_summary.pdf (noting that there is insufficient water supply to meet this minimum stream flow requirement, the state established the “Idaho Water Transaction Program, which utilizes Idaho’s existing Water Bank and local rental pools to purchase water, create agreements not to divert, conduct source switches, and implement other water saving techniques that put more water in stream for listed aquatic species.”); Adell L. Amos & Christopher R. Swensen, *Evaluating Instream Flow Programs: Innovative Approaches and Persistent Challenges in the Western United States*, 61 *ROCKY MTN. MIN. L. INST.* 22-1, 22-20-22-21 (2015).

14. State of Idaho, *Agreement Summary* (2004), http://www.idwr.idaho.gov/waterboard/WaterPlanning/nezperce/pdf_files/agreement_summary.pdf.

15. Szeptycki et al., *Environmental Water Rights Transfers: A Review of State Laws*, *WATER IN THE WEST* 1, 18 (2015) <http://waterinthewest.stanford.edu/sites/default/files/WITW-WaterRightsLawReview-2015-FINAL.pdf>.

16. IDAHO WATER RES. BD., *THE STATE WATER PLAN 73* (2012), <https://www.idwr.idaho.gov/files/board/2012-State-Water-Plan.pdf>.

17. Joseph Q. Kaufman, *An Analysis of Developing Instream Water Rights in Oregon*, 28 *WILLAMETTE L. REV.* 285, 285 (1992).

an administrative process.¹⁸ Under that law, the Department of Environmental Quality and the Department of Fish and Wildlife could apply for minimum perennial stream flows, and the Water Resources Commission had the authority to establish new minimum stream flows or modify existing ones.¹⁹

In 1987, the state enacted an instream water rights statute under which the Department of Fish and Wildlife, the Department of Environmental Quality, and the State Parks and Recreation Department may petition the Water Resources Commission for instream flow rights.²⁰ If a petition is granted, the Water Resources Department holds the right as trustee.²¹ As of 2015, more than 500 of the minimum stream flows established pursuant to the 1955 law have been converted to instream flow rights thereby providing a mechanism for the enforcement of those rights.²² The Commission has issued more than 900 instream flow rights requested by state agencies.²³

Additionally, any water right holder may convert or lease an existing water right for instream flow purposes, and that instream flow right will carry with it the priority date of the original water right.²⁴ Leases are limited to five-year periods, but they may be renewed an unlimited number of times.²⁵ The state has also authorized split-season leases, where a holder may use a water right for a portion of the year and dedicate the same water right for instream flow purposes the rest of the year.²⁶ The split-season use is currently subject to a sunset provision effective in 2024.²⁷

New instream flow rights are considered subordinate to certain water rights, including those for “multipurpose storage or municipal uses,” those held by a municipality, and those dedicated to hydroelectric projects.²⁸ However, that subordination does not apply to instream flow rights converted from minimum perennial flows, nor does it apply when an existing water right is converted or leased, permanently or temporarily, to an instream flow use.²⁹

The state is also utilizing an innovative water conservation program to keep water in the stream.³⁰ Under the Allocation of Conserved Water Program, the state provides a portion of the funding for irrigation improvements that conserve water.³¹ In exchange, at least twenty-five percent of the con-

18. Cynthia F. Covell, *A Survey of State Instream Flow Programs in the Western United States*, 1 U. DENV. WATER L. REV. 177, 180–81 (1998).

19. *Id.*

20. OR. REV. STAT. § 537.336 (2016).

21. *Id.* § 537.341.

22. OREGON WATER RES. DEP'T, 2015 INSTREAM ACCOMPLISHMENTS <http://www.oregon.gov/owrd/WR/docs/2015%20Instream%20Accomplishments-final-7-28-2016.pdf>; http://arcweb.sos.state.or.us/pages/rules/oars_600/oar_690/690_077.html.

23. *Id.*

24. OR. REV. STAT. § 537.348(1) (2016).

25. *Id.* § 537.348(2).

26. *Id.*

27. *Id.* § 537.348.

28. *Id.* § 537.352.

29. *Id.* § 537.348; *id.* § 537.352.

30. OREGON WATER RES. DEP'T, ALLOCATION OF CONSERVED WATER, http://www.oregon.gov/owrd/pages/mgmt_conserved_water.aspx.

31. OREGON WATER RES. DEP'T, ALLOCATION OF CONSERVED WATER, 2015–2017 GENERAL FUND GRANTS ALLOCATION PLAN (2015), <https://www.oregon.gov/LCD/docs/grants/>

served water must be allocated to the state for instream flow purposes.³² The state's portion of the conserved water may be higher if the state or federal government provided more than twenty-five percent of the funding for the project or if the water user allocates more to the state for instream use.³³ As of 2015, the Water Resources Department had approved sixty-eight applications under that program, resulting in 366 cubic feet per second ("cfs") allocated for instream flow.³⁴

C. WASHINGTON

Like Idaho and Oregon, Washington has a long history of protecting its state water sources.³⁵ The state adopted its first instream flow protection legislation in 1949, by enacting a statute recognizing that a water right could be denied if it would decrease flow needed to support fish populations.³⁶ Its 1971 Water Resources Act recognized that beneficial use of water includes recreational, piscatorial, wildlife, and environmental uses.³⁷ Thus, anyone may obtain water rights for instream flow purposes, and water users may lease or transfer existing water rights to instream flow.³⁸

Additionally, the Minimum Water Flows and Levels Act of 1967 tasked the Department of Ecology with promulgating rules to establish minimum stream flows in the state's watersheds.³⁹ However, Ecology is permitted to grant withdrawals of water that conflict with minimum stream flow rules "where it is clear that overriding considerations of the public interest ["OCPI"] will be served."⁴⁰ Ecology has made several attempts to broadly construe that "OCPI" exception, at one point establishing a three-step test that ultimately allowed "reservations" for new agricultural, residential, and commercial uses even though they conflicted with minimum stream flows.⁴¹ However, the Washington Supreme Court ruled against Ecology's broad interpretation of the OCPI exception in two recent cases. In 2013, the Court stated that the exception is a very narrow one and that the statute "requires extraordinary circumstances before the minimum flow water right can be impaired."⁴² The Court rejected Ecology's interpretation of the OCPI exception again in 2015, reversing the department's approval of a municipality's water right that would permanently impair minimum stream flows.⁴³

2015-17_GrantsAllocationPlan_LCDC_final.pdf.

32. *Id.*

33. OREGON WATER RES. DEP'T, *supra* note 30.

34. OREGON WATER RES. DEP'T, *supra* note 22.

35. Covell, *supra* note 18.

36. *Id.*

37. Haylee J. Hurst, *Changing Course: Revisiting Instream Flow Rulemaking in Washington State Following Swinomish v. Ecology*, 90 WASH. L. REV. 1901, 1910-11 (2015).

38. Amos & Swensen, *supra* note 13, at 22-5, 22-6.

39. WASHINGTON DEP'T OF ECOLOGY, INSTREAM FLOW LAWS AND RULES, <http://www.ecy.wa.gov/programs/wr/instream-flows/isfrul.html> (last visited Mar. 21, 2017).

40. WASH. ADMIN. CODE 173-501-020 (1988).

41. *See Swinomish Indian Tribal Cmty. v. Washington State Dept. of Ecology*, 311 P.3d 6, 11-12 (Wash. 2013).

42. *Id.* at 8.

43. *Foster v. Washington State Dep't of Ecology*, 362 P.3d 959, 962 (Wash. 2015).

In addition to its statutory scheme, Washington developed two programs in the early 2000s, the Water Acquisition Program and the Irrigation Efficiencies Program, both of which aim to help replenish salmon populations in sixteen watersheds by encouraging water users to dedicate portions of their existing water rights to instream flow.⁴⁴ Under the Water Acquisition Program, Ecology buys and leases water rights to improve stream flow in ESA listed streams.⁴⁵ Water leased or temporarily donated to Ecology is not subject to relinquishment, although water rights that are temporarily “parked” in donation require proof of use within the previous five years.⁴⁶ The state goes through the process of changing that water right to an instream right, permanently or temporarily, and then holds that leased water in trust.⁴⁷

The state’s Irrigation Efficiencies Program is similar to Oregon’s Allocation of Conserved Water Program in that it allows the state to provide funding for more efficient irrigation systems.⁴⁸ However, under Washington’s program, the entire amount of conserved water is converted for instream flow.⁴⁹ As of 2015, the state had completed sixty-two irrigation efficiency projects, which resulted in 66 cfs converted to instream flow.⁵⁰

D. MONTANA

Montana first began protecting instream flows in 1969 through legislation that directed the Fish and Game Commission to file for water rights “to maintain stream flows necessary for the preservation of fish and wildlife habitat.”⁵¹ That law was repealed in 1972,⁵² but those water rights, dubbed Murphy Rights in honor of the bill’s sponsor, protect minimum stream flows on twelve streams.⁵³

The state’s current system for protecting instream flows is much more diverse. The state’s regime includes: 1) a statutorily designated reservations program through which government agencies may reserve water for stream level or lake level protection; 2) private water-leasing agreements; 3) utilizing water stored in federal storage projects to augment stream flows; and 4) judicial determinations upholding instream flow water rights that predate the

44. WASHINGTON DEP’T OF ECOLOGY, WATER ACQUISITION, <http://www.ecy.wa.gov/programs/wr/instream-flows/wacq.html> (last visited Mar. 21, 2017); WASHINGTON STATE CONSERVATION COMM’N, IRRIGATION EFFICIENCIES GRANT PROGRAM, <http://scc.wa.gov/iegp/> (last visited Mar. 21, 2017).

45. WASHINGTON DEP’T OF ECOLOGY, *supra* note 44.

46. Water Resources Program Guidance, 23 <https://fortress.wa.gov/ecy/wrx/wrx/fsvr/cylcyfsvrxfile/WaterRights/wrwebpdf/guid1220.pdf>.

47. *Id.*

48. WASHINGTON STATE CONSERVATION COMM’N, *supra* note 44.

49. *Id.*

50. *Id.*

51. MONTANA FISH, WILDLIFE & PARKS, INSTREAM FLOW, <http://fwp.mt.gov/fishAndWildlife/habitat/fish/waterManagement/instreamFlows.html> (last visited Mar. 21, 2017); MONTANA FISH, WILDLIFE & PARKS, MURPHY WATER RIGHTS, <http://fwp.mt.gov/fishAndWildlife/habitat/fish/waterManagement/murphyWaterRights.html> (last visited Mar. 21, 2017).

52. Amos & Swensen, *supra* note 13, at 22-22 n. 138.

53. MONTANA FISH, WILDLIFE & PARKS, MURPHY WATER RIGHTS, <http://fwp.mt.gov/fishAndWildlife/habitat/fish/waterManagement/murphyWaterRights.html> (last visited Mar. 21, 2017).

state's 1973 Water Use Act.⁵⁴

The most common form of instream protection in the state is the water reservation.⁵⁵ Under the applicable statute,⁵⁶ any state or federal agency may reserve water to protect stream flow, lake levels, or water quality.⁵⁷ No agency may reserve more than fifty percent of the stream's average annual flow.⁵⁸ To date, the state's department of Fish, Wildlife & Parks, the Montana Department of Environmental Quality, and the U.S. Bureau of Land Management have applied for and/or established more than 700 reservations for minimum flows.⁵⁹ While other forms of reservation are subject to review every ten years, the legislature amended the statute in 2015⁶⁰ to specifically prevent reservations for "maintaining a minimum flow, level, or quality of water" from being revoked or diminished.⁶¹

A statute also authorizes the state Department of Fish, Wildlife, and Parks to lease water for instream flow purposes.⁶² Each right may be leased for as long as ten years, but those leases may be renewed an unlimited number of times.⁶³ Moreover, "a lease of water made available from the development of a water conservation or storage project" may last for up to thirty years.⁶⁴ Each proposed lease must go through an administrative and public review before the Montana Department of Natural Resources and Conservation.⁶⁵ The same statute authorizes only the Department of Fish, Wildlife, and Parks to permanently convert a water right to instream flow.⁶⁶

Montana is currently in the middle of a statewide adjudication, authorized by the 1973 Act to determine pre-1973 water rights, which include state-held rights for recreational purposes.⁶⁷ The Montana Supreme Court, in its *Bean Lake* decisions, has issued two important opinions related to how instream flow rights may be adjudicated in this process. First, the Court held that instream flow rights are not limited only to recreational rights.⁶⁸ Second, it held that the state is not the only party that may go before a water court to adjudicate an instream flow right.⁶⁹

E. ALASKA

Alaska has developed one of the more robust statutory instream flow pro-

54. MONTANA FISH, WILDLIFE & PARKS, INSTREAM FLOW, <http://fwp.mt.gov/fishAndWildlife/habitat/fish/waterManagement/instreamFlows.html> (last visited Mar. 21, 2017).

55. Amos & Swensen, *supra* note 13.

56. MONT. CODE ANN. § 85-2-316 (2016).

57. *Id.*

58. *Id.*

59. Amos & Swensen, *supra* note 13, at 22-23.

60. MT LEGIS 281 (2015), 2015 Montana Laws Ch. 281 (S.B. 330)

61. MONT. CODE ANN. § 85-2-316(6).

62. *Id.* § 85-2-436(1).

63. *Id.* § 85-2-436(3)(e).

64. *Id.*

65. *Id.* § 85-2-436(3)(a)-(b).

66. *Id.* § 85-2-436(6)(a).

67. Amos & Swensen, *supra* note 13, at 22-26.

68. *Id.*

69. *Id.*

grams.⁷⁰ Under its broad statute, enacted in 1980, any state agency, any federal agency, or any individual may:

reserve sufficient water to maintain a specified instream flow or level of water at a specified point on a stream or body of water, or in a specified part of a stream, throughout a year or for specified times, for (1) protection of fish and wildlife habitat, migration, and propagation; (2) recreation and park purposes; (3) navigation and transportation purposes; and (4) sanitary and water quality purposes.⁷¹

An applicant must prove that:

(1) the rights of prior appropriators will not be affected by the reservation; (2) the applicant has demonstrated that a need exists for the reservation; (3) there is unappropriated water in the stream or body of water sufficient for the reservation; and (4) the proposed reservation is in the public interest.⁷²

The instream flow statute also requires that the Department of Natural Resources review instream flow reservations every ten years to determine whether they continue to meet the above criteria.⁷³

While such a broad statute allowing anyone to hold an instream flow reservation seems ideal, the state's Department of Natural Resources has stated it does not have the funding to process all applications, leading to a backlog of applications before the Department of Natural Resources.⁷⁴ As of 2015, the Alaska Department of Fish and Game alone had filed for reservations on 265 river reaches and four lakes.⁷⁵ The DNR has approved less than half of the Department's applications.⁷⁶ In 2002, the DNR and Department of Fish and Game formulated a Memorandum of Understanding in hopes of reducing the backlog of applications.⁷⁷ While that agreement has seemed to speed up the process for that department's applications, the DNR is still unable to efficiently process requests from private applicants.⁷⁸

F. CALIFORNIA

While California still requires diversion for establishing a new water right and does not include an instream flow concept within the definition of a "diversion," state legislation does allow the transfer of an existing right for instream flow purposes.⁷⁹ Any water right holder may change an existing right "for purposes of preserving or enhancing wetlands habitat, fish and wildlife re-

70. Covell, *supra* note 18.

71. ALASKA STAT. ANN. § 46.15.145(a) (2017).

72. *Id.* § 46.15.145(c).

73. *Id.* § 46.15.145(f).

74. Amos & Swensen, *supra* note 13, at 22-28.

75. ALASKA DEPARTMENT OF FISH AND GAME, INSTREAM FLOW PROTECTION IN ALASKA, No. 16-09, 5 (2015) <http://www.arlis.org/docs/vol1/K/951782475.pdf>.

76. Amos & Swensen, *supra* note 13, at 22-7-22-8.

77. *Id.*

78. *Id.*

79. CAL. WATER CODE § 1707(b) (2017).

sources, or recreation in, or on, the water.”⁸⁰ Thus far, that statute has been utilized sparingly, as the State Water Board has processed fewer than 40 petitions for transfers.⁸¹

The state also allows changes of existing rights to split-season instream flow rights, and the water right holder does not risk abandoning or forfeiting the water right he or she dedicates to that use.⁸²

The state’s Fish and Game Code also provides for flow protection for fisheries.⁸³ The Department of Fish and Wildlife is currently tasked with “identify[ing] and list[ing] those streams and watercourses throughout the state for which minimum flow levels need to be established in order to assure the continued viability of stream-related fish and wildlife resources.” As of 2015, the department identified twenty-two streams and the necessary flows to maintain them.⁸⁴

G. COLORADO

Colorado’s statutory regime for replenishing and protecting streams changed a great deal over the last few decades, and the state has focused on developing innovative rules and programs. For a detailed discussion of the state’s evolving and robust toolbox for keeping water in natural streams, see Zach Smith, *Making Colorado’s Rivers a (Senior) Priority*, 20 U. Denv. Water L. Rev. 369 (2017).

H. WYOMING

A Wyoming statute limits instream flow appropriation to the purpose of establishing or maintaining fisheries.⁸⁵ Only the State of Wyoming may hold an instream flow right for the minimum amount necessary to establish or maintain the fishery.⁸⁶ The statute requires a complex analysis for deciding where and how much water to appropriate.⁸⁷ The state currently holds 121 instream flow rights, covering 466 miles of stream.⁸⁸

Over the last two decades, the legislature rejected many attempts to allow instream flows for other uses.⁸⁹ The legislature also rejected attempts to allow water right holders to temporarily dedicate water to instream flow purposes.⁹⁰

Currently pending legislation would allow any person to acquire a water

80. *Id.* § 1707(a); *A Practitioner’s Guide to Instream Flow Transactions in California*, California’s Small Watershed Instream Flow Transfers Working Group, https://s3.amazonaws.com/american-rivers-website/wp-content/uploads/2016/11/21092958/A-Practitioners-Guide-to-Instream-Flow-in-CA_March2016.pdf.

81. Amos & Swensen, *supra* note 13, at 22-8.

82. *Id.*

83. *Id.*

84. *Id.*

85. WYO. STAT. ANN. § 41-3-1002.

86. *Id.* § 41-3-1006.

87. *Id.* § 41-3-1002.

88. Wyoming State Engineer’s Office, *Instream Flow Filings*, <http://seo.wyo.gov/surface-water/instream-flow> (instream flow spreadsheet).

89. Reed D. Benson, “Adequate Progress” or Rivers Left Behind? *Developments in Colorado and Wyoming Instream Flow Laws Since 2000*, 36 ENVTL. L. 1283, 1297-98 (2006).

90. *Id.*

right temporarily for instream flow purposes.⁹¹

I. KANSAS

By 1980, Kansas lawmakers saw the need to protect the state's vulnerable streams and rivers.⁹² To that end, the legislature enacted a minimum desirable streamflow law, which provided that, "whenever the legislature enacts legislation establishing a minimum desirable streamflow for any watercourse in the state, the chief engineer shall withhold from appropriation that amount of water deemed necessary to establish and maintain for the identified watercourse the desired minimum streamflow."⁹³ By codifying the goals of the minimum desirable streamflow program, the legislature sought to, "preserve, maintain or enhance baseflows for in-stream water uses relative to water quality, fish, wildlife, aquatic life, recreation, general aesthetics and domestic uses and for the protection of existing water rights."⁹⁴ The legislature updated the Kansas Water Appropriation Act in 1984 to include the first four streams protected by the minimum desirable streamflow law.⁹⁵ The Act was subsequently amended in 1985,⁹⁶ 1987, and 1989 to include a total of twenty-three applicable rivers and streams.⁹⁷

In Kansas, minimum desirable streamflows are administered by withholding quantities of water from appropriation rather than granting instream flow water rights.⁹⁸ The rivers and streams to which minimum desirable streamflows apply must be designated by the legislature,⁹⁹ and the process for establishing the minimum desirable stream flow involves negotiations between various water agencies for the State of Kansas.¹⁰⁰ For the purpose of minimum desirable streamflows, junior water right holders are those whose water rights were appropriated after April 12, 1984.¹⁰¹ If average daily streamflow identified at a gaging station falls below the established minimum desirable streamflow threshold set by the legislature for a particular river or stream for seven consecutive days, the Chief Engineer must determine whether to curtail use by junior water right holders.¹⁰² Due to unique circumstances in the Lower Republican River, there is an additional criterion for the administration of mini-

91. H.B. 264, 64th Leg., Gen. Sess. (Wyo. 2017).

92. John C. Peck & Doris K. Nagel, *Legal Aspects of Kansas Water Resource Planning*, 37 U. KAN. L. REV. 199, 217 (1988).

93. KAN. STAT. ANN. § 82a-703a.

94. *Id.* § 82a-928(i).

95. Act approved Apr. 6, 1984, ch. 376, § 1, 1984 Kan. Sess. Laws 1809 (setting minimum desirable streamflows for the following rivers and streams: Marais de Cygnes, Neosho, Cottonwood, and Little Arkansas).

96. 1985 Kan. Sess. Laws 1446, ch. 338, § 1 (setting minimum desirable streamflows for the following rivers and streams: Saline River, Smoky Hill River, Medicine Lodge River, Chikaskia River, Big Blue River, Little Blue River, Republican River, Mill Creek, and Delaware River) (codified as amended at KAN. STAT. ANN. § 82a-703a (2017)).

97. KAN. STAT. ANN. § 82a-703(a-c) (2017).

98. Peck & Nagel, *supra* note 92, at 220.

99. *Id.*

100. Covell, *supra* note 18, at 186.

101. *Id.*

102. KAN. STAT. ANN. § 82a-703(a-c).

most desirable streamflows on that river.¹⁰³ The additional criterion provides that the average daily streamflow must fall below 150 percent of the established monthly minimum streamflow criteria for sixty consecutive days.¹⁰⁴

J. NEBRASKA

Likely due to the state's agricultural background, instream flow rights have been a contentious topic in Nebraska. The state passed legislation in 1984 which explicitly recognizes protection of fish, wildlife, and recreation as beneficial uses of water.¹⁰⁵ Only the Game and Parks Commission, a natural resources district, or a public water supplier¹⁰⁶ may obtain instream flow rights for "recreation, fish and wildlife, induced recharge for municipal water systems, and water quality maintenance."¹⁰⁷ Those rights are limited to the minimum amount necessary to protect fish, wildlife, or recreation.¹⁰⁸

Instream flow rights are subject to review every fifteen years.¹⁰⁹ At a hearing, the Director of the Department of Natural Resources is to determine whether the right still serves its original beneficial purposes and whether that right still serves the public interest.¹¹⁰ The Director may cancel or modify the right.¹¹¹

Thus far, the state instream flow program has been highly underutilized. As of 2013, only two segments of streams or rivers have been protected, resulting in about 285 miles of protected stretches.¹¹² Over 97.7 percent of the state's rivers and streams remain unprotected.¹¹³

K. UTAH

Utah law does not allow any new instream flow rights to be established from unappropriated water.¹¹⁴ However, the legislature vested in the Division of Wildlife Resources and Division of Parks and Recreation the ability to permanently or temporarily change an existing water right for "the propagation of fish; public recreation; or the reasonable preservation or enhancement of the natural stream environment."¹¹⁵

While the statute originally allowed only those two state entities to change water rights for instream flow uses, recent legislation allows "fishing groups" to "file a fixed time change application on a perfected, consumptive water right

103. See KAN. ADMIN. REGS. § 5-15-4.

104. *Id.*

105. NEB. REV. STAT. § 46-2,108.

106. *Id.* §§ 46-2,108, 111.

107. *Id.* § 46-2,116.

108. *Id.* § 46-2,108.

109. *Id.* § 46-2,112.

110. NEB. REV. STAT. § 46-2,112.

111. *Id.*

112. Neb. Game & Parks Comm'n, *Questions and Answers on Instream Flows* (Nov. 2015), http://outdoornebraska.gov/wp-content/uploads/2015/11/Instream_Flows_Q_A.pdf.

113. *Id.*

114. Covell, *supra* note 18, at 188; UTAH CODE ANN. § 73-3-30 (West 2016).

115. UTAH CODE ANN. § 73-3-30 (West 2016).

for the purpose of providing water for an instream flow.¹¹⁶ Fishing groups are defined as federally-tax exempt organizations that “promot[e] fishing opportunities in the state.”¹¹⁷ For example, in 2016, Trout Unlimited obtained its first instream flow lease for 1.49 cfs on the Lower Weber River.¹¹⁸

L. ARIZONA

Instream flow rights in Arizona are grounded in the state’s water code, which provides for appropriation of water for recreation and wildlife.¹¹⁹ In the hierarchy of preferred uses, rights pertaining to recreation and wildlife are out-ranked by domestic and municipal uses, irrigation and stock watering, and power and mining.¹²⁰

The state has few restrictions on who may appropriate water for instream flow purposes,¹²¹ and the Arizona Supreme Court has broadly interpreted the Department of Water Resource’s authority to issue instream flow rights.¹²² Thus, individuals may hold instream flow rights. Water right holders may also transfer existing rights permanently or temporarily for instream flow purposes, but transferred rights must be approved by a state or local entity and must not cause injury.¹²³ However, it is the the United States Forest Service that currently holds the largest instream flow right in the state, along with nine other instream flow rights and nine more expected to be approved in the near future¹²⁴.

In 2012, the legislature enacted specific requirements for obtaining an instream flow right. An applicant must provide “at least five years of continuous streamflow measurement data” with the application, along with a description of the amount of streamflow required for the instream flow right and the availability of water.¹²⁵

M. NEVADA

Like Arizona, instream flow rights in Nevada are authorized through interpretations of the state’s overarching appropriation statute requiring beneficial use.¹²⁶ The statute specifies that recreation is a beneficial use, and the state supreme court has held that diversion is not required for an appropriation.¹²⁷ Additionally, the state’s Water Plan states that “[i]nstream beneficial uses in

116. *Id.*

117. *Id.*

118. Marie C. Kellner, *How A State Known for Its Rivers Ends Up with Dry Riverbeds Every Year: A Look into Idaho’s Minimum Stream Flow Law*, 58 *ADVOCATE* 23, 25 (2015); *Utah approves TU’s first in-stream flow lease*, Trout Unlimited, <https://www.tu.org/blog-posts/utah-approves-tus-first-in-stream-flow-lease>.

119. Amos & Swensen, *supra* note 13, at 22-15.

120. Covell, *supra* note 18, at 189.

121. *Id.* at 188-89.

122. Amos & Swensen, *supra* note 13, at 22-15.

123. *ARIZ. REV. STAT. ANN.* § 45-172.

124. *Instream Flow Water Rights Program*, U.S. Forest Service, https://www.fs.usda.gov/detail/tonto/landmanagement/resourcemanagement/?cid=fsbdev3_018784.

125. *ARIZ. REV. STAT. ANN.* § 45-152.01.

126. Covell, *supra* note 18, at 189; *see NEV. REV. STAT.* § 533.030(1).

127. *NEV. REV. STAT.* § 533.030 (2016); *State v. Morros*, 766 P.2d 263, 267 (Nev. 1988).

Nevada include habitat for aquatic invertebrates, fishes, birds and other wildlife, maintenance of water quality, and recreation.¹²⁸

In 2007, the state legislature expressly authorized temporary transfers of agricultural water rights “for wildlife purposes or to improve the quality or flow of water.”¹²⁹ Such temporary conversions are limited to three years in duration, but they can be renewed an indefinite number of times.¹³⁰

Within that framework, the most common mechanism for protecting instream flows has been through large-scale projects that involve state and local government entities purchasing land and water to protect streams. One project allowed two federal agencies to work with the Nevada Division of State Lands to acquire water rights from willing sellers to protect 25,000 acres of wetlands.¹³¹ The federal government appropriated sixteen million dollars to facilitate these purchases.¹³²

N. NEW MEXICO

Described as the West’s last holdout state on instream flow rights, New Mexico’s battle over recognizing those rights has been drawn-out and contentious.¹³³ Even now, the right to appropriate water for instream flow purposes is not specifically authorized in any statutes. Currently, instream flow rights rest in the state engineer’s current definition of a beneficial use, which includes fish and wildlife, and recreational uses.¹³⁴ The definition likely stems from a 1998 agency document that was penned by then Attorney General Tom Udall, which stated that New Mexico law does permit instream flow rights for “recreational, fish or wildlife, or ecological purposes.”¹³⁵

In 2005, the legislature passed the Strategic Water Reserve Act, under which water may be reserved by the Interstate Stream Commission “to assist the state in complying with interstate stream compacts and court decrees” or to “assist the state and water users in water management efforts for the benefit of threatened or endangered species or in a program intended to avoid additional listings of species.”¹³⁶ The Commission has focused efforts on providing water to augment streams in the Pecos River Basin as a means of protecting threatened species’ critical habitat.¹³⁷ As of 2013, the state no longer had funding to purchase water rights to augment those streams. According to the Commission Director at the time, “the greatest impediment to this effort has been loss of interest from potential lessors.”¹³⁸

128. NEV. DIV. OF WATER PLANNING, NEV. STATE WATER PLAN 3-B1 (1999).

129. NEV. REV. STAT. § 533.0243 (2016).

130. *Id.*

131. Amos & Swensen, *supra* note 13.

132. *Id.*

133. Denise D. Fort, *Instream Flows in New Mexico*, 7 RIVERS 155, 155 (2002).

134. N.M. CODE R. § 19.26.2.7(D) (2016).

135. N.M. Att’y Gen. Op. No. 98-01 (Mar. 27, 1998).

136. N.M. STAT. ANN. § 72-14-3.3 (2017).

137. MICHELLE HENRIE, NEW MEXICO LAW AFFECTING THE PECOS RIVER 8 (Feb. 18, 2015), <http://www.pecosriverresolution.com/~pecosriver/pdf/2015-02-18-Appendix-to-New-Mexico-Laws-Affecting-Pecos-River.pdf>.

138. *Id.*

II. CONCLUSION

In testimony to the adaptability of western states' prior appropriation systems to changing water needs, instream flow water rights to protect fisheries, aquatic habitat, and similar environmental values have become accepted as beneficial uses of water in most western states. Instream rights for recreation, water quality protection, and other uses have likewise gained acceptance in some states. However, this acceptance is tempered by the fact that the number of stream miles protected by instream flow water rights is small compared to the total number of stream miles in the West. Moreover, instream water rights continue to be subject to restrictions not imposed on other water rights, such as periodic review and subordination to uses perceived as more important. In short, although instream flow water uses are recognized as beneficial uses of water, these uses are carefully limited, and generally have not been allowed to seriously threaten other water uses. The continued viability of instream flow programs, and likelihood of broader utilization, is threatened by lack of funding and increasing demands for water for industrial and municipal uses resulting from new methods of resource development, population increase, and the very real but unknown impact of climate change.

MAKING COLORADO'S RIVERS A (SENIOR) PRIORITY

ZACH SMITH¹

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I. INTRODUCTION

For 138 years, Colorado's court doors have been open to confirm irrigation water rights.² For 114 years, those doors have been open to all water rights except instream flow water rights.³ Just in the last forty-four years have courts confirmed instream flow water rights.⁴ It's not difficult to see that in this race to the courthouse called the prior appropriation system, rivers were held at the starting line. Before 1973, as Colorado's population grew and withdrawals from rivers increased, if water remained in a river, it was a product of geography and administration: a reservoir release or bypass, a downstream call, or a compact allocation.

But today, as Colorado sits firmly in a new era—one of reallocation—the landscape for rivers and their place within the prior appropriation system has improved. This article examines the ways in which stakeholders, such as the Colorado Water Conservation Board ("CWCB"), the General Assembly, the state court system, water users, and non-profit partners have all cooperated to restore rivers in Colorado. Recently, a report from Stanford University ranked Colorado first among Colorado River basin states for the "extent and effectiveness of laws and policies . . . to create dedicated water rights for instream and other environmental uses."⁵ What follows is how Colorado got there and where it is going.

II. CREATION OF ISF PROGRAM

Gaylord Nelson, a United States Senator from Wisconsin, spoke to a crowd gathered in Denver on April 22, 1970.⁶ Nelson, one of the main backers of a new event called Earth Day, encouraged his audience to elect a Congress that would "build bridges between our citizens and between man and nature's systems."⁷ Americans did. On a federal level, the Clean Water Act, the Safe Water Drinking Act, the Clean Air Act, the Endangered Species Act, and the National Environmental Policy Act were all enacted or amended between 1969 and 1973.⁸ Water, as usual, was a particularly contentious issue. Western states were long accustomed to managing in-state water issues (compacts and equitable apportionments aside), but they saw in the federal environmental movement a threat to a century of established water allocation.⁹ In addition, concern was

2. See Act of Feb. 19, 1879, 1879 Colo. Sess. Laws 94-108, *see also* Santa Fe Trails Ranches Prop. Owners Ass'n v. Simpson, 990 P.2d 46, 52 (Colo. 1999).

3. Act Concerning Water Rights, 1903 Colo. Sess. Laws 297-98.

4. S.B. 73-97, 49th Gen. Assemb., 1st Reg. Sess (Colo. 1973) (codified at COLO. REV. STAT. §§ 37-92-102(3)(1973)).

5. SZEPTYCKI, L. & PILZ, D. COLO. RIVER BASIN ENVTL. WATER TRANSFERS SCORECARD 3 (Stanford Woods Inst. for the Env. 2017). The report notes, however, how far ahead of Colorado other western states like Oregon are.

6. *Gaylord Nelson and Earth Day*, NELSON INSTITUTE FOR ENVIRONMENTAL STUDIES, <http://www.nelsonearthday.net/earth-day/4-22-1970.php> (last visited Aug. 7, 2017).

7. *Partial Text for Sen. Gaylord Nelson, Denver, Colo.*, WISCONSIN HISTORICAL SOCIETY (April 22, 1970) http://www.nelsonearthday.net/docs/nelson_26-18_ED_denver_speech_notes.pdf.

8. Reed Benson, *Alive but Irrelevant: The Prior Appropriation Doctrine in Today's Western Water Law*, 83 U. COLO. L. REV. 675, 686 (2012).

9. *Id.*

growing in Colorado that increased transbasin diversions would dewater head-water streams on the West Slope and that required water bypasses weren't protectable downstream as against other diverters.¹⁰ To demonstrate state effort on environmental issues without compromising the prior appropriation system, Colorado, led by farmer and legislator Fred Anderson, introduced and passed Senate Bill 97, establishing the state's Instream Flow Program.¹¹

In Senate Bill 97, the General Assembly "recogniz[ed] the need to correlate the activities of mankind with some reasonable preservation of the natural environment",¹² language strikingly similar to Nelson's Denver Earth Day speech three years previous. To accomplish that balance, the legislature created two distinct authorities within the Colorado Water Conservation Board—to appropriate and to acquire, "waters of natural streams and lakes as may be required to preserve the natural environment to a reasonable degree."¹³ Colorado was one of the first states to adopt such a law.¹⁴

Today, the CWCB has appropriated water on 9,661 miles of stream, 24.5 percent of Colorado's perennial river and streams, and has acquired water under eight short-term leases, three long-term leases, and thirty permanent acquisitions of senior water rights and interests in water.¹⁵

Although the expansiveness of the program has grown and shrunk and grown again over the last forty-four years—with many of those iterations described here—the CWCB's broad authorities to protect and restore water to rivers have remained essentially the same: (1) to appropriate new instream flow water rights to preserve the natural environment to a reasonable degree, each with a priority date based on the CWCB's public demonstration of its intent to make the appropriation; and (2) to acquire water, water rights, or interests in water, and apply it to instream flow use in amounts it determines appropriation to preserve or improve the natural environment.¹⁶

The two authorities provide different benefits. Instream flow appropriations function to keep river and stream levels as they are at the time of the appropriation (although contested appropriations can result in negotiated decrees that adjust flow rates). Appropriations, although junior, produce real protections—they routinely prevent future withdrawals from rivers that would cause levels to dip below minimum flows. For example, in the winter of 2015 the CWCB placed a call for its instream flow water right on the upper Colorado River, calling out junior snowmaking water rights on the upstream Fraser River.¹⁷

10. *Former CWCB Director Spurred Development of Program*, INSTREAM COLO., Oct. 1999 at 1; Steven J. Shupe, *The Legal Evolution of Colorado's Instream Flow Program*, 17 COLO. LAW. 861, 861 (1988).

11. *Profile: Water Rights Leader Fred E. Anderson*, INSTREAM COLO., July 1998 at 5.

12. COLO. REV. STAT. § 37-92-102(3) (2016).

13. S.B. 73-97, *supra* note 4.

14. Sasha Charney, *DECADES DOWN THE ROAD: AN ANALYSIS OF INSTREAM FLOW PROGRAMS IN COLORADO AND THE WESTERN UNITED STATES* 20 (2005).

15. INSTREAM FLOW PROGRAM, Colorado Water Conservation Board, <http://cwcb.state.co.us/environment/instream-flow-program/Pages/main.aspx> (last visited May 1, 2017).

16. COLO. REV. STAT. § 37-92-102(3) (2016).

17. Colorado Water Conservation Board & Division of Water Resources, *Administrative Call Details* (Nov. 30, 2015), http://www.dwr.state.co.us/CDSS/Contents/CallDetail.aspx?call_num=17858.

In addition, instream flows require senior water right holders to maintain decreed instream flow rates when they change water rights from an existing use to a new use in a Water Court proceeding. Despite their protective utility, appropriations are limited in their restorative effect. Because appropriations rely on creating a water right out of water available at the time of the appropriation, the State cannot revive a dry section of a river with an appropriation. If there's no water in a river, there's no water for an appropriation—even for an instream flow.

How then is water restored to thirsty rivers under Colorado's Instream Flow Program? From its inception, the Instream Flow Program has had the authority to acquire senior water rights and to change those senior water rights through a typical change process to add instream flow as a use.¹⁸ Reallocation of water from the original use to new uses through a change case proceeding has occurred since at least 1891.¹⁹ As in many cases, the Instream Flow Program has looked at the tools available to consumptive users and applied them to instream flows. Under the available statutory change of water right processes, the new use retains the senior priority.²⁰ With acquired water, rivers formerly swept by senior diversions may keep fish wet at crucial times. More robust acquisition efforts can restore fisheries or protect them during drought. Until 2008, the CWCB had no dedicated funding to use to buy water, and so most acquisitions have relied on donations of water into the program.²¹

The manner in which the CWCB may acquire water is broad. The statute takes a "kitchen sink" approach²², and to date the CWCB has entered into long-term and short-term leases, a trust agreement, a permanent split season-use agreement, and numerous permanent fee-simple transfers.²³ Few look the same because the terms of the transfer are driven by the water right owner's needs. An agreement with the City of Boulder, for example, allows the City to pull water out of the CWCB's program in case of drought.²⁴ Many agreements also permit the re-use of the historical consumptive use downstream of the protected stream reach.²⁵

A key component of both appropriations and acquisitions is the recom-

18. These processes include change cases, COLO. REV. STAT. § 37-92-302(1)(a) (2016); substitute water supply plans, COLO. REV. STAT. § 37-92-308 (2016); interruptible water supply agreements, COLO. REV. STAT. § 37-92-309 (2016); short-term loans, COLO. REV. STAT. § 37-83-105(2) (2016); agricultural water protection water rights, COLO. REV. STAT. § 37-92-308 (2016); and fallowing-leasing, COLO. REV. STAT. § 37-60-115(8) (2016).

19. See *Strickler v. Colorado Springs*, 26 P. 313 (Colo. 1891).

20. *Santa Fe Trail Ranches Prop. Owners Ass'n v. Simpson*, 990 P.2d 46, 54 (Colo. 1999).

21. H.B. 08-1346, 66th Gen. Assemb., Reg. Sess. (Colo. 2008). Lack of funding was one of the main reasons a group of water attorneys and water engineers founded the Colorado Water Trust.

22. See COLO. REV. STAT. § 37-92-102(3) (2016) ("The board also may acquire, by grant, purchase, donation, bequest, devise, lease, exchange, or other contractual agreement, from or with any person, including any government entity").

23. See *Instream Flow Program: Completed Transactions*, COLORADO WATER CONSERVATION BOARD <http://cwcb.state.co.us/environment/instream-flow-program/Pages/CompletedTransactions.aspx> (last visited May 1, 2017).

24. Agreement between CWCB and the City of Boulder (recorded Aug. 27, 1990) (available at <http://cwcbweblink.state.co.us/WebLink/DocView.aspx?id=62218&page=1&dbid=0>).

25. *Id.*

mentation by the CWCB's sister agency and built-in wildlife biological consultant, Colorado Parks and Wildlife (CPW).²⁶ CPW has an instream flow coordinator position who works as a liaison between the CWCB and the fish biologists at CPW and who specializes in quantifying the specific amount of water necessary for new appropriations to preserve the natural environment to a reasonable degree.²⁷ The CPW instream flow coordinator also quantifies the amount of water that is appropriate for acquisitions to preserve or improve the natural environment to a reasonable degree.²⁸ This includes on-the-ground measurements of existing flow and stream channel dimensions, a survey of the species present, and a biological quantification of the flows appropriate to preserve or improve the natural environment to a reasonable degree.²⁹ To make legal the appropriation or acquisition of water as a beneficial use, the CWCB relies upon CPW's biological analysis to support the ecological 'need' for the water.

III. AGE OF CHALLENGES

A. CONSTITUTIONALITY

The CWCB's director from 1958 to 1979, Felix Sparks, and his attorneys and technical staff, took this newfound charge in 1973 to balance human needs with the environment and set about appropriating the first instream flow water rights.³⁰ The first appropriated instream flows sought to protect required by-passes from federal transbasin water projects, mostly in the Roaring Fork basin.³¹ The challenge to the program came when the CWCB voted 8-4 to appropriate flows on the Crystal River, among others, without a federal project water bypass nexus, and asked the Water Court for a decree protecting up to 100 cubic feet per second ("cfs") in the summer with a 1975 priority.³²

The Colorado River Water Conservation District, which had lost its own attempt to appropriate instream flows a decade before, opposed the application.³³ The Water Court ruled in favor of the CWCB, and the River District appealed to the Colorado Supreme Court, attacking the constitutionality of the Instream Flow Program and its technical flow quantification process.³⁴ The Colorado Supreme Court affirmed the Water Court ruling and the constitutionality of the statute establishing the Program—thus establishing the first stand-alone instream flow water rights in the state.³⁵ The Instream Flow Program survived

26. 2 COLO. CODE REGS. §§ 408-2 (6f) (2), (11c) (2009).

27. *Id.*

28. *Id.*

29. See Colorado Water Conservation Board, R2Cross, <http://cwcb.state.co.us/technical-resources/R2CROSS/Pages/main.aspx>; see also *R2Cross Efficient for Quantifying Instream Flows*, INSTREAM COLO., Jan. 1999 at 1.

30. *Former CWCB Director Spurred Development of Program*, INSTREAM COLO., Oct. 1999 at 1.

31. *Id.*

32. Judgment and Decree at 2-3, *In re Roaring Fork River and Its Tributaries*, No. 75W2720 (Colo. Water Ct. Div. No. 5 June 26, 1978); Judgment and Decree at 2-3, *In re Roaring Fork River and Its Tributaries*, No. 75W2721 (Colo. Water Ct. Div. No. 5 June 26, 1978).

33. *Colo. River Water Conservation Dist. v. Rocky Mountain Power Co.*, 406 P.2d 798, 799 (Colo. 1965).

34. *Id.*

35. *Id.*

its first challenge, but more would come from both the courts and the legislature.

B. ENFORCEABILITY OF AN INSTREAM FLOW WATER RIGHT

Although now established as constitutional, instream flow rights faced their next challenge in the question of whether they are enforceable. That is, does an instream flow water right hold the same status as a more traditional water right, and is thus protectable against injury by another water user?³⁶ This question came to a head in the 1990s, when the City of Central filed a series of applications with the Division 1 Water Court to meet its future water demands, seeking water rights changes, an augmentation plan, conditional water rights, and exchanges.³⁶

Under Central's application, Central would divert under a priority junior to an existing instream flow on North Clear Creek and replace those out-of-priority diversions with substitute supplies farther downstream, shorting the middle portion of an instream flow and thus, from the CWCB's perspective, cause injury.³⁷ The CWCB asked for protective terms in Central's augmentation plan decree, Central refused in part, and the Water Court found in favor of Central.³⁸ The CWCB then appealed to the Colorado Supreme Court.³⁹

The Supreme Court reversed the Water Court ruling, holding that "[I]nstream flow or lake levels rights are no different in concept from other appropriative rights.⁴⁰ They must be decreed to be administered; are given a fixed priority date, a specified flow rate of volumetric quantity, time and place of use; and are administered like any other water rights, but no means of diversion is required."⁴¹ Preventing the CWCB from protecting existing instream flows from injury would frustrate the clear purpose of the legislature in creating instream flows.⁴² Instream flows are therefore entitled to protective terms and conditions as legally enforceable water rights—thus protecting stream conditions in changes of water rights proceedings, as well as applications for plans for augmentation and exchanges.⁴³

IV. CWCB EXCLUSIVITY

A. DIRECT FLOW APPROPRIATIONS

Today, the CWCB has the express "exclusive authority [to appropriate] such waters of natural streams and lakes."⁴⁴ And "[i]n the adjudication of water rights pursuant to [37-92-102(3)], no other person or entity shall be granted a decree adjudicating a right to water or interests in water for instream flows in a

36. *Colo. Water Conservation Bd. v. City of Central*, 125 P.3d 424, 428 (Colo. 2005).

37. *Id.* at 429.

38. *Id.* at 427.

39. *Id.*

40. *Id.* at 427-28.

41. *Colo. Water Conservation Bd. v. City of Central*, 125 P.3d at 438-39.

42. *Id.* at 439.

43. *Id.* at 438-39.

44. COLO. REV. STAT. § 37-92-102(3) (2016).

stream channel between specific points.⁴⁵ The exclusive authority language has been in the statute since 1987, when Senate Bill 212 clarified who could actually hold instream flows.⁴⁶ Over the years this has been a lively conversation between water users and the CWCB in the courts and in the legislature.

As early as 1963, the General Assembly delegated authority to the Colorado River District “to file upon and hold for the use of the public sufficient water of any natural stream to maintain a constant stream flow in the amount necessary to preserve fish.”⁴⁷ When the River District attempted to exercise this authority in the White River basin, the Colorado Supreme Court dispatched that attempt in a brief opinion in 1965 holding that no water right could be created without diversion.⁴⁸

After Senate Bill 73-97 was enacted, a group of water users on Illinois Creek in Water Division 4 began filing for instream flow water rights.⁴⁹ The Water Court granted the water rights, ruling that Senate Bill 73-97 grants the CWCB new authority to file for instream flows but does not limit any other party from doing the same;⁵⁰ the elimination of the diversion requirement applied to all appropriators.⁵¹ The Water Court did provide for one limitation: these decrees could only be granted in stream reaches upstream of all other existing water rights.⁵²

One decree, Case No. W-1987, was ultimately challenged at the Colorado Supreme Court in 1992 by Arapahoe County.⁵³ In 1990, Arapahoe County, owner of junior water rights in the Taylor River basin, asked the Water Court to vacate W-1987.⁵⁴ It claimed the Water Court lacked subject matter jurisdiction to grant the decree because W-1987 was actually a riparian right, and that notice at the time of the original proceeding was insufficient.⁵⁵ The Water Court dismissed Arapahoe’s complaint with prejudice.⁵⁶

When Arapahoe (and others) appealed, the Colorado Supreme Court, although acknowledging that Arapahoe “makes some compelling arguments that the 1974 court misconstrued Senate Bill 97”, held that addressing that interpretation was unnecessary to find that the Water Court had subject matter jurisdiction.⁵⁷ The Court held that even “if the Water Court erred and did in fact decree a private instream flow right, this would simply constitute legal error vulnerable

45. *Id.*

46. S.B. 87-212, 56th Gen. Assemb., Reg. Sess. (Colo. 1987).

47. COLO. REV. STAT. § 37-46-107(1)(j) (2016).

48. *Colo. River Water Conservation Dist. v. Rocky Mountain Power Co.*, 406 P.2d 798, 800 (Colo. 1965); S.B. 73-97 49th Gen. Assemb., Reg. Sess. (Colo. 1987) eliminated the diversion requirement.

49. Ruling of Water Referee at 2-4, *In re Application for Water Rights of Kysar Triangle 2 Ranch, Inc.*, No. W-1985 (Colo. Water Ct. Div. No. 4).

50. *Id.*

51. *Id.*

52. *Id.* at 3. Although there are plenty of instream flows that exist among or downstream of headgates, administration remains a challenge, requiring proper measurement of water to the satisfaction of the local water users, the water commissioner, and the CWCB.

53. *Bd. of Cty Cmm'rs v. Collard*, 827 P.2d 546, 547 (Colo. 1992).

54. *Id.* at 549.

55. *Id.* at 547.

56. *Id.* at 549.

57. *Id.* at 551.

to reversal upon appeal, but would not constitute an overstepping of jurisdictional authority.”⁵⁸ The Court also found the original resume notice was valid, and so any collateral attack on W-1987 was barred by section 37-92-304(10), C.R.S. (1990), upholding the Water Court’s ruling.⁵⁹

Rural water users were not alone in pursuing in-river water uses in the 1980s. In 1986, the City of Fort Collins filed for a water right claiming 55 cfs for “municipal purposes, including recreational, piscatorial, fishery, wildlife and other beneficial uses . . .” in the Cache La Poudre River.⁶⁰ Fort Collins initially claimed the diversionary structure was the Poudre River corridor.⁶¹ The CWCB, among others, objected, and in 1988 Fort Collins amended the application to list two structures that would control the flow of water in the Poudre, the Nature Dam and the Power Dam, thereby distinguishing the claimed in-river water rights from an instream flow (which requires no diversion or control structure).⁶² The CWCB settled out, but Thornton and others stayed in, resulting eventually in a Water Court decree that gave Fort Collins a water right for the Nature Dam but not for the Power Dam.⁶³ Thornton and Fort Collins each filed appeals, and eventually both water rights were granted in Fort Collins’ favor.⁶⁴

After Fort Collins’ original application, the legislature passed Senate Bill 212 to clarify the CWCB’s exclusive authority to keep in-river uses within the state agency. But Fort Collins’ victory had carved out a different kind of in-river water right that was distinguishable from an instream flow. The victory led to similar in-river requests from five additional communities, and finally resulted in the creation of the State’s Recreational In-Channel Diversion program.⁶⁵

The above cases dealt with appropriations of water to be left in rivers.⁶⁶ There are many diversions of water into ditches for private aesthetic, piscatorial, and recreational uses.⁶⁷ The Colorado Supreme Court issued a decision on these so-called “fish ditches” in 2015, holding that a private entity’s aesthetic, recreation, and piscatorial uses of water in a ditch do not qualify as beneficial uses.⁶⁸ The legislature responded in 2017, passing House Bill 17-1190, limiting the applicability of the holding to conditional or absolute appropriations made after July 15, 2015.⁶⁹

58. *Bd. of Cty Cmm’rs v. Collard*, 827 P.2d at 551-52.

59. *Id.* at 553.

60. *Thornton v. Fort Collins*, 830 P.2d 915, 919 (Colo. 1992).

61. *Id.*

62. *Id.* at 920.

63. *Id.* at 921.

64. *Id.* at 921-22, 933.

65. Press Release, Holland & Hart, LLP, Colorado Board Adopts Rules for “Recreational In-Channel Diversion” Water Rights (March 22, 2002), <https://www.hollandhart.com/colorado-board-adopts-rules-for-recreational-in-channel-diversion-water-rights>; see COLO. REV. STAT. § 37-92-102(6)(a) (2001).

66. See *Colo. River Water Conservation Dist. v. Rocky Mountain Power Co.*, 406 P.2d 798, 798 (Colo. 1965); *Bd. of Cty Cmm’rs v. Collard*, 827 P.2d 546, 557 (Colo. 1992).

67. See, e.g., *St. Jude’s Co. v. Roaring Fork Club, L.L.C.*, 351 P.3d 442, 446 (Colo. 2015).

68. *Id.* at 451-52.

69. H.B. 17-1190, 71ST Gen. Assemb., Reg. Sess. (Colo. 2017).

B. STORAGE RELEASES

The use of stored water for instream flow purposes gives the CWCB and its partners the flexibility to release water at the most crucial times for rivers and aquatic species.⁷⁰ On the Alamosa River, a river decimated by cyanide leaching from a gold mine upstream, the CWCB and the Alamosa RiverKeepers purchased two water rights, and through an agreement with an irrigation company, now store that water throughout the irrigation season.⁷¹ Each year, when flows begin to drop in the Alamosa, the CWCB calls for the release of its water to extend the number of days the river has healthy flows for fish.⁷² Recently, a bait and tackle shop opened in Capulin as locals rediscovered fishing in their local river.⁷³

This project is housed in the Instream Flow Program, but there are examples of private or other public entities using stored water to restore flows to rivers. Colorado courts have analyzed stored water in this context differently than they have analyzed direct flow.

Case No. 4-86CW202 was a consolidation of two applications filed by the Upper Gunnison River Water Conservancy District (“the District”) related to how the District delivered water out of Taylor Park Reservoir through the Aspinall Unit to the Gunnison Tunnel for the Uncompahgre Valley Water Users Association (“UVWUA”).⁷⁴

Before the construction of the Aspinall Unit (Blue Mesa, Morrow Point, and Crystal Reservoirs), Taylor Park Reservoir would make releases to help satisfy water needs at the Gunnison Tunnel.⁷⁵ These releases “destroyed fish habitats and spawning areas and at times endangered persons seeking to fish” because of their irregularity and intensity.⁷⁶ After the Aspinall Unit was built, which helped manage flow, the District and several other parties including the United States and the UVWUA entered into an agreement in 1975 that detailed optimum flow rates for fish between Taylor Park and Blue Mesa, ranging from 100–150 cfs from mid-October to March, 300–500 cfs from April to June, and 500 cfs from July to mid-October.⁷⁷

After the 1975 agreement, the District filed for additional storage in Taylor Park Reservoir in 1986, using the 1975 agreement as the date of appropriation

70. See, e.g., *Alamosa River Keepers*, COLORADO WATER TRUST (Nov. 17, 2015) <http://www.coloradowatertrust.org/programs/projects/alamosa-riverkeepers> (last visited April 4, 2017).

71. *Id.*

72. *Alamosa River Receives Streamflow Restoration*, VALLEY COURIER (Nov. 17, 2015) <http://www.coloradowatertrust.org/newsroom/alamosa-river-receives-streamflow-restoration> (last visited April 4, 2017).

73. *Id.* Much of the restoration work has been conducted under Superfund. The restoration of flows was a small piece of the entire effort to improve the Alamosa River. See *Alamosa River Keepers*, COLORADO WATER TRUST (Nov. 17, 2015) <http://www.coloradowatertrust.org/programs/projects/alamosa-riverkeepers> (last visited April 4, 2017).

74. Findings, Conclusions and Judgment on the Merits of the Applications, *In re* The Upper Gunnison River Water Conservancy Dist., No. 86CW0202 (Colo. Water Ct. Div. 4 Sep. 18, 1990).

75. *In re* Applications for Water Rights of Upper Gunnison River Water Conservancy Dist., 838 P.2d 840, 844 (Colo. 1992).

76. *Id.*

77. *Id.* at 845–46.

for the added storage.⁷⁸ In its application, the District sought to count water released for fish habitat as a beneficial use, and thus receive storage credit for those releases.⁷⁹ The Water Court agreed with the District, so several opposers appealed that ruling (among others) to the Colorado Supreme Court.⁸⁰

Before the Court, Arapahoe County claimed that the Water Court's decision to allow releases for fish pursuant to the 1975 agreement to be credited as appropriated storage in Taylor Reservoir impermissibly granted an instream flow right to the District.⁸¹ The Court disagreed, upholding the Water Court decree.⁸² The Court held the "the right to appropriate water for ultimate beneficial use by diversion or control" is distinct from and does not conflict with appropriating for an instream flow.⁸³ Instead, the District appropriated water generally for storage and subsequent releases for beneficial uses downstream pursuant to the 1975 agreement.⁸⁴ Finally, the Court held because CWCB minimum instream flow appropriations are "sufficient only to protect fish species for short periods of time," and because the District's flow agreement would enhance the fishery "to a substantial degree throughout the year," the appropriations were therefore distinct.⁸⁵ The Court upheld the District's releases as beneficial uses and included those releases in its storage credit.⁸⁶

This issue of whether water diverted into storage and then released should then be protected downstream remains contested.⁸⁷ However, the ability to deliver and protect water out of reservoirs outside of the Instream Flow Program forms the backbone of efforts to deliver water to the endangered fish reach of the Colorado River near Palisade. It is also vital to smaller projects, like the City of Steamboat Springs and the Colorado Water Trust's 2016 project to deliver municipal water from Stagecoach Reservoir to the City's wastewater treatment plant outfall as a lawful municipal use.⁸⁸

V. REDUCTION IN INSTREAM FLOW PROGRAM AUTHORITY - CONDITIONAL WATER RIGHTS TRANSFERS

Until 1994, the CWCB's authority was silent as to whether it could acquire conditional water rights. Conditional water rights are placeholder water rights that allow a water user to get in line in the priority system upon meeting the

78. *Id.* at 846.

79. *Id.*

80. *In re Applications for Water Rights of Upper Gunnison River Water Conservancy Dist.*, 838 P.2d at 846-47.

81. *Id.* at 853.

82. *Id.*

83. *Id.* at 854.

84. *Id.*

85. *Id.*

86. *Id.*

87. The conversation on storage continues. House Bill 17-282 attempted to simplify a Water Court procedure for a reservoir owner to dedicate releases to the Instream Flow Program.

88. See *Stagecoach Reservoir /Yampa River*, COLORADO WATER TRUST (2016) <http://www.coloradowatertrust.org/programs/projects/stagecoach-reservoir-yampa-river> (last visited April 4, 2017).

necessary legal standards without having to make the actual diversion and application of water to the contemplated beneficial use.⁸⁹ In 1987, The Nature Conservancy (“TNC”) received a donation of 300 cfs of a total 800 cfs conditional water right from The Pittsburgh and Midway Coal Mining Company. Under a 1990 agreement, TNC donated that water right to the CWCB for instream flow purposes. In Case No. 92CW107, the CWCB applied to change the conditional water right to an absolute instream flow water right in the Gunnison River from the Gunnison Tunnel to the its confluence with the North Fork of the Gunnison, receiving a decree in 1995.⁹⁰

Opponents of the acquisition immediately saw the potential for water users to perfect conditional water rights by transfers to the CWCB without ever having had to apply that conditional water to a beneficial use. So after the donation agreement was signed, but before the Water Court issued the decree, the General Assembly passed Senate Bill 94-54, limiting the CWCB’s ability to acquire conditional water rights to specific conditions related to federally endangered species.⁹¹ Eventually, that exception was eliminated as well.⁹²

VI. INSTREAM FLOW PROGRAM EXPANSION ATTEMPTS – FAILED

A. EFFICIENCY TRANSFERS

What if an irrigator could line her ditch, grow the same crop, and transfer any water saved during delivery to the Instream Flow Program, protecting only the historical diversion amount from the headgate to the point of return flow accrual? The General Assembly has tried at least six times to explicitly allow a water user to improve the efficiency of their water delivery or application system and then transfer that saved diversion water to a new use.⁹³ This is separate

89. COLO. REV. STAT. § 37-92-103(6) (2016); A conditional water right is defined as “a right to perfect a water right with a certain priority upon the completion with reasonable diligence of the appropriation upon which such water right is to be based.” *Id.* In *City of Thornton v. Bijou Irrigation Company*, the Colorado Supreme explained that

[t]o establish a conditional water right, an applicant must show in general that a ‘first step’ toward the appropriation of a certain amount of water has been taken, that the applicant’s intent to appropriate is not based upon the speculative sale or transfer of the appropriative rights, and that there is a substantial probability that the applicant can and will complete the appropriation with diligence.

926 P.2d 1, 31 (Colo. 1996).

90. Findings of Fact, Conclusions of Law, Judgment and Decree, Case No. 92CW107 at 2 (Colo. Water Ct. Div. No. 4).

91. S.B. 94-54, 59th Gen. Assemb., 2d Reg. Sess. (Colo. 1994).

92. H.B. 00-1438, 62d Gen. Assemb., 2d Reg. Sess. (Colo. 2000).

93. S.B. 84-161, 54th Gen. Assemb., 2d Reg. Sess. (Colo. 1984); H.B. 91-1110, 58th Gen. Assemb., 1st Reg. Sess. (Colo. 1991); H.B. 93-1158, 59th Gen. Assemb., 1st Reg. Sess. (Colo. 1993); S.B. 13-19, 69th Gen. Assemb., 1st Reg. Sess. (Colo. 2013); S.B. 14-23, 69th Gen. Assemb., 2d Reg. Sess. (Colo. 2014); H.B. 15-1222, 70th Gen. Assemb., 1st Reg. Sess. (Colo. 2015).

water from saved consumptive use transfers, which undergirds nearly every water right transfer in Colorado.⁹⁴ Five of the six attempts died in committee.⁹⁵ Governor Hickenlooper vetoed the other in 2014.⁹⁶

B. PRIVATELY-HELD INSTREAM FLOWS

Although the privately-held direct flow instream flows in Division 4 remain an odd wrinkle in time, talk of explicitly allowing private individuals to hold instream flows to expand flow protections efforts in the state most recently boiled over into proposed legislation in 2002.⁹⁷ Supporters believed allowing anyone to protect water in rivers would increase the breadth of the program. Senate Bill 156 as introduced allowed owners of absolute water rights to change their water rights to “sustain or enhance uses for recreation, fish and wildlife, scenic beauty, or ecologically purposes.”⁹⁸ It did not survive as introduced. Senate Bill 156 became a compromise bill that expanded the amount of water that could be changed for instream flow purposes by the CWCB—described more fully below. The CWCB’s exclusive authority remained intact.⁹⁹

VII. INSTREAM FLOW EXPANSIONS – SUCCESSFUL

A. ACQUISITION CLARIFICATION AND ADDITION OF ‘IMPROVE’

Under the original 1973 Instream Flow Program scheme, the CWCB had the authority “to appropriate in a manner consistent with sections 5 and 6 of article XVI of the statute constitution, or acquire, such waters of natural streams and lakes as may be required to preserve the natural environment to a reasonable decree.”¹⁰⁰

From the outset, the CWCB could appropriate or acquire, but only to preserve the natural environment to a reasonable degree. The legislature had enlarged the beneficial use definition in the statute by adding “beneficial use shall

94. Mark Squillace and Anthony McLeod, in their article *Marketing Conserved Water*, define conserved water as “water that was previously consumed but that is no longer consumed in the agricultural enterprise”, and then say that methods which can save this water, including deficit irrigation, crop-switching, and rotational fallowing, “cannot legally be transferred or sold to urban, industrial, or any other potential users” in Colorado. Mark Squillace & Anthony McLeod, *Marketing Conserved Water*, 46 ENV’T L. L. 1, 4 (2016). This is not true. The McKinley Ditch and the Coats Bros Ditch transfers to the Instream Flow Program do just that with deficit irrigation. See Colo. Water Conservation Bd., *McKinley Ditch - Little Cimarron River*, COLO. DEPT. OF NAT. RES., <http://cwcb.state.co.us/environment/instream-flow-program/Pages/McKinleyDitchACQ.aspx> (last visited April 4, 2017); *Lease of Water Rights from the Coats Bros Ditch*, COLO. DEPT. OF NAT. RES., <http://cwcbweblink.state.co.us/weblink/0/doc/195219/Electronic.aspx?searchid=70465416-38a6-41df-bc2b-7e60575cf175> (last visited April 4, 2017). Additionally, rotational fallowing with subsequent transfer is occurring in the Arkansas Basin. Colo. Water Conservation Bd., *Criteria and Guidelines for Fallowing-Leasing Pilot Projects*, COLO. DEPT. OF NAT. RES., <http://cwcb.state.co.us/water-management/water-projects-programs/Pages/Fallowing-LeasingPilotProjects.aspx> (last visited April 4, 2017).

95. See S.B. 84-161, *supra* note 57.

96. Lynn Bartels, *Gov. Hickenlooper hammered over veto of water-efficiency measure*, *DENV. POST* (Jun. 10, 2014).

97. S.B. 02-156, 63d Gen. Assemb., 2d Reg. Sess. (Colo. 2002) (Introduced Bill).

98. *Id.*

99. See COLO. REV. STAT. § 37-92-102(3) (2016).

100. S.B. 73-97, *supra* note 4.

also include the appropriation by the State of Colorado in the manner prescribed by law of such minimum flows between specific points or levels for and on natural streams . . . as are required to preserve the natural environment to a reasonable degree.”¹⁰¹ In 1973, the word “minimum” was included in the definitions section for appropriations, but not in § 37-92-102(3). The word “minimum” was taken by some to mean “enough to keep the backs of fish under water.”¹⁰²

“Minimum” only entered § 37-92-102(3) in 1987 under Senate Bill 87-212. Senate Bill 87-212 limited both the CWCB’s appropriation and acquisition authorities to “minimum stream flows.”¹⁰³ Over the years, the legislature imposed more structure to the program around notice and conditional water rights; however, CWCB’s fundamental authorities remained generally unchanged until 2002.

As described above, river advocates’ efforts to fundamentally change the Instream Flow Program to allow private individuals to change their water rights to instream flow hit the ground with the introduction of Senate Bill 156. The introduced bill met heavy resistance, and the legislature spent the session coming to a negotiated end to the privatization push, passing Senate Bill 156 in another form.¹⁰⁴ The bill removed the “minimum stream flow” restriction from the CWCB’s acquisition authority and replaced it with the still-current language: “in such amount as the board determines is appropriate for stream flows.” It also added authority to “improve” the natural environment. As it happened, the improve authority had an immediate impact on a project occurring at the same time.

In 2001, the San Juan Resource Conservation and Development Council (“SJRCDC”) offered to donate a 15 cfs water right off of Mineral Creek in the San Juan Mountains to the CWCB for instream flow use.¹⁰⁵ SJRCDC determined that water diverted under the Carbon Lake ditch was picking up mining pollutants and seeping those into Mineral Creek, causing damage to the creek’s aquatic resources.¹⁰⁶ SJRCDC took the lead in purchasing the water right, and then offered it as a donation to the CWCB in 2001.

As always, Colorado’s wildlife agency (at the time, the Division of Wildlife) went to work to determine the amount of water that would preserve the natural environment in the restoration reach of Mineral Creek. Those numbers came back between 2.5 and 6.6 cfs, well below the 15 cfs offered by SJRCDC. Under the statutory scheme as it existed in 2001, the CWCB would have to leave the difference, up to 12.5 cfs, on the table, frustrating the donor’s intent and efforts

101. *Id.* The section remains basically the same today. See COLO. REV. STAT. § 37-92-103(4)(c) (2016).

102. Joshua Zaffos, *CWCB’s Instream Flow Program matures*, COLO. FOUNDATION WATER EDUCATION, <https://www.yourwatercolorado.org/cfwe-education/water-is/water-law/100-headwaters-magazine/headwaters-fall-2009-the-cwcb/343-cwcb-instream-flow-program-matures>.

103. S.B. 87-212, *supra* note 46.

104. S.B. 02-156, *supra* note 96.

105. Agreement between Colo. Water Conservation Bd. And the San Juan Resource Conservation and Dev. Council (Jan. 19, 2007), <http://cwcbweblink.state.co.us/weblink/0/doc/104642/Page1.aspx?searchid=b634cf6b-d7c5-419e-a477-ee395a365019>.

106. Colo. Found. for Water Educ. staff, *Instream Flows, Improving and Protecting our Streams and Lakes*, HEADWATERS 11 (Spring 2004).

to protect more water in Mineral Creek.¹⁰⁷

Before the deal was entirely finalized, Senate Bill 156 passed, and the CWCB overnight gained the authority to protect more than the minimum amount of water in a river. Carbon Lake Ditch became the first transfer into the Instream Flow Program to utilize the “improve” authority. In 2003, the CWCB and SJRCDC amended the original donation agreement to allow for the Board to accept the entire 15 cfs into the program.¹⁰⁸

While the term “improve” remains statutorily undefined, the removal of the minimum limit on the CWCB’s acquisition authority has freed up the CWCB to acquire water rights to preserve and improve to levels that it determines to be “appropriate”.

The “improve” authority is critical. It allows instream flow acquisitions to restore flows to dewatered streams to a higher level than the minimum, and it can bring additional flow protection on top of an existing junior, appropriated instream flow. How does this work in practice? Take, for example, the following hypothetical that includes the improve authority: the CWCB appropriated a 1980 instream flow right on a river, preserving the natural environment up to 5 cfs. Later, the CWCB acquired a 1900, 3 cfs water right in the same reach to preserve and improve the natural environment. In drier years, the 5 cfs water right will be called out, but the 3 cfs acquisition keeps the river wet thanks to its senior priority. In wetter years, the CWCB can operate the 5 cfs and 3 cfs instream flow rights independently, producing a combined 8 cfs of flow protection.¹⁰⁹ Analyzing the same hypothetical in 2001 before the CWCB’s improve authority was created, the acquired 3 cfs water right could only protect water up to the 5 cfs preserve limit. Therefore, in wetter years, if the 5 cfs water right was fully satisfied, the CWCB could not protect the additional 3 cfs.

B. PROTECTIONS FOR WATER USERS - REMOVING DISINCENTIVES

As interested water users investigated the potential for long-term leases into the CWCB’s Instream Flow Program, one issue kept popping up: during the term of a lease, the local water commissioner would look at the leased water right’s headgate, note no water diverted, and record a zero into the water rights diversion records. A long-term lease would collect zeros for every year water was left in the stream, and so the lessor would see a gradual decline in transferable water under a subsequent change. Potential lessors were hesitant to devalue their water rights in this way.

To address this issue, the General Assembly passed HB 08-1280. The bill outlined further requirements for how the CWCB would analyze and enter into leases, and provided that in a change decree adding instream flow as a use, the historical consumptive use would be quantified, and that quantification “shall not result in a reduction of the historical consumptive use of that water right during the term of the leases or loan, except to the extent such reduction is

107. Memorandum from Dan Merriman & Anne Janicki to Colo. Water Conservation Bd. (Jan. 8, 2003).

108. *Id.*

109. The CWCB is required to do a stacking analysis under Rule 6c. 2 COLO. CODE REGS. § 408-2(6c).

based upon actual amount of water available under said rights.”¹¹⁰ A collection of zeros in a diversion record would no longer be counted against a water right leased to the CWCB.

Temporary, administratively approved changes of water rights have these protections as well. Section 37-83-105(c) provides similar protections for short-term, administratively approved loans of water to the CWCB.¹¹¹ Moreover, the Colorado Supreme Court has noted that these temporary changes in water rights deserve such protection; otherwise those penalties would prevent water right owners from taking advantage of them.¹¹² HB 08-1280 also provided protections against abandonment when water is enrolled in the Instream Flow Program.¹¹³

C. FUNDING

Until 2008, the CWCB had no dedicated fund to acquire water rights and relied instead on private groups like TNC and the Colorado Water Trust, or on water providers like the Mt. Werner Water & Sanitation District and the City of Fort Collins to donate water to the program. The General Assembly—understanding having an acquisition program with no money was like a car with no gas—passed House Bill 08-1346, creating an annually updating one million dollar fund for acquisitions and transaction costs. The legislation required the CWCB to promulgate a spending policy for the fund, now known as Policy 19.¹¹⁴ The funding has been used to buy permanent interests of water in the Gunnison basin and for leases in the Colorado River basin.

VIII. TODAY’S EXPANDING ACQUISITION PROGRAM

A. DIVERSION TRANSFER AND REMARKET

To date, the CWCB and its partners have completed forty one transactions transferring water rights into the State’s Instream Flow Program, resulting in approximately 621.12 cfs and 14,504.21 acre-feet (“AF”) added to the state’s rivers and protected under more senior priorities.¹¹⁵ The amount of water that can be transferred to a new use without injury to other water users is the “pattern of historic diversions and use under the decreed right for its decreed use at its

110. H.B. 08-1280, 66th Gen. Assemb., 2d Reg. Sess. (Colo. 2008) (codified in COLO. REV. STAT. § 37-92-102(3) (2016)). This statutory change immediately resulted in an acquisition for the Instream Flow Program. Declaration of a Revocable Trust: The Pitkin County Water Rights Revocable Trust, COLORADO WATER CONSERVATION BOARD (December 23, 2009), <http://cwcbweblink.state.co.us/weblink/0/doc/151124/Electronic.aspx?searchid=2e830e61-2d5d-4af9-9a5f-0c7cd0f2c68a> (last visited May 1, 2017).

111. COLO. REV. STAT. § 37-83-105(2)(c) (2016).

112. ISG, LLC v. Arkansas Valley Ditch Ass’n, 120 P.3d 724, 734 (Colo. 2005).

113. H.B. 08-1280, *supra* note 109 (codified in COLO. REV. STAT. § 37-92-10(2)(b)(VI)(2016)).

114. Expenditures of Funds for Water Acquisitions for Instream Flow Use Pursuant to COLO. REV. STAT. § 37-60-123.7 (2016).

115. *Completed Transactions*, COLORADO WATER CONSERVATION BOARD, <http://cwcb.state.co.us/environment/instream-flow-program/Pages/CompletedTransactions.aspx> (last visited April 21, 2017). It is difficult to quantify cfs and acre-feet resulting from acquisitions due to seasonal flows and many other variables. These numbers result from averages.

place of use."¹¹⁶ That pattern will become the true measure of the mature water right for change purposes, typically quantified in acre-feet of water consumed."¹¹⁷

Since the earliest instream flow transfers, the CWCB and its partners have interpreted, and Water Courts have confirmed, this bedrock provision of Colorado water law to allow for the protection of historical diversion amounts in the reach of stream between the headgate and point of return flows, and protection of historical consumptive use from the point of accrual of return flows down to a convenient or necessary stopping point.¹¹⁸ This practice makes sense in at least two respects. One, no water users in the diversion reach ever relied on the water historically diverted out of the stream, and therefore could not be injured by the practice of now bypassing that same water past their diversions.¹¹⁹ The diversion amount is, therefore, fully consumptive to the reach of the river upstream of the historical return flows.¹²⁰ And two, in the case of an irrigation water right, the diversion amount of a water right is the historical consumptive use plus the owed return flows. So, in claiming the diversion amount as protected down to the point of return flows, the CWCB is simply delivering owed return flow water to downstream users to prevent injury. Often, the protectable diversion amount rate is twice that of the protectable historical consumptive use rate and represents the greatest benefit of a transaction.

Past the lower terminus of instream flow use, historical consumptive use is often remarketed into another use, particularly if an expanding river downstream ceases to need streamflow restoration as urgently.¹²¹

B. SPLIT-SEASON TRANSFERS

For most changes of irrigation water rights, lands under irrigation have been dried up permanently.¹²² Typically, a buyer will require the seller to record a dry-up covenant on the formerly irrigated land to ensure that a particular water right will never be used again on the property. This is evidence that the water right's use will not be enlarged.

However, with political willingness to find ways of improving the state's waterways while preserving Colorado's agricultural heritage, the CWCB and its partners have begun exploring deficit irrigation techniques.¹²³ For example, Western Rivers Conservancy, the Water Trust, and CWCB's McKinley Ditch project in the Gunnison basin is close to receiving a decree that contemplates

116. *Grand Valley Water Users Ass'n v. Busk-Ivanhoe, Inc.*, 386 P.3d 452, 463 (Colo. 2016).

117. *Id.*

118. *See Resume Notification for 05CW265*, Division 5 Water Resume (Dec. 2005) https://www.courts.state.co.us/Courts/Water/Resumes/Div5/12_2005.pdf (last visited May 1, 2017); Municipalities take a similar approach; many municipal change decrees allow for a municipality to call for historical diversion amounts to their intakes and replace return flows when a senior call is on. *Chapter 6: Water Supply Management*, COLORADO'S WATER PLAN 2015, 6-77 to 6-82, <https://www.colorado.gov/pacific/sites/default/files/CWP2016.pdf>.

119. A change of water right "shall be approved if such change . . . will not injuriously affect the owner of or persons entitled to use water under a vested water right or a decreed conditional water right." COLO. REV. STAT. § 37-92-305(a) (2016).

120. Ditch losses may reduce this diversion number.

121. *See e.g.*, Decree, Case No. 05CW264, 6, (Colo. Water Ct. Div. No. 5, Apr. 14, 2011).

122. *See e.g.*, *City of Thornton v. Bijou Irr. Co.*, 926 P.2d 1, 87 (Colo. 1996).

123. COLORADO'S WATER PLAN, *supra* note 116, at 6-93 to 6-126.

four different approved water management practices.¹²⁴ Historically, this water right irrigated a nearly two hundred-acre high-altitude ranch to produce one cutting of grass hay per season.¹²⁵ Afterwards, cattle would be left to graze off the remaining forage.¹²⁶ By applying less water in the late season, this project is what many commentators call deficit irrigation, whereby consumptive use water is saved through an early cessation of irrigation.¹²⁷ The Water Trust is studying the impacts to the grass hay crop as a result of the reduced irrigation with the help of Colorado State University.¹²⁸

To give some certainty to the Water Trust, the future irrigator, and the CWCB, the partners have developed a streamflow forecasting model that will predict streamflows in the basin to determine that year's need for instream flow water. Using that forecast, the partners will choose one of the following water management scenario to use for that year: (1) full season irrigation, (2) full season instream flow, (3) irrigation through June, or (4) irrigation through July. To the knowledge of the Water Trust it will be the first permanent split (also known as partial) season agricultural and instream flow water sharing decree in the western United States.

C. 3-IN-10 LOANS TO THE CWCB

During the 2002 drought—which brought fire, fish kills, and emergency bucket brigades of people moving fish from dry reaches of rivers to rivers with water—water rights owners approached the CWCB looking to act quickly to leave their water in their local river. Faced, however, with a potential two-year Water Court change case, the event highlighted that no mechanism was in place for willing water rights owners to act quickly to preserve their rivers in droughts.

In a swift bipartisan response, the General Assembly passed House Bill 1320 the next year, authorizing temporary loans of water rights for instream flow use during times of drought.¹²⁹ A year later, the drought emergency requirement was removed.¹³⁰ Instead of a longer and more expensive Water Court process, the state and division engineer are tasked with reviewing the change of water right under the injury standard, and are charged to do so within twenty days of notice of the application.¹³¹ The tool, however, remains limited in temporal and geographical scope.¹³² Water loaned can only be used three years out of ten, for

124. *Findings of Fact, Conclusions of Law, Ruling of the Referee, and Decree of the Water Court*, Case No. 14CW3108, 6-9 (Colo. Water Ct. Div. No. 4, Nov. 18, 2016).

125. *Id.* at 6.

126. *See id.* at 6-9.

127. Squillace & McLeod, *supra* note 93, Lease of Water Rights from the Coats Bros Ditch, COLO. DEPT. OF NAT. RES., 7, <http://cwcbweblink.state.co.us/weblink/0/doc/193219/Electronic.aspx?searchid=70465416-38a6-41df-bc2b-7e60575cf175> (last visited April 12, 2017).

128. Peter Leigh Taylor & Kelsea MacIlroy, *Uncovering Barriers and Disincentives, as well as Opportunities for Effective Conservation*, COLO. WATER, Nov.-Dec. 2015, at 8, http://wsnet.colostate.edu/cwis31/ColoradoWater/Images/Newsletters/2015/CW_32_4.pdf (last accessed May 1, 2017).

129. H.B. 03-1320, 61st Gen. Assemb., Reg. Sess (Colo. 2003) (codified at COLO. REV. STAT. § 37-83-105(2)).

130. H.B. 05-1039, 63rd Gen. Assemb., Reg. Sess. (Colo. 2005).

131. COLO. REV. STAT. § 37-83-105(2)(b) (2016).

132. *Id.* § 37-83-105(1).

a maximum of 120 days in any given year.¹³³ Once used, the approval can never be renewed.¹³⁴

Geographically, water may not be loaned to the CWCB unless there is an existing instream flow present and that instream flow is water short (i.e. does not have a full supply legally and physically available to it).¹³⁵ Additionally, water loaned to an unmet instream flow cannot be protected in amounts greater than the unmet instream flow's decreed flow rate. These restrictions come in part because of the speed at which CWCB staff may approve such loans and ask for ratification from their Board afterwards.¹³⁶ In essence, because a decreed instream flow is already present on a particular reach, the CWCB can skip the need analysis and recommendation from Colorado Parks and Wildlife for the use of this new temporary loan of water.¹³⁷

After approval in 2003, this tool sat unused on the shelf until 2012. Looking at bright red snowpack maps, foreboding a repeat of 2002's dry rivers, the Colorado Water Trust partnered with the CWCB to create a statewide "Request for Water," in which the Water Trust asked willing water rights owners to submit offers on a confidential, standardized form, and then vetted those water rights for meeting the statutory criteria, for transferability, and for environmental benefit.¹³⁸ That year, the Water Trust reviewed ninety-four offered water rights and completed leases with the CWCB on six of them.¹³⁹ The next year, which began as a drought year, the Water Trust reviewed 130 water rights, and leased seven water rights with the CWCB.¹⁴⁰

Part of the roll out of the effort included outreach to law firms, engineering firms, large water suppliers, and other water agencies to fully explain the program and to shake the trees for offers. During outreach to the Division of Water Resources ("DWR"), the Water Trust and CWCB asked DWR staff, the agency that would eventually review the temporary loan applications, how the partners could speed up the process. One of their specific recommendations was to avoid submitting technically challenging applications, such as applications for split-season, if the Water Trust and the CWCB wanted their fastest response. However, circumstances were such that some water users desired split-season use—they still needed to support cattle or other ranch operations on their property. The water right engineering consultants and Water Trust and CWCB staff worked to prove non-injury to the satisfaction of DWR, whose staff responded with expedience in kind.

133. *Id.* § 37-83-105(2)(a)(IV).

134. *Id.*

135. *Id.* § 37-83-105(2)(a); 2 COLO. CODE REGS. § 408-2(6)(k) (2016).

136. *See, e.g.*, COLO. REV. STAT. § 37-83-105(2)(a).

137. *See, e.g., id.*

138. Bruce Finley, *Colorado rivers, streams may get boost from lease of water rights*, DENV. POST, April 25, 2012, <http://www.denverpost.com/2012/04/25/colorado-rivers-streams-may-get-boost-from-lease-of-water-rights/> (last visited May 1, 2017).

139. *Id.*

140. The attrition rate was high, as these numbers suggest. One reason for that is that we asked people who were willing to submit their water rights to our confidential review not to self select. As long as they fell into one of our priority basins, we encouraged people to offer water and let the Water Trust and CWCB determine whether the water could be useful. Another reason for a high attrition rate was that many offers had too little historical use, or were of too junior a priority.

These new tools required in-house administration changes at DWR. When water users lease or loan their water to the Instream Flow Program, there are specific statutorily provided protections for those water rights from diminishment of historical consumptive use and from abandonment. Without proper coding in DWR's records, a consultant reviewing a leased water right's records twenty years from now would not be alerted that the years in which the water was used in the Instream Flow Program do not count in that water right's record. CWCB and Water Trust staff have worked closely with the record-keeping section of DWR to make sure those protections are enshrined properly and consistently in DWR's records.

D. INSTREAM FLOW AUGMENTATION PLAN

Augmentation plans are a statutory creation under the 1969 Water Right Determination and Administration Act, designed to allow for flexibility and reliability of new water uses in Colorado's over-appropriated river basins.¹⁴¹ Traditionally, a plan for augmentation has been viewed as a vehicle to allow a water user to divert water out-of-priority as long as a plan for replacing those out-of-priority diversions offsets those withdrawals.¹⁴² More broadly, the Colorado Supreme Court has viewed augmentation plans to be part of "a policy of maximum flexibility."¹⁴³ The definition of an augmentation plan captures that flexibility: "a detailed program . . . to increase the supply of water available for a beneficial use" by using a variety of different means, including pooling water or providing substitute supplies.¹⁴⁴

What makes augmentation plans even more flexible is their ability to accept previously unidentified sources of supply under procedures that can be set out in the original decree for the plan.¹⁴⁵ These procedures can often just require notice and comment with an administrative approval—sharply reducing the amount of time required to add further supplies when needed.¹⁴⁶

Since 1986, the CWCB has had the authority to file for plans for augmentation if the Board determines a plan is "necessary or desirable" for using acquired water, water rights, or interests in water.¹⁴⁷ The CWCB and Water Trust are working with water users on the Cache La Poudre River to explore an instream flow augmentation plan in that basin to address seasonally dry reaches of river.¹⁴⁸ What makes the idea particularly attractive in that basin and other developed basins is the potential availability of already-decreed augmentation water which might be conveniently used in such a voluntary, market-based program.

141. *See generally* Empire Lodge Homeowners' Ass'n v. Moyer, 39 P.3d 1139, 1149-50 (Colo. 2001).

142. *Id.*

143. *Id.*

144. COLO. REV. STAT. § 37-92-103(9) (2016).

145. COLO. REV. STAT. § 37-92-305(8)(c) (2016).

146. Findings of Fact, Conclusions of Law, and Decree of the Water Court at 16.3, *In re Ogilvy Augmentation Co.*, No. 03CW150 (Colo. Water Ct. Div. No. 1 July 25, 2013).

147. S.B. 86-91, 55th Gen. Assemb., 2d Reg. Sess. (Colo. 1986) (enacted).

148. Poudre Runs Through It Study/Action Work Grp., *Improving Flows While Respecting Water Rights*, <http://prti.colostate.edu/Flows.shtml>.

IX. OTHER KINDS OF FLOW RESTORATION

The CWCB's Instream Flow Program is a robust and powerful way to restore and protect streamflows within Colorado's prior appropriation system. It is not the only way. Entities ranging from the water users in the Colorado River basin¹⁴⁹ and Arkansas River basin¹⁵⁰ to reservoir owners in the San Luis Valley¹⁵¹ have all found ways to improve their rivers and protect the economic values associated with healthy, flowing rivers. Below are some of the evolving ways individual water rights can restore flow to rivers.

A. WATER CONSERVATION PROGRAMS

As discussed earlier, one of the several previous attempts at explicitly allowing the transfer of efficiency savings to the Instream Flow Program was not wholly unsuccessful. In 2013, State Senator Gail Schwartz of the Roaring Fork Valley championed one such bill, Senate Bill 13-19.¹⁵² In the end, the language allowing transfers of savings to the CWCB was removed, but protections for appropriators who wished to reduce their use remained.¹⁵³ Valid now in Water Divisions 1, 2, 3, 4, 5, and 6,¹⁵⁴ Water Conservation Programs allow an irrigator to decrease or forego diversions while participating in an approved water conservation program and be freed—at least for some years—from the “use it or lose it” pressures of Colorado water law.¹⁵⁵ Once these protections are in place, water users have the freedom to experiment with efficiencies, reducing diversions in drought years, or other water management scenarios that might have been considered too risky without statutory protections from abandonment and diminution of historical consumptive use.¹⁵⁶

The bill is, at its root, an agricultural bill—the bill does not protect water in rivers, it solely gives irrigators cover when they decide to manage their water

149. Kerry Sundeen, et al., *10825 Water Supply Alternatives Summary: Phase 2 Assessment* at 1 (Jan. 2008 draft), <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0ahUKEwjUu4bMqd7SAhWZ0YMKHRnTCmgQFggmMAI&url=http%3A%2F%2Fwww.fws.gov%2FRegion6Test%2Fdocuments-publications%2Ftechnical-reports%2Fisf%2F10825SumJan08.pdf&usq=AFQjCNFIssud83sS4YYeeYWeS9DZNYCBWg&bvm=bv.149760088,d.amc> (Colorado River water users provide water to the upper Colorado River Endangered Fish Recovery Program).

150. Colorado Division of Wildlife, *Voluntary Flow Program in Full Swing on the Arkansas River* (July 13, 2013), <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=11&ved=0ahUKEwjvfx9qd7SAhXo24MKHcvODEm4ChAWCBkAA&url=https%3A%2F%2Fcoyotegulch.blog%2F2013%2F07%2F13%2Fvoluntary-flow-program-in-full-swing-on-the-arkansas-river%2F&usq=AFQjCNG5Tz410zR2BAooan2gfPYU3OXXSA&bvm=bv.149760088,d.amc> (Arkansas River water users have come together to time releases from upstream reservoirs to benefit the rafting industry and to protect fish).

151. Colorado Parks and Wildlife, *Rio Grande Cooperation Aids Irrigation and Wildlife* (Nov. 26, 2012), <http://cpw.state.co.us/aboutus/Pages/News-Release-Details.aspx?NewsID=3912> (Reservoir owners are looking at alternative release schedules to support fish in downstream stretches of river).

152. S.B. 13-19, 69th Gen. Assemb., Reg. Sess. (Colo. 2013) (enacted).

153. *Id.*

154. The original geographic limitation was lifted by HB 17-1233. See H.B. 17-1233, 71st Gen. Assemb., Reg. Sess. (Colo. 2017).

155. See *id.*

156. See *id.*

differently. But in certain circumstances it can be used for streamflow restoration. To receive protections against diminishment of historical consumptive use and abandonment, the reduced use must be the result of participation in a water conservation program approved or established by a variety of water-related agencies or local government.¹⁵⁷ For example, the Water Trust has a project with the owner of a ranch in Grand County with relatively junior water rights.¹⁵⁸ At times when the senior water users upstream are fully satisfied and water does flow downstream to the ranch, the ranch's water rights have the ability to sweep Willow Creek, disconnecting prime tributary habitat for fish from the mainstem of the Colorado River. No transfer is necessarily needed to restore this connection—just less water use at crucial times. The ranch's owners, however, worried that not diverting their water right as much as possible put their water right at risk. The Water Trust helped the owner create a water conservation program, which was then submitted to and approved by the Colorado River Water Conservation District, an authorized entity under the statute.¹⁵⁹

Water conservation programs are a key component of Colorado River Basin-wide water use conversations. The System Conservation Pilot Program created by major water users in the basin and operated through the Upper Colorado River Basin Commission intends to explore the legal and technical underpinnings of freeing up historical consumptive use to reduce the risk of a Colorado compact call.¹⁶⁰ Water users who enroll in the program are required to reduce their consumptive use. Their water rights are not at risk because those water rights are enrolled in a water conservation program approved by the CWCB. Fourteen water users in Colorado reduced their use over 2015 and 2016 as a part of the pilot, all covered under water conservation program approved by the CWCB.

B. DOWNSTREAM TRANSFERS

In 2012, 2013, and 2017, the Water Trust and CWCB leased water from the Upper Yampa Water Conservancy District under the CWCB's temporary loan statute to fill in flow deficits to the CWCB's existing instream flow right on the Yampa River from Morrison Creek to Lake Catamount.¹⁶¹ That instream flow reach stretches only 5.4 miles and ends upstream of the City of Steamboat Springs. As July 4th approached in 2012, flows were reaching a nadir in town, nearing 40 cfs. The City imposes a voluntary closure of the river to tubing and

157. COLO. REV. STAT. § 37-92-305(3)(c) (2016) (S.B. 13-019 couples with S.B. 05-133, codified at COLO. REV. STAT. § 37-92-103(2) to protect the water user from abandonment as well).

158. Colorado Water Trust, *Rio Colorado / Willow Creek*, <http://www.coloradowater-trust.org/programs/projects/rio-colorado-willow-creek/>.

159. *Id.*

160. Bureau of Reclamation, *Pilot System Conservation Program (Pilot Program)* (Dec. 2, 2016), <https://www.usbr.gov/lc/region/programs/PilotSysConsProg/pilotsystem.html>.

161. *Stagecoach Reservoir / Yampa River*, COLO. WATER TRUST, <http://www.coloradowater-trust.org/programs/projects/stagecoach-reservoir-yampa-river>; Findings of Fact, Judgment and Decree of the Water Court, *In re: The Colorado Water Conservation Board ex rel.*, No. 01CW106 (Colo. Water Ct. Div. No. 6 2003).

fishing at flows below 85 cfs, a threshold thought to indicate when fish may become stressed.¹⁶² With the warm holiday weekend approaching, the City was facing real economic and fish habitat challenges.

The Water Trust searched for a way to authorize DWR to administer the leased water farther down the river, not just through the 5.4-mile segment below the reservoir. With water supplies so limited by the drought, Tri-State Generation & Transmission indicated they might have a need for additional supplies at their Craig Station Power Plant, ninety-two miles downstream of Stagecoach Reservoir.¹⁶³ The Water Trust entered into a water use agreement with Tri-State for their use of the leased water at Craig, and that agreement permitted DWR to administer the released water from the end of the instream flow segment at Lake Catamount down the Yampa to Craig.¹⁶⁴

C. AG-TO-AG

Agricultural users have a special loan mechanism that allows for quick loans of agricultural irrigation water rights from one farmer or rancher to another on the same stream system upon the approval of the division engineer.¹⁶⁵ This statute has been in place since the early 1900s, and was recently amended to allow for instream flow use as well (see 3-in-10 section above).¹⁶⁶ But an ag-to-ag transfer could have streamflow benefits without a formal instream flow transaction. Moving irrigation in dry years from upstream farms to downstream farms restores water from the original point of diversion to the downstream new point of diversion.

X. CONCLUSION

More and more, traditional water users are looking for opportunities to use their water in flexible ways, often with the added or express purpose of improving local river health. The motivation is not all environmental warm and fuzziness. Particularly on the West Slope, water users are realizing the economic value a running river has for their communities. Sometimes these efforts fall outside of the State's Instream Flow Program. In 2016, the City of Steamboat released more than five hundred acre-feet from storage for municipal uses, resulting in improved streamflows on the Yampa River during a low-runoff summer.¹⁶⁷ Water users and suppliers on the Eagle River reduced their diversions during the 2012 drought to keep the Eagle wet.¹⁶⁸ Other times these water users

162. MIKE NEUMANN & CHRIS WILSON, *YAMPA RIVER MANAGEMENT PLAN IV-6* (2003) (The City has embarked on a stream management planning process to bring more science, clarity, and stakeholder buy-in to determining desired flow rates through the City).

163. Colorado Foundation for Water Education, *Power in the Marketplace*, HEADWATERS, Fall 2013 <https://www.yourwatercolorado.org/headwaters-archive-blank/287-headwaters-magazine/fall-2013-the-energy-issue/626-power-in-the-marketplace>.

164. *Id.*

165. COLO. REV. STAT. § 37-83-105(1) (2016).

166. H.B. 03-1320, *supra* note 127.

167. Tom Ross, *Colorado Water Trust Praises Local Agencies for Leadership, Buys Water to Boost Yampa River*, STEAMBOAT TODAY (Sep. 23, 2016), <http://www.steamboatto-day.com/news/2016/sep/23/colorado-water-trust-praises-local-agencies-leader/>.

168. S.B. 13-19, *supra* note 150 (Hearings Before the S. Comm. on Agriculture, Natural Resources, & Energy (2013) (testimony of Kristin Moseley)).

look to the CWCB as the partner that has the statutory authority to deliver and protect water downstream as it flows downstream, to which the Colorado River Cooperative Agreement¹⁶⁹ and a recent Denver Water¹⁷⁰ acquisition agreement attest.

Through these projects, water users become aware of both the challenges and opportunities working on streamflow restoration and can and have helped expand those opportunities in legislation and policy. Senior water right holder involvement in streamflow restoration is absolutely vital. Indeed, inside Colorado's prior appropriation system, partnership with senior users is the only way for rivers to become a senior user once again.

169. Letter from Linda J. Bassi to Colo. Water Conservation Bd. (Sept. 1, 2011), <http://cwcbweblink.state.co.us/WebLink/ElectronicFile.aspx?docid=154553&searchid=c29a9723-911c-4624-901c-95c3e981747f&dbid=0>.

170. Agreement between Colo. Water Conservation Bd. and City & Cty of Denver (Feb. 15, 2013), <http://cwcbweblink.state.co.us/weblink/0/doc/191578/Electronic.aspx?searchid=4297794d-bc87-4deb-889c-cfac8b680f31>.

ELEVENTH UPDATE TO COLORADO WATER LAW: AN HISTORICAL OVERVIEW

THE HONORABLE GREGORY J. HOBBS, JR.

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To provide our readers with the most up-to-date water law information, the editors periodically include updates of works previously published in the *Water Law Review*. The following is the eleventh update to *Colorado Water Law; An Historical Overview, Appendix—Colorado Water Law: A Synopsis of Statutes and Case Law*,¹ selected by the Honorable Gregory J. Hobbs, Jr.²

COUNTY OF BOULDER V. BOULDER AND WELD COUNTY DITCH COMPANY

“The water court perceived several fatal flaws in the County’s HCU (historical consumptive use) analysis: first, the County inaccurately calculated the amount of water used pursuant to the Bailey Farm Inches; second, the County failed to prove that the 70-acre parcel, which comprised over two-thirds of the County’s claimed acreage, was historically irrigated with the Bailey Farm Inches . . . In light of these flaws, the water court rejected the County’s HCU analysis and concluded that the County had failed to carry its burden of proving HCU. The water court determined that the County could not carry its primary burden of showing the absence of injury to other water users without an accurate HCU analysis, and the court therefore denied the change of use of the Bailey Farm Inches.”

County of Boulder v. Boulder and Weld County Ditch Company, 367 P.3d 1179, 1185 (2016).

1. Gregory J. Hobbs, Jr., *Colorado Water Law: An Historical Overview*, 1 U. DENV. WATER L. REV. 1, 27 (1997). The first update to Justice Hobbs’s article appears at 2 U. DENV. WATER L. REV. 223 (1999); the second update is at 4 U. DENV. WATER L. REV. 111 (2000); the third update is at 6 U. DENV. WATER L. REV. 116 (2002); the fourth update is at 8 U. DENV. WATER L. REV. 213 (2004); the fifth update is at 10 U. DENV. WATER L. REV. 391 (2007); the sixth update is at 13 U. DENV. WATER L. REV. 389 (2009); the seventh update is at 14 U. DENV. WATER L. REV. 159 (2010); the eighth update is at 16 U. DENV. WATER L. REV. 137 (2012); the ninth update is at 18 U. DENV. WATER L. REV. 390 (2015); the tenth update is at 19 U. DENV. WATER L. REV. 261 (2016).

2. Internal citations and footnotes have been omitted from segments of the opinions reproduced below.

“This HCU analysis quantifies the water right for which the change is sought based on the amount of water actually and lawfully used over time under the right, not the amount specified in the original decree. Because ‘a proper HCU analysis measures the amount of water actually *and lawfully* used,’ HCU is determined not only by calculating the amount of water used during a representative time period, but also by limiting that calculation to water used on the specific acreage for which the appropriation was made.”

Id. at 1188.

“In addition to an acceptable water-quantity figure, the County had to base its HCU analysis on an acceptable acreage figure. This means the County had to prove not only that the acreage claimed in its analysis was part of the lawful place of use of the MM water right, but also that the claimed acreage was in fact historically irrigated with the Bailey Farm Inches. The water court found that the County failed to satisfy this latter basic requirement. This, too, is supported by the record, and we therefore uphold it. The County’s claimed 101 acres consisted of two parcels of land within the Bailey Farm: the 31-acre parcel located in the northwest portion of the property and the 70-acre parcel located in the eastern portion. However, the County offered no definitive proof that the Bailey Farm Inches were ever applied to the 70-acre parcel.”

Id. at 1190.

“Because that evidence was premised on an unsubstantiated assumption that the Bailey Farm Inches were historically used on the 70-acre parcel, it does nothing to undermine the water court’s finding that the County failed to prove that assumption was correct in the first place. Thus, absent sufficient evidence of actual application of the Bailey Farm Inches to the 70-acre parcel, the water court properly determined that the County failed to carry its burden of proving the Bailey Farm Inches were historically used to irrigate 101 acres on the Bailey Farm.”

Id. at 1191.

UPPER EAGLE REGIONAL WATER AUTHORITY V. WOLFE

“We hold that where there is no evidence of waste, hoarding, or other mischief, and no injury to the rights of other water users, the owner of a portfolio of water rights is entitled to select which of its different, in-priority conditional water rights it wishes to first divert and make absolute. We note that this holding is limited to conditional water rights, and does not extend to a choice between senior and junior absolute water rights. Further, the portfolio owner must live with its choice. Since it has chosen to make a portion of the Junior Eagle River Right absolute, the Authority may not now divert and use the Senior Lake Creek Right unless it demonstrates that it needs that water right in addition to the Junior Eagle River Right.”

Upper Eagle Regional Water Authority v. Wolfe, 371 P. 3d 681, 684 (2016).

“An applicant seeking to make a conditional water right absolute must show

its need for the conditional right, and cannot do so ‘unless it can demonstrate that it has exhausted its absolute rights first.’ Thus, an applicant ‘must show with quantifiable evidence that it in fact appropriated water in excess of its existing absolute decrees’ before making a conditional water right absolute. Because it has chosen to make 0.47 cfs of the Junior Eagle River Right absolute, the Authority may not now seek to make any portion of the Senior Lake Creek Right absolute unless it can show that it needs to divert to Cordillera more than the 5 cfs decreed to the Junior Eagle River Right for the same claimed beneficial uses. Contrary to the Engineers’ argument, therefore, permitting the Authority to first perfect its junior conditional right would not permit it to change its attribution of diversions at a whim. If the Junior Eagle River Right proves sufficient to serve Cordillera at full build-out, it is possible that the Authority might not ever make the Senior Lake Creek Right absolute. In short, the Authority must live with its choice.”

Id. at 687.

GRAND VALLEY WATER USERS ASSOCIATION V. BUSK-IVANHOE, INC.

“First, the water court erred when it concluded that storage of the Busk-Ivanhoe rights on the eastern slope prior to use for their decreed purpose was lawful. Under Colorado law, the right to store water is not an automatic incident of a direct flow right. This principle does not change simply because the diverted water is exported transmountain; the right to reuse and successively use imported water is not the equivalent of a right to store imported water without authorization before it is first applied to its decreed beneficial use. Thus, the right to store water in the basin of import prior to use is not an automatic incident of transmountain water rights, but rather, must be reflected, or at least implied, in the decree. In this case, the 2621 Decree is silent with respect to storage of the water on the eastern slope prior to use for supplemental irrigation and the record does not support the water court’s finding of an implied right in the decree for such storage. That the transmountain water was to be used for “supplemental” irrigation does not, without more, suffice to infer a separate right to store the water on the eastern slope before using it for that purpose, particularly here, where the decree expressly included storage on the western slope prior to export. And although a court may rely on extrinsic evidence such as the applicant’s underlying statement of claim or testimony to construe or interpret a decree, here the petition and statement of claim upon which the 2621 Decree is based give no indication of the appropriators’ intent to store on the eastern slope. On the facts of this case, we conclude that the water court erred by relying on other extrinsic evidence of the appropriators’ intent to infer a separate storage right on the eastern slope because this evidence was not before the court in the 2621 proceedings and therefore could not have factored into the rights confirmed in the 2621 Decree. On remand, the water court must requantify the water rights subject to change; to the extent that unlawful storage of the water on the eastern slope expanded the decreed Busk-Ivanhoe rights, such amounts cannot be included in the historic use quantification of those rights.

Second, because storage of the subject water rights in the basin of import prior to use was unlawful, the water court erred in including the volumes of exported water paid as rental fees for storage on the eastern slope in its historic

consumptive use quantification of the water rights.

Finally, the water court erred in concluding that it was required to exclude the twenty-two years of undecreed use of the subject water rights from the representative study period. In this case, the undecreed use did not represent expanded use of the decreed right for which an appropriator may not receive credit. Rather, the undecreed municipal use of the water occurred in lieu of its decreed purpose for supplemental irrigation. In other words, the period of undecreed use in this case reflects twenty-two years of non-use of the decreed rights. Because unjustified non-use of a decreed right should be considered when quantifying historic consumptive use for purposes of a change application, we remand the case to the water court to determine whether the years of non-use of the Busk-Ivanhoe rights for their decreed purpose were unjustified. If so, the water court should consider including the years of unjustified non-use in the representative study period as “zero-use” years for purposes of its historic consumptive use analysis. Accordingly, we reverse the water court’s May 27, 2014, Order and August 15, 2014, Judgment and Decree and remand to Water Division 2 for further proceedings consistent with this opinion.”

Grand Valley Water Users Association v. Busk-Ivanhoe, Inc., 386 P.3d 452, 460-61 (2016).

“We further disagree that a right to store the Busk-Ivanhoe water rights on the eastern slope may be implied from the 2621 Decree and its underlying pleadings. The 2621 Decree makes no reference at all to storage of the water on the eastern slope before being used for supplemental irrigation. And although a court may rely on extrinsic evidence such as the applicant’s underlying statement of claim or testimony to construe or interpret a decree, here the petition and statement of claim upon which the 2621 Decree is based give no indication of the appropriators’ intent to store on the eastern slope. On the facts of this case, we conclude that the water court erred by relying on other extrinsic evidence of the appropriators’ intent to infer a separate storage right on the eastern slope because this evidence was never presented to the water court in the 2621 Decree proceedings and could not have formed the basis of its supposed recognition of the appropriators’ intent to store the water on the eastern slope.”

Id. at 464.

“In short, if an asserted right exists, it must be found in the language of the decree or at least ‘implied from the express provisions of the decree.’ In this case, the 2621 Decree adjudicates a storage right for 1,200 acre-feet of water in the Ivanhoe Reservoir on the western slope prior to export. Yet the 2621 Decree contains no reference to storage of the Busk-Ivanhoe System rights on the eastern slope before such water is put to beneficial use. To the contrary, the language of the 2621 Decree repeatedly states that both the direct flow water and the water released from storage in the Ivanhoe Reservoir, once exported, will be released into Lake Fork Creek ‘and thence into the Arkansas River,’ from which it will be diverted for irrigation of lands in the Arkansas River Basin.”

Id. at 466-67.

“Accordingly, on remand, the water court must determine to what extent storage of the Busk-Ivanhoe rights on the eastern slope prior to using the water for its decreed purpose caused an unlawful expansion of the decreed right. In conducting its historic consumptive use analysis, the water court should exclude the amounts, if any, by which the rights have been expanded by the unlawful storage.”

Id. at 468.

“We conclude that the water court erred in concluding that it was required to exclude the periods of undecreed use from the representative study period. In this case, the undecreed use did not represent expanded use of the decreed right for which an appropriator may not receive historic use credit. Rather, here, the water was used for undecreed municipal purposes in lieu of its decreed purpose for supplemental irrigation. Consequently, the period of undecreed use in this case reflects twenty-two years of non-use of the decreed rights for their decreed purpose. Because unjustified non-use of a decreed right should be considered when quantifying historic consumptive use for purposes of a change application, the water court should have considered including any years of unjustified non-use of the decreed water rights as ‘zero-use’ years when selecting a representative study period. By omitting years of unjustified non-use from a representative study period, the average annual historic use is artificially inflated, thereby effectively giving credit for the undecreed use in the quantification of the right.”

Id. at 470.

BOOK NOTE

John Fleck, *Water is for Fighting Over: And Other Myths about Water in the West*, Island Press, Washington D.C. (2016), 264 pp; ISBN: 978-1610916790.

In *Water is for Fighting Over*, John Fleck¹ takes a positive outlook on the future of the Colorado River, despite its decreasing quality and flow. As a recurring theme, Fleck sets his sights on debunking the titular assertion and a variety of other Western water myths that propagate scarcity, conflict, and disaster. He highlights different instances of collaboration, conservation, and collective water-share efforts by communities utilizing the river that put these myths to bed. Fleck spends the pages convincing readers that fighting over scarcity of water resources never eradicates issues, but utilizing less water collectively could help save the flow of the Colorado River for years to come.

Chapter one, “*Rejoining the Sea*,” describes how water distribution should be handled in the Colorado River Basin. Fleck makes observations about different areas of the U.S. drying up through drought or over-allocation of water resources and the ways in which cities make do with less water in these circumstances. As a solution to this issue, he points to the role “the network” can play in resolving difficult water disputes. Fleck believes this informal group of experts—engineers, lawyers, environmentalists, and water managers who all deal with the river and its allocations, conservation, and management on a daily basis—is essential to better management of the Colorado River. This sort of collaboration is what Fleck believes will alleviate the multitude of allocation issues facing the Colorado River Basin year after year.

Chapter two, “*Water Squandered on a Cow*,” outlines water apportionment disputes and wasteful irrigation practices in Colorado, specifically highlighting improved farming routines associated with the alfalfa crop. Fleck begins the chapter by explaining where the Colorado River’s water actually comes from: snowmelt. The issue with the Colorado River is that most of the time there is not enough snowmelt water to fulfill every entity’s legal entitlements. When there is not enough water, the Colorado River Compact first fulfills its duty of water allocation to those senior rights holders who put their allocations to beneficial use. This means the agricultural communities are characteristically safe in times of water shortage because their rights are first priority when the water is short. Yet, studies show that alfalfa is still able to produce a crop without water for a season (albeit at a lower yield). This means cities and other essential—but more junior—water users can “borrow” water in times of dire shortages from alfalfa farmers and compensate for the loss in crop yield. Fleck takes issue with

1. John Fleck is a former journalist for the *Albuquerque Journal*, and the current director of the University of New Mexico’s Water Resources Program. He maintains a blog touching on topics regarding water and climate in the West, and he sends out periodic email newsletters with updates. *Water is for Fighting Over* is his second book. His first book, *The Tree Rings’ Tale*, is a book for middle-school-aged students about the climate of the West.

the fact that farmers and municipalities only take advantage of this preservation tactic when all parties need to take a huge cut in their allocations for conservation purposes. Instead, he would like to see protection practices such as these taking over the agricultural industry by choice rather than necessity. In light of the senior rights system and the ability of crops to survive with little water for a season or two, the myth of farmers and crop-growers running out of water is, in most cases, exaggerated.

Chapter three, "*Fountains in the Desert*," highlights the triumphs of Las Vegas' water management system despite its dry climate and miniscule allocation of the Colorado River. The focus of conservation has been so effective that Las Vegas does not use its full apportionment of water from the Colorado River, and while its water use decreases, the city's population continues to grow. Surprisingly, in a city known for its hedonistic qualities, the community managed to reduce its water usage by twenty percent because of its willingness to participate in government conservation efforts without fighting back. Las Vegas accomplished these reduction efforts during a significant population boom, further debunking the myth that a population increase compels an increased need for water.

In chapter four, "*Negotiating the Rapids*," Fleck points out the value of informal conversations to river management. He identifies how many of these types of interactions are so successful because, in these informal settings, individuals speak as individuals, not stakeholders for their place of employment. Fleck provides one example of a group created as a result of an informal conversation: the Yuma Desalter Working Group. One of the federal government's senior water managers formed this group during a rafting trip on the Colorado River. After a weekend of hanging out by the river, drinking beer, and casually discussing current water issues, the group met later on and came up with plans to reduce the dry-up risk of lower Colorado River Basin users while, at the same time, maintaining the wildlife and habitat at the Cinega de Santa Clara. Fleck credits the accomplishments of this group to a breaking down of professional conversational barriers before digging into the issues, obviating the worry that people of different backgrounds and beliefs will refuse to compromise.

Chapter five, "*Arizona's Worst Enemy*," provides an example of the consequences of unwillingness to compromise. Fleck describes Arizona's various actions that denote its historical belief that "water is for fightin' over," the main myth that this book aims to engage. This contentious attitude continues to cause issues for Arizona beyond the original refusal to sign the Colorado River Compact in 1922, the agreement that created an interstate Colorado River share system. After officials refused to compromise, Arizona received its first break from detrimental allocation sizes in court: Arizona sued California and prevailed in obtaining the water it believed it needed to survive, even though Arizona would soon find itself trading water for California's help transporting it into the state. The ongoing lawsuits between Arizona and California are still long from over, and the outcome of this suit only amplifies the allocation issues the Colorado River Compact presented. Fleck believes compromise will be even more imperative if redistribution occurs in terms of allocations, and he does not predict Arizona will be willing to cooperate in the future either.

Chapter six, "*Averting Tragedy*," describes how compromise, rather than fighting, alleviated the first instance of potential groundwater exhaustion in Los

Angeles County's West Basin ("West Basin"). Finding new solutions to groundwater pumping and finding an imported water supply to replace the salty groundwater were proving to be difficult tasks for city water managers. The difficulty came about because each community continued pumping groundwater without regard for its neighbors. Political scientist Elinor Ostrom studied the disregard for neighboring communities that plagued this situation, and she found that it caused severe interstate agency rivalries. She believed, much like Fleck, that informal conversation, or what she called "cheap talk," was the best technique for getting communities to come together and compromise. As a result of "cheap talk," the West Basin Water Association materialized, and all but one of the communities joined together to combat the issues as a team. Not until the court ordered the lone holdout community to participate did the reckless groundwater pumping completely stop. Fleck concluded that sometimes the courts are the only entity that can successfully set rule-breakers in their place for the greater good, further proving that fighting over water is not the best solution to large scale problems.

Chapter seven, "*Turning off LA's Tap*," details another successful instance of compromise over conflict in California. The state has a historical tendency to claim upper basin states' unused water allotments without permission. While this forms a temporary fix for California's drought issues, eventually upper basin states needed to save water rather than spend it. This trend caused conflict between California and upper basin states, and eventually all seven states banded together to address and resolve the conflict in 1990. With the input of all seven states regarding California's request to receive the surplus water each year, a protocol for handling river allocation proposals was born, and the states agreed that nothing would pass as law without approval from all seven states. When the compact states did not approve the surplus request, California needed to create a soft landing for itself by decreasing its river use, starting with the places it used water the most: local agricultural or urban communities. Despite its efforts, California failed to reduce usage, and the government stepped in and slashed the overused allocation to its originally defined amount. Although this action was a harsh wake-up call for California, the other six states felt the original allocations were fair, proving once again that compromise, albeit as a result of a little government intervention, is often necessary to drive revolutionary changes.

Chapter eight, "*So Cal Cuts Back*," shows California's efforts to dial back water usage as demanded by the government. As a fix for this, the metropolitan communities formed a management system. The original objective of this group was to find a way to supply the urban areas with the amount water they required. This tactic quickly failed as all three water storage areas dried. The Metropolitan Water District ("Metropolitan") governance realized it needed to abandon the plans and changed focuses. The spotlight turned to groundwater recovery and the recycling of water previously unfit for human use. Fleck illustrated a state's ability to manage a change in allocation or a shortage in resources by banding together with its individual communities, demonstrating the importance of exploring alternatives before succumbing to the fear of water scarcity.

Chapter nine, "*The Great Fallowing*," lays out the history of the Imperial Irrigation District ("Imperial"), the district with the most water allocated from the Colorado River. To eliminate the frequent flooding that would jeopardize

the lower river valley, the district created The Hoover Dam and the All-American Canal. The dams evened out the flow, making year-round irrigation possible. Once these structures were set up, Imperial's wasteful practices of hoarding water became more apparent among its residents: farmers continued to overestimate the amount of water they needed, creating an excess of runoff, and the sea began to rise and flood the nearest farmland. When other states expressed concern, Imperial chose to join together with the water-hungry Metropolitan, and it promised a share of its unused water if Metropolitan could come up with a way to conserve Imperial's water. The practices soon turned a surplus into a deficit, and the agricultural community had to learn how to farm with less. This instance points us back to the notion of efficiency in agricultural techniques. Fleck once again challenges local governments with this chapter to look into this scarcity strategy, not only in times of scarcity but in everyday irrigation practices.

Chapter ten, "*Emptying Lake Mead*," highlights the trials of keeping the Lake Mead and Lake Powell Reservoirs relatively full while fulfilling Mexico's water distribution requirements. Lake Mead's level was dropping quickly, and policy debates began about shortages that the Colorado River Basin states had never encountered. When Lake Powell surpassed Lake Mead in dry-up potential, the network of water collaborators came together just as it did to create the Colorado River Compact in 1922. It came up with a plan, to which all states agreed, that required proportional allocation cuts when the water was low for each state. When 2014 rolled around and Lake Mead was still declining, Fleck says it was apparent that the deal did not go far enough in terms of cutting back. The network had a lot more work to do to stop the depletion of both reservoirs.

In chapter eleven, "*Who's Left Out*," Fleck addresses, once again, the importance of inclusiveness. During the change in operations at the Glen Canyon Dam, electricity consumers were left out of the conversation. New water management around the Salton Sea did not think to include the public health community when making the changes would impact the surrounding air quality, and when the Bureau of Reclamation conducted its "Colorado River Basin Water Supply and Demand Study," it failed to mention large stake holding Native communities entirely. When these issues were brought up, Fleck was careful to point out that the changes often had a sizable impact on Native American tribes, who are very rarely included in the conversation. The Colorado River Compact rarely mentions the Native communities, and decision-makers did not invite any of them to participate in water conversations. Lastly, when making influential decisions about water management, the host often fails to consult or invite environmentalist groups. Fleck believes that leaving out these groups can harm the progress that "network" groups are making by slowing down the process and requiring revision of previous decisions for inclusiveness.

Chapter twelve, "*A Beaver Returns to the Delta*," further discusses inclusivity, and shows how collaboration between formally feuding groups can help to undo much of the damage we have done to the Colorado River over the years. Fleck explained that after the Colorado River Compact creators divided the river, they found that dry spots would emerge in arid seasons, and the wildlife would migrate until the river started flowing again. Most recently when the river started flowing again in the previously dry Colorado River Delta, Mexico, the United States, and environmental groups met to devise a plan to keep the water flowing through this delta. This plan, titled Minute 319, was the first of its kind

that mentioned environmental implications and wildlife preservation. This collaboration felled two myths. The first was that environmentalists and water managers could not work together to achieve common goals. The second was that the delta was dead, and that rejuvenation of wildlife and surrounding communities was impossible due to the growing water demands and the consistent population booms alongside the Colorado River.

In chapter thirteen, "*Conclusion*," Fleck wraps up his book by highlighting the issues with over-allocation, hoarding of rights, and "use it or lose it" laws, and by stating the major issues and providing potential solutions. He believes that every state will need to understand each other's needs and work together to solve the problems of the Colorado River. Fleck also warns of the media's ability to shape the viewpoints of people or the tone of events. He finally stresses the importance of communication, and he reminds us that a simple informal conversation or meeting could solve problems that the many entities of the Colorado River face each year.

In conclusion, *Water is for Fighting Over* serves as a call to collaborative action for those sharing and managing water stemming from the Colorado River. Fleck provides a positive outlook on the future of the Colorado River if communities find ways to come together for conservation efforts and management rather than turn to fighting over every last drop. The book supplies a comprehensive history of systematic inefficiencies and the collaborative ways that we can address them in the West. Fleck illustrates the various instances that he believes debunk the myths that create sleepless nights for many who depend on the Colorado River's allocation system. He shows that water is not for fighting over, but it is for sharing and finding solutions to its management as the years go on.

Rebecca Spence

**“A MAN WHO IS HIS OWN LAWYER HAS A FOOL
FOR A CLIENT” - PRO SE REPRESENTATION IN
COLORADO WATER COURTS, 359 P.3D 29**

KATHLEEN CECELIA CUNILIO*

Concerning the Application for Water Rights of Town of Minturn
Supreme Court of Colorado

Supreme Court Case No. 14SA295
October 26, 2015

An Appeal from the District Court Water Division No. 5
Case No. 12CW77
Honorable Judge Thomas W. Ossola

I. INTRODUCTION

Generally, individuals may represent themselves in courts of law.¹ For example, a criminal defendant may choose to serve as his own counsel in his death penalty trial.² In the realm of water law in Colorado, any person may insert themselves into water-court proceedings.³ However, after a recent decision, a person may not proceed *pro se* in water court while acting in a trustee capacity.⁴ This article addresses why the ability to represent oneself in Colorado water court exists, even in the context of *Tucker v. Minturn*. The article will first provide pertinent background on Colorado’s water regime as well as context to the *Minturn* decision. Moreover, the article suggests this ruling is analogous to the way courts treat unrepresented parties in water court. Last, the article will make a policy recommendation that could potentially ameliorate the inequity that exists in the realm of water disputes.

* J.D., University of Denver, 2017. A tremendous thank you to Professor Tom Romero for his mentorship, comments, and support in the writing of this piece. Thanks also to the editors of the University of Denver Water Law Review for their work in editing this Note. Finally, thank you to the Open Courts Colorado program for providing Colorado law students like myself with an opportunity to observe appellate court proceedings, such as *Tucker v. Minturn*. 1. *People v. Adams*, 243 P.3d 256, 265 (Colo. 2010) (“An individual has the right to represent himself *pro se*, as his own counsel in civil and criminal cases. . .”).

2. Kevin Sack, *Dylann Roof to Represent Himself at Trial in Charleston Church Shootings*, N.Y. TIMES (Nov. 28, 2016), http://www.nytimes.com/2016/11/28/us/dylann-roof-charleston-massacre.html?_r=0 (last visited Nov. 28, 2016).

3. See COLO. REV. STAT. § 37-92-302(1)(b) (2012).

4. *In re Water Rights of Town of Minturn*, 359 P.3d 29, 30 (Colo. 2015).

II. BRIEF BACKGROUND ON COLORADO WATER COURTS

In order to understand how a *pro se* water court litigant wrote his own legal brief and argued before the Colorado Supreme Court, it is helpful to first explain the legal regime behind Colorado water law. Pursuant to Colorado's Constitution, water rights are unique because ownership remains in the general public, subject to prior appropriation.⁵ Under the Water Rights Determination and Administration Act of 1969 ("the Act"),⁶ the Colorado legislature created a framework for specialized water court proceedings.⁷ Unlike other states that have created administrative water agencies, under the Act, Colorado "retained a judicial system and charged it with administrative functions."⁸ The Act divided Colorado into seven water divisions, corresponding to its seven major drainages.⁹

A user must file an application with the appropriate water clerk in order to be granted a water right or to change an existing water right.¹⁰ Every month, each water division prints resumes of pending water applications, publishing them both in newspapers and online.¹¹ Moreover, the resumes are sent to rights-holders potentially affected by an application.¹² If someone wishes to object to an application, he or she may file a statement of opposition.¹³ A water referee, serving as a fact-finder, consults with the division engineer before making a ruling to either approve, partially approve, or deny each application.¹⁴ Notably, "[i]nterested parties who are dissatisfied with the ruling may file a protest. A protest results in a hearing at which the water judge determines the issues [on a] *de novo*" standard of review.¹⁵ These hearings are safeguards for potentially injured parties to state or restate their opposition to an application. In these protest hearings, the applicant, and all other parties who oppose the application, will generally hire lawyers and engineers, which "can be rather expensive."¹⁶

Another safeguard ensuring that referees' determinations are appropriate is that their rulings are reviewed semi-annually by the division's water court judge, who has the statutory power to confirm, modify, or reverse the decisions.¹⁷ Thereafter, any appeals go directly to the Colorado Supreme Court.¹⁸

5. COLO. CONST. art. 16, § 5; COLO. REV. STAT. § 37-92-103(12) (2014).

6. COLO. REV. STAT. §§ 37-92-101-602 (2016).

7. DAVID H. GETCHES ET AL., WATER LAW IN A NUTSHELL 164-165 (4th ed., 2009) [hereinafter GETCHES].

8. *Id.* at 164.

9. *Id.* at 165.

10. A. DAN TARLOCK ET AL., WATER RESOURCE MANAGEMENT: A CASEBOOK IN LAW AND PUBLIC POLICY 203 (7th ed., 2014) [hereinafter TARLOCK].

11. *Id.*

12. *Id.*

13. COLO. REV. STAT. § 37-92-302(1)(b).

14. TARLOCK, *supra* note 10, at 203.

15. *Id.*; see also *Wadsworth v. Kuiper*, 562 P.2d 1114, 1119 (Colo. 1977) (noting that "persons, including the State of Colorado, might file a protest to the ruling of a referee even though they had not filed a statement of opposition to an application" for a water right).

16. TARLOCK, *supra* note 10, at 203.

17. *Id.*

18. *Id.*

III. FACTS OF THE MINTURN CASE

The town of Minturn is a small municipality located upstream from the confluence of Gore Creek and the Eagle River on Colorado's Western Slope.¹⁹ In fulfilling its duty to provide water to its residents, Minturn was originally decreed what is known as the Bolts Lake conditional water right in 1999 for 320 acre-feet in the District Court for Water Division 5 ("Division 5 Water Court").²⁰

Bolts Lake lies on a property known as Battle Mountain.²¹ This property is described as "one of the most coveted, disputed, and complex pieces of land in the Rocky Mountains."²² Although Battle Mountain was not at issue in the *Minturn* case, its description serves as an appropriate primer for water rights, which could also be characterized as coveted, disputed, and complex.

In 2012, Minturn filed its sexennial application for a finding of reasonable diligence in developing its Bolts Lake water right.²³ This finding was an important step because it would be Minturn's only storage right,²⁴ and without a water storage right, Minturn's "beneficial use of water would be limited to short runoff periods."²⁵

Soon after Minturn filed its application, Mr. Jeff Tucker inserted himself into the adjudication by filing a statement of opposition, claiming an interest in affected water rights as a trustee of an express trust.²⁶ However, Tucker provided no evidence regarding the purported trust nor the allegedly affected water rights.²⁷ Notably, Tucker has previously opposed efforts by Minturn to appropriate the Bolts Lake water right.²⁸

Incidentally, back in 2011, a Colorado magazine referred to Tucker as a "mysterious man" who had filed several lawsuits related to Battle Mountain.²⁹ Moreover, in its answer brief to the Supreme Court, Battle Mountain Entities

19. TOWN OF MINTURN HISTORY, <http://www.minturn.org/community/MinturnHistory/index.html> (last visited Mar. 13, 2017).

20. Brief of Applicant-Appellee at 4, *Town of Minturn v. Tucker*, No. 2014SA295 (Colo. Sept. 30, 2015) [hereinafter Brief of Applicant-Appellee].

21. See BATTLE MOUNTAIN RESORT, <http://battlemountainresort.com/description/> (last visited Mar. 13, 2017) ("Bolts Lake itself was built by the Bolt brothers at the turn of the century and used for fishing and boating. They cut a channel through solid rock to feed it with a diversion from Cross Creek.").

22. Patrick Doyle, *The Last Resort*, 5280 MAGAZINE, June 2011, at 72, available at http://www.minturn.org/pdf/PublicNotices/5280_Article_-_The_Last_Resort_06-2011.PDF [hereinafter Doyle].

23. Brief of Applicant-Appellee, *supra* note 20, at 3.

24. *Id.* at 4.

25. GETCHES, *supra* note 7, at 200.

26. Brief of Opposer-Appellee at 3, *Town of Minturn v. Tucker*, No. 2014SA295 (Colo. Sept. 30, 2015) [hereinafter Brief of Opposer-Appellee].

27. *Id.* ("Trustee's Statement of Opposition does not state for what entity or trust he is acting as trustee.").

28. See Winslow Taylor, *Town of Minturn v. Tucker*, 16 U. DENV. WATER L. REV. 485, 493 (Apr. 15, 2013) ("After the water court entered . . . the final decrees, Minturn discovered the stipulation decree based several consumptive use calculations on billing statements . . . which made the monthly calculations differ by one month and not reflect[ive] of actual monthly historical use numbers. Minturn petitioned the water court to correct the decrees. Tucker was the only opposer [to these decree corrections].").

29. Doyle, *supra* note 22, at 92.

asserted “Tucker has inserted himself into many Colorado cases, claiming various entities . . . hold an interest in the Battle Mountain Property.”³⁰ The answer brief also indicated that Tucker has a history of fraudulent, failed property ownership claims, casting doubt on the veracity of his trusteeship.³¹

In response to Tucker’s Bolts Lake opposition, the Water Court held a case management conference and raised *sua sponte* the question whether Tucker could proceed *pro se* in the capacity of a trustee.³²

The Water Court ultimately held that the Tucker, a non-attorney, could not represent a trust in a water proceeding, and the court granted Minturn’s application and Decree.³³ Tucker appealed the Water Court’s ruling, which propelled the issue to the province of the Colorado Supreme Court.³⁴

Oral arguments for *Minturn* occurred on September 30, 2015.³⁵ Tucker, acting as his own attorney, argued against attorneys from the well-known firm Holland & Hart, and argued first.³⁶ At the podium, Tucker made no mention of the unidentified beneficiaries of the trust, further exacerbating the legitimacy of his role as a *pro se* opposer.³⁷

One notable query for Tucker came from Chief Justice Rice, who expressed her concern with the rule against the unauthorized practice of law.³⁸ Rice suggested that Tucker’s self-representation implicated the interests of (albeit unknown) others, which could cross that line.³⁹ In response, Tucker made an interesting characterization: He stated that it was his personal perspective that Americans have always had the right to represent themselves in court, and that the right to be represented by counsel is more of a secondary right.⁴⁰

Next, Minturn’s attorney, Megan Winokur, argued before the justices. Winokur conceded that there is a unique level standing in Colorado water law.⁴¹ Any person has a right to file a statement of opposition in a case without demonstrating any explicit interest or injury.⁴² This lower threshold for standing results from Colorado’s waters belonging to the public.⁴³

30. Brief of Opposer-Appellee, *supra* note 26, at 3 n.2.

31. *Id.*

32. Brief of Applicant-Appellee, *supra* note 20, at 10 (At this hearing Senior Water Court Judge Ossola said, “And here we have Mr. Tucker, who I understand is not a lawyer . . . and styles himself in the pleadings as trustee, but . . . I don’t know what Mr. Tucker is trustee of. The term ‘trustee’ causes me to assume that there is a trust of which he is the trustee, and that raises the question [what he is a] trustee of.”).

33. *See Minturn*, 359 P.3d at 31.

34. *Id.*

35. *Oral Argument Schedule*, STATE OF COLO. JUDICIAL DEP’T (Sep. 30, 2015), https://www.courts.state.co.us/Courts/Supreme_Court/Oral_Arguments/Index.cfm?year=2015&month=9.

36. *See* Oral Argument 14SA295, *Tucker v. Town of Minturn*, 359 P.3d 29 (Colo. 2015), <https://cojudicial.ompnetwork.org/shows/14sa295> (last visited Nov. 29, 2016) [hereinafter Oral Argument Video Recording].

37. *Id.*

38. *Id.* at 8:07; *See* Colo. Rev. Stat. § 12-5-101 (2014) (In Colorado, an individual is statutorily required to obtain a law license to practice law).

39. Oral Argument Video Recording, *supra* note 36, at 8:10.

40. *Id.* at 11:10.

41. *Id.* at 15:10.

42. *Id.* at 15:18.

43. *Id.* at 15:25; *see also* Colo. CONST. art. XVI, § 5.

Nonetheless, Winokur asserted that there are good reasons to require counsel on behalf of parties in water court.⁴⁴ First, individuals are entitled to competent representation.⁴⁵ Second, attorneys are held to certain ethical standards.⁴⁶ Third, having attorneys represent the rights of clients ensures orderly and organized legal proceedings.⁴⁷ Last, Winokur stressed that Tucker's *pro se* participation implicated "the time and [financial] resources of a small municipality" in defending the Water Court's decision.⁴⁸

A month later, the court upheld the Water Court's determination: because Tucker was trying to represent the interests of a trust, he was acting in a capacity that involved the interests of individuals other than himself, which meant he, as a trustee, was not allowed to represent a trust *pro se* in a litigation matter.⁴⁹

IV. THE ISSUE OF SELF-REPRESENTATION IN WATER COURT

An issue the court did not directly address in its short *Minturn* decision is whether Colorado water court proceedings are fundamentally different from other court proceedings requiring counsel. The uniqueness of water law creates a paradox for self-represented parties. *Minturn*'s own attorney noted the lower threshold of standing in water disputes that entitles anyone, with or without an attorney, to file a statement of opposition, which represents "a legal system that provides stability and fairness" to all Coloradans.⁵⁰ Since "water is legally and historically a public resource," water proceedings implicate fundamentally different values than more privatized or individualized disputes where attorneys are prevalent.⁵¹ Thus, although Tucker may not have been the most appropriate *pro se* party for whom this suggestion should be made, the current framework provides a mechanism for lay people, without the resources to hire a lawyer, to challenge another's use of water.

More broadly speaking, however, the *Minturn* ruling is consistent with other Colorado court decisions that hold *pro se* water court parties to a certain standard. For example, a non-attorney's water lawsuit was dismissed for lack of jurisdiction because the petitioner improperly filed it in district court, not water court.⁵² Thus, the court did not grant the petitioner special consideration because he lacked a law degree.⁵³

Moreover, the Colorado Supreme Court has also found that merely because a *pro se* party "did not know of his obligations under the Water Court Rules or the Rules of Civil Procedure d[id] not excuse his failure to make . . .

44. Oral Argument Video Recording, *supra* note 36, at 22:15.

45. *Id.* at 22:28; see also COLO. RULES OF PROF'L CONDUCT r. 1.1 (2016).

46. Oral Argument Video Recording, *supra* note 36, at 22:38; see generally COLO. RULES OF PROF'L CONDUCT pmbl. (2016).

47. Oral Argument Video Recording, *supra* note 36, at 22:41.

48. *Id.* at 24:28. Moreover, Winokur also told the court that Tucker's *pro se* involvement with the Water Court implicated the three types of concerns she listed.

49. *Minturn*, 359 P.3d at 32.

50. GETCHES, *supra* note 7, at 3; Oral Argument Video Recording, *supra* note 36, at 15:18; Brief of Opposer-Appellee, *supra* note 26, at 28 n.4.

51. GETCHES, *supra* note 7, at 11.

52. See *People v. Spencer*, 524 P.2d 1084, 1085 (Colo. 1974).

53. *Id.* at 1085-87.

required disclosures.”⁵⁴ The Court further held that, “[w]hile courts may take into account the fact that a party is appearing *pro se*, *pro se* parties are ‘bound by the same rules of civil procedure as attorneys licensed to practice law.’”⁵⁵

Thus, non-attorneys like Tucker have the right to present their own case, but Colorado courts will hold them to the same standard as lawyers because “otherwise, ignorance is unjustly rewarded.”⁵⁶ In *Minturn*, Tucker asserted a perplexing due process claim for the first time to the Colorado Supreme Court.⁵⁷ Tucker’s choice not to hire counsel means that he “must be prepared to accept the consequences of his mistakes and errors” in representing himself both in the water court and on appeal.⁵⁸ Therefore, there is a balancing act in keeping water courts accessible to those who may not be able to afford an attorney, while also ensuring that water court proceedings are not abused by *pro se* litigants.

Despite the unique public entitlement to Colorado’s unappropriated waters, when a non-attorney represents his or her own interests (or the interest of others like in *Minturn*) in a legal forum, issues may arise. One litigator notes that “self-represented part[ies] suffer from lack of experience, expertise, and often, basic competence.”⁵⁹ Further, unrepresented parties’ lack of training and experience creates more of a burden for courts, “which often must decipher unclear arguments, tease out unmade arguments, and parse the record to a greater extent than it would for a represented party.”⁶⁰

V. POLICY RECOMENDATION: PRO BONO WATER COURT PROGRAM

While there may be equally “keen competition among [all types of] water users,”⁶¹ there is oft-times inequitable bargaining power among those users due to disparate financial resources and knowledge of Colorado’s regime governing water law. Water disputes can be highly-technical processes, involving scientific assessments.⁵⁷ It may be difficult for a person who cannot hire an engineer, let alone an attorney, to successfully bring an action in a water court. Therefore, the fundamentally complicated nature of water law often motivates interested parties to retain counsel.

However, in light of available resources for *pro se* litigants in other contexts, there is an opportunity to provide self-represented litigants with attorneys in

54. *Cornelius v. River Ridge Ranch Landowners Ass’n*, 202 P.3d 564, 572 (Colo. 2009).

55. *Id.* (citing to *Negron v. Golder*, 111 P.3d 538, 540 (Colo. App. 2004)).

56. *Knapp v. Fleming*, 258 P.2d 489, 489–90 (Colo. 1953).

57. Opening Brief of Opposer-Appellant at 14–16, *Town of Minturn v. Tucker*, No. 2014SA295 (Colo. Sept. 30, 2015).

58. *Viles v. Scofield*, 261 P.2d 148, 149 (Colo. 1953).

59. Marcy G. Glenn, *Pro Se Civil Appeals: The Problem and Special Standards and Rules*, COLO. LAW., Mar. 2016, at 63, 64. [hereinafter Glenn I].

60. Marcy G. Glenn, *Pro Se Civil Appeals-Resources and Opportunities*, COLO. LAW., June 2016, at 57, 60 [hereinafter Glenn II].

61. GETCHES, *supra* note 7, at 1.

⁵⁷James S. Witwer and P. Andrew Jones, *Statutory and Rule Changes to Water Court Practice*, COLO. LAW., June 2009, at 53, 56 (stating that “[t]oday’s water litigants arrive at the courthouse with complex hydrologic models, gigabytes of data, and a cadre of expert witnesses. Colorado has a large number of qualified, ethical professionals who fulfill this role, helping attorneys, participants, and judges understand the complexities of hydrology and related technical fields”).

water court. Notably, by way of a recent Chief Justice Directive, Colorado courts are permitted to supply “limited self-help assistance to *pro se* litigants in non-criminal appeals, [in order] to facilitate their access to the courts.”⁶² Perhaps this type of program could be extended and tailored to assist *pro se* water court litigants.

In the appellate context, the Colorado Bar Association has initiated the Appellate Pro Bono Program.⁶³ This program pairs indigent litigants, who would otherwise appear unrepresented, with volunteer lawyers.⁶⁴ A way to make water court proceedings more fundamentally fair would be to create a Water Court Pro Bono Program for the seven water court divisions, streamlining disputes involving unrepresented parties.

Another potential avenue for *pro se* Colorado water court litigants would be the creation of a water law clinic at the University of Denver Sturm College of Law. Given the demographic and economic difficulties associated with agricultural water users in particular, the establishment of this type of clinic could help farmers and other water users navigate the court process. For example, student attorneys could assist clients in protecting their own water rights. The University of Denver’s strong reputation for both water law and its clinical programs, coupled with its expanding water law course offerings,⁶⁵ including a Water Court Practice Seminar and a Water Transactions Seminar, would make it an ideal forum for a clinic serving *pro se* water court litigants who need assistance.

VI. CLOSING

While water law is complex, *Minturn* demonstrates it remains rife with contention as its public nature opens the floodgates for *pro se* parties to insert themselves into water court proceedings. However, if Jeff Tucker had been required to meet with a water law attorney, or alternatively, have law students from a Water Law Clinic work with him, perhaps his lengthy and costly appeal could have been avoided.

62. Glenn I, *supra* note 59, at 65; see generally CHIEF JUSTICE MICHAEL L. BENDER, COLO. CHIEF JUSTICE DIRECTIVE 13-01 (June 12, 2013), https://www.courts.state.co.us/Courts/Supreme_Court/Directives/13-01.pdf.

63. Glenn II, *supra* note 60, at 57.

64. *Id.*

65. See generally Course List, University of Denver College of Law Registrar, <http://www.law.du.edu/forms/registrar/course-list.cfm> (last visited May 8, 2017).

**IN SUPPORT OF COLORADO HOUSE BILL 16-1392 -
A BILL FOR AN ACT CONCERNING THE
ADMINISTRATION OF WATER BANKS**

THOMAS WITT

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A. Water banks allow for temporary transfers of water from agricultural areas while preserving Colorado’s agricultural heritage 415

B. HB 16-1392 is specifically tailored to address Colorado’s water needs and agricultural traditions. 416

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I. INTRODUCTION AND SUMMARY OF HOUSE BILL 16-1392

Colorado House Bill 16-1392 was introduced in March 2016 within the context of increasing water demands, which, without proper management will outpace the available supply by 2050.¹ The House Committee on Agriculture, Livestock, and Natural Resources postponed the bill indefinitely in April 2016.² To date, growing demand has largely been addressed through water conservation, construction of new water infrastructure, and the permanent transfer of water rights from agricultural areas to support municipal supplies.³ Unfortunately, conservation alone is insufficient, new storage projects are costly, and permanent acquisition of agricultural lands and water rights can have detrimental impacts on agricultural communities and may lead to habitat loss and impacts to recreational water uses.⁴

1. COLO. WATER CONSERVATION BD., THE COLORADO WATER PLAN, 1-9 (Nov. 2015), <https://www.colorado.gov/pacific/sites/default/files/CWP2016.pdf>. In Colorado, there is an increasing gap between supply and demand in municipal water supplies, particularly along the Front Range. The completion of new water projects is likely to be insufficient to address this gap, and by 2050 water shortfalls are predicted statewide. *Id.*

2. Hearing on H.B. 16-1392 Before the H. Comm. On Agric., Livestock & Nat. Res., 70th Gen. Assemb., 2nd Reg. Sess. (Colo. 2016) (voting to postpone indefinitely on April 11, 2016).

3. *Id.* at 6-1, 6-59, 6-115-116, 6-127.

4. *Id.* at 6-1, 6-8, 6-59, 6-142.

Colorado is a prior appropriation state, one of many across the American West.⁵ Prior appropriation means that the right to use water follows a “first in time, first in right” approach, giving the first person to appropriate water from a river or stream the right to use the water over all subsequent users.⁶ Unlike riparian systems in the Eastern United States, the Colorado system of prior appropriation does not limit an individual’s right to use water to those who own lands adjacent to the source. Therefore, water rights holders are free to transport water, sometimes great distances, to its intended place of use.⁷

In the prior appropriation system, rights can be transferred like any other property right.⁸ However, transfer of water rights in Colorado can come at a high cost. Water transfers require adjudication before a Colorado water court. Before approving the transfer, the water court will assess the historic consumptive use of the water right to ensure that the amount transferred does not injure other water right holders, which may decrease the amount of the original appropriation—and therefore the value of the right.⁹ That means if a farmer wants to transfer a water right originally decreed for one hundred acre feet of water, and the water court finds that he has only historically used seventy-five acre feet, his water right is reduced to seventy-five acre feet, significantly decreasing its value. The risk of this loss, along with the high transaction costs of the water court adjudication process, has limited the number of water transfers that take place.¹⁰

Legislators drafted House Bill 16-1392 to address some of these issues. The drafters of the bill intended to set rules for the creation of water banks and facilitate the temporary transfer of water rights at a reduced transactional cost, with limited court involvement.¹¹ The legislation would have placed the Colorado Water Conservation Board (“CWCB”) in charge of operating the water banks created under the program (consulting with the state engineer and with some responsibilities delegated to individual water districts).¹² The CWCB would have also been charged with establishing rules for their administration in accordance with specific guidelines for the rules in the proposed legislation.¹³

5. Chennat Gopalakrishnan, *The Doctrine of Prior Appropriation and Its Impact on Water Development: A Critical Survey*, 32 AM. J. ECON. & SOC. 61, 61 (1973).

6. Janis M. Carey & David L. Sunding, *Emerging Markets in Water: A Comparative Institutional Analysis of the Central Valley and Colorado-Big Thompson Projects*, 41 NAT. RESOURCES J. 283, 308 (2001).

7. *Id.* at 307-08.

8. JUSTICE GREG HOBBS, *THE PUBLIC’S WATER RESOURCE: ARTICLES ON WATER LAW, HISTORY, AND CULTURE*, 71-72 (2d ed. 2010).

9. Megan Hennessy, *Colorado River Water Rights: Property Rights in Transition*, 71 U. CHI. L. REV. 1661, 1670 (2004), *see also* David C. Taussig, *The Devolution of the No-Injury Standard in Changes Cases of Water Rights*, 18 U. DENV. WATER L. REV. 116, 117-18, 144 (2014).

10. ANNE J. CASTLE & LAWRENCE J. MACDONNELL, *AN ENHANCED WATER BANK FOR COLORADO 2* (Getches-Wilkinson Ctr. for Nat. Resources, Energy and the Env’t, Univ. of Colo. Law Sch. (2016), <https://www.colorado.edu/law/sites/default/files/An%20Enhanced%20Water%20Bank%20for%20Colorado.pdf>).

11. H.B. 16-1392 §§ 1 (37-80.3-102(1)(a),(b)(I)), 70th Gen. Assemb., 2nd Reg. Sess. (Colo. 2016).

12. H.B. 16-1392 §§ 1 (37-80.3-104(1),102(a)), 70th Gen. Assemb., 2nd Reg. Sess. (Colo. 2016).

13. H.B. 16-1392 §§ 1 (37-80.3-102(1)(a), 104(2)), 70th Gen. Assemb., 2nd Reg. Sess. (Colo.

There is no universal definition for a water bank, and in fact, states that have developed water banks tailor them specifically to the resources available and the needs of the state.¹⁴ In general, water banks are intended to pair water sellers with water users, to help facilitate the temporary exchange of water rights with reduced transaction costs, and decrease long-term liability for water right holders.¹⁵ While the form of water banks varies, their basic purpose has typically been to encourage the transfer of water from areas with low economic use to areas of high economic use and high demand.¹⁶

At a basic level, this is the goal of HB 16-1392. The bill, if enacted, would have provided a powerful tool for Colorado municipalities to manage their future water demands while protecting vested rights and preserving Colorado's agricultural heritage and local economies.

II. BENEFITS OF PASSING HB 16-1392

HB 16-1392 is favorable because it would: (A) provide a cost-effective mechanism for temporarily transferring water from consumptive agricultural uses to municipal use while reducing impacts on farming; (B) address specific issues with previous attempts at water banking in Colorado; and (C) reduce transaction costs and long time periods for transfers.

A. WATER BANKS ALLOW FOR TEMPORARY TRANSFERS OF WATER FROM AGRICULTURAL AREAS WHILE PRESERVING COLORADO'S AGRICULTURAL HERITAGE

Open water markets, where water is exchanged as any other fungible commodity, is conceptually appealing, particularly in the West where supplies are limited.¹⁷ Water markets prioritize higher value uses of water, specifically low consumption-high value municipal use over highly consumptive agricultural uses.¹⁸ The prior appropriation system, while bearing some resemblance to a market with the ability to sell and exchange water rights, actually works counter to the market favoring older priority uses over newer, growing demands.¹⁹

Open water markets, however, can have devastating effects on smaller farming communities. Allowing a market driven approach, especially given the disparity in value, may encourage "buy and dry" approaches, where water is sold

2016).

14. Amanda E. Cronin and Lara B. Fowler, *Northwest Water Banking: Meeting Instream and Out of Stream Water Needs in the Pacific Northwest*, 102 WATER REP. 10, 10., (Aug. 15, 2012), http://www.coloradowatertrust.org/images/uploads/resources/Northwest_Water_Banking.pdf.

15. *Id.*

16. See Loretta Singletary, *Water Banking: What it is and How Does it Work?*, W. RESOURCE ISSUES EDUC. SERIES, no. 6., (n.d.), <https://www.unce.unr.edu/publications/files/ho/other/fs9809.pdf>. (providing an overview of water banking).

17. *Id.*

18. Mark Squillace, *Water Transfers for a Changing Climate*, 53 NAT. RES. J. 55, 56 (2013) (stating that "[w]ater markets have special appeal in the western United States where the prior appropriation doctrine favors historic, low-value agricultural water rights over far more valuable domestic water rights").

19. *Id.*

or permanently transferred to municipal use.²⁰ “Dry” agricultural lands can be overcome with noxious, invasive species, and the permanent loss of agricultural land can have severe impacts on local farming communities that rely on agricultural production for a wide range of economic activities.²¹ As a result, while the market may incentivize individual farmers to sell their water rights for individual gain, the economic loss on the community as a whole may be far reaching.²²

The Colorado legislature agrees the danger of “buy and dry” approaches must be mitigated,²³ and the proposed HB 16-1392 attempts to mitigate that danger by restricting the market’s ability to fully control water transfers. Under the proposed legislation, transfer of a full water right would only be allowed for up to three years in a ten-year period, or alternatively, thirty percent of a water right could be transferred over a ten-year period.²⁴ The proposed legislation ensures that market incentives don’t result in the whole-sale transfer of agricultural water rights. This preservation of agricultural use will protect against encroachment of invasive species (and, therefore, protect agricultural economies) while still allowing transfers to supplement farmer’s incomes and supplement municipal water supplies.

B. HB 16-1392 IS SPECIFICALLY TAILORED TO ADDRESS COLORADO’S WATER NEEDS AND AGRICULTURAL TRADITIONS.

Previous attempts in Colorado, most notably the Arkansas River Water Bank (“ARWB”), have not been successful.²⁵ Stakeholders have identified several reasons for the failure of the ARWB, among them were the high prices of banked water, that fact that the ARWB was a virtual bank with no firm storage for physically banking the water, and uncertainty about the ARWB’s ability to deliver water to various regions.²⁶

HB 16-1392 is an attempt to rectify some of ARWB’s failings by better tailoring the approach to Colorado’s needs. First, by expanding the banking system to basins outside of the Arkansas River basin, it includes markets that can accommodate the higher cost of water, such as markets with larger urban

20. *Id.* at 62. *See also 26th Annual Water Law Conference: Twenty-First Century Water Supply,*

Use and Distribution: Do the Rules Still Apply?, 11 U. DEN. WATER L. REV. 389, 405–06 (2008) (“[B]uy and dry’ [is] the permanent transfer [of water] from agricultural use to municipal use that can dry the land. . . . [T]he transfer is a one-time deal where municipalities buy shares in a ditch company, often far from the municipality, and the water is permanently removed from irrigation use by the ditch company. The irrigator and the region then can suffer from the limited or lost agricultural productivity resulting from the water transfer.”).

21. Squillace, *supra* note 13A, at 62.

22. Peter D. Nichols, Leah K. Martinsson & Megan Gutwein, *All We Really Need to Know We Learned in Kindergarten: Share Everything (Agricultural Water Sharing to Meet Increasing Municipal Water Demands)*, 27 COLO. NAT. RES., ENERGY & ENVTL. L. REV. 197, 202–03 (2016).

23. *Id.*

24. H.B. 16-1392 § 1 (37-80.3-104(2)(i)), 70th Gen. Assemb., 2nd Reg. Sess. (Colo. 2016).

25. RALPH SCANGA, JR., UPDATE OF WATER BANKING IN THE ARKANSAS PRESENTED TO THE INTERIM WATER RESOURCES REVIEW COMMITTEE, (Aug. 21, 2013), <https://www.colorado.gov/pacific/sites/default/files/13WaterResourcesUpdateonWaterBanking.pdf> (stating that while some water “deposits” were made into the bank, no withdrawals were ever made).

26. *Id.*

populations.²⁷ Additionally, the transfers under HB 16-1392 will hopefully provide a stronger incentive for participation by allowing the transfer of surface water.

C. UNLIKE TRADITIONAL TRANSFERS, WATER BANK TRANSFERS UNDER HB 16-1392 WOULD HAVE LOWER TRANSACTION COSTS AND ARE LESS LIKELY TO RUN AFOUL OF THE “NO-INJURY RULE”.

One major impediment to traditional water transfers is the high transaction cost. In addition to the transaction costs of obtaining court approval, transfers are also forced to absorb any third-party costs intended to prevent material injury to other vested rights owners, and not run afoul of the “no-injury” rule.²⁸ In some markets, this “potential” for injury can add significant costs to a transaction and may eliminate the value of the transfer entirely.²⁹ Unlike other western states, under Colorado’s prior appropriation law, the transfer of a water right requires adjudication from a water court rather than an administrative agency.³⁰ Like many of Colorado’s water laws, this approach is highly protective of existing water users, but is costly, reduces flexibility in the system, and can discourage otherwise beneficial transfers. In order to file for a transfer, the water right holder must file an application with the water court, which allows any person to file a statement of opposition within two months of the application, forcing a public hearing.³¹ A final decree is not awarded until after the hearing. The result is that a single transfer can be costly and may take up to five or ten years.³²

Additionally, in order for any water transfer to be approved it must pass the “no-injury rule.” The “no-injury” rule states that changes in water type, place, or time of use can only be approved if it will have no injury to other users.³³ To determine if an injury may occur, the “historic consumptive use” must be calculated. In addition to being a time-consuming and possibly costly calculation, determining the historic consumptive use can result in a permanent reduction in the water right itself.³⁴ The uncertainty of how the court will calculate historic consumptive use can reduce the incentive for any temporary transfers.³⁵

27. Colorado is divided into seven different management division based on hydrological basins. STATE OF COLO. DEPT OF NAT. RES. DIV. OF WATER RES., COLORADO RIVER BASINS (2005), https://www.colorado.gov/governor/sites/default/files/documents/colorado_river_basins.pdf.

28. Hennessy, *supra* note 7, at 1670. (describing the operation of the “no injury rule” in water transactions).

29. *Id.*

30. Nichols, Martinsson & Gutwein, *supra* note 14, at 205.

31. *Id.* (If there is no opposition, or if a settlement can be reached with any opposing parties, the court can approve the transfer with stipulations, if necessary).

32. *Id.* at 206.

33. *See* Hennessy, *supra* note 7, at 1669-70.

34. *See* Taussig, *supra*, note 7, at 144.; *See* JUSTICE GREG HOBBS, *supra* note 6, at 72; *See* Empire Lodge Homeowners’ Ass’n v. Moyer, 39 P.3d 1139, 1157-58 (Colo. 2001) (The burden of showing no injury is on the party seeking the transfer. The challenge of proving a negative leads to both higher costs and greater uncertainty in the outcome of a hearing. In fact, in the Arkansas River Basin, the Colorado Supreme Court has held that there is a presumption of injury that must be overcome for some transfers).

35. *See* Hennessy, *supra* note 7, at 1670; *See, e.g.*, In Re Water Rights of Cent. Colo. Water Conservancy Dist., 147 P.3d 9, 20 (Colo. 2006) (a rather extreme example of how uncertainty regarding the calculation of historic consumptive use can result in the permanent reduction of

HB 16-1392 addresses the cost and injury issues raised by traditional water transfers. First, deposits and withdrawals from the bank would not require a court adjudication or a change of use approval.³⁶ However, the state engineer's would still need to certify water bank applications and would review each application to ensure beneficial use of the water and avoid potential injury.³⁷ Furthermore, notice is still required and interested parties can comment on deposit and withdrawal applications.³⁸ As opposed to a hearing, commenters are invited to have a conference with all parties and the state engineer to discuss ways in which the withdrawal or deposit can be structured so as to avoid material injury.³⁹ While the goal of the bill is to limit challenges and hearings, it preserves the rights of interested parties to challenge deposits and withdrawals that may injure their vested rights.

Second, the proposed 37-80.3-104(n)-(r), requires the CWCB to develop a streamlined process for calculating historic consumptive use, return flow obligations, and material injury.⁴⁰ CWCB must establish a website where users can confidentially review their historic consumptive use and return flow obligations.⁴¹ As further protection, "[p]articipation in the water bank cannot serve as a basis for a reduction of the historical consumptive use, loss, or abandonment of a water right."⁴² However, if a deposit is made and there is no withdrawal of the banked water after two years, then it may be considered a failure to put the water to beneficial use.⁴³ This provision is intended to prevent water users from using the bank as a means of preserving unused water rights when there is no demand for withdrawal.

The streamlined process is one of the key features of HB 16-1392, and is essential to water banking in general. While the adjudications place a higher burden on those challenging the transactions, that is inevitable when attempting to facilitate the quick and easy transfers and necessary to promote efficient water use and support the growing municipal need.

III. CONCLUSION

Although water banking is likely to serve as only one tool in meeting the growing needs for municipal water in the state, it can be a powerful means of making water available to growing cities without endangering local economies or Colorado's traditional agricultural heritage. Although the failure of the ARWB identified some of the problems facing water banking in Colorado, the specific approach proposed under HB 16-1392 should help address the issues that resulted in the previous failures. Although the Bill has been indefinitely postponed due to lack of support, water banking likely represents a necessary tool for Colorado's water future.

water rights).

36. H.B. 16-1392 § 1 (37-80.3-104(2)(e)), 70th Gen. Assemb., 2nd Reg. Sess. (Colo. 2016).

37. *Id.* at (g),(k).

38. *Id.* at (m)(II)-(III).

39. *Id.* at (m)(IV).

40. *Id.* at (n)-(r).

41. *Id.* at (s).

42. *Id.* at (8).

43. *Id.*

CONFERENCE REPORTS

UNIVERSITY OF DENVER WATER LAW REVIEW ANNUAL SYMPOSIUM 2017: AT THE CONFLUENCE: THE PAST, PRESENT, AND FUTURE OF WATER LAW

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“TO BE A COLORADAN, WHAT WATER MEANS?” KEYNOTE PRESENTATION BY KEN SALAZAR, FORMER U.S. SECRETARY OF THE INTERIOR AND U.S. SENATOR

At the 2017 University of Denver Water Law Review Symposium in Denver Colorado, former United States Secretary of the Interior, Ken Salazar, offered his insight into what water means as a Coloradan.

Secretary Salazar began with how his history has defined what water means to him. His family has farmed and ranched the soils of the Rio Grande and its tributaries in the San Luis Valley since 1598. His family had priority number twenty-three out of the Rio San Antonio, and good and bad years affected his family's crop. Secretary Salazar said he did not grow up rich, but he grew up surrounded by the Sangre de Cristo and San Juan mountains and the Rio Grande and Rio San Antonio. A lot of the divine providence that guided him through the experiences of serving the people of Colorado and the United States he said started in the San Luis Valley where he learned about the nexus between humans and the planet on which we survive.

Secretary Salazar applauded Colorado for being a pioneer in dealing with water issues, but warned that the state still has a long way to go. Colorado pioneered the doctrine of Prior Appropriation, which, despite criticism, has changed and evolved to become a working system. Other historic examples of where Colorado led the way include Colorado's efforts to integrate ground and surface water uses in the 1960s and Colorado's creation of the Instream Flow Program in the 1970s.

Secretary Salazar next identified two major water-related challenges facing Colorado: population growth and climate change. Colorado's population is expected to nearly double in the next forty years. The challenge Colorado faces is how to supply those additional people and still preserve the open spaces its citizens have come to love. Secretary Salazar also briefly addressed climate change. According to projections, the Colorado River and the Rio Grande basins can expect to see a significant reduction in precipitation. So, as environmental demands increase, Secretary Salazar is hopeful that society will continue to recognize the importance of protecting and restoring America's ecosystems.

In the face of such challenges, Secretary Salazar said it is important to look

back on stories where Colorado has been successful. For example, he recounted a story from 1990 when he was head of Colorado's Department of Natural Resources. California, in the midst of a severe drought, was preparing to litigate some of the miscalculations made during the drafting of the Colorado River Compact hoping to get a greater share of the water supply. Secretary Salazar oversaw a group of Colorado officials tasked with responding to California. Just when all hell seemed ready to break loose, Secretary Salazar and the group decided to send an olive-branch in the form of a letter. In that February 21, 1991 letter, which Secretary Salazar authored and Governor Roy Romer sent to Governor Pete Wilson of California, Colorado offered to collaborate. It said Colorado understood California's needs, and that it was willing to work with the other Colorado River basin states and the federal government to assure that California would make it through the drought. However, the letter also indicated that Colorado wanted to be sure that any ensuing agreements were addressed within the Law of the River and that the framework of the law not be changed. A quarter century later, the February letter has stood the test of time and set a precedent for collaboration among the Colorado River basin states, the federal government, and the nation of Mexico. So, if collaboration was possible on such a litigated river, then it is possible that the tradition of collaboration might continue in the future.

"In the West, when you touch water, you touch everything," concluded Secretary Salazar, quoting the late Congressman from Colorado, Wayne Aspinall. This is true today, and will remain true in the future. So, in looking for solutions, Secretary Salazar urged the audience to look back at the past to provide lessons for the present.

After sharing his insight, Secretary Salazar provided the symposium with an opportunity for questions, during which time the symposium raised four matters: the Sangre de Cristo mountains; the 1872 Mining Law; the Senate's recent decision to exercise the "nuclear" option for confirming Supreme Court nominee Neil Gorsuch; and, Secretary Salazar's opinion of current Secretary of the Interior, Ryan Zinke.

Secretary Salazar finished his keynote address with a message of hope. He said that even though nothing is certain because of the current presidential administration, the United States is a strong nation and a strong democracy. Time will pass and there will be new leaders. Climate change is not going away, it is an existential issue with which someone will have to grapple. Secretary Salazar pointed to energy innovation by the private sector and explained that he is not despairing. There will be a 2020 and a 2024. The United States of America has the capacity to grapple with these tough issues that affect Colorado, the nation, and the planet.

Trevor C. Lambirth

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THE CLEAN WATER ACT AND THE SCOPE OF FEDERAL POWER

For this panel discussion, David Ivester, Melinda Kassen, Peter Nichols, and Paul Kibel each spoke about a different aspect of the Clean Water Act (“CWA”) and its various intersections with federal power.

First, David Ivester, partner at a land use, environmental, and water law firm Briscoe Ivester & Bazel, detailed the background of the CWA and the two different types of jurisdiction contained within it. Simply put, the CWA regulates discharges of pollutants from point sources into navigable waters. Under the relevant definitions, pollutants include dredge or fill material and navigable waters are simply “waters of the United States.” The CWA governs two types of jurisdictions: geographic and activity. Geographic jurisdiction allows the CWA to protect all waters with a “significant nexus” to traditionally navigable waters. This theory derived from three Supreme Court opinions interpreting the CWA. First, in *United States v. Riverside Bayview Homes*, the Court upheld the Army Corps of Engineer’s claim that the CWA’s geographic reach includes wetlands adjacent to navigable waters. Then, in *Solid Waste Agency of Northern Cook County v. Army Corps of Engineers* (“SWANCC”), the Court found that Congress did not intend the CWA to reach isolated, non-navigable, intrastate waters. Finally, the Court in *Ripanos v. United States* issued a plurality opinion holding that the CWA extends only to relatively permanent, standing, or continuously flowing bodies of water and those wetlands attached to such bodies of water. Interestingly enough, Kennedy’s concurring opinion in *SWANCC* used a significant nexus as a test for determining CWA jurisdiction.

Mr. Ivester then discussed activity jurisdiction of the CWA, specifically in reference to plowing. An Army Corps of Engineers regulation excludes plowing as a discharge. Mr. Ivester then pointed out that, while the regulation defines and excludes plowing, it does not include redistribution of soil that changes any water to dry land. Finally, Mr. Ivester showed a picture of a freshly-tilled land asked the audience to consider whether plowing had occurred.

Next, Melinda Kassen, Interim Director of the Theodore Roosevelt Conservation Partnership’s Center for Water Resources, explained the CWA’s statutory and regulatory landscape, specifically focusing on the “waters of the United States” rule. First, Ms. Kassen discussed various health and safety issues with rivers prior to the CWA. For instance, rivers were burning and life within them was dying. Even following the Water Quality Act of 1965, these same issues persisted. As a result, Congress passed the CWA in 1972. From around the 1970’s until 2006, the CWA utilized a definition of the “waters of the United States” that included all waters subject to the ebb and flow of the tide, the territorial seas, and all interstate and intrastate waters and their tributaries, including lakes, rivers, and streams.

Moreover, a series of opinions – elaborated in depth by Mr. Ivester – examined this definition, and Ms. Kassen pointed out interesting parts of two of the opinions. For instance, in *SWANCC*, the court held that waters need not literally be navigable, yet it also said that all words must have meaning. Moreover, in *Rapanos*, the Court required a significant nexus to navigable waters alone or in combination with similarly situated navigable waters. In this opinion, the Chief Justice himself mentioned that the best way to deal with the continuous stream of navigable water issues was to adopt rules. Finally, in 2015, the agencies adopted a rule defining the waters of the United States using connectivity and bright line theories. For connectivity, the rule required some form of nexus to a river, stream or body of water. The rule also introduced what Ms. Kassen referred to as “bright lines.” That is, the rule dictates that waters within a given distance of navigable waters are automatically within the definition. Many states objected to this rule and filed suit. The Sixth Circuit consolidated all of the cases and as recently as January 20, 2017, the parties filed the opening briefs in the case. Moreover, President Trump issued an Executive Order in February 2017 regarding the waters of the United States rule.

Finally, Ms. Kassen closed by asking the audience to consider who will implement the next version of the CWA. Originally based on cooperative federalism, the CWA did not maintain that mantra for long, especially in the expensive permitting process. For example, only two states currently issue their own 404 permits. Simply put, states are forced to do more in carrying out the CWA, but those states lack sufficient funding to provide the necessary services. As a result, CWA enforcement drops and a downward spiral may continue.

Peter Nichols, Board Member of University of Colorado Law School’s Getches-Wilkinson Center for Natural Resources, spoke third, and he discussed the intersection of water quality and water quantity. Specifically, he discussed physical water transfers and question of whether these transfers that do not add anything else to the destination body require permitting under Section 402 of the CWA. First, Mr. Nichols noted that, for most transfers, the destination body sees no impact. However, other transfers can exceed or contribute to exceeding current water standards by introducing more suspended solids such as nutrients and metals. Moreover, the National Pollutant Discharge Elimination System (“NPDES”) permitting include discharge limits that concern primarily with contamination. Thus, water transfers must meet NPDES compliance standards and often involve a water treatment plant.

At this junction, Mr. Nichols pointed out that compliance with NPDES standards for water transfers is difficult for three reasons. First, permitting, treating, and transferring are expensive practices, making the process almost economically infeasible. Second, the transfers must operate among a range of differences in water volume and water quality, presenting a technical challenge to transfers. Finally, transfer sites are limited and environmentally difficult to operate. Faced with these challenges, a transferor only has two options. On one hand, it could cease waters when transfers do not meet the standards. This presents a problem, as stopping during a critical time may result in a chronic lack of water for the season. On the other hand, the transferor may continue transferring water and take the fines. Regardless, high NPDES standards lead to a significant reduction in water transfers and net loss of water supplies.

Mr. Nichols noted that this issue has occupied water transfers from the

1970's through today. For example, the EPA's water transfers rule in 2008 exempted certain water transfers from NPDES permitting requirements. Parties challenged the rule, and the Eleventh Circuit consolidated all of the cases, only to dismiss them for lack of jurisdiction. The claim reappeared in the Southern District of New York, which vacated the order. However, varying rulings still persist. Even this year, the Second Circuit held that water transfers do not require NPDES permits. Finally, Mr. Nichols laid out the bottom line of his presentation: that Western residents rely on water transfers daily. In many cases, these transfers are economically, technically, and environmentally impossible to meet. The critical issue here arises from concerns about traditional federal deference to the state water law.

The fourth and final panelist, Paul Kibel, professor of environmental, natural resource, and water law at Golden Gate University School of Law, detailed how the state of California is protecting instream flows. Mr. Kibel. First, he explained that fisheries are facing decline in California. Traditionally, the state has a robust commercial fishery industry with salmon stocks playing an important role in the economy. Moreover, federal laws and agency work has usually kept water in streams for fisheries. However, these fisheries face a future with uncertainty concerning continued support.

After laying out the problem, Mr. Kibel explained three major impacts of reduced instream flows on fisheries. First, the reduction in instream flow results in seawater intrusion into rivers, raising their salinity. Moreover, as the freshwater supply meeting the oceans decreases, the intrusion increases, pushing salt water further and further up the deltas. Increased saline levels in the water can even affect the fish. For instance, the Delta smelt lives well in brackish waters, but it dies in saline waters. Second, reduced instream flow results in increased water temperature. Without much water coming downstream, the rivers warm and, in some cases, decimate fish populations. Third, reduced instream flows result in slack water conditions. Then, these slowly flowing waters grow algae and parasites, which can harm the fish.

Next, Mr. Kibel gave examples of federal laws playing a big role in keeping instream water flows steady then explained how California has safeguards if the water rushes out. First and foremost, the Clean Water Act compels the EPA to review state water quality standards. Moreover, states also have the power to propose beneficial uses to the EPA for approval. Pursuant to this authority, the California State Water Board is updating its water plan to establish base instream flows for tributaries of the San Joaquin River. Next, Section 7 of the Endangered Species Act requires drafting biological opinions during consultation. Additionally, courts have upheld these biological opinions supporting instream flows for salinity and temperature concerns. Third, the *Winters* Doctrine allows tribes to hold federal water rights to fulfill the purposes for which reservations are created. This authority includes rights to instream water for supporting salmon stocks. Next, the National Environmental Policy Act compels creating Environmental Impact Statements, and Kibel pointed to the California Water Fix as a situation where an EIS protected water and salmon. Finally, Section 10 of the Federal Power Act requires non-federal dam permits to protect fish spawning.

What happens, Mr. Kibel posited to the audience, when these federal powers no longer support instream flows in California? Luckily, California has its

own protections in place. For instance, California's state Clean Water Act requires appropriation similar to the federal statute. Similar to the court-supported federal ESA, California courts have also held that state agencies have the authority to protect instream water for public services. As a response to the *Winters* Doctrine, both the California Constitution and its Water Code operate under a reasonable use law. Under this scheme, unreasonable methods of diversion are unlawful, which protects instream flows from improper diversion. Where biological opinions may not be available, the California Fish and Game Code requires dam operators to release enough water to maintain downstream fishers. Even better, this provision applies to federal dams within the state. Finally, Section 401 of the CWA requires the federal government to obtain water quality certification from the states for certain activities. While the state is considering the effect of a project on its waters, it may impose instream requirements on those water quality certifications to protect them.

Connor Pace

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**EVOLVING WATER LAW AND MANAGEMENT IN THE UNITED STATES:
DELAWARE, KANSAS, MONTANA, AND INTERSTATE LITIGATION**

Professor John Peck of the University of Kansas School of Law introduced the second panel of the 2017 Water Law Review Symposium entitled "Evolving Water Law and Management in the United States: Delaware, Kansas, Montana, and Interstate Litigation." Professor Peck chose these states because they represent a cross-section of the United States. He highlighted the major differences in rainfall between the states and explained that these states differ in the way they use groundwater and the rights applied to it.

Professor James May of the Widener University Delaware School of Law presented first regarding Delaware, which was the first state in the country to have water law. Delaware applies riparian water rights, which is mostly derived from the state's common law.

Water use greatly affects the abundant wildlife in Delaware's waters. The Delaware Bay Estuary is habitat for many water-dependent species, including migratory birds, marine turtles, horseshoe crabs, and twenty threatened or endangered species. Delaware has a high extinction rate—second only to Hawaii.

Furthermore, since the Swedes landed in Delaware in 1658 and first established water laws, water rights have been an important part of industrial development. Water law established through common law focused primarily on mill owners' rights until the late Nineteenth Century.

Administrative agencies also manage Delaware's water resources. The Department of Natural Resources and Environmental Control (the "DNREC") is responsible for regulating water in Delaware and enforcing the Delaware Coastal Zone Act. The legislature passed the Act in 1971 to prohibit new heavy industry, bulk transfer facilities, and other non-conforming uses.

A compact between Delaware, New Jersey, Pennsylvania, New York, and the United States created the Delaware River Basin Commission (the "DRBC") in 1961 to address and regulate a variety of water quality and quantity issues affecting the Delaware River Basin, such as permitting, water conservation issues, drought management, flood loss reduction, and recreation. The DRBC covers land under the Delaware River down to the low water mark in Delaware and New Jersey. New Jersey has been trying to get ownership of the land under the river back to the 1700's and 1800's, and as recently as 2008, but Delaware has always won those lawsuits.

Professor Peck began his discussion of water issues in Kansas with a general description of water in the state. Northeastern Kansas receives a great deal more rainfall than the southwest, but the west has most of the groundwater. There are several large aquifers in western Kansas, including the Ogallala, Great Bend Prairie, and the Equus Beds, as well as federal reservoirs. Kansas has two major river basins—the Kansas-Missouri River Basin in the north and the Arkansas River Basin, which starts in Colorado and flows down through Wichita and Tulsa, and eventually converges with the Mississippi River.

Professor Peck discussed the evolution and sources of water law in Kansas. The courts established most water law from the time Kansas got its statehood in 1861 until 1945, but there were very few cases. The state adopted common law at formation, including riparian water rights for surface water and absolute ownership for groundwater.

From 1945 to 1967, a mix of legislative and judicial actions managed water law. The legislature passed the Kansas Water Appropriation Act in 1945, which changed water rights from the common law doctrines of riparian and absolute ownership to prior appropriation. People using water in 1945 could get vested water rights, but people who were not using water in 1945 lost any rights the day the Act went into effect. Kansas citizens who lost their water rights brought claims alleging the Act was unconstitutional because it was a taking for which compensation should be paid, but the Kansas Supreme Court upheld the constitutionality of the Act by a six-to-one decision.

From 1967 to the present, administrative, legislative, and judicial processes have governed Kansas water law. By the 1960's, users were depleting groundwater aquifers so, in 1972, the legislature passed the Kansas Groundwater Management Act, which permitted groundwater management districts to be set up for local control.

In 1978, the legislature made it a crime to divert water without a permit, except for domestic use, and created new districts for Intensive Groundwater Use Control Areas ("IGUCAs"). These IGUCAs gave the Chief Engineer extraordinary power, including the ability to change priority dates. The Chief Engineer established nine IGUCAs, including Walnut Creek, which includes the Cheyenne Bottoms wetlands at its eastern edge. The Fish and Game Commission ("FGC") applied for a permit covering Walnut Creek to help preserve wetlands.

The Division of Water Resources issued several hundred permits in the alluvial of Walnut Creek after 1950, and by the mid-1980's the creek began to dry up. After the FGC asked for assistance, the Chief Engineer set up hearings and issued an order, which found the total annual quantity allowed under the

existing permits was well beyond the long-term sustainable yield, and the reasonable amount needed for irrigation was 12-14" per year. The order divided the prior appropriation rights into two groups. Those who had their rights before October 1965 had senior water rights, but those who acquired their rights after that date had junior rights. The order reduced senior rights from 18" per year to 12-14", and junior rights from 18" to 6 ¼ - 5 ¼".

Looking towards the future, former Governor Sam Brownback created a new program called the "50 Year Vision," which addresses construction of the Missouri River Aqueduct, climate change, global warming, and interstate conflicts. The biggest question the program seeks to address are whether the state will mandate further water restrictions and if those restrictions will be constitutional. Professor Peck believes water issues affecting Kansas may require a change from cattle production since it requires so much water to produce a pound of beef.

Next, Professor Irma Russell of the University of Missouri Law School spoke about Montana's water management. The eastern part of Montana may be dry, but there is a lot of rain and flowing rivers west of Missoula. Professor Russell analogized water users to a family and described additional water needs like another child joining the family. She believes Montana is a great example of water law in the western states because Montana demonstrates how water law relates to something larger than law as a controversy. In 1865, two decades before Montana became a state, the territory's legislature passed an irrigation law. When the state's Constitutional Convention met in Montana in 1972, the delegates agreed to include the right to a clean and healthful environment in their state constitution.

In terms of future challenges, Professor Russell believes it is necessary to find a unifying theme between different voices that have different interests to be able to see water law in an atmosphere of service and solicitude to the need to exist and to thrive. Senior and junior water rights holders' reasonable interests weigh against these concerns. People are always looking to what they have, how things are shared, and who has a right to it. That is the call of defending rights and figuring out how to live together and thrive together in the future.

Professor Burke Griggs, a visiting professor at the Washburn University School of Law, spoke last about the history of interstate water litigation. The Classical Period from 1900 to 1949 consisted of equitable apportionment and reticence; compact resolutions; and Congressional apportionments like the Rio Grande. Groundwater extraction and compliance with compact rules has dominated interstate water issues during the last fifty years. This phase of interstate water litigation has also dealt with groundwater modeling fights. Overall, cases have been more successful when the litigants used shared modeling.

Professor Griggs discussed a few examples of recent interstate litigation. In Mississippi vs. Tennessee, the Special Master found the Doctrine of Equitable Apportionment applies, so Tennessee did not trespass or convert water when it pumped groundwater out of the Mississippi Embayment Regional Aquifer System. In Florida vs. Georgia, the Special Master found that Georgia was probably harming Florida by over-pumping groundwater and starving Georgia's oysterbeds, but since the U.S. Army Corps of Engineers was not a part of the lawsuit, the Court could not help.

Looking forward, Professor Griggs posed several issues likely to come up in the future of interstate water, such as how states will respond over the next fifty years as water in the Ogallala decreases and if there will be compact litigation over water quality?

Erica Montague

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**SCIENCE AND THE COURTROOM: HOW MODELING IS CHANGING THE
GAME**

Meg Frantz, an engineer at Brown & Caldwell, moderated this panel discussion on science, data, and math modeling in water law. The panel featured: Dick Wolfe, State Engineer & Director of the Colorado Division of Water Resources; Chris Sanchez, a Hydrogeologist at Bishop-Brogden & Associates, Inc.; and Burke W. Griggs, visiting professor at Washburn University School of Law.

Chris Sanchez, who has testified in the Division 1 Water Court providing expert testimony about water, oil, and gas rules, offered a view from the perspective of an engineer and spoke about the difficulties related to communication especially with the more technical aspects of hydrology and water law. Sanchez also spoke about the varying accuracy models have in accounting for the interaction between groundwater and surface water. He indicated that current models can account for surface water fairly easy, but using models to make predictions about groundwater is much more difficult because there are still many unknowns and missing information in the field of groundwater modeling. Complicating this issue is that groundwater moves slowly and that some aquifers are buried and can be shallower, deeper, or more connected than others.

Moreover, Mr. Sanchez said that the impacts of groundwater wells on these aquifers and streams is also hard to predict because of all the variables and inputs involved, including the fact that aquifer depletion continues after the pumping stops. Mr. Sanchez's said that the ground-surface water interaction is determined by the attributes of that individual, which are not always easily to isolate for the purposes of modeling. Next, Mr. Sanchez explored some of the different models used in many courtrooms—such as Modflow and others based on Glover inputs—before discussing communication and cultural issues in the world of water law. From the perspective of an engineer, Mr. Sanchez expressed that it is not always easy to communicate the technical work he does even to skilled attorneys and consultants. He continued on this theme and said that it was even more difficult to defend the models and work that water engineers do in court. He elaborated on the difference in the kind of testimony required when he appears in front of a water court judge or in front of a jury.

Dick Wolfe also offered an engineer's perspective. Mr. Wolfe has been Colorado's State Engineer for the Division of Water Resources for the last ten

years. Mr. Wolfe spoke about the use of groundwater models in intra/interstate litigation and advocated for developing models for purposes other than litigation. However, Mr. Wolfe also discussed the importance challenging current groundwater models through litigation because states cannot manage what they cannot measure accurately. Mr. Wolfe pointed out the practical use of models in helping to develop rules, then later the operational plans based on these rules. He gave three instances of models being used in this way: creating irrigation rules in Arkansas River Basin, creating Compact compliance rules in the Republican River Basin, and in developing the Rio Grande Aquifer new-use rules in the Rio Grande decision support system. However, Mr. Wolfe explained that these models took a long time to create and were fairly expensive. But, this was not a recommendation to stop using models because Mr. Wolfe also emphasized the importance of science leading the way in policymaking and ensuring that the state legislature bases new laws on science and reality, not mere speculation.

Dr. Burke Griggs, a lawyer and professor at the Washburn University School of Law, provided an overview of some of the most contentious litigation between states over water-related issues. For example, Dr. Griggs talked at length about the Daubert motions for expert witness testimony in a case where Kansas sued Colorado. He emphasized the common practice of relying on their one's own experts with their own models to make their case. He characterized this situation as being a "battle of the experts" and discussed the cultural differences that can arise when lawyers interact with engineers and other water resource professionals. Dr. Griggs also explored how the federal government can assist states by creating models used in litigation. For example, he said the USGS can help states develop more expansive Modflow models and pointed to a federally funded groundwater analysis used when a dispute arose between Mississippi and Tennessee. Dr. Griggs' point was that federal funding has really helped modeling because without the funds from federal agencies, creating models is much more difficult for individual litigants.

Members of the panel followed their remarks by answering questions from the audience. In responding to the question of how to resolve the tension between legal and engineering cultures, panelists said that having proper expectations, developing realistic outcomes, and acknowledging differences in the different fields were all positive ways to make headway towards increasing communication. Another audience member asked about high transactions costs for litigants and what changes can be made to reduce them. Mr. Wolfe responded to this question by pointing to Colorado's Decision Support System, a program that allows for anyone to browse a wide range of water-related databases and records, and explaining that it has made a lot of progress towards reducing these costs through increasing transparency.

Next, an audience member asked whether there could be a risk of repression of these models as there currently has been with climate change data. Panelists answered that models are relatively insulated from data repression by an unfriendly federal government because of the extensive framework that exists around these models and jurisdictional difficulties with the federal government trying to interfere as most models exist at the state level.

Following that question, another person asked whether water law is moving more towards a mediation-based practice and if so, if that would be any better

than the current system. Mr. Dick Wolfe responded that there are problems with high transaction costs in water courts and that water judges were working to solve those issues. However, Mr. Wolfe was not entirely sure that a mediation-based model would work much more effectively than the current system, pointing to required non-binding arbitrations in the Republican River Compact that have led to little actual progress. Alternatively, Mr. Wolfe also said that mediation has worked well in the Platte River Compact because it is more focused on species conservation.

The final question was about how to ensure courts are using the best science. The panelists responded to this by saying that water decrees have made things more complicated and that scientific tools are used on a case-by-case basis, so it is hard to know exactly what the “best” science is in an individual situation because each is so vastly different. But, they also said that the legislature can help make sure that scientists have the best tools and data that they need to present the “best” science in the courtroom through enacting legislation that enables science to continue to move forward and make more discoveries.

Gracen Short

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**SEPARATION OF POWERS: A COMPARISON OF ADMINISTRATIVE,
LEGISLATIVE, AND JUDICIAL WATER REGIMES**

This panel brought in three experts to discuss the benefits and drawbacks of water law regimes that are administrative, legislative or judicial in nature. Sturm College of Law Professor Tom Romero moderated the panel.

David Barfield, the Kansas Chief Engineer, spoke first and discussed the administrative regime. He explained the background of Kansas water law and the historical development of its administrative regime. The population of Kansas mostly resides in the wetter southeast, while most irrigation occurs in the west. This, combined with occasionally unavailable surface water, has led western irrigators to rely upon the groundwater of the Ogallala-High Plains aquifers. These aquifers do not interact with the surface stream and receive essentially no recharge.

To deal with these issues, Kansas has used several different water regimes. Before 1945, Barfield explained that Kansas used a judicial regime with few water laws. The state instead relied on the common law of riparian rights. The courts also interjected some elements of prior appropriation, creating a confusing mix of doctrines. In 1944, the Kansas Supreme Court decided this system no longer worked. The legislature responded, passing the 1945 Kansas Water Appropriation Act. Barfield said this legislative regime lasted from 1945 to about 1978. During this period, the legislature entered interstate compacts, partnered with the federal government to improve water storage, created an office dedicated to water planning, and much more. In 1978, the legislature made

major amendments to its water law, shifting Kansas into an administrative regime. This put the chief engineer in charge of administering the state's water system. The chief engineer's duties include managing permitting, all prior vested rights, all prior appropriation rights, any changes of water rights, and any other issues that may come up. While this system effectively manages the state's water, it has not fully addressed groundwater overdevelopment.

To deal with the overdevelopment problem, the Kansas legislature passed the Groundwater Management District Act, which created five groundwater management districts. In each district, the locals adopt management programs for groundwater use, subject to chief engineer approval. However, Barfield said, these plans have at best slowed down aquifer depletion. He said solving this problem requires solving hundreds of smaller problems. One of the problems he identified is the worry that conserving water will result in losing water rights. To address this, Barfield has eliminated "use it or lose it" within closed management districts. The irrigators' water rights will no longer lose their water right by non-use. Barfield said since this elimination irrigators have reduced their use of the aquifers. While the issues persist, Barfield explained that Kansas' administrative regime has been working towards solutions.

Rich Gordon, a former member of the California State Assembly spoke next to discuss the legislative regime. He discussed California's blend of prior appropriation and riparianism. California's prior appropriation roots date back to the 1849 Gold Rush. The miner's used first-in-time, first-in-right to determine water rights. In 1850, California adopted riparian rights in its constitution, but by 1851 California recognized prior appropriative rights as equals with riparian rights. In 1914, California established a permit system for its appropriative rights. This led to a system with three types of rights: pre-1914 appropriative, post-1914 appropriative, and riparian. On their own, riparian rights are difficult to quantify without stream-wide adjudication. But only a few streams have received these. Groundwater poses similar issues because its only regulations have been court imposed. In addition, the majority of California's water is in the north, while most of its need for water is in the south. With this variety of rights, difficulty of quantification, limited control of groundwater, and geographic disparity, California's water rights system has become difficult to navigate.

With these difficulties as a baseline, Gordon explained that California's legislature only gets involved to respond to crises or to headlines. California's recent drought provided both. Gordon noted the significance of the legislature passing the Sustainable Groundwater Management Act (SGMA). SGMA aimed to address the subsidence issue resulting from groundwater over-pumping. Originally, the act would have fully regulated groundwater basins. However, because it resulted from compromise (as legislation tends to do), SGMA instead requires local governments to establish groundwater sustainability agencies to manage wells. Though later questioned about the actual adoption of these agencies, Gordon said he believes that people will prefer local control over a state imposed system.

Gordon also discussed the major issue resulting from California's premise that most of the state's water can be stored in snowpack. The state does not have the capacity to store water outside snow pack. Combine this with California's penchant for wet or dry years (rather than average years), and the state

cannot capture the benefit of the wet years to make up for the dry years because of its lack of storage. One of the solutions the legislature has put forth, has been allowing public entities to obtain water rights for captured storm water. Gordon concluded by describing the difficulty of working in the legislative role. Because legislation requires compromise, it is difficult to fully solve real problems.

Finally, Greg Hobbs, a retired Colorado Supreme Court Justice, spoke to discuss the judicial regime. He began by detailing the evolution of Colorado's water regime. Congress carved Colorado out to cover the head waters of five great rivers—the Platte, the Arkansas, the Colorado, the Republican, and the Rio Grande. After Colorado's gold rush in 1859, agriculture became a huge industry, because it was "rumored that the miners liked to eat." Colorado needed the prior appropriation system because it allowed moving water from rivers to farms. An early draft of the Colorado Constitution declared water to be the property of the state, left to the legislature to distribute, but the influence of farmers led to a different final wording. Instead the constitution embraces prior appropriation by declaring the water of the natural stream to be the property of the public, subject to appropriation. The early Colorado Supreme Court case, *Coffin v. Left Hand Ditch*, firmly rejected the existence of any riparian water rights.

The Colorado legislature later gave the district courts the responsibility to decree water rights. According to Hobbs, the legislature did not trust itself or an administrative apparatus to hand out water rights. He said the legislature did not want to require the people ask the government to use water. By putting the decision into the courts, the legislature instead trusted the people with their own water. In 1881, the legislature created the State Engineer to enforce those decrees and administer the system of water rights.

Unfortunately, these judges did not have a full view of the streams. The 1969 Act addressed this by creating seven water divisions, each based upon a major river basin. Each with a water judge, an alternate water judge, and a water referee. The referee works with the parties to investigate the water rights and attempt to obtain a consent decree. The act also explicitly recognized tributary groundwater within the priority system, because new wells had previously forced 1860s water rights to be curtailed.

When questioned about the cost of the court system limiting access, Hobbs noted that it still provides the best protections. In 1969, the Colorado legislature considered several options, including administrative and political regimes. These were all rejected in favor of the water court system and the water referee. This system provides extensive protection for everyone's water rights and, Hobbs asserted, without these protections Colorado would not have such an extensive water market.

Hobbs explained that by splitting the water regime into a system of checks and balances—water rights decreed by the court, administered by the executive branch, and problems solved by the legislature—Colorado avoids the pressures that could be applied on any one branch to not enforce the doctrines of prior appropriation in some circumstances. Hobbs expressed worry about the pressure faced by administrative agencies that both hand out water permits and enforce those permits.

With each panelist having discussed their regimes, Romero moved the

panel into question and answer. He asked the panelists how their regimes could benefit from a change or borrow from the other regimes to improve or address the challenges posed by social, political, and environmental issues. Gordon said that, while Californians never want to admit they can learn from others, their system is convoluted and would be better off with a more coordinated system that could better address groundwater. Barfield said that Kansas has already borrowed extensively from other states to create their system. He said, contrary to Hobbs' worries about an administrative regime, that chief engineers can certainly do it all. He does not foresee further changes to Kansas' system. Hobbs noted that the downstream states keep Colorado honest. Through compacts, Colorado has been forced to consider other states, and better administer its own waters. Similarly, Hobbs explained that other interests, including reserved water rights, and public lands continue to impact considerations of water rights within Colorado. The panelists then fielded questions from the audience until they ran out of time.

Each panelist discussed how the unique history of their state molded the regime it now uses. It is the unique challenges faced by each state that has created differing water systems that, mostly, work to create efficient use and administration of water.

Rioux Jordan

**UNIVERSITY OF DENVER WATER LAW REVIEW ANNUAL
SYMPOSIUM 2017: AT THE CONFLUENCE: THE PAST, PRESENT,
AND FUTURE OF WATER LAW**

Denver, Colorado

April 7, 2017

**ETHICAL AND PROFESSIONAL STANDARD FOR LAWYERS & ENGINEERING
EXPERTS IN WATER COURT LITIGATION AND DISPUTE RESOLUTION**

The final panel at the 2017 *University of Denver Water Law Review Annual Symposium* consisted of Stephen Leonhardt, a Partner at Burns, Figa & Will, PC, Kevin Rein, Deputy State Engineer of the Colorado Division of Water Resources, Ema Schultz, Assistant Attorney General with the Colorado Department of Law, and Janet Williams, Chairman at Leonard Rice Engineers, Inc.

Stephen Leonhardt opened the panel by giving a roadmap of the many rules governing lawyers in water court proceedings that include the Colorado Rules of Professional Conduct, Colorado Rules of Civil Procedure, Water Court Rules, Federal Rules of Evidence, and Colorado Rules of Evidence. Mr. Leonhardt noted the role lawyers play as zealous advocates, but said that lawyers must also follow the rules of professional conduct, act with candor, adhere to confidentiality requirements, and satisfy certain disclosure responsibilities. Mr. Leonhardt mentioned that the rules pertaining to disclosure have changed, and that the Federal Rules of Civil Procedure were amended in 2010 to narrow the disclosure requirements; the current rule requires disclosure of the facts or data considered by the witness in forming the expert's opinion. Mr. Leonhardt then explained that the Colorado Rules of Civil Procedure were amended similarly. Under the current rules, draft expert reports are generally protected from disclosure or discovery, except for those identifying facts, data, or assumptions that

the expert considered in forming their opinion. Mr. Leonhardt further stated that under Water Court Rules the duty of the expert witness is to the court and to assist the trier of fact and not to the attorney.

Next, Janet Williams addressed the ethical obligations and principles for engineers serving as experts. Ms. Williams noted that engineers owe a duty of honesty and impartiality to the public, their employers, and clients. Further, Ms. Williams stated that an engineer's role as an expert witness is to provide objective, unbiased, independent judgment to help the water judge determine the facts in dispute. Ms. Williams discussed several factors that help an engineer maintain objectivity. These factors included the importance credibility plays in the industry, the objection process in which opposing counsel reviews the expert report for bias, and the peer review that occurs in expert meetings.

Ema Schultz then spoke and addressed the duty of the Attorney General in water court litigation from her perspective. As the exclusive legal representative of the State, Ms. Schultz noted that the Attorney General has the duty to set consistent legal policy and to consider the larger interests of the State and its citizens when determining the course of litigation. As Assistant Attorney General, Ms. Schultz stated that her role is to advocate for her clients, coordinate the litigation process, and provide legal advice for water administrators.

Kevin Rein, the Deputy State Engineer of the Colorado Division of Water Resources ("DWR"), concluded the panel by discussing the role the DWR plays in the court. Mr. Rein discussed the DWR's role as the administrator of water rights, and their statutory responsibility to oversee water compacts and to use their technical and legal expertise to assist the court to ensure that the court's decrees comply with those compacts. Mr. Rein stated that the DWR prioritizes being objective, comprehensive, and transparent when it consults with the water court.

At the end of the panel an audience member asked the question of whether the DWR or the Attorney General had any ethical obligations to fully inform the water court whether the position they take in a particular case is consistent with their past administrative actions. Kevin Rein discussed his hope that the actions of DWR in the field and the DWR's positions taken in the court would be consistent, especially as it applies to similar structures or similar water rights. Mr. Rein could not think of a situation where this had occurred, but stated that in a situation where this were true, the DWR would want to disclose this to the water court. Ema Schultz added that this was largely because the goal of the engineers in the case is to be able to administer the decree on the ground. Stephen Leonhardt expanded on this topic by noting that he had seen a few times over the years where administration had recently changed. Mr. Leonhardt asked the other panelists their thoughts on the disclosure of past administrative practices up until the recent change. Mr. Rein explained that as the DWR's understanding of what is happening evolves and is refined over time, and when DWR looks at facts and issues surrounding administration through that finer lens, there might be the need to do something different from what a past administration have done.

Reggie Norris

**PUBLIC INTEREST ENVIRONMENTAL LAW CONFERENCE 2017: ONE CAUSE,
ONE VOICE**

Eugene, Oregon

March 2-5, 2017

**PROTECTING AND RESTORING FREE FLOWING RIVERS, PRESENTED BY:
DOUGLAS W. WOLF, CENTER FOR BIOLOGICAL DIVERSITY; DREVET
HUNT, LAWYERS FOR CLEAN WATER; AND KONRAD FISHER, KLAMATH
RIVERKEEPER.**

This panel explored a series of legal tools available for attorneys to protect and restore instream flows.

To begin, Douglas Wolf discussed legal tools that the Center for Biological Diversity (the “Center”) and other organizations use to fight harmful seasonal flow diversions on the Gila River. Specifically, Wolf explained how the Center used critical habitat of the endangered fish to protect instream flow on the Gila River using the Endangered Species Act (“ESA”) by focusing on the risk that spring-runoff diversions posed to the threatened loach minnow’s critical habitat to help protect the Gila River’s instream flows. In 2009, the Center won a lawsuit against the United States Fish and Wildlife Service arguing that a previous designation of five hundred river miles of critical habitat for the loach minnow was insufficient. In 2012, Service not only designated 710 miles of critical habitat, but also listed the loach minnow as an endangered species.

The next panelist, Drevet Hunt, discussed three examples of litigation tactics used to restore instream flows. First, Hunt discussed how petitioners sued under Section 9 of the ESA to increase flows on the Shasta River below the Dwinnell Dam in California by arguing the dam blocked historic runs of the endangered coho salmon and constituted an unpermitted taking. A 2013 settlement resulted in the dam operators needing to get an incidental take permit and create a long-term flow and habitat restoration plan to encourage coho salmon populations. Second, Hunt next discussed how California attorneys use the state’s constitutional prohibition against waste and unreasonable use to protect instream flows. In 2014, Lawyers for Clean Water sued the state over the City of Buena Ventura’s over-pumping of the Ventura River affecting eleven endangered species and reducing local steelhead populations by ninety-six percent. This litigation is still pending, but the state has made some efforts in working to enhance Ventura River flows. Third, Hunt explored how petitioners successfully used Section 5937 of California’s Fish and Game Code against dam operators to restore instream flows. This section of the code mandates owners of dams “allow sufficient water at all times to pass . . . to keep in good condition any fish that may be planted or exist below the dam.” In one example, a federal court even enforced this law against a federal dam operator, the United States Bureau of Reclamation.

Last, Konrad Fisher discussed the impacts of diversions on the Klamath River and how he would like to see in how the public approaches water quantity issues, such as by reframing water diversions as percentages rather than total quantities. He argued the public would be more understanding of water quantity issues if water settlements apportioned seventeen percent of flows for fish.

WESTERN WATER AND LIVESTOCK PRODUCTION: A DESTRUCTIVE PAST AND UNSUSTAINABLE FUTURE, PRESENTED BY: JOSH OSHER, WESTERN WATERSHEDS PROJECT; GEORGE WUERTHNER, PUBLIC LANDS MEDIA; JULIA DEGRAW, FOOD & WATER WATCH.

This panel discussed the destructive impacts of large-scale cattle operations on landscapes and ecosystems. The panel focused on cattle grazing and industrial farming as some of the lead causes of environmental destruction in the American West.

Josh Osher spoke about the widespread damages cattle grazing. Not only does cattle grazing affect more than two hundred million acres of land in the American West, but it has also damaged eighty percent of streams and riparian areas in the region. Osher contended that the only way to prevent further degradation of western ecosystems through cattle grazing is to remove the cattle from the land. Once cattle are removed, he argued, lands have shown a surprising resilience and ability to rebound from substantial degradation.

George Wuerthner discussed how legislators and government agencies have failed to combat the cattle industry. Wuerthner highlighted this failure by exploring the Clean Water Act's exception that allows industrial agricultural producers to operate without obtaining discharge permits, despite the fact that cattle in Montana produce waste equivalent to a human population of 100 million. Wuerthner also discussed the disproportionate access the industry has to water. In Nevada for example, the cattle industry only provides some 25,000 jobs but it may take up to eighty-five percent of the state's water. Wuerthner concluded his segment by imploring the attendees to fight this inequity by eating more fruit and vegetables.

Last, Julia DeGraw presented on how important it is for society to shift how we use water. To highlight this importance, DeGraw explored two mega-dairy farms, one in operation and the other slated for future operation, near Boardman, Oregon. The groundwater underneath Boardman has long been in decline, yet the combined dairy farms could withdraw an estimated 1.4 million gallons of water a day to support 100,000 cattle. This would not only severely affect local hydrologic conditions, but it would also reduce local air and water quality. DeGraw argued that the cost of beef does not internalize its environmental destruction.

CALIFORNIA GROUNDWATER MANAGEMENT, PRESENTED BY: ALISON DIVINE, COMMUNITY LEGAL INFORMATION CENTER, CALIFORNIA STATE UNIVERSITY, CHICO.

Alison Divine discussed how the California Sustainable Groundwater Management Act of 2014 ("SGMA") has impacted the state. Divine first discussed the history of groundwater management in California, then the general functions of SGMA, and finally how SGMA has developed during its infancy.

California's groundwater system is expansive. Seventy-five percent of Californians depend on groundwater, in some part, for their primary water supply. The state recognizes two types of groundwater: subterranean streams, which consist of groundwater flowing in a known and definite channel; and percolating groundwater, which a California court once eloquently described as "vagrant wandering drops [of water] moving by gravity in any and every direction along

the line of least resistance.” From 1850 until 1903, California landowners possessed absolute ownership of the groundwater under their land. After 1903, California adopted a correlative rights system for groundwater use. Until 2014, California only regulated its groundwater through local agencies, groundwater ordinances, and basin adjudications.

SGMA is California’s first statewide groundwater management act, and it provides a long-term framework for sustainable management in California by requiring the establishment of Groundwater Sustainability Agencies (“GSAs”) in each county by June 30, 2017. GSAs may be formed in a variety of ways, including: (1) as local public agencies; (2) as a public water agency, county, or municipality; and (3) through a Joint Powers Agreement (“JPA”) or Memorandum of Agreement (“MOA”) between multiple agencies. Each GSA has wide authority to manage the sub-basin(s) on which it sits. GSAs may regulate groundwater well registration, measurements of groundwater extraction and metering, filing of annual reports, well spacing, and basin boundaries. GSAs may also establish sub-basins, limit groundwater extraction, and establish recharge, conjunctive management, or pumping reduction programs. However, to manage sub-basins and basins, GSAs must submit a Groundwater Sustainability Plan (“GSP”), which must include a description of the aquifer, historical data, a discussion of historical and projected water demand and supplies, a detailed map of the basin’s boundaries, and a map identifying existing and potential recharge areas.

Divine discussed how eleven counties in the Sacramento River Hydrologic Region had adapted to SGMA’s requirements by March 2017. For several of these counties, jurisdictional challenges have inhibited progress. With so many applications, it may be hard for these counties to come to a consensus on which GSAs to select. At the same time, however, two counties have received no GSA applications, and another has only received one. Without having a defined GSA before June 30, 2017, several counties will not be able to submit a GSP. Yet, other counties in the region have had more progress. Butte County, Tehama County, and Colusa County have all experienced higher levels of success in preparing for SGMA’s early deadlines. These counties provide an example of what effective, long-term, and local management of groundwater may look like in California.

THE CITIZENS OF ROCKAWAY BEACH, OREGON—HOW ONE
COMMUNITY STARTED TO FIGHT FOR THEIR DRINKING WATER, AND
ENDED UP FIGHTING FOR US ALL, PRESENTED BY: NANCY WEBSTER,
CITIZENS FOR ROCKAWAY BEACH WATERSHED PROTECTION; KATE
TAYLOR, FRIGATE ADVENTURE TRAVEL; STEVE PERRY, CITIZENS FOR
ROCKAWAY BEACH WATERSHED PROTECTION; JASON GONZALES,
OREGON WILD.

This panel featured citizens of Rockaway Beach, Oregon who experienced the destruction of their local watersheds by clearcutting. The panelists spoke about their experiences throughout the clearcutting process, including their frustrations with inaction from both local and state governments.

Rockaway Beach, a small town on the northern Oregon coast, relies on Jetty Creek for its freshwater supply. One panelist described the creek as “a

crevice between hills, but it's our lifeline." Yet, from 2003–2014, timber companies removed eighty-two percent of the trees around Jetty Creek. Overall, timber companies have removed ninety percent of the trees from Jetty Creek. Often, these companies performed aerial sprays of "chemical cocktails" over the trees before and after clearcutting. The State of Oregon does not require timber companies to release information about what chemicals these sprays contain, nor does the state provide notice to locals before sprays occur. The Oregon Forestry Practices Act contains almost no requirements for watershed protection. Furthermore, the City of Rockaway Beach, the municipality with regulatory authority of Jetty Creek, does not require any notification or information on the contents of chemicals.

The combination of a lack of regulatory oversight and an acquiescence to the timber industry has effectively ruined Jetty Creek. Since clearcutting began, levels of trihalomethanes in Jetty Creek have rapidly increased and are far beyond the EPA's suggested levels. Panelists spoke about how logging practices have, among other things, increased turbidity of the creek, harmed local animal populations, left the town with no reliable source of drinking water, and negatively impacted the local water-tourism industry. When trying to seek the help of the local and state official on these issues, panelists said they were met with defensiveness, inaction, and industry protectionism.

Frustrated with the state and city, the citizens performed "citizen science" to prove to regulators that the logging industry has been negatively affecting watersheds. Through citizen action, the panelists and other members of the public have created a series of legislative proposals to limit aerial spraying in the timber industry. Oregon Democratic State Senator Michael E. Dembrow recently sponsored Senate Bill 892, or "The Timber Aerial Spray Right to Know" bill. This bill was accompanied by Senate Bill 500, which provides agriculturalists with a cause of action for damages resulting from timber companies that conduct aerial sprays.

Overall, any short-term gains in the legislature will prove insufficient. The panelists warned that other parts of the Oregon coast, notably Short Sands Beach, are in imminent danger of succumbing to the same fate as Jetty Creek. The only true way to prevent watershed destruction in Oregon, the panelists contended, is to fundamentally reshape the state's approach to the timber industry.

FILM PRESENTATION OF *PAYA: THE WATER STORY OF THE PAIUTE*, FOLLOWED BY A QUESTION AND ANSWER SESSION WITH: JENNA CAVELLE, DIRECTOR; HARRY WILLIAMS, BISHOP PAIUTE TRIBAL MEMBER & ACTIVIST; JACKLYN VELASQUEZ, BIG PINE PAIUTE TRIBAL MEMBER & VERMONT LAW SCHOOL; AND CHRIS MORROW, VITERBI GRADUATE SCHOOL OF ENGINEERING.

The landscape in Owens Valley—in arid Inyo County—contains evidence of long-standing irrigation practices predating the American West's colonial era. These dried up channels and diversions come from the people who traditionally inhabited Owens Valley. Today, the descendants of those people belong to the Bishop Paiute, the Big Pine Paiute, and a number of other tribes in the area. The film *Paya: The Water Story of the Paiute* explores a series of extensive pre-historic irrigation systems in the Owens Valley and how evidence of

early beneficial use may help establish a substantial water right for the region's present Indian tribes. The film frames the exploration by discussing intervening historical injustices that prevented local tribes from conducting irrigation.

In order to establish a substantial water right, the local tribal members must first establish evidence proving the existence and the scope of historical water use. To this end, it has been relatively easy to show that pre-historic irrigation channels actually existed. Based on various historical sources, the film estimates that native people constructed over sixty distinct networks of ditch systems in the Owens Valley. But it is much more difficult to show the water quantity used. The more difficult task for people like Harry Williams, a Bishop Paiute tribal member, and others is to prove the quantity of water that flowed through these irrigation systems, but the film estimates tribes might be able show use of up to tens of thousands of acre-feet each year if they successfully applied for water rights.

History has not been kind to the tribes. The indigenous people of Owens Valley were forcibly removed in the 1860s. Even after being allowed to return home, Indians could not purchase land. As a result, the Bishop Paiute and other tribes experienced a "forced, sudden amnesia," and lost their irrigation practices. Then in response to rapid population growth in the early 1900s, the City of Los Angeles began building the Los Angeles Aqueduct and purchasing water rights and land in Owens Valley. Since then, the City of Los Angeles has pumped hundreds of thousands of acre-feet per year from Owens Valley, radically altering the valley.

Unlike many tribes, the Big Pine Paiute and others in the Owens Valley never received a federal Winters right to water, but if tribes can establish beneficial use predating the aqueduct, they could prevent the Los Angeles from diverting massive amounts from the Owens Valley. However, Los Angeles has long been militant in its Owens Valley litigation and owns vast quantities of the area's land. For local Indian tribes to establish a water right, they must create a compelling package of evidence that can accurately describe the prehistoric beneficial use of people in the area.

The film's director, Jenna Cavelle, and others spoke about the film saying it has created a movement within the local community to establish a water right, but tribal communities face an uphill battle because they lack the funding needed to hire experts and accumulate the necessary evidence.

TRANSBOUNDARY WATER ISSUES: CHALLENGES AND OPPORTUNITIES,
PRESENTED BY: ERIC BENJAMINSON, FORMER UNITED STATES
AMBASSADOR; TODD JARVIS, OREGON STATE UNIVERSITY; AUSTEN
PARRISH, INDIANA UNIVERSITY SCHOOL OF LAW; FATIMA TAHA, OREGON
STATE UNIVERSITY.

This panel consisted of four panelists who discussed separate challenges that attorneys and other professionals face when solving transboundary water issues.

Todd Jarvis, a hydrologist and professor at Oregon State University, began the discussion by outlining six issues anyone working in transboundary water agreements should be ready to face. Jarvis began by outlining the advantages and disadvantages of using conceptual models, which can be important—espe-

cially for groundwater. Second, Jarvis compared countries that allow local management with countries that use national legal framework. Third, a lack of data can prevent countries from wanting to agree to solutions. Fourth, boundaries can change, which can compound other issues associated with transboundary water agreements. Fifth, Jarvis discussed how “dueling experts” can hold back transboundary water agreements through cherry-picked and politicized data. Sixth, Jarvis stated that transboundary water agreements can be expensive to reach.

Next, Eric Benjaminson, a former United States Ambassador to Gabon and to São Tomé and Príncipe and former United States Economic Minister Counselor in Canada, discussed how international disputes over Devils Lake in North Dakota reflect the challenges that professionals working in transboundary water disputes must face. Canada is concerned a plan for a spillway on Devils Lake would have had a negative impact on Lake Winnipeg, the eleventh largest freshwater lake on Earth. One of the biggest problems is that the U.S. federal government largely lacks jurisdiction over the lake making it difficult to intervene.

Austen Parrish, dean of Indiana University’s Maurer School of Law, next presented, arguing that one way to solve transboundary water issues is to shy away from a model that encourages local authorities. He stated that small scale attempts to fix transboundary water issues invariably fail, and such challenges require large-scale and complex solutions. Local authorities can be hyper-political, and lose perspective of the end goal. To show how localized solutions are ineffective, Parrish discussed difficulties that the Confederated Tribes of the Colville Reservation faced when a Canadian mining company, Teck, polluted the tribe’s water supply. Without a transboundary agreement over actions such as Teck’s, it is much harder for United States citizens to seek justice. Parrish used this example to show how vital it is to have transboundary agreements that are respected at a high level of international policy. Without such an agreement, citizens are left to fight under domestic laws and uncertain precedents.

Fatima Taha, a graduate student at Oregon State University, concluded the presentation by discussing her research into resolving transboundary water issues using a live-action “serious game,” designed to simulate and encourage effective transboundary negotiations. In this game, players participate on teams of three. Each team represents a country and its three players participate as a head of state, an agriculturalist, and an environmentalist. Each country must work with other countries to coordinate the development of food grains, meat, dairy, and a healthy environment, but negotiations between teams can quickly fall apart through news of extreme drought or war. Overall, Taha’s game helps participants de-politicize issues and seek an equitable solutions that makes sense for all parties involved.

Matthew Kilby

**THIRTY-FIFTH ANNUAL AMERICAN BAR ASSOCIATION WATER LAW
CONFERENCE**

Los Angeles, California

March 29, 2017

AGRICULTURAL WATER CONSERVATION: IS IT REALLY SO SIMPLE?

Jan Newman from Tonkon Torp, LLP moderated the panel discussion on water law issues as it relates to agricultural water conservation was moderated. The panel featured three distinguished speakers who contributed their views and experience in water conservation as it relates to agricultural development in the United States. The speakers were James Eklund, outgoing Director of the Colorado Water Conservation Board, Warren H. Peterson, Vice President of Farmland Reserve, Inc. headquartered in Salt Lake City, Utah, and Adam Schempp, Director of the Western Water Program at the Environmental Law Institute in Washington, D.C. The main theme of the panel was whether traditional water law doctrines, such as prior appropriation—"first in time, first in right"—and beneficial use promote water conservation efforts.

Adam Schempp began the panel with a general overview of the challenges western water users face, and the possible solutions to these challenges. Water conservation efforts are restricted by the physical geography of the arid western landscape where sources of surface water and groundwater are intrinsically bound by the layout of the land. There are also inconsistencies in the legal doctrines each state legislature uses as a basis for developing their own water laws. Economic considerations also shape conservation efforts in the various western states. Schempp noted that water conservation is a complex topic, and there are a multitude of issues and considerations in each of the three broad categories described above.

Next, Warren Peterson discussed his views on water conservation efforts based on his work and experience in the Utah water law landscape. Peterson believes that water conservation is always a question that revolves around the reallocation of resources: how much water may be retrieved or preserved after use. He suggested that the best way to promote agricultural water conservation is for farmers to utilize more efficient irrigation techniques. Science and technology are friends of water conservation, and creative new irrigation systems could drastically decrease the total amount of water needed for crops as well as increase the amount of reallocated water leftover after use. To illustrate his point, Peterson presented a quick case study about the hydrology of Utah's Sevier River and the effects of water appropriation for agricultural and urban use on the river system.

James Eklund followed Peterson's discussion with his insights regarding the state of water conservation in Colorado. Eklund began by noting that Colorado is home to two of the world's top eighteen most stressed river basins. This designation is probably the result of the unique physical landscape within the state of Colorado. With a map of Colorado and the surrounding states as a visual reference, Eklund pointed to the fact that Colorado is separated into two distinct regions: the water rich western area and the water poor eastern area. Not only that, many of Colorado's water sources flow out of the state without having a significant amount of water sources flowing in. Tension between water

users from the two regions has shaped the history of water law in Colorado. This tension between the two regions is exacerbated by Colorado's geographical dichotomy as the western regions of Colorado has a low population and is primarily rural agricultural, and the eastern regions of Colorado has a high population and is generally urban. Furthermore, the urban population in the eastern regions of Colorado has increased drastically in recent years. Such a growth puts pressure on the state to allocate enough water to supply the urban populations. This kind of water allocation negatively impacts water rights holders residing in western Colorado. The political battle between the agricultural west and the urban east is constant and greatly affects statewide water use planning and conservation efforts.

After Eklund's overview on the nature of Colorado's water infrastructure, Schempp gave a brief conclusion to summarize the panel discussion. Schempp emphasized the primary purpose of water conservation - to return more water to the stream or, alternatively, to maintain a higher volume of water flowing in stream. The key to water conservation is not to reduce the amount water rights holders may use but rather to use the amount of water they already have in more efficient ways so as to promote a higher return of water to the stream. Current agricultural water conservation projects have mostly been tested on a smaller scale, with individual private farmers. But the results have been positive and overall very promising. Schempp ended the discussion by characterizing successful water conservation as a collaborative effort; states must work together to change laws that are outdated and outmoded, implement new technology and innovative strategies to promote water conservation, and give farmers incentives to utilize their water more efficiently and to produce less waste.

Tina Xu

THIRTY-FIFTH ANNUAL AMERICAN BAR ASSOCIATION WATER LAW CONFERENCE

Los Angeles, CA

March 28-29, 2017

THE FUTURE OF INDIAN WATER RIGHT SETTLEMENTS IN AN AGE OF UNCERTAINTY

Jennifer Gimbel, a senior research scientist at Colorado State University, moderated the panel discussion entitled, "The Future of Indian Water Right Settlements in an Age of Uncertainty." Gimbel began her introduction by acknowledging that certainty is the main goal when identifying water rights; states and water users want to know what belongs to Indians and how they want to use it. Gimbel introduced two of the most pressing sources of uncertainty—funding and resources. Over the last few years, states "ponied up" a considerable amount for successful settlements. Nonetheless, states want to maintain control over water, making it difficult to determine how water rights should be administered.

Pamela Williams, Director of the Secretary's Indian Water Rights Office in the U.S. Department of Interior ("Department of Interior"), began her discussion by quoting Secretary Ryan Zinke:

I believe Indian water right settlements are a critical part of the United States government's responsibility for tribes across the country. During my time as a Montana congressman, I fought [to ratify] the Blackfeet Nation's water compact because water is both life to the Tribe and also a key resource for the surrounding community. Not only is water an economic driver, it is an important component of [Blackfeet Nation's] culture and traditions. As Secretary of the Interior, I recognize the importance of maturing these resources.

Williams then said that water right settlements are not over, they will continue. By Williams's count, over the past thirty years, Congress enacted thirty-one settlements. The Department of Interior is "hard at work" on the eighteen settlement negotiations in place and are implementing the recently enacted settlements.

Williams continued by discussing the way in which the Department of Interior handles Indian water right settlements. A group called "Working Group on Indian Water Right Settlements," which is composed of high-level decision makers, including all assistant secretaries and the Solicitor, makes recommendations to the Secretary of Interior regarding Indian water right settlements. The Secretary's Indian Water Rights Office coordinates Indian water rights settlements through teams in the field that include representatives from, *inter alia*, the U.S. Bureau of Indian Affairs, the U.S. Bureau of Reclamation, the Solicitor's Office, and the U.S. Department of Justice.

In 1990, the Criteria and Procedures for Participation of Federal Government in Negotiating for Settlement of Indian Water Rights Claims was published in the Federal Register. Williams clarified that these Criteria and Procedures are not regulations, but rather they are guidelines agencies and administrations follow to determine what settlements it will support and the extent of federal contributions. Since the 1990 publication, every administration has applied the Criteria and Procedures with varied interpretations. Williams acknowledged that some individuals think they are poorly written, while others think they are a masterpiece of flexibility.

Williams then discussed a recent development regarding negotiating water rights settlements. In February 2015, Representative Rob Bishop, Chairman of the United States House Natural Resources Committee, sent a letter to the Department of Interior and the Department of Justice outlining the process that the House Resources Committee would follow when entertaining Indian water rights settlements. Specifically, he requested a formal statement from the Department of Interior and Department of Justice affirming post-settlement compliance with his additional criteria that emphasize compliance with the 1990 Criteria and Procedures focusing on financial aspects of settlements. The Department of Interior complied and provided statements on binding water right settlements, including the four passed in the 114th Congress. Those four included Blackfeet Water Rights Settlement Act—a "tremendous victory," Pechanga Band of Luiseno Mission Indians Water Rights Settlement Act, amendments to the San Luis Rey Indian Water Rights Settlement Act, and the Chocktaw Nation of Oklahoma and Chickasaw Nation Water Settlement. Williams noted the Bishop process is functioning—although it is not followed in the Senate, it is followed in the House.

Vanessa Ray Hodge, an attorney at Sonosky, Chambers, Sachse, Endreson & Perry, continued the discussion by focusing on the Criteria and Procedures

applied to Indian water rights settlements. The 1990 Criteria and Procedures purport to guide Indian water rights settlement negotiations. Hodge noted that the sixteen criteria were developed in response to a Federal executive branch desire to have a more principled negotiating role and intended to outline general policy goals that water settlements should reflect. These include substantive goals such as federal waivers, legal claims, appropriate financial contribution (including federal government and non-Indian parties), and procedural goals such as how to budget the settlements, types of funds to create settlement, and calculating infrastructure cost.

At the time the 1990 Criteria and Procedures were developed, Congress passed few settlements. Indian water rights settlements significantly increased and, over time, the Department of Interior and Department of Justice developed a specific approach to their application of criteria and procedures for settlements. Hodge opined that Department of Interior generally applies those procedures to all Indian water rights settlements, notwithstanding factual histories or circumstances related to individual tribes and their specific negotiations. In that regard, Hodge believes that, although the 1990 Criteria and Procedures are useful, they should be updated to reflect a more holistic approach to Indian water rights settlements.

Maria O'Brien of Modrall Sperling in Albuquerque, NM, took a step back from the technical discussion and first asked, "Why should we care about Indian water rights settlements?" The answer, she said, "Start[s] with the premise that Indian water rights require a source and certainty of access to supplied water to sustain homelands and economic development."

Indian water rights settlements play a significant role by acting as a mechanism for solving a "complex conquest over water." Thus, O'Brien continued, irrespective of ever-changing administrations, we will continue needing Indian water right settlements. Conflicts over water are consistent, and a myriad tribes throughout the United States are still without water rights settlements.

Settlements allow flexible, creative approaches and solutions to issues involving infrastructure and water allocation—issues that could not be addressed by simply quantifying Indian water rights in the context of litigation. Settlements, as opposed to litigation, unite states, the federal government, tribes, and other significant water users, which can provide varied resources not limited to financial contributions, such as modeling resources and technical assistance. These broad contributions enable the settlements to move forward and solve disputes over Indian water rights as well as local concerns about the water supply in a way that is not possible when resorting to litigation.

O'Brien then discussed a recent success in Indian water rights settlement arena—Oklahoma's first Indian water right settlement between Choctaw Nation of Oklahoma and Chickasaw Nation. Congress enacted this Indian water right settlement in December 2016, after five years of negotiation. It started with litigation, but Oklahoma and the Tribes decided to "roll up their sleeves" and reach a settlement. The federal government participated in the negotiation and was instrumental in its success. O'Brien considers every settlement to be unique, and in this one, Oklahoma and the Tribes needed work through policy issues that sourced their mutual conflict for many decades. Although settlements are unique, common issues do prevail, such as a mutual desire to reach a resolution and identify core principles at issue. It can take a substantial

amount of time for parties to articulate their individual needs. Even so, settlements are favored over litigation because they encourage resolution rather than frame settlements as purely adversarial.

Next, Williams discussed the way in which the federal government funds these settlements. In 2009, from the same Omnibus Appropriations bill that enacted the Navajo Water Rights Settlement Act, Congress created a reservation settlement fund that is apportioned from the Bureau of Reclamation fund containing billions of dollars. The reservation settlement fund only applies to settlements with a Bureau of Reclamation component and does not relieve financial pressure on the Bureau of Indian Affairs. The reservation settlement fund is intended to last until 2029 and provide roughly \$120 million per year for certain identified settlements. These include the Crow and Blackfeet Tribes in Montana that settled for roughly \$400 million each, and the Navajo Tribe in Arizona that settled for one billion dollars.

Finally, O'Brien extended the dialogue by differentiating the types of available funding. She first explained that congressionally enacted settlements rely on discretionary funding which only authorizes appropriations for each individual settlement. This discretionary funding is given to the Bureau of Indian Affairs and the Bureau of Reclamation (when projects involve a water settlement component) when the agencies ask for funds in their programmatic budget to fulfill financial obligations when settlements are enacted.

On the other hand, the 2010 Claims Resolution Settlement Act provided mandatory congressional funding for Indian water rights settlements enacted under this statute. For Congress to appropriate mandatory funding, it must find a same-year offset, meaning Congress reallocates funding from one program into another needing the mandatory funds. One of the first Indian water settlements receiving mandatory funding was the Crow Tribe Water Rights Settlement Act, which is almost fully funded, unlike the discretionary funding for the Pechanga and Blackfeet Tribes water rights settlements which are funded over time.

Gia Austin

THIRTY-FIFTH ANNUAL AMERICAN BAR ASSOCIATION WATER LAW CONFERENCE

Los Angeles, California

March 29, 2017

THE PUBLIC TRUST DOCTRINE: A MODERN DEBATE OVER A CLASSIC DOCTRINE

Three speakers came together to discuss their views on the public trust doctrine as it applies to the current state of water law. Jennifer Harder moderated the discussion. She is a professor of law at the University of the Pacific, McGeorge School of Law, in Sacramento, California. The first part of the discussion was led by Buzz Thompson of O'Melveny & Myers, who is also a professor at Stanford Law School. He was followed by J. Craig Smith of Smith Hartvigsen, PLLC, located in Salt Lake City, Utah. Cynthia Koehler, co-founder and executive director of WaterNow Alliance, a non-profit organization based in San Francisco, concluded the discussion.

Thompson introduced the panel topic and provided general background information regarding the public trust doctrine and its application to the area of water rights. He informed the audience that the application of the public trust doctrine to water law sports about fifty years of legal history. Yet, this doctrine remains extremely controversial as it exposes a variety of legal puzzles. Only a handful of state courts have written on the subject; for example, both the California Supreme Court and the Hawaii Supreme Court published landmark opinions regarding the public trust doctrine in water law. Generally, states recognize that water is a public resource, exclusively owned by the state, even if states also recognize a variety of water rights held by private individuals.

Thompson pointed to several concerns regarding the public trust doctrine. Some believe that the doctrine will give courts a license to engage in strong judicial intervention. Others feel that this doctrine is simply a form of broken judicial takings. Yet still, others are worried that this doctrine is anti-majoritarian because the legislature may not be able to override judicial opinions on the applicability of the doctrine. There is an even split amongst courts who have addressed this topic; states such as California have applied the public trust doctrine to their state consumptive water laws, while other states, including Colorado, have explicitly rejected the application of the doctrine to water rights. At this time, it is unclear as to whether applying the public trust doctrine will yield positive or negative consequences.

Smith followed Thompson's introduction with his views on the public trust doctrine in the context of the prior appropriation system. He does not believe that the public trust doctrine should be applied to water law where the prior appropriation doctrine governs and private property rights are at stake. Smith feels that this public trust movement reflects the general unease the public feels about private property rights over a public resource. For example, in Utah, like in many arid western states, private water rights held by individuals or private companies are key to the value of their property holdings. The properties of many land owners would be essentially worthless if those private water rights are taken away. The value of the land is tied to the water rights that comes with it. Smith believes that the well-established prior appropriation system works well and will continue to work well, even if we are not comfortable with the idea.

A current case in Utah arose from a unique situation created by a clash between the public trust doctrine and prior appropriation. The questions posed were: whether water is a public resource; if the public has a right to access the water, to what extent would that encroach on the rights of private individuals; can a certain amount of limited trespass be allowed through private property to access water sources; and should this sort of access be limited to only navigable waters? Smith concluded that in the future, state legislatures must pick a side because the two doctrines conflict with each other on a fundamental basis. If both doctrines exist together, there will be much confusion and inconsistencies in state policies and laws, which will in turn hurt those who has invested an immense amount of resources in water infrastructure and legislation.

Koehler took the opposite view in her discussion of the public trust doctrine in water law. She began by noting that the public trust doctrine is actually quite old, extending back to England and the concept of sovereign ownership – the monarchy owns resources that benefit the citizenry and hold such resources in trust. This idea immigrated to the United States and several U.S. Supreme

Court cases in the Nineteenth Century established that each state, as its own sovereign, has the right and responsibility to hold public resources in trust for the benefit of its citizens. Although Koehler agrees with Craig that the public trust doctrine impose limitations on private enterprises, she believes that this is necessary to protect the interest of state citizens. The key question to ask is: to what extent is it acceptable for the public trust doctrine to limit private property rights?

Koehler demonstrated situations where the destruction or damage to natural resources and the environment is so severe and so prevalent that the state has a duty to step in and intervene. States have an obligation to preserve the value of such resources for future generations. Water, like other aspects of nature - the land, the sea, the air, is a different type of property, public property. Such property cannot be parceled out and used in the same way as other more traditional kinds of private property. To withhold access to water would have a significant impact on the general population and society as a whole. Koehler feels that to view water as a resource equivalent to other types of private property is misguided and dangerous. This kind of view, when reflected in policy and law, will only cause harm to state citizens and to the state's natural environmental, as well as, create irreparable damage to natural resources and alter our nation's environment permanently.

Tina Xu

COURT REPORTS

FEDERAL COURTS

UNITED STATES COURT OF APPEALS FOR THE NINTH CIRCUIT

Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water Dist., 849 F.3d 1262 (9th Cir. 2017) (holding: (i) the United States impliedly reserved a water right when establishing the Agua Caliente Reservation; (ii) the Tribe’s implied federal reserved water right extended to groundwater; and (iii) the Tribe’s state water entitlements to groundwater did not disqualify its implied federal reserved water right).

The Agua Caliente Band of Cahuilla Indians (“Tribe”) inhabited the Coachella Valley prior to California’s Admission to the Union in 1850. Two Presidential Executive Orders issued in 1876 and 1877 established the majority of the Agua Caliente Reservation. Today, the United States holds a series of lands that are “interspersed in a checkerboard pattern” in trust for the Tribe.

The Coachella Valley contains an arid southwestern desert. Rainfall averages three to six inches per year and the Whitewater River System, the only source of surface water, produces a fluctuating annual supply between 4,000 and 9,000 acre-feet that primarily occurs in winter months. Currently, the Tribe receives surface water from the Whitewater River System consistent with the Whitewater River Decree, a 1983 California Superior Court adjudication that addressed state-law water rights for river system users. The adjudication resulted in a state court order that allotted water for the Tribe’s benefit, primarily because the United States, as holder of partial Agua Caliente Reservation lands in trust, participated in the adjudication on the Tribe’s behalf. However, the adjudication reserves only a minimal amount of water for the Tribe, providing enough to irrigate nearly 360 acres of the reservation’s approximately 31,369 acres. Additionally, the river system peaks in the winter months, which leaves the allotment filled outside of growing season.

This inconsistent and “virtually nonexistent” surface water supply causes the Tribe to predominantly rely on groundwater for all consumptive use on the reservation during the year. Therefore, almost all regional water is sourced from the Coachella Valley Groundwater River Basin, the aquifer underlying the valley. The Tribe, however, does not pump groundwater on its reservation, but purchases groundwater from the Coachella Valley Water District and the Desert Water Agency (“water agencies”).

Over concern for diminishing groundwater resources, the Tribe filed an action for declaratory and injunctive relief against the water agencies in the United States District Court for the Central District of California. The Tribe requested a declaration that it had a “federally reserved right and an aboriginal right to the groundwater underlying the reservation.” The district court later

granted the United States' motion to intervene as a plaintiff to support the Tribe's allegation that it had a reserved right to groundwater.

The parties divided the litigation into three phases. With respect to Phase I, the only phase relevant for this case, the district court held that "the reserved rights doctrine applied to groundwater and that the United States reserved appurtenant groundwater when it established the Tribe's reservation." Subsequently, the district court certified its order for interlocutory appeal and the water agencies petitioned the Ninth Circuit Court of Appeals for permission to hear the appeal. The court, on de novo review, addressed the only issue on appeal: whether the Tribe had a federal reserved right to the groundwater underlying its reservation. In so doing, the court approached its analysis in three steps.

First, the court determined whether the United States impliedly reserved water when establishing the Agua Caliente Reservation. This question is two-pronged: (1) whether water is reserved if a reservation's primary purpose anticipates water use; and (2) if so, whether the Agua Caliente Reservation's primary purpose contemplated water use.

The court began its analysis by examining the *Winters* doctrine, and found that it established that "federal reserved water rights are directly applicable 'to Indian reservations and other federal enclaves, encompassing water rights in navigable and nonnavigable streams.'" However, the *Winters* doctrine is limited to certain situations; it reserves water necessary to accomplish the purported means of the reservation and reserves water if it is appurtenant to the withdrawn land. Following that understanding, the court differentiated the parties' and the district court's application of the *Winters* doctrine that specifically addressed whether the Tribe's reserved right extended to groundwater from the more overarching issue concerning whether the mere existence of a federal reserved right depended on the Agua Caliente Reservation maintaining an implicit right to use water.

The court then evaluated the first prong when addressing the Tribe's implied reserved right to water. The court invoked *United States v. New Mexico* and reasoned, "the federal purpose for which land was reserved is the driving force behind the reserved rights doctrine." Further, that the *New Mexico* Court patterned a consistent conclusion whenever the reserved water rights doctrine is raised—an insufficient water supply defeats the purposes of the reservation. Therefore, the court adopted *New Mexico's* holding that water is reserved when the reservation's primary purpose foresees water use. The court then evaluated the second prong, whether the Tribe's primary purpose contemplated water use. To answer this question, the court synthesized the Executive Orders establishing the Agua Caliente Reservation and Supreme Court precedent to conclude that "the primary purpose underlying the establishment of the reservation was to create a home for the Tribe, and water was necessarily implicated in that purpose." Therefore, the United States impliedly reserved water for the Tribe.

Second, the court addressed whether the Tribe's implied reserved water right extended to the Agua Caliente Reservation's underlying groundwater. The court reiterated the *Winters* doctrine requirements and determined that although the Tribe met the first requirement that the reservation's purported means necessitated water use, the second requirement that unappropriated water must be appurtenant to the reservation remained. To find a resolution, the

court reasoned that appurtenance is not limited to surface water and extrapolated from Supreme Court precedent that the United States can protect groundwater and, along that vein, impliedly reserved water may include appurtenant groundwater. Further, the court considered the Tribe's reliance on groundwater when reasoning that the minimal surface water availability conditions the Tribe's survival on groundwater access. From this line of reasoning, the court clarified that the *Winters* doctrine purported to provide sustainable livelihoods to Tribes inhabiting reservations in arid areas, like the Agua Caliente Reservation, and included access to both appurtenant surface water and groundwater. Therefore, the Tribe's implied reserved water right included groundwater.

Third, the court addressed whether the above two holdings withstood the water agencies' arguments that: (1) the Tribe received water pursuant to California's correlative rights doctrine; (2) the Tribe did not need a federal reserved right to groundwater in light of its allotted surface water from the Whitewater River Decree; and (3) the Tribe never drilled for groundwater on its reservation. The court rejected each in turn. First, federal water rights, such as the implied federal reserved water right, preempt state water rights. Second, *New Mexico* did not inquire into the *current* necessity of water, it focused on whether the reservation's *inception* purported such a necessity. Third, lacking historical access to groundwater on the reservation did not foreclose the Tribe's current access to groundwater. Therefore, compounded with the federal primacy of reserved water rights, the Tribe's implied federal water right to groundwater remained intact.

Accordingly, the court affirmed the district court holding that the United States impliedly reserved appurtenant groundwater when creating the Agua Caliente Reservation.

Gia Austin

STATE COURTS

ARIZONA

Silver v. Pueblo Del Sol Water Co., 384 P.3d 814 (Ariz. Ct. App. 2016) (holding: (i) that the Arizona Department of Water Resources' ("ADWR") interpretation of "legal availability" was valid under the statute defining "adequate water supply"; (ii) that ADWR must consider an unquantified federal reserved water right for the purposes of an Adequate Water Supply Designation ("AWSD"); and (iii) that ADWR was not required to separately consider the impact of pumping on a conservation area and the local surface or groundwater).

In 1988, the United States Congress designated roughly thirty-six miles of the San Pedro River basin ("Basin") as a national conservation area ("Conservation Area"), and simultaneously created a federal reserved water right for the Conservation Area "in a quantity sufficient to fulfill the purpose" of protecting the public lands surrounding the River. The Bureau of Land Management ("BLM") manages the Conservation Area. Since 1989, BLM has filed three statements of claim for the Conservation Area covering surface and groundwater.

The General Stream Adjudication for the Gila River System (“Gila Adjudication”), active for approximately 40 years, has exclusive jurisdiction to adjudicate the conflicting claims and water rights for the Basin. BLM federal reserved rights are part of the Gila Adjudication. The Gila Adjudication will determine whether BLM “has a reserved right to the groundwater ‘where other waters are inadequate to accomplish’” the reservation’s purpose and the minimum amount necessary to achieve that purpose.

Pueblo Del Sol Water Company (Pueblo) is a private water company. Pueblo serves an area five miles from the San Pedro River. In June 2011, Pueblo applied for an AWSDD, which would allow it to pump groundwater to a planned community subdivision and other projects. Pueblo’s application included its Certificate of Convenience and Necessity (“CC&N”), a certification provided by the Arizona Corporation Commission to public utilities. Pueblo sent its application to ADWR, the agency that reviews AWSDD applications. Ariz. Rev. Stat. § 45–108 requires subdivision developments outside active water management areas to show the existence of an adequate water supply as designated by ADWR. Under ADWR’s regulations, an adequate supply requires continuously legally and physically available water to satisfy the proposed needs for at least one hundred years. BLM objected to the Pueblo’s application, citing failure to properly analyze availability of water under ADWR’s regulations.

ADWR rejected the objection and accepted Pueblo’s application. BLM appealed to the Superior Court of Arizona, which reversed ADWR’s decision. The lower court held that ADWR abused its discretion because ADWR failed to meet its statutory duty to ensure that the water source will be available for at least 100 years. The lower court found that ADWR’s definition of “legal availability” erroneously allowed a decision to be based solely on whether the applicant had a CC&N. ADWR and Pueblo appealed the judgment.

On appeal, the Court of Appeals of Arizona decided three issues: (1) whether ADWR’s interpretation of “legal availability” under the statute defining adequate water supply was valid; (2) whether ADWR should have considered BLM’s unquantified reserved water right in its AWSDD determination; (3) and whether ADWR was required to consider the impact of pumping on the Conservation Area and local surface and groundwater.

First, BLM argued that ADWR failed to make a valid determination of legal availability when it accepted Pueblo’s application without initially considering the federal government’s senior, unquantified federal reserved right. The court disagreed with BLM, finding that ADWR’s interpretation of legally available was valid when the statutes and regulations were read together.

Legal availability is a two-step determination under ADWR’s interpretation of A.R.S. § 45–108(I)(1). First, ADWR must find that the water company is using the water for a reasonable and beneficial use. Second, ADWR must find that the water company has a legal means of delivering the water. ADWR has determined under R12–15–718(C) that the second step means a private water company has a CC&N.

The court agreed with ADWR that Pueblo’s planned use of the water was reasonable and beneficial because they planned to supply a subdivision with the water, thus satisfying the first step. The court also agreed with ADWR that

Pueblo demonstrated a legal means of delivering the water because it had a CC&N, thus satisfying the second step. The court explained that ADWR's determination that the second step requires the company to have a CC&N should be given great weight because the Director is an expert in the field vested with broad powers to achieve groundwater conservation. The court explained further that the department's requirement that a water company have a CC&N kept with the consumer protection purposes of the statute because it requires the utility to be sufficiently financially viable to deliver, store, and treat such water.

The court also noted that in addition to determining mere *legal* availability, the Director of the ADWR has a more involved duty to determine whether adequate water is available. To make this determination, the Director is obligated to consider physical availability, which required the director to consider the water already committed to approximately 200 users. The ALJ determined that the Director considered Pueblo's proposed water source and the demands from other users, and that Pueblo demonstrated that sufficient water would be available for 100 years.

Second, BLM argued that ADWR should consider its unquantified federal reserved water right, which has priority over Pueblo's. ADWR countered by arguing that determination of those water rights fell under the exclusive jurisdiction of the Gila Adjudication and could not be adjudicated by ADWR in this proceeding. The court agreed with BLM, finding that ADWR not only had jurisdiction to consider the BLM's claimed right, but had a duty to do so.

The court interpreted the language of R12-15-716(B), which requires the Director to consider the existing uses of groundwater, to include the consideration of the BLM's federal reserved right. The court found that requiring ADWR to consider BLM's right was in keeping with the intent of the groundwater statutes to protect Arizona's economy and welfare, and to provide a comprehensive framework for the management and regulation of groundwater, without compromising the preservation of the conservation area.

The court stated ADWR could use its expertise and knowledge to create an educated estimate of BLM's quantified water right. However, the court distinguished ADWR's duty to consider BLM's claim from quantifying it. The court explained that quantification was the exclusive domain of the Gila Adjudication.

Finally, BLM argued that Pueblo's proposed pumping might interfere with the Conservation Area and local surface or groundwater. The court found that ADWR was not required to separately consider the impact of pumping on the Conservation Area and local surface or groundwater. The court did not want to impose an obligation beyond ADWR's obligation to consider adequate water.

Accordingly, the court vacated the judgment of the superior court, and remanded the action to ADWR with instructions to consider the BLM's water rights claim in its evaluation of Pueblo's application.

Trevor C. Lambirth

CALIFORNIA

People v. Davis, 3 Cal. App. 5th 708 (Cal. Ct. App. 2016) (holding that the State of California could not convict a criminal defendant of simple larceny for capturing flowing water from a natural stream, because the state did not hold a superior possessory interest in water).

In September 2009, Kenneth Davis's neighbor told the sheriff that Davis diverted water from a stream to irrigate medical marijuana. The neighbor showed authorities a makeshift well and a 2,500 gallon tank buried nearby on a railroad company's property. The tank captured water that Davis used to irrigate his fields. In February 2010, the California Department of Fish and Game found that Davis's irrigation system drew from a stream that was part of the state's water system. Davis did not receive approval from the landowner or the state to create the diversion. As a result, prosecutors charged Davis with illegally diverting the natural course of a stream, as well as petty theft of water.

At trial, the jury found Davis guilty of both charges and a judge placed him on informal probation conditioned upon a ninety-day jail term. Davis sought review by the Appellate Division of Butte County, which affirmed the lower court's holding but later certified the case for transfer to the Court of Appeals at the defendant's request. On appeal, the court only considered whether a court could properly convict a criminal defendant of petty theft of water.

The court first discussed whether any party held complete ownership or a superior interest in the disputed water. To bring a larceny claim, the state must show that a party stole personal property subject to ownership. Larceny claims in California require that the victim has a possessory interest in the stolen property that is superior to the defendant's. In California, the public holds a collective vested interest in the state's water. This collective ownership of water is a legal fiction, called the public trust doctrine, in which the state is the public trustee of its resources for use by its people. Consequently, ownership rights are usufructuary and incorporated with the needs of others to use the available water resources. Further, because the state holds water in public trust, it is legally inalienable. The state cannot grant property rights to water. However, water can be owned if it is lawfully captured. If the captured water is then released, it again becomes part of the state's resource trust. Therefore, in common law, water could not be the subject of larceny because it would not be anybody's personal property.

The court found that the state had not demonstrated that it, nor any other entity, had ownership of the water that was superior to the defendant's ownership interest. Therefore, the charge was insufficient to support larceny. The railroad company who owned the land that the tank was placed on did not possess a superior interest because it made no attempt to capture the water and thus had not claimed ownership of the water. The court also rejected the state's argument that its regulatory powers under the public trust doctrine created a superior possessory interest. The court found that, while Davis may have violated California's regulatory powers, the state could not bring a larceny charge against him because its regulatory responsibility did not create a possessory interest in the water. Therefore, Davis's conviction was inappropriate because the state failed to meet the ownership or superior interest requirement of a larceny charge.

The court next addressed the state's claim that it could establish Davis's ownership through severance of the water from the property. The court stated that water may be held as personal property once it is severed from the land through capture and storage. However, water that is diverted for irrigation is not considered to have been severed and does not qualify as personal property. The prosecution claimed that a larceny charge could be brought according to precedent regarding the severance of oil. Severance of oil converted it to personal property and subjected it to a valid claim of larceny. However, the court found that Davis used the water from the tank for irrigation, which did not create a severance of the water and did not convert the water into personal property. Therefore, the prosecution's alternate claim was insufficient to bring a larceny charge.

Accordingly, the court reversed Davis's conviction for petty theft, with instructions to dismiss the count. It otherwise affirmed the judgment against Davis, and ordered an amended probation order.

Ryan Hull

COLORADO

Cty of Boulder v. Boulder & Weld Cty. Ditch Co., 367 P.3d 1179 (Colo. 2016) (holding that the water court correctly denied the County of Boulder's change of use application because it failed to meet its burden of proving an accurate historical consumptive use analysis).

Beginning in the early 1990s, the County of Boulder (the "County") entered into a series of transactions to acquire the Bailey Farm, a 290-acre property historically use for irrigated agriculture and gravel mining. The County aimed to develop the Bailey Farm into an open-space park featuring two ponds made from gravel pits filled with groundwater. The ponds would expose groundwater and increase evaporation, requiring the County replace lost water through an augmentation plan under Colo. Rev. Stat. § 37-90-137. To meet this requirement, the County filed an application in the District Court for Water Division No. 1 for underground water rights, approval of a plan for augmentation, a change of water rights, and an appropriative right of substitution and exchange. Each component was interdependently linked. The application hinged on approval of the change in water rights. The County sought to change fifty inches of its Martha M. Matthews Ditch surface water right ("MM water right"), used historically to irrigate the Bailey Farm (the "Bailey Farm Inches"), into an augmentation plan. Boulder and Weld County Ditch Company ("BW Ditch") opposed the County's application, claiming injury from the proposed change.

At trial, the County submitted two historical consumptive use ("HCU") analyses examining the Bailey Farm Inches to prove BW Ditch would not suffer injury. Both analyses included a prorated estimate that assumed previous users delivered the Bailey Farm Inches entire to 101 acres of the Bailey Farm. The County's first analysis assumed full delivery of all fifty Bailey Farm Inches to Bailey Farm from 1950 to 2000; however, BW Ditch records later revealed the HCU analysis overestimated actual consumption by thirty-seven percent from 1973 to 2000. As a result, the County supplemented the original HCU analysis with BW Ditch's correct numbers from 1973 to 2000 and the same estimated numbers for 1950 to 1972. The court cited three fatal deficiencies in the

County's HCU analysis.

First, the County inaccurately calculated actual use of the Bailey Farm Inches. BW Ditch claimed the County overstated the number of acres the Bailey Farm Inches historically irrigated, which would unlawfully enlarge the Bailey Farm Inches water right and injure down-stream users. Second, the County failed to prove the Bailey Farm Inches irrigated the seventy-acre parcel of land that the County purported. Specifically, the County assumed without support that the Bailey Farm Inches irrigated the entire Bailey Farm and based the HCU analysis on these figures. Finally, the County ignored the historical consumption of other water rights by conducting a parcel-specific analysis, rather than ditch-wide analysis. The water court rejected the County's findings as inaccurate and insufficient to meet the County's burden of proving HCU, and consequently dismissed the entire application because the County could not demonstrate an absence of injury to others or that the proposed change in water rights would not fully compensate for the anticipated loss. The County appealed the court's determination.

On appeal, the Colorado Supreme Court affirmed the water court's holding. The Court divided its analysis into two stages. First, the Court discussed applicable principles of Colorado water law. Second, the Court discussed whether the County provided an accurate HCU analysis.

In its discussion of legal principles, the Court explained why an accurate HCU analysis is necessary for persons exposing groundwater through gravel pits. It first explained the interaction between surface and ground water rights, and the Water Right Determination and Administration Act of 1969, which integrated the prior appropriation of surface with ground water while maximizing beneficial use of water. Integrating surface rights with groundwater often requires augmentation plans. Augmentation plans allow users out-of-priority groundwater diversions, so long as he or she adequately replenishes the diversion from existing water rights to protect senior water rights. Water districts only approve augmentation plans that do not injure other users. A careful accounting of actual water use may help demonstrate lack of injury and prevent the unlawful expansion of water rights.

Next, the Court examined long-established principles regarding changes of water rights and HCU analyses. The Court noted that the amount of water changed must reflect the actual amount of water used and exist within the water's contemplated use at the time of appropriation. This limitation comes from the principle that water rights derive from both appropriation and beneficial use. Once diverted, the water's beneficial use becomes the basis, measure, and limit of the water right. The Court also explained that modification of use itself cannot injure other water users. Courts often intertwine these principles, as an expansion of a water right's previous use often reduces the amount of water in return flow. Thus, established principles allow water rights holders to change only as much water as they historically consumed in the manner contemplated by those rights.

The Court then analyzed whether the County upheld its burden in proving a reliable HCU. The Court first found the County did not accurately report historical consumption of Bailey Farm Inches. As the applicant, the County had to prove that previous users of the Bailey Farm Inches actually used the water as calculated in the HCU analysis. Despite this change, the Court found

the inaccurate estimate cast serious doubt on the validity of the remaining figures and, thus, the entire report. The County failed to provide a convincing explanation for their inaccurate HCU. Thus, the Court affirmed the water court's decision that the County failed to carry its burden of accurately quantifying the amount of Bailey Farm Inches actually used on the Bailey Farm.

The Court also held that County did not show the Bailey Farm Inches historically irrigated the entire Bailey Farm. Covering a total of 101 acres, the Bailey Farm existed as two main parcels: a thirty-one-acre parcel and a seventy-acre parcel. To carry its burden, the County had to prove that the 101 acres of the Bailey Farm claimed was within the lawful place of use and historically irrigated with Bailey Farm Inches. The County failed to offer definitive proof that the larger portion of the Bailey Farm in fact received Bailey Farm Inches for irrigation. Specifically, the Court pointed to the lack of evidence on the record demonstrating the seventy-acre parcel received any of the Bailey Farm Inches. Without actual evidence showing past users irrigated the seventy-acre parcel with Bailey Farm Inches, the Court could not accept the analysis. Moreover, the Court also explained that even if the seventy-acre parcel fell within the lawful place of use, the County would still have to prove that the MM water right was actually used on that land over time. At first, different entities appropriated the Bailey Farm Inches to use in different properties. Over time, the owners consolidated the properties. Because of the convoluted past, the water court required an accurate accounting of actual past use. Absent actual proof of historical use, the water court declined to rely on the County's HCU. In committing these two errors, the County failed to prove the HCU and, thus, failed to prove a lack of injury to other water users.

The Court also rejected the County's request for an appropriative right of substitution and exchange. The Court found the County could not supplement its augmentation plan through a water lease with the City of Lafayette because the lease alone could not satisfy the County's replacement obligations.

Accordingly, the Court affirmed the ruling of the water court and denied the County's change of use application.

Connor Pace

MONTANA

United States v. Barthelme Ranch Corp., 386 P.3d 952 (Mont. 2016) (holding: (i) the U.S. Bureau of Land Management could perfect stockwatering appropriation claims in its reservoirs irrespective of contentions rooted in historic water use from the same source and (ii) the United States owned reserved water rights for stockwatering in a pothole lake on federal grazing land pursuant to an Executive Order).

The United States Bureau of Land Management ("BLM") filed six water right claims in Montana. These included five reservoir claims rooted in Montana law, and a reserved water right in Pothole Lake, a natural feature located on a federal land reservation. The BLM claimed to use each water source, all located wholly or partially on federal land, for wildlife and stockgrazing for grazing permittees, the latter being the primary focus in the following discussion.

The BLM's five reservoir claims relate to the agency's acquisition of Funnells Reservoir in 1951, and its construction of the Windy Day Reservoir in

1955, Tallow Creek Reservoir in 1936, North Flat Creek Reservoir in 1937, and the Sharon Reservoir in 1961. The sources of contention regarding the BLM's water right claims, including Pothole Lake, stemmed from the respective holders of property interest in surrounding land ("Objectors"). The Objectors claimed proper ownership of BLM's water rights, claiming instead their own right that derived from ancestral free grazers who, prior to the reservoir construction, owned and grazed livestock on the appurtenant land.

BLM claimed a reserved water right in Pothole Lake pursuant to two legal frameworks: (1) the Stock Raising Homestead Act enacted in 1916, which permitted the Secretary of the Interior to reserve lands containing "waterholes or other bodies of water needed or used by the public for watering purposes"; and (2) the Public Water Reserve No. 107 ("PWR 107") enacted pursuant to a 1926 Executive Order, which "reserved all springs and water holes on vacant, unappropriated, and unreserved public land throughout the country." The Objectors claimed, however, that ancestral free grazers owned and watered stock in the same area.

The BLM moved for summary judgment for all objections and the Montana Water Court consolidated them into this single case. The water court first addressed the validity of the Objectors' claims to BLM reservoirs. The water court recognized as undisputed that the BLM developed the Windy Day, North Flat Creek, Tallow Creek, and Sharon Reservoirs with a stockwater right priority date coinciding with their respective completion and since consistently used the reservoirs for stockwatering. Then, after addressing the common law elements for valid water appropriation, the water court determined that impounding water into a reservoir is a sufficient diversion and the sole contention rested on whether the BLM applied the water to beneficial use. The Objectors claimed that the BLM *itself* did not own livestock or use reservoir water and thus under Montana law, BLM could not perfect its stockwatering claims.

However, the water court examined principles from a governing precedent, *Bailey v. Tintinger*, that "an appropriation of water for the use of *others* was complete upon the completion of the diversion system [in this case the reservoirs] and making the water available for use by others." When extending this principle to the present case, the water court determined that Montana law did not require that BLM own and graze livestock to perfect water rights and complete appropriation.

Similarly, the water court found it undisputed that BLM consistently used Funnels Reservoir since acquiring its property interest. Thus under Montana law, BLM also acquired any appurtenant water rights.

Although the Objectors claimed prior use by their ancestral free grazers precluded BLM's six water right claims, this contention ran counter to the core principle of water rights governed by Montana law that "multiple appropriators can enjoy rights from the same source." The water court also clarified that the Objectors' claimed stockwatering by direct uses from water sources, not by reservoir impoundments, and it followed that the Objectors' claims differed from the subsequent BLM reservoir claims.

The water court next addressed the Objectors' claim to Pothole Lake and determined that PWR 107 reserved Pothole Lake's respective land and water.

The Objectors appealed. The Montana Supreme Court ("Court"), under

the “clearly erroneous” standard, reviewed two issues on appeal: (1) whether the BLM held stockwatering rights in constructed reservoirs under Montana law and (2) whether the BLM owned reserved water rights for stockwatering in Pothole Lake. The Objectors made multiple contentions and the Court rejected each as invalid when evaluating them pursuant to relevant federal and Montana law.

The first issue raised three primary contentions. First, the Court confirmed that BLM appropriated water. However, Objectors argued that irrespective of a capability to appropriate water, the BLM failed to meet the requirements for perfecting water rights because it did not charge grazers for reservoir use. The Court quickly dismissed this contention when reiterating that *Bailey* expressly recognized that, “as long as the water is made available for sale, rental, or *distribution* or *disposal* to others, it is a valid appropriation.” Additionally, the Court acknowledged that Montana public policy encourages capable individuals and entities to appropriate water and make it available for use by others. Further, the Court recognized that Montana law commits to “recognizing the ability to appropriate water for its ultimate use by a third party.”

Second, the Objectors argued that even if BLM could appropriate water, it did not do so by impounding water in reservoirs because “simply facilitat[ing] use of water already appropriated” by ancestral free grazers did not constitute a valid appropriation. Again, the Court dismissed this contention as unsupported by Montana water law and public policy when noting, “multiple appropriators can claim water rights from the same source, and that the first in time has the best right.” Along that vein, the first user on a water source does not obtain the right to exclude all others from claiming water from the same source. The Court noted, for example, if Objectors held viable stockwatering claims based on ancestral free grazers, then those rights would be senior to those claimed by BLM because each right has its own priority in time.

Third, the Objectors contended that by developing new reservoirs, the BLM “simply modified” prior stockwatering practices by ancestral free grazers rather than creating a new appropriation. The Court acknowledged, however, that although a direct-flow water user can construct reservoirs to stabilize available water without creating new appropriations, the BLM claimed no such direct-flow water rights. BLM only claimed new rights to stored water with mid-twentieth century appropriation dates, which created separate rights with their respective priority dates.

Once resolving the contentions, the court then emphasized its unwillingness to depart from the “bedrock principles” of Montana water law that multiple appropriators can perfect claims from the same water source and thus the water use by ancestral free grazers did not preclude the BLM from claiming water rights to the same source. Further, Montana public policy encourages the benefits arising from allowing appropriations that make water available to third party users.

The second issue led the Court to determine the broad language of PWR 107 reserving “every spring or waterhole, located on unsurveyed public land” encompassed Pothole Lake. Therefore, the BLM maintained a reserved stockwatering right on federal land and the Objectors raised no valid contentions to undermine this established right.

Accordingly, the court affirmed the water court holding that the BLM maintained valid appropriations in its reservoirs under Montana law and the BLM owned reserved water rights for stockwatering in Pothole Lake pursuant to PWR 107.

Justice Laurie McKinnon, dissenting.

Justice McKinnon disagreed with the majority's application of *Bailey* to conclude that the BLM put water to beneficial use and completed an appropriation. Instead, the dissent argued that the majority expanded *Bailey's* narrow exception that applied to public service corporations. The *Bailey* court determined that to require a corporation to perfect a water right upon showing of an actual beneficial use would be impractical because corporations could not perfect a water right until a third party put water to a beneficial use. Here, the dissent argued the majority misinterpreted that exception to include "anyone" who "distributes" water could perfect a water right. In so doing, the dissent raised foundational legal principles to conclude that beneficial use "is one that inures to the benefit of the appropriator." Along that vein, the dissent contended that the ancestral free grazers inured to their benefit when their cattle grazed and drank water, and thus completed a valid appropriation. Conversely, the dissent further argued the BLM did not perfect a water right because it "never owned the livestock that appropriated the water or grazed federal lands" and thus, irrespective of reservoir construction, the BLM did not appropriate water under Montana law.

Gia Austin

Clark Fork Coal. v. Tubbs, 380 P.3d 771 (Mont. 2016) (holding that the Montana Department of Natural Resources and Conservation's ("DNRC") rule that required groundwater developments to be physically connected was inconsistent with the plain language of the statutory "combined appropriation" exception to the exemption of certain groundwater developments from the permit requirement).

Montana uses a comprehensive permit system for water appropriation. Groundwater appropriations of less than thirty-five gallons per minute and ten acre-feet per year can be exempt from the permit requirement. The law also contains an exception to this exemption. Under the Act, groundwater appropriators must acquire a permit if the "combined appropriation" from two or more wells or developed springs that draw from the same source exceeds thirty-five gallons per minute and ten acre-feet per year. Over time, the DNRC promulgated rules to further define "combined appropriation." The first of these rules ("the 1987 rule") explained that groundwater developments need neither to "be physically connected nor have a common distribution system to be considered a 'combined appropriation.'" The DNRC replaced this rule in 1993 with a rule ("the 1993 rule") that instead requires a physical connection to exist between appropriations to count as combined. Using the Act and the 1993 rule, exempt appropriations of groundwater rose by about 3,000 each year, totaling about 113,000. These appropriations consume large quantities of water.

In response, the Clark Fork Coalition (the "Coalition"), senior water users affected by this consumption, petitioned the DNRC to declare the 1993 rule inconsistent with the statute. After the DNRC refused, the Coalition petitioned

the First Judicial District Court, Lewis and Clark County to invalidate the 1993 rule as inconsistent with the Act and to reinstate the 1987 rule. The lower court agreed with the Coalition, reinstated the 1987 rule, and further directed the DNRC to initiate rulemaking to develop a new rule consistent with this ruling. While the DNRC did not appeal the decision, the Montana Well Drillers Association, the Montana Association of Realtors, and the Montana Building Industry Association (the "Well Drillers") did. On appeal, the Montana Supreme Court considered whether the lower court erred when it invalidated the 1993 rule, reinstated the 1987 rule, and directed the DNRC to initiate a new rulemaking.

The Court broke the first question into two parts: whether the rule was inconsistent with the plain language of the statute and whether the legislature's subsequent amendments adopted the interpretation of the 1993 rule. The Court explained that, when deciding if a rule is inconsistent with statutory language, it must first ascertain the plain language meaning of the statute. If a statute does not have a plain language meaning, then it is ambiguous. Once the Court determines whether there is a plain language meaning, it will determine whether a rule is inconsistent or in conflict with the statute. If it determines there is an inconsistency or conflict, then the rule is invalid. The Court explained that an agency's "subsequent inconsistent rules" do not create ambiguity in a statutory terms. Then the Court explained that statutory amendments do not change the intent of unchanged language.

Applying these rules, the Court examined the plain language meaning of "combined appropriation" using dictionary definitions and grammar rules. First, it explained that "appropriation" refers to a quantity of water removed. Second, the Court explained that because "combined" precedes "appropriation," "combined appropriation" means a combined quantity of water, not a physically combined groundwater development. This placement does not allow "combined" to modify anything but "appropriation." Because the term refers to quantity, and not method of removal, the Court determined that the 1993 rule "effectively swallow[s] up the underlying exception" because it limits the exception to structurally combined appropriations by enabling groundwater appropriators to pump beyond the statutory limit as long as they did not physically combine their pumping systems. This contradicts the intent of the legislature because it allows combined appropriations of a greater quantity than authorized by statute. The Court went on to explain that the legislature's amendments, which continually lowered the quantity allowed for exempt ground developments but left the combined appropriation language untouched, did not adopt the 1993 rule interpretation of the term because it did not modify the combined appropriation language. Therefore, the intent of the combined appropriation language remained the same, consistent with the plain meaning of the original words and unchanged by the 1993 rule's interpretation. The Court rejected DNRC's 1993 rule.

The second question, whether the lower court erred by reinstating the 1987 rule, appeared to the Court as a question of first impression. The Court first looked to federal Administrative Procedure Act ("APA") case law that replaced an invalidated rule with the previous valid rule. Then it compared this approach to the similar approach for invalidated statutes and looked through the Montana APA for potential inconsistencies. Finding no inconsistencies, the Court

adopted the federal approach to invalidated rules and held that lower court did not err by reinstating the 1987 rule.

Finally, the Court considered the Well Driller's argument that the lower court could not require the DNRC to initiate rulemaking consistent with the order. The Court reasoned that, because courts have the authority to "pronounce a judgment and carry it into effect," the lower court could require rulemaking to be consistent with its order. However, the Court agreed that the District Court could not compel DNRC to initiate a new rulemaking. Because it is the DNRC's responsibility to adopt necessary rules, it is the DNRC's decision whether or not to keep the reinstated 1987 rule.

Accordingly, the Court partially affirmed the lower court's decision invalidating the 1993 rule.

Justice Jim Rice, dissenting.

Justice Rice dissented. He did not find the plain language of the statute "clear on its face." He found it strange that the Court's ruling implied that the "DNRC inexplicably misinterpreted and misapplied a clear statute for the past 23 years." Rather, he thought the Court found the significant increase in exempt appropriations startling and acted as a legislative body to correct a perceived policy failing.

N. Rioux Jordan

Granite Cty. Bd. Of Comm'rs v. McDonald, 383 P.3d 740 (Mont. 2016) (holding the Water Court did not err in its interpretation of a 1906 decree stating a reservoir owner must release not less than 1200 miner's inches of water for senior downstream appropriators during irrigation season, while also enjoining downstream users from demanding more than the natural flow of the creek above the dam in times of shortage).

This case came before the Supreme Court of Montana as an appeal from a decision of the Water Court regarding the decree from a 1906 case, the interpretation of which clarified disputed water rights between Granite County ("the County") and McDonald, a private party.

The rights under dispute in this case arose from the terms of the 1906 Decree in *Montana Water, Electric and Mining Co. v. Schuh*, decided by the United States District Court for the District of Montana. That court granted Montana Water, Electric and Mining Company ("the Company"), the predecessor to Granite County, water rights associated with storage of Flint Creek water in the Georgetown Lake reservoir for the purposes of generating hydro-electric power. McDonald, who is a successor to one of the defendants in that case, objected to the County's water right claims, two of which arise out of the *Schuh* Decree.

The root of the controversy in *Schuh* is the Decree's seemingly conflicting language. The Decree states that during irrigation season, the Company must cause to flow into the channel of Flint Creek "not less than 1200 miner's inches" of water below its electric plant, enjoining the Company from diverting water from the creek decreed to downstream users. At the same time, the Decree recognized downstream user's rights were limited to the natural inflow of the creek. As a result, the Company was prohibited from releasing any amount

exceeding that of the “average natural flow” which, during the irrigation season, does not “exceed 1200 miner’s inches” of water.

For purposes of this case the Water Court defined “natural inflow” as that amount of water that would pass through the creek without interference from the dam and defined “storage water” as water from the natural flow of the creek that was impounded for use during times of low natural flow.

Applying the analysis in *Schuh*, the court had to determine whether the Decree intended that the reservoir release 1200 miner’s inches of storage water throughout the irrigation season, or whether Granite County was only required to release to downstream users that amount equivalent to the natural inflow of the creek above the dam. McDonald argued that the wording in *Schuh* required the County to maintain a constant flow of not less than 1200 miner’s inches of water for senior downstream appropriators to use at all times during irrigation season regardless of the natural flow of the creek into the reservoir. The County contended it was only required to release the natural inflow of Flint Creek, and not to release storage water from the reservoir when the natural inflow from the creek fell below 1200 miner’s inches.

The Water Court looked to other decisions of the Montana Supreme Court, explaining that limiting downstream users to the natural conditions of a stream at the time of appropriation and not considering storage water as part of the natural flow of a creek was consistent with established Montana Law. The Water Court further explained that Montana case law has recognized that downstream appropriators may not demand release of storage water exceeding the natural inflow of the creek. Though the *Schuh* Decree did not state this explicitly, the language of the Decree implicitly recognizes this principle. The *Schuh* court’s decision was consistent with the law as it applies to storage rights, which recognizes natural flow may only be impounded for storage purposes when there is enough water to satisfy rights of senior downstream appropriators. However, a reservoir is not required to release lawfully impounded storage water to downstream appropriators in times of low natural flow.

In interpreting seemingly conflicting statements in the *Schuh* Decree, the Water Court determined the *Schuh* court did not intend for downstream users to receive a benefit that the law did not provide; in this case, the mandatory release of storage water is the unintended benefit. Instead, the *Schuh* court’s instruction that the Company release 1200 miner’s inches “at all times” was designed to ensure that the water that was used in the hydroelectric plant was returned to the creek and not diverted elsewhere. It was not meant to be interpreted that the Company release 1200 miner’s inches at all times during irrigation season regardless of natural flow levels of Flint Creek. The Water Court held this was consistent with the County’s contention that it was not required to release storage water for downstream appropriators to use during times of shortage.

The Supreme Court affirmed the Water Court’s decision, concluding that the *Schuh* Court did not intend for downstream appropriators to have a right to water stored behind an upstream dam as long as the dam operator released that amount of water which would naturally flow through the stream without the interference of the dam.

The final issue the Water Court contemplated was McDonald’s assertion

that principles of claim preclusion estopped the County from contending that it was not required to release 1200 miner's inches of water at all times during irrigation season. The Water Court dismissed a *res judicata* argument on grounds that both parties agreed the point under dispute was the interpretation of rights the *Schuh* Decree already recognized, and interpreting a decree is not the same as re-litigating issues of fact already decided in it. The Water Court next considered McDonald's claim of judicial estoppel. The court dismissed the claim, finding her argument failed because she showed no evidence the County intended to commit fraud or abuse the judicial process, thus failing to demonstrate all the elements of judicial estoppel.

The Supreme Court affirmed the Water Court's dismissal of McDonald's estoppel argument, holding the Water Court properly applied the principles of claim preclusion upon which McDonald relied.

In a specially concurring opinion, Justice McKinnon agreed with the opinion of the court that downstream appropriators have no right to water stored behind an upstream dam as long as the dam operator releases that amount of water which would naturally flow through the stream without the interference of the dam. She concurred specially to opine that the *Schuh* Decree established a quantity of natural flow above the dam only, and this did not enjoin senior downstream appropriators from using in excess of 1200 miner's inches when the natural inflow of the Flint Creek exceeded 1200 miner's inches. Similarly, the Decree did not require the Company to draw from its reservoir to supplement inflow rates when they dropped below 1200 miner's inches.

Megan McCulloch

NEBRASKA

Lingenfelter v. Lower Elkhorn Nat. Res. Dist., 881 N.W.2d 892 (Neb. 2016) (holding that (i) a farmer's uncontroverted claim that he had received approval to irrigate his land did not constitute approval by a Natural Resource District to irrigate those lands; (ii) a Natural Resources District's cease-and-desist order against the farmer was proper because the district created a rule that prohibited farmers from irrigating undesignated land without obtaining approval; and (iii) the district's rules of land designation were not arbitrary and capricious and did not violate the farmer's due process or equal protection rights).

The Nebraska Ground Water Management and Protection Act ("Act") created twelve Natural Resources Districts ("NRDs") within the state. NRDs have authority to regulate ground water. The NRDs' legislative purpose is to develop, manage, utilize, and conserve groundwater and surface-water. NRDs set limits on total ground water usage, require practices that promote the efficiency of ground water usage, and "limit or prevent the expansion of irrigated acres." This authority allows NRDs to protect groundwater quantity and quality. State legislators deemed this protection as "essential to the general welfare." Since the Act's adoption in 1975, NRDs have gained increasingly more authority to regulate Nebraska's groundwater. By 1996, the NRDs' authority was extended to regulate surface water that was hydrologically connected to groundwater.

The Lower Elkhorn Natural Resources District ("District") is the NRD that

regulates groundwater in northeastern Nebraska. The District has the authority to require reports and issue cease-and-desist orders in order to “administer and enforce” the Act and its goals. The District designates two types of lands that may be irrigated. First, it designates “Historically Irrigated Acres” as lands that were irrigated for at least one year between 1999 and 2008 or that are enrolled in a conservation plan. The second designation, “New Groundwater Irrigated Acres” covers other irrigated lands. The District sets rules that govern other irrigated lands. District Rules 13 and 15, promulgated in 2009, prohibited irrigators from receiving a certification for New Groundwater Irrigated Acres without a variance. Rule 14 outlines the certification process and requires either approval by the District’s board of directors or a “look-back” acknowledgement by the District that the land was irrigated between 1999 and 2008.

Lingenfelter, a farmer, purchased Rehfeld farm, located within the District, to use its well to irrigate the nearby Dunaway Farm. Prior to purchasing the farm, Lingenfelter met with a District employee. At this meeting, Lingenfelter and the employee calculated the amount of water available at the Rehfeld Farm. After purchasing the farm, Lingenfelter used the Rehfeld Farm well to irrigate the Dunaway Farm until 2013, when he received a cease-and-desist letter from the District. The letter explained that his irrigated land, which hydrologically connected ground water from the Rehfeld well to surface water on his other land, would likely be prohibited irrigation of New Groundwater Irrigated Acres under Rules 13 and 15.

Lingenfelter requested a hearing with the District over the cease-and-desist letter and sought the District’s certification of his water use. Before the hearing, he received a preliminary decision that the District would not approve his water use and that to continue irrigating, Lingenfelter had to obtain a variance. At the hearing, Lingenfelter could not show that he irrigated that land between 1999 and 2008, nor could he show that the land was certified. The District upheld the cease-and-desist demand, and Lingenfelter appealed to a district court.

Lingenfelter appealed under two causes of action. First, he requested judicial review of the District’s cease-and-desist order. Second, Lingenfelter requested a declaratory judgment that the District’s Rule 14, as well as its rule that defined Historically Irrigated Acres, violated his rights under the Nebraska Constitution and exceeded statutory authority.

Under the APA, the district court reviewed the District’s decision *de novo*. Under the first cause of action, Lingenfelter argued that the cease-and-desist order was not supported by the facts Lingenfelter presented. Lingenfelter first argued that he received approval to irrigate the Dunaway Farm in the meeting with a District employee and thus the district court should estop the District’s cease-and-desist order. He also argued that the District misapplied its own rules in determining the Dunaway Farm was not “irrigated acres.” Finally, he argued that Rule 14’s look-back provision was arbitrary and capricious.

The district court rejected all of these arguments. First, it stated that Lingenfelter could not prove that the District employee approved his project beyond his subjective assumption that irrigating the Dunaway Farm was “not an issue.” Second, the district court determined that the District did not misapply its own rules when it abstained from deciding whether Lingenfelter’s land constituted irrigated acres. The district court found that this analysis was not relevant because the District issued a cease-and-desist order because Lingenfelter

had failed to ask for a variance and not because he was irrigating an area without a Historic Irrigated Acres designation. Third, the district court rejected Lingenfelter's Rule 14 argument as convoluted and misplaced and because the record was insufficient for review of an administrative rule.

Under Lingenfelter's second cause of action, he requested that the district court issue a declaratory judgment that Rule 14 violated the Nebraska Constitution's equal protection and due process clauses. He claimed that because the rule was arbitrary and capricious, it violated his rights to due process. The district court ruled that the District's rules had a purpose of responding to recent drought conditions, and therefore they could not be arbitrary.

Lingenfelter appealed all of the district court's decisions to the Nebraska Supreme Court, arguing the district court failed to estop the District's cease-and-desist order, erroneously found his land to not be irrigated acres, and misunderstood his arbitrary and capricious argument, among other procedural complaints.

Lingenfelter argued to the Court that under the APA, the district court should have viewed the evidence in favor of the plaintiff and estopped the District's cease-and-desist order. To this point, Lingenfelter stated that if the district court had viewed the evidence in his favor then it would have understood his meeting with a District staff member as a confirmation that he could irrigate the Dunaway Farm with water from the Rehfeld Farm.

The Court disagreed and stated that because this was an administrative appeal, rather than a complaint to a district court, that the APA did not require the district court to view evidence in favor of the plaintiff. The Court also found that because Lingenfelter's belief that he could irrigate the Dunaway Farm using water from Rehfeld Farm was contradicted, the district court properly abstained from finding in his favor under Nebraska case law.

The Court also upheld the District's decision not to apply one of the two irrigation classifications, Historically Irrigated Acres and New Groundwater Irrigated Acres, to Lingenfelter's land. The Court concluded that because the District chose to not apply one of the designations to the land, it was likely forcing irrigators to seek certification so that it could ensure the water would be used properly. Furthermore, Lingenfelter never offered any evidence that his land had been irrigated between 1999 and 2008. Therefore, the District's decision was consistent with rules that prohibited New Groundwater Irrigated Acres and prevented any land that was not certified or Historically Irrigated from being irrigated.

The Court also addressed Lingenfelter's request under the APA for a declaratory judgment that Rule 14 was arbitrary and capricious, and therefore unconstitutional. The Court first noted that causes of action under the APA's declaratory judgment provision only apply to agencies. The APA's declaratory judgment provision was inapplicable here because NRDs were not agencies, but rather statutorily created as political subdivisions. Therefore, Lingenfelter could not use the APA to request a declaratory judgment against the District.

Instead of opining on constitutional issues through Lingenfelter's declaratory judgment, the Court reviewed the district court's summary judgment on constitutional issues in favor of the District. The Court first reviewed Lingenfelter's argument that Rule 14 violated his substantive due process rights.

Under the Nebraska Constitution, substantive due process inquiries require a determination of “whether a right in which the plaintiff has a legitimate property interest” was unconstitutionally taken from the plaintiff. A property interest is unconstitutionally taken if the government acted in a way that has no substantial relation to the general welfare. Lingenfelter argued that using water to irrigate the Dunaway Farm was a legitimate property interest and that Rule 14 arbitrarily and capriciously took that interest away. The Court rejected this argument, finding that Rule 14 was reasonably related to ensuring adequate groundwater supplies in Nebraska.

Lingenfelter’s next constitutional argument stated that violated his right to equal protection because it “divides landowners ‘into winners and losers based upon an arbitrary calendar date.’” Nebraska’s equal protection provision is identical to the United States Constitution’s provision. The Court approached this claim under a rational basis test because no suspect class was involved. The Court found Rule 14 was rational because it was driven by a policy that established a baseline of acres historically irrigated in order to conserve groundwater. Accordingly, the Court rejected both of Lingenfelter’s constitutional arguments.

Finally, the Court rejected Lingenfelter’s last three arguments that the District’s authority to make rules was “fundamentally unfair,” that there was insufficient evidence to determine whether Rule 14 was rationally related to the availability of groundwater, and that the district court misunderstood his arguments against the District’s adoption of Rule 14. The Court rejected the first argument because NRDs are statutorily authorized to make such rules. It rejected the second argument because it Act specifically refers to preventing droughts and because the Court properly reviewed the question *de novo*. The Court rejected the third argument because Lingenfelter did not explain how this error prejudiced the result.

Accordingly, the Court affirmed the district court’s decision and allowed the District to issue its cease-and-desist order without resistance.

Travis Parker

NEVADA

Rand Props., LLC v. Filippini, No. 66933, 2016 WL 1619306 (Nev. Apr. 21, 2016) (holding that: (i) a person who has acquired a right to a quantity of water from a stream may take it at any point of the stream and may change the character of use as long as it does not affect the rights of others; (ii) stock water rights on public lands pass by chain of title in Nevada; and (iii) a private party may convey a stock water appropriation certificate).

On June 7, 2011, Daniel and Eddyann Filippini (“Filippini”) filed a complaint to adjudicate stock and irrigation water rights on Trout Creek against Julian Tomera Ranches, Inc. (“Tomera”), and Rand Properties, LLC. (“Rand”). The Sixth Judicial District Court, Lander County adjudicated the case on April 8, 2013, and established priority dates for each party’s stock and irrigation water rights. Rand appealed to the Supreme Court of Nevada on grounds that the district court erred in its finding of priority dates, stock water rights title passage, and conveyance of a stock appropriation certificate.

First, Rand asserted that its priority date began in 1869, and that the district court erred by finding that Rand’s priority date began in 1901. The district

court found that a change in the place of use on Trout Creek by Rand's predecessors in interest created a new appropriation instead of a continuation of the chain of title because it occurred before statutory enactment of a law allowing for one to change the place of use. By setting a later priority date, the district court did not rule on whether Rand had proper title to its claim dating to 1869.

The Court overturned the district court, finding it relied on an erroneous conclusion of law. The Court looked to Nevada common law and held that a person who has acquired a right to a quantity of water from a stream may take it at any point of the stream, and he may change the character of its use at will as long as it does not affect the rights of others. The Court then vacated and remanded the issue for further proceedings as to Rand's connection to the chain of title.

Second, Rand argued that the district court did not sufficiently explain its decree that Filippini's priority date began in 1871 through a connection by title to a predecessor in interest named James Hughes and lacked the evidentiary support of a conveyance. The petitioner claimed that Filippini did not offer evidence that established a connection of title between 1891 and 1897. The Court concluded the district court's ruling relied upon was insufficient. Under the district court's ruling, it did not need to rule on the connection of title because it held that Rand's priority date did not predate 1897. Accordingly, the Court vacated and remanded for further proceedings on the issue.

The Court then turned to the district court's finding that a predecessor in interest named J.R. Bradley established the domestic stock water priority date held by Filippini in 1862 because Bradley's outfit drank and diverted water from Trout Creek. The district court found that federal grazing permits acted as a proxy for establishing stock water rights and that proof of a chain of title is unnecessary for stock water rights on public lands owned by the United States and that each party held federal grazing permits. The Court disagreed, finding that stock water rights on public domains pass by chain of title in Nevada and that federal grazing rights and water rights are separate issues. Subsequently, the Court vacated and remanded to the district court to find on the issue of the party's current rights to the disputed stock water that had passed by a chain of title.

Finally, the Court overturned the district court's decision to prohibit the conveyance of a grazing certificate to Rand. Leroy Horn originally secured the certificate, certificate 12160, by building the Trout Creek pipeline to water his 600 cattle on a federal grazing allotment in 1979. In 1989, Horn agreed to sell his grazing preferences to Tomera and to sell Badger Ranch to Filippini in a three-way contract. The contract included the federal grazing privileges and all water rights, including stockwatering rights used in connection with the land. However, when Rand purchased Trout Creek Ranch from Broughton in 2009, the deed purported to convey certificate 12160 to it. On appeal, Rand argued that, because a Nevada statute requires conveyance of water rights by deed, Tomera cannot be the proper owner, and Rand was a bona fide purchaser nonetheless.

The district court relied on a Nevada statute prohibiting conveyance of stock water appropriation certificates to conclude that Rand could not own certificate 12160. The district court found that Rand could not put the water to beneficial use under the statute since it did not possess a grazing preference for

600 cattle at the place of use. The Court concluded that the district court erred in determining that the statute prohibited the conveyance to Rand; although the statute prevents issuance of a certificate from the State Engineer, it does not prohibit conveyance of certificates by a private party. Nevertheless, the Court found that Tomera could be the proper owner, since the conveyance occurred prior to the enactment of the statute requiring a person to obtain title to a certificate by deed. The Court then vacated and remanded to the district court to properly review Rand's bona fide purchaser defense.

Accordingly, the Court reversed the judgment of the district court and remanded for further proceedings.

Dalton Kelley

NEW MEXICO

State Eng'r of New Mexico v. Diamond K Bar Ranch, LLC, 385 P.3d 626 (N.M. 2016) (holding: (i) waters diverted from an out-of-state river into New Mexico by ditch remained unappropriated waters of New Mexico subject to the regulatory authority of the New Mexico State Engineer; and (ii) the landowners' use of water in excess of existing permitted water rights was an illegal use of surface water).

The Animas River flows south from Colorado into New Mexico. The Ralston Ditch, located in southern Colorado, diverts water from the Animas River into New Mexico. The Echo Ditch Decree ("Decree") established the rights of Petitioner, Diamond K Bar Ranch, LLC ("Diamond") to water diverted by the Ralston Ditch. The State Engineer of New Mexico ("State Engineer") brought suit against Diamond for using river waters in excess of the permitted quantity under the Decree.

Diamond claimed it was entitled to appropriate more water than provided in the Decree and filed a motion to dismiss alleging (1) that the State Engineer lacked the regulatory and constitutional authority to enjoin them from the use of river waters when the water was transported by a ditch from Colorado into New Mexico and (2) that the Ralston Ditch was exempt from permitting requirements because it was a "community ditch." A district court denied Diamond's motion to dismiss but certified its ruling for interlocutory appeal. The appellate court quashed Diamond's interlocutory appeal and the New Mexico Supreme Court granted Diamond's petition for writ of certiorari.

The Court first considered Diamond's argument that the Ralston Ditch was not a "natural watercourse" that flowed into New Mexico and thus not subject to the State Engineer's authority because the water became private at the point of diversion. The Constitution of the State of New Mexico broadly granted the State Engineer the authority to regulate the unpermitted appropriation of water of "every natural stream" within the state of New Mexico. Diamond primarily relied on *Turley v. Furman*, in which the court found that the New Mexico State Engineer did not have the jurisdictional authority to grant a permit for the construction of a new diversion in Colorado. Distinguishing *Turley v. Furman*, the Court noted that the State Engineer made no attempt to exercise authority over the appropriation of out of state waters or the construction of a new out of state ditch, but instead regulated the appropriation of New Mexico surface waters for use on lands in New Mexico.

The Court also recognized that New Mexico allows only a usufructuary right to water and that a person cannot have a private ownership in the corpus of the water. Accordingly, the Ralston Ditch alone could not create a water right. The Court rejected Diamond's argument that waters diverted into New Mexico by ditch conveyance was "by artificial means" and thus rendered its use private because the water never flowed "in a natural stream" within the state of New Mexico. The Court held that the waters diverted from the Animas River into the Ralston Ditch remained natural, unappropriated waters, subject to the regulation of the State Engineer.

The Court next addressed Diamond's argument that it was not required to obtain a permit to divert water from the Ralston Ditch waters because it was an existing community ditch. Community ditches are early New Mexico diversion that do not require a diversion permit pursuant to N.M.S.A. Section 72-5-2. The Court recognized that the Ralston Ditch was a community ditch constructed in the 1880s and that Diamond's pre-1907 water rights did not require a permit for the under N.M.S.A. Section 72-5-2. However, citing several New Mexico statutes, the Court recognized that the exemption applied only to the place of diversion and not to the quantity of water appropriated, and that community ditch users remained subject to the regulation by the State Engineer. The State Engineer alleged that Diamond had used an amount of water that exceeded its permitted right and that Diamond had used the water to irrigate lands not appurtenant to such rights. The State Engineer also had authority to regulate Diamond's water consumption because the Decree stated that "the State Engineer must approve *any change*" in water use, regardless of whether the ditch is a community ditch. The Court acknowledged that the Ralston Ditch to the Decree. The Court held that although Diamond had a vested water right as a community ditch user, they were still subject to regulation by the State Engineer.

Accordingly, the Court affirmed the district court's denial of Diamond's motion to dismiss and remanded the case for trial.

Reggie Norris