SEARCHING FOR CÍBOLA: COMMUNITY-BASED ENVIRONMENTAL RESTORATION IN THE COLORADO RIVER WATERSHED

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Why should we tolerate a diet of weak poisons, a home in insipid surroundings, a circle of acquaintances who are not quite our enemies, the noise of motors with just enough relief to prevent insanity? Who would want to live in a world which is just not quite fatal?[1]

I. INTRODUCTION

Hegel once suggested that America would never develop a true civic culture until it was finally forced to face itself. The seemingly inexhaustible lands and resources of the American continent, Hegel thought, provided an escape valve which kept its people from being "pressed back upon each other."[2] There was always a new, unspoiled place to go, a new frontier to be conquered. Until "such a condition of things presents itself that a large portion of the people can no longer satisfy its necessities," Hegel thought, there would be no reason for people to work together to pursue the common good.[3]

The ethic of opportunity and exploitation that developed on the American frontier has remained a dominant theme in our relationship with the environment,

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1. RACHEL CARSON, SILENT SPRING 12 (1962) (quoting Paul Shepard).

2. GEORG WILHELM FRIEDRICH HEGEL, THE PHILOSOPHY OF HISTORY 86 (J. Sibree trans., 1900).

3. *Id.* at 85–86.

overlying a system of economic relationships which has sought to maximize exploitation of natural resources with little regard for future consequences.[4] This ethic has been accompanied by a tendency towards rootlessness and disconnection from the landscape, "a feeling that an owner's ties to the land could be, and one day probably would be, broken, a belief that an owner who degraded the land need merely depart, not despair."[5]

Our "escape valve" is closing, if it has not closed already. We are now, in many places, face-to-face with a legacy of environmental damage that is impossible to ignore. We are facing global environmental degradation that will require major efforts to remedy, where it can be remedied. There is a growing awareness of the inequity with which environmental costs and burdens generated by our society are distributed. And we are increasingly confronted with community life that is as degraded as the environment we inhabit. Even in the face of these realities, however, the influence that environmental values have gained in decisionmaking seems to be waning.[6]

This can be traced at least in part to the inability of our legal and political systems to deal with the complex relationships that underlie environmental problems. The same disconnection that divides our social and ecological realities is deeply embedded in our legal system. Our laws are premised on fundamental separations and boundaries: between humanity and nature, between water in a stream and water in the ground, between my land and your land. Yet these separations, and the black and white relationships they imply, are not borne out by scientific reality. Complex, discursive, and reciprocal relationships are at the heart of ecological principles, and we continue to discover new connections between ourselves and our environment. We, too, have a place in Rachel Carson's "web of life,"[7] and not just an observer's role.

The thesis of this Article is that community-based environmental restoration, both as a process and in its results, offers an effective method for beginning to address this concern. The work of the Sonoran Institute[8] ("SI") and other non-profit conservation organizations has demonstrated that inclusive and collaborative approaches to restoration can overcome some of these disconnections, improving the ecological integrity of local and regional landscapes, while enhancing the economic condition of local communities.

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4. *See* Fred Bosselman, *Four Land Ethics: Order, Reform, Responsibility, Opportunity*, 24 ENVTL. L. 1439, 1476 (1994).

5. Eric T. Freyfogle, *Ethics, Community, and Private Land*, 23 ECOLOGY L.Q. 631, 642 (1996).

6. *See generally* MARK DOWIE, LOSING GROUND: AMERICAN ENVIRONMENTALISM AT THE CLOSE OF THE TWENTIETH CENTURY (1997).

7. CARSON, *supra* note 1, at 64.

8. The Sonoran Institute, 7650 E. Broadway Blvd., Suite 203, Tucson, AZ. 85710, <http://www.sonoran.org>.

Part II of this Article examines two places within the Colorado River watershed where SI is assisting in restoration projects: the upper Santa Cruz River Valley and the Colorado River Delta. Part III argues that the legal system is poorly equipped to deal with the environmental problems facing these places and, as a whole, presents obstacles to restoration of the Colorado River watershed. Part IV discusses the value of community-based restoration as a tool for improving human relationships with the environment and dealing with complex environmental problems like those facing the Colorado watershed.

II. THE COLORADO RIVER WATERSHED: THE ECOLOGY OF DISCONNECTION

> *We spoke harshly of the Spaniards who, in their zeal for gold and converts, had needlessly extinguished the native Indians. It did not occur to us that we, too, were the captains of an invasion too sure of its own righteousness.*[9]

A. The Son of the Sun

In 1540, Hernando de Alarcón was sent up the Gulf of California with three ships, carrying supplies for the infamous expedition of Franscisco Vásquez de Coronado, who was attempting to locate the mythical kingdom of Cíbola and its Seven Cities of Gold before his competitors did.[10] Alarcón was under orders to locate the supposed port of Chichilticale and deliver supplies to Coronado. The original idea, based on unreliable information concerning the supposed geography of the area, was that Coronado's track would parallel the coast to the designated port.[11]

As it turned out, however, Coronado was heading deep inland, and Alarcón ran out of ocean in the Colorado River Delta (at the head of the Gulf of California). Claiming to be a deity by the name of the "Son of the Sun" in his communications with the natives,[12] Alarcón made his way up the lower reaches of the Colorado in hopes of reaching Coronado with the supplies, or, failing that,

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9. ALDO LEOPOLD, A SAND COUNTY ALMANAC 137 (1966).

10. Hernando Cortés, Pedro de Alvarado, Cabeza de Vaca, Nuño de Guzmán, and Hernando de Soto were all rival contestants for the conquest of Cíbola with Viceroy Antonio de Mendoza, who organized and financed the Coronado expedition. Francisco de Ulloa, an explorer in the employ of Cortés, actually beat Alarcón to the "discovery" of the Colorado River Delta. Ulloa landed on an island at the head of the Gulf and witnessed the tidal bore, but did not proceed any farther, exploring the coast of the Baja peninsula instead. *See* HERBERT E. BOLTON, CORONADO: KNIGHT OF PUEBLOS AND PLAINS 40–48 (1964).

11. *See* Pedro de Castañeda, *Account of the Expedition to Cíbola which took place in the year 1540, in which all those settlements, their ceremonies and customs, are described, Chapter VI* (1596), *reprinted in* GEORGE PARKER WINSHIP, THE CORONADO EXPEDITION: 1540–1542, at 186, 194 (Rio Grande Press 1964) (1896).

12. BOLTON, *supra* note 10, at 159–60.

exploring the river and finding Cíbola to his own greater glory.[13] However, Alarcón made it only as far as the junction of the Gila and the Colorado, near Yuma, where he left some letters for Coronado and gave the local villagers some seeds—a portent of things to come, as we shall see.[14]

Perhaps distracted by his visions of wealth and power, Alarcón wrote little about the Delta. However, Aldo Leopold, 300 years later, found it to be a wondrous place.

> [T]he river was nowhere and everywhere, for he could not decide which of a hundred green lagoons offered the most pleasant and least speedy path to the Gulf. So he traveled them all, and so did we. He divided and rejoined, he twisted and turned, he meandered in awesome jungles, he all but ran in circles, he dallied with lovely groves....
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> The still waters were of a deep emerald hue.... A verdant wall of mesquite and willow separated the channel from the thorny desert beyond. At each bend we saw egrets standing in the pools ahead.... Fleets of cormorants drove their black prows in quest of skittering mullets; avocets, willets, and yellow-legs dozed one-legged on the bars; mallards, widgeons, and teal sprang skyward....
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> Often we came upon a bobcat.... Families of raccoons waded the shallows.... Coyotes watched us from inland knolls.... At every shallow ford were tracks of burro deer.[15]

In 1935, only thirteen years after Leopold's description was written, the gates closed on Hoover Dam, restricting the flow of water; after the construction of Morelos Dam fifteen years later, very little water reached the Delta except in flood years. The final blow was the completion of Glen Canyon Dam in 1963. For twenty years, as the reservoir filled with almost three times the annual flow of the Colorado, virtually no water reached the Delta at all.[16]

Once a wild, muddy river, every drop of the Colorado is now carefully planned and controlled, irrigating more than 1.5 million hectares of land, and supplying water to more than 30 million people.[17] By the time it leaves the United States, the mighty Colorado is now exhausted to little more than a large stream—a stream which in most years will dry up long before it reaches the Gulf of California.[18] With Lake Powell now full, floods occasionally reach the Delta,[19] but

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13. *See id.* at 155.
14. *See id.* at 165.
15. LEOPOLD, *supra* note 9, at 142–43.
16. *See* JASON I. MORRISON ET AL., THE SUSTAINABLE USE OF WATER IN THE LOWER COLORADO RIVER BASIN 22 (1996).
17. *See id.* at ix.
18. *See* Mark K. Briggs & Steve Cornelius, *Opportunities for Ecological Improvement Along the Lower Colorado River and Delta*, 18 WETLANDS 515, 515 (1998).
19. *See id.*

generally the only water to reach the Gulf is in the form of return flows from Mexicali valley. In the words of Philip Fradkin, the presence of the river in the Delta "depends on when the toilet is being flushed."[20]

In the approximately seventy years since Leopold's visit, the Delta has been severely degraded. Of the 3800 square miles of wetlands that once existed there, only 40,000 or so acres remain today, much of it sustained only by agricultural return flows.[21] The loss of the greatest part of this prolific ecosystem has devastated Gulf fisheries, wildlife populations, and Delta communities.[22]

It is too easy to blame the Delta's fate merely on a few major dams, however. The Delta is, as the terminus of the river, the sum total of every stream, marsh, and river that comprises the watershed as a whole; each change upstream, however small, is carried downstream as surely as the waters of the river. What has happened to the Delta is the cumulative effect of changes throughout the Colorado watershed—some of which have been as extensive as those which have occurred in the Delta itself. No single account could ever hope to catalog all of these changes. The Colorado River flows nearly 1700 miles on its journey from the Wind River Range in Wyoming to the Gulf of California, draining nearly 244,000 square miles which enclose virtually every type of terrestrial ecosystem—from the alpine glaciers of the Wind Rivers to the deserts of the Southwest.[23] Along the way, it is subjected to an equally broad range of human impacts. This Article focuses on just one small place as a microcosm of the river basin as a whole—the upper Santa Cruz River Valley, which straddles the border between Mexico and Arizona; from there, the Santa Cruz River trends north, passing west of Tucson before its confluence with the Gila River.

B. The Santa Cruz River: The Ecology of an Expedition

In the spring of 1540, Francisco Vásquez de Coronado set out on what is generally regarded to be the largest land expedition in the history of North America. Accompanied by as many as 250 armed cavalry, 100 foot soldiers, 300 Indians and slaves, 1000 pack horses and mules,[24] and huge herds of cows, pigs, and sheep (estimated between 1500 and 6500 animals),[25] Coronado headed north from Mexico City to locate the mythical kingdom of Cíbola and its Seven Cities of Gold. Following the fantasies of Friar Marcos, a missionary who claimed to have actually seen Cíbola, Coronado expected to find a large city of majestic stone

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20. PHILIP L. FRADKIN, A RIVER NO MORE: THE COLORADO RIVER AND THE WEST 321 (1995).

21. *See* Sue McClurg, *Cutting Colorado River Use: The California Plan*, WESTERN WATER, Nov.–Dec. 1998, at 12.

22. *See* Briggs & Cornelius, *supra* note 18, at 515.

23. *See* FRADKIN, *supra* note 20, at 15.

24. *See* BOLTON, *supra* note 10, at 67–69.

25. *See* FRADKIN, *supra* note 20, at 76.

houses, filled with gold, silver, and precious gems.[26] Cíbola would be a crown jewel in Spain's empire, and make him and his investors rich.

Crossing into the modern day United States along the Arizona border near the headwaters of the San Pedro, Coronado and a small advance guard finally reached "Cíbola"—the beautiful Zuni town of Háiwikuh (located in far western New Mexico).[27] Given their expectations, however, the Spaniards were unimpressed. One observer recorded: "such were the curses that some hurled at Friar Marcos that I pray God may protect him from them. It is a little, unattractive village, looking as if it had been crumpled all up together. There are mansions in New Spain which make a better appearance at a distance."[28]

The whole quest was somewhat disappointing. Chichilticale, supposedly a port on the Pacific Ocean, turned out to be a pueblo ruin 200 miles from the Gulf of California.[29] As a result, Alarcón's supply ships never arrived, and by the time they reached Háiwikuh, Coronado and his men were starving.[30]

Even more insulting for Coronado was the cold reception of the natives to the reading of the *Requerimiento*—a legal statement read to every soon-to-be-conquered town which essentially informed them that the Pope, as the earthly representative of the one true God, had given their lands to the King of Spain, that they were all now his subjects, and that they were to immediately become Christians or else.[31] Surprisingly, the natives refused to submit themselves to a ragtag army of starving white people, guided by a crazed priest, claiming to be their earthly rulers, and demanding that they worship a strange foreign god. They shot some arrows at the Spaniards and retreated inside the city. Insulted and hungry, Coronado attacked.[32] Coronado then proceeded on a bloody conquest of the neighboring pueblos, several Hopi villages to the northwest, and the pueblos along the Rio Grande to the east, where the army made its winter camp.[33]

After an interminable winter with Coronado's army, the pueblo villagers apparently talked a visiting Plains Indian, whom the Spaniards called "the Turk," into luring the Spaniards off with a fanciful account of a city called Quivira with an abundance of gold, silver, and gems that lay far to the east.[34] A somewhat more skeptical Coronado set off on a 700 mile journey into the Great Plains.

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26. *See* BOLTON, *supra* note 10, at 49–50.

27. *See* PEDRO DE CASTAÑEDA ET AL., THE JOURNEY OF CORONADO xxii–xxiii (George Parker Winship trans. & ed., 1990).

28. Castañeda, *supra* note 11, at 203.

29. *See* BOLTON, *supra* note 10, at 105–07.

30. *See* Letter from Francisco Vasquez de Coronado to Viceroy Antonio de Mendoza (Aug. 3, 1540), *reprinted in* CASTAÑEDA ET AL., *supra* note 27, at 86–99.

31. *See* ROBERT A. WILLIAMS, JR., THE AMERICAN INDIAN IN WESTERN LEGAL THOUGHT: THE DISCOURSES OF CONQUEST 91–93 (1990).

32. *See* Letter from Francisco Vasquez de Coronado to Viceroy Antonio de Mendoza, *reprinted in* CASTAÑEDA ET AL., *supra* note 27, at 91.

33. *See* BOLTON, *supra* note 10, at 133–52, 193–230.

34. *See id.* at 301.

Unfortunately for the villagers, he soon sent the larger part of his huge army back to the pueblos,[35] and even more unfortunately for the Turk, Coronado's men strangled him after they found that Quivira was a village of straw huts in Kansas.[36] Facing rebellious Indians and discouraged men, and suffering from head injuries he received falling off his horse, Coronado packed up the army and went back to Mexico with bad news for his investors.[37]

The true legacy of the expedition, however, was not a hoard of silver and gold, but rather what it left behind: friars, cattle, and a lust for gold—portents of the forces that would remake the ecology of the Santa Cruz River Valley and the entire Southwest. While the native civilizations in the area had a significant effect on the ecology of the region, through food gathering, fire practices, and irrigation along the small streams and the river banks,[38] Spanish, Mexican, and American activities in the area have had profound ecological effects that have eclipsed those of the native inhabitants.

These transformations have been wrought by an attitude toward land and the environment that fundamentally fails to grasp the limits imposed by nature. As has been so often repeated in the history of the West, human activities in the Santa Cruz River Valley (activities which on a small scale might have been sustainable) developed over time into what essentially amounted to mining operations.

C. Missions and Miners

Friar Marcos was almost certainly not as disappointed in the outcome of the expedition as Coronado had been. As one author put it: "Quite apart from gold, Marcos saw a great harvest all around him—a harvest of souls. What he wrote about treasure was for the encouragement of others."[39] Among the people who remained behind from the expedition were three friars, who joined the vanguard of the Spanish missions in the region.[40] However, the Spanish presence in the Southwest was as much a massacre as a mission. The arrival of the Spanish and the combination of conquest, disease, slaving, killing, colonization, and Christianization that followed massively reduced the human population. From an estimated 250,000 in Sonora and southern Arizona, the population declined to less than a quarter of that number in only 100 years.[41]

The three missions in the Santa Cruz River Valley, like those scattered throughout the region, attempted to move the Indians who remained into

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35. *See id.* at 268.
36. *See id.* at 291–303.
37. *See id.* at 330–32.
38. *See* JAMES RODNEY HASTINGS & RAYMOND M. TURNER, THE CHANGING MILE: AN ECOLOGICAL STUDY OF VEGETATION CHANGE WITH TIME IN THE LOWER MILE OF AN ARID AND SEMIARID REGION 25–27 (1965).
39. BOLTON, *supra* note 10, at 102.
40. *See* WINSHIP, *supra* note 11, at 90–91.
41. *See* HASTINGS & TURNER, *supra* note 38, at 30.

settlements near the missions "to Christianize them; to teach them artisan skills, farming, and animal husbandry; to change them...from savages into 'people of reason.'"[42] This had the result of concentrating native populations in mission centers, where they came to rely much more heavily on cultivation and irrigation.[43] This trend, coupled with depopulation, changed the balance of native plant life, and began a legacy of irrigated agriculture that over time replaced more sustainable native stream-side irrigation practices with large-scale industrial farming.[44] The cumulative effects of excessive groundwater pumping, fertilizer and pesticide pollution, and habitat alteration, combined with the fact that agriculture has become one of the largest users of water in the valley, implicate agriculture as a significant contributor to environmental degradation in the valley.

While the missions established Spanish settlements in the region, the lust for wealth that had fired Coronado's efforts inspired prospectors and miners for centuries to come. Gold, silver, and copper mining soon deforested large areas of the Santa Cruz River Valley. "Making charcoal, timbering shafts, smelting the ore, and keeping the inhabitants warm made such heavy demands on local fuel resources that oak was wiped out."[45]

While these small operations had only a local effect on the ecosystem of the Santa Cruz, within grazing and wood hauling distance of the mines, their descendants have had staggering impacts on the valley. The Santa Cruz River Valley is now home to enormous mining operations with pits and tailings that cover tens of square miles of the valley floor and cut into its mountains. In addition to consuming vast amounts of water, the seepage from mine operations is a major contributor to groundwater pollution.

D. Mining Grass

The most lasting environmental legacy of the Spanish may have resulted from the introduction of livestock to the region.[46] Coronado's army lost or abandoned enough cattle along the way that the wild herds which descended from them became the catalyst for a booming cattle industry in Sonora a hundred years later.[47] In the first fifty years after the conquest, the sheep herd grew to 2,000,000 and cattle to 200,000. The next fifty years saw sheep increased to 8,000,000 and

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42. *Id.* at 28.

43. The arrival of the Apache in the region in the 1680s and 1690s eventually forced the abandonment of many settlements, at least until trading relations were established between the Spanish and the Apache. *See* SONORAN INSTITUTE, A PROFILE OF ARIZONA'S SAN RAPHAEL VALLEY 2–4 (1994).

44. *See* HASTINGS & TURNER, *supra* note 38, at 30.

45. *Id.* at 32.

46. Cattle ranching remains an important industry in many parts of the Santa Cruz River Valley, both economically and in terms of land use. *See generally* SONORAN INSTITUTE, *supra* note 43.

47. *See* PAUL I. WELLMAN, THE TRAMPLING HERD: THE STORY OF THE CATTLE RANGE IN AMERICA 18–19 (1988).

cattle to 1,000,000 in what is now Mexican Sonora, eventually pushing into Southern Arizona. By 1694, 100,000 cattle ranged around the headwaters of the San Pedro and Bavispe Rivers.[48]

By the early 1820s, the Mexican cattle industry had expanded into the Santa Cruz River Valley.[49] While most of the ranches were abandoned by the time of the Mexican-American War, a large number of wild cattle were left behind to roam the valley.[50] In 1854, Mexico sold the area to the United States.

The Santa Cruz River Valley, with its herds of wild Mexican cattle, was rediscovered by American cattle ranchers only twenty years later. By the 1880s, American settlers were headed for the area in force.[51] In 1880, there were only 35,000 cattle in the territory of Arizona, but by 1885, that number had increased to more than 675,000. By 1890, this number had increased to 1.1 million, and by 1891, the territorial governor estimated the cattle population at 1.5 million. Ranchers were concerned about range overcrowding; with the summer rains below normal, the rangelands were being rapidly denuded of grass.[52]

In 1893, disaster struck when the cows and climate collided.[53] A dry winter and arid spring left the herds starving for grass, and they started to die. The summer rains were again below normal, and by the spring of 1893, the loss of animals was horrifying. One observer wrote: "Dead cattle lay everywhere. You could actually throw a rock from one carcass to another."[54] The governor estimated that between fifty and seventy-five percent of the cattle in the state had been lost.[55] Thousands of square miles of land were laid bare of virtually all vegetation. When the rains finally came to the Santa Cruz River Valley, they ravaged the landscape, cutting deep arroyos through stream and river beds, stripping away the soil, and destroying the expansive riparian zones in the valley.[56]

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48. *See* HASTINGS & TURNER, *supra* note 38, at 30–31.

49. *See id.* at 33.

50. *See id.* at 34.

51. *See id.* at 40. Renewed hostilities with the Apache had forced the Mexicans to abandon the ranches; however, during the 1870s the U.S. Army launched a brutal campaign against the Apache people. Although Geronimo did not surrender until 1886, the Apache had largely been forced onto reservations by 1872, clearing the way for white settlement in an area which was considered ideal for cattle ranching, with lush grasslands and perennial rivers and streams. *See generally* CONRAD JOSEPH BAHRE, A LEGACY OF CHANGE: HISTORIC HUMAN IMPACT ON THE VEGETATION OF THE ARIZONA BORDERLANDS (1991).

52. *See* HASTINGS & TURNER, *supra* note 38, at 40–41.

53. *See id.* at 41–44.

54. *Id.* at 41 (quoting EDWARD LAND, REMINISCENCES (1934) (manuscript on file with the Arizona Pioneers' Hist. Soc'y, Tucson, Ariz.)).

55. *See id.* at 41.

56. *See id.* at 41–43.

The effects throughout the rest of Southern Arizona were apparently similar. Not only had the herds been lost, the entire landscape was lost with them. As historian Philip Fradkin recounts:

> While the cattle would return again in more moderate numbers, the land would never again be as productive. At no time in this country's history has a landscape been so quickly, so unalterably changed...not dissimilar to what had occurred eight hundred years earlier in Chaco Canyon [on a far smaller scale]. But this time the inhabitants would not have to leave, at least not yet, because they could dig deeper for water.[57]

E. Mining Water, Mining Landscapes

Since 1893, extensive groundwater pumping has badly degraded what remains of the historic Santa Cruz River ecosystem, particularly along its lower reaches within the Tucson active groundwater management area. This water supports extensive irrigated farming, stock watering, mining companies, towns, subdivisions, and the cities of Nogales and Tucson. Groundwater overdraft has transformed the Santa Cruz from a perennial river into an intermittent stream, and the water table in many areas has fallen below the root zone of plants, killing vegetation. For the most part, the river flows aboveground only in the upland areas where groundwater depletion has not occurred, or where bedrock is shallow, forcing water to the surface. Otherwise, the river only flows in flood or as the result of artificial additions, such as wastewater outflows from Nogales and Tucson.[58]

Water use represents an enormous long-term problem for riparian ecosystems throughout Arizona; excessive use of water has already contributed to the degradation of ninety percent of Arizona's streams, rivers, and riparian habitats.[59] Moreover, the demands on water in Arizona are increasing exponentially, with groundwater withdrawals hugely exceeding natural recharge,[60] even as per capita use of water increases.[61]

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57. FRADKIN, *supra* note 20, at 78–79.

58. *See generally* BARBARA TELLMAN ET AL., ARIZONA'S CHANGING RIVERS: HOW PEOPLE HAVE AFFECTED THE RIVERS (1997); Julie C. Stromberg et al., *Release of Effluent into the Upper Santa Cruz River, Arizona: Ecological Considerations*, *in* AWRA 29TH ANNUAL CONFERENCE, PROCEEDINGS OF THE SYMPOSIUM ON EFFLUENT USE MANAGEMENT AND ABSTRACTS 81–90 (Kenneth D. Schmidt & Mary G. Wallace eds., 1993).

59. *See* Robert J. Glennon & Thomas Maddock III, *In Search of Subflow: Arizona's Futile Effort to Separate Groundwater from Surface Water*, 36 ARIZ. L. REV. 567, 567 (1994).

60. *See id.* at 592–93.

61. *See* A. Dan Tarlock & Sarah B. Van de Wetering, *Growth Management and Western Water Law from Urban Oases to Archipelagos*, 5 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 163, 169 (1999).

In addition to groundwater depletion, a host of other activities affect the health of the valley. Sprawling developments, spreading from Nogales at the southern end of the valley and from Tucson at the north, have reduced habitat and place increasing pressure on groundwater. Invasive plant species, many spread by cattle, are a serious threat to native plants.[62] Channel "improvements" have damaged riparian areas, increased the velocity of river flow, and contributed to channel instability downstream.[63] Pollution from an international wastewater facility has caused additional, significant impacts.

F. The Changing of the Santa Cruz and the Colorado River Watershed

The cumulative impact of human activity in the Santa Cruz River Valley has resulted in an immense transformation in the ecology and physical character of the region. In the 1860s, the Santa Cruz River and its streams "wound sluggishly along for much of their course though grass-choked valleys dotted with cienegas [marshes] and pools. In spite of the onslaught by the mountain men, beaver dams were still numerous...."[64] After 1893, the Santa Cruz River Valley was unalterably changed:

> The marshy, flat riverbottoms and perennial streams disappeared, to flow underground and only intermittently above ground through a drier, more crackly landscape.... The grass cover disappeared, to be replaced by shrubs spread by cattle ingesting, then eliminating, the seeds.... Ocotillo, turpentine bush, desert broom, and rabbitbrush invaded the grasslands. The zone of oak woodland moved uphill.[65]

Similar changes throughout the lower Colorado watershed have had a dramatic impact. The Santa Cruz was once a free flowing river most of the way to its confluence with the Gila. Today, the waters of the Santa Cruz are largely gone before the river reaches Nogales. Following a dry channel, the Santa Cruz joins the over-used Gila, whose channel runs nearly to the Colorado without seeing water.[66] From its junction with the Gila, the bulk of the Colorado flows only a few short miles to the massive diversions at Imperial Dam. What little water remains is diverted a few tens of miles further at Morelos Dam to irrigate Mexicali valley.

Once again, Coronado's expedition and Alarcón's gift of seeds to the villagers on the Colorado seem a harbinger of things to come. Throughout the river basin, irrigated agriculture, much of it growing alfalfa for cattle, accounts for

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62. *See generally* BAHRE, *supra* note 51.

63. *See, e.g.*, Julio L. Betancourt & Raymond M. Turner, *Historic Arroyo-Cutting and Subsequent Channel Changes at the Congress Street Crossing, Santa Cruz River, Tucson, Arizona*, *in* ARID LANDS TODAY AND TOMORROW 1353 (Emily E. Whitehead et al. eds., 1988).

64. HASTINGS & TURNER, *supra* note 38, at 35.

65. FRADKIN, *supra* note 20, at 79.

66. *See generally* AMADEO M. REA, ONCE A RIVER: BIRD LIFE AND HABITAT CHANGES ON THE MIDDLE GILA (1983).

more than eighty-five percent of all water use.[67] The valleys surrounding Yuma, the Colorado River Indian reservations immediately north and south, and the neighboring Imperial and Mexicali valleys in the United States and Mexico, together rank as one of the largest agricultural producing areas in the world. They also use virtually all the remaining flow of the Colorado, already cut in half by diversions upstream. Only the tiniest bit reaches the Delta—and the sea.

That these changes could have occurred in such a short span of time seems amazing enough. What is perhaps even more amazing is that it was all perfectly legal.

III. THE LAW OF THE RIVER

> *In the East, to "waste" water is to consume it needlessly or excessively. In the West, to waste water is* not *to consume it—to let it flow unimpeded and undiverted down rivers.*[68]

A. Groundwater and the Santa Cruz

The laws governing water use throughout the Colorado watershed reflect attitudes towards land, water, and natural resources that lie at the heart of what has happened to the Colorado watershed. If overuse of water is the most crucial problem facing the Santa Cruz and other riparian ecosystems, then western water law is a crucial reason that this problem has not been solved.

West of the 100th meridian, surface water historically has been allocated on the "first in time, first in right" doctrine of prior appropriation to whomever (whether they are a riparian user or not) first puts water to a beneficial use.[69] Once appropriated, the water right takes the status of a private property right, albeit with some special limitations,[70] allowing the appropriator to permanently transport water away from the stream, and even out of the watershed where it originated.[71] Once an appropriation has been acquired, it is exercised in order of its seniority, based on the date the water was first appropriated. The most senior appropriator takes her share first; only after all senior users have received their shares can a junior remove her own—even if this denies her any share whatsoever.[72]

This proposition, giving a person a private property right in a public resource simply because they used it first, found its origins in the customs of the

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67. *See* FRADKIN, *supra* note 20, at 32.

68. MARC REISNER, CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER 12 (1986).

69. *See* JOSEPH L. SAX ET AL., LEGAL CONTROL OF WATER RESOURCES: CASES AND MATERIALS 10 (2d ed. 1991).

70. *See* Reed D. Benson, *Whose Water is It? Private Rights and Public Authority Over Reclamation Project Water*, 16 VA. ENVTL. L.J. 363, 383 (1997).

71. *See* SAX ET AL., *supra* note 69, at 138.

72. *See id.*

lawless mining camps of the Sierra, spreading thence throughout the West.[73] From the perspective of the miners, most if not all of whom were trespassing on the public domain, and whose only right to mine was based on being there first, such a system was only natural. For the booming West, however, prior appropriation advanced the cause of private enterprise in a water-scarce environment. The limited amount of water could best be used for the benefit of the few, not the many; the market would make sure that water was put to its "highest use."[74] In this way, prior appropriation encompassed an attitude towards nature that was emerging in the capitalist cultures of the time:

> that the West should in fact be growing crops and building up its population, that it should be cut up into private property, that its water or any other resource should be exploited to its maximum economic potential. Take all those premises for granted, and the doctrine of appropriation made good sense. It was then rational to destroy a river completely, to send it through canals or tunnels to another watershed altogether, to wherever a man could make money from it. Indeed, it was *irrational* to do otherwise....
>
> The doctrine of appropriation...seemed to be natural and reasonable to a group of people who were intent on conquering, expanding, accumulating, and getting ahead.[75]

Given the incentive created by the priority system to appropriate water as rapidly as possible, prior appropriation is a virtual guarantee of dry rivers and streams.[76] Moreover, given the protection of appropriations as property once they are acquired, the system generates a series of vested rights to water from which it is very difficult to retreat.

In Arizona, the system of groundwater regulation only exacerbates these problems. It is axiomatic in hydrology that groundwater and surface water are usually connected. Where the water table falls below the level of a stream, the stream generally will lose water into the water table; where it is above the level of the stream, the stream will gain water from it.[77] Recognition of this connection is critical; unless the use of groundwater is controlled, surface water resources cannot be effectively protected.

However, early Arizona cases subjected groundwater to the doctrine of reasonable use, under which the owner of land overlying an aquifer can pump any

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73. *See* DONALD WORSTER, RIVERS OF EMPIRE: WATER, ARIDITY, AND THE GROWTH OF THE AMERICAN WEST 89 (1985).

74. *See id.* at 91.

75. *Id.* at 92.

76. *See* Tarlock & Van de Wetering, *supra* note 61, at 172–73.

77. *See* ROBERT JEROME GLENNON & THOMAS MADDOCK III, THE CONCEPT OF CAPTURE: THE HYDROLOGY AND LAW OF STREAM/AQUIFER INTERACTIONS, at §§ 22-7 to 22-10 (1997) (from the proceedings of the 43d Annual Rocky Mountain Mineral Law Institute).

amount of water, so long as the water is used on the overlying tract and the use is "reasonable."[78] In practice, this rule results in virtually uncontrolled groundwater pumping and inevitable groundwater overdraft once water use surpasses the rate of natural recharge.[79] The diminishment and disappearance of surface water, and the loss of vegetation dependent on shallow groundwater, is the inevitable result as the water table falls.[80]

In an inconsistent series of cases, the Arizona Supreme Court has considered and reconsidered the reasonable use doctrine.[81] In the end, the court found itself bound to the established system of water rights to avoid compromising investments made in reliance on the old system.[82] At the same time, the court recognized that the archaic principles of hydrology embodied in its precedents, derived from a 1912 textbook by Clesson S. Kinney, were "less precise" than modern science.[83] As one commentator stated: "Kinney's hydrology is 'less precise' in the same way that the nineteenth century practice of medicine, with blood letting and leeches, is less precise than today's medical knowledge."[84]

Arizona's Groundwater Management Act of 1980[85] ("GMA") instituted a complex system regulating groundwater use, particularly within five "Active Management Areas" ("AMAs") where overdraft was most serious. The goal for four of the five AMAs is to achieve "safe yield," a balance between discharge and

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78. *See* Maricopa County Mun. Water Conservation Dist. No. One v. Southwest Cotton Co., 39 Ariz. 65, 77–103, 4 P.2d 369, 374–83 (1931).

79. *See* SAX ET AL., *supra* note 69, at 374–78 (providing an example discussion).

80. *See* KENNETH N. BROOKS ET AL., HYDROLOGY AND THE MANAGEMENT OF WATERSHEDS 93–110, 337–64 (describing the processes of groundwater and riparian systems).

81. *See* Bristor v. Cheatham, 73 Ariz. 228, 238–40, 240 P.2d 185, 192–93 (1952) (considering and abandoning the reasonable use doctrine); Bristor v. Cheatham, 75 Ariz. 227, 233–38, 255 P.2d 173, 176–80 (1953) (reversing *Bristor* on motion for rehearing and reinstating the reasonable use doctrine); Jarvis v. State Land Dep't, 104 Ariz. 527, 531–32, 456 P.2d 385, 389–90 (1969); Jarvis v. State Land Dep't, 106 Ariz. 506, 509–11, 479 P.2d 169, 172–74 (1970); Jarvis v. State Land Dep't, 113 Ariz. 230, 231–32, 550 P.2d 227, 228–29 (1976) (refining, gradually, reasonable use doctrine, allowing Tucson to move pumped water off-tract); Farmers Investment Co. v. Bettwy, 113 Ariz. 520, 529–30, 558 P.2d 14, 23–24 (1976) (reversing the trend of the *Jarvis* cases, reinstating on-tract use requirements); *In re* the General Adjudication of All Rights to Use Water in the Gila River System and Source, 175 Ariz. 382, 388–93, 857 P.2d 1236, 1242–47 (1993) (reaffirming reasonable use doctrine).

82. *See In re* the General Adjudication of All Rights to Use Water in the Gila River System and Source, 175 Ariz. at 388–93, 857 P.2d at 1242–47. The court reasoned that since various commercial interests "have accommodated themselves" to an outdated understanding of basic hydrology, "it would be inappropriate to undo that which has been done in the past." *Id.* at 389, 857 P.2d at 1243.

83. *Id.* at 389, 857 P.2d at 1243 (citing CLESSON S. KINNEY, THE LAW OF IRRIGATION AND WATER RIGHTS (2d ed. 1912)).

84. Glennon & Maddock, *supra* note 59, at 572.

85. ARIZ. REV. STAT. ANN. §§ 45-411 to -637 (West 1994 & Supp. 1999).

recharge within the basin.[86] To promote good relations with Mexico, the upper Santa Cruz River Valley, which constitutes one of the AMAs, has the additional goal of preventing local water table declines,[87] and is subject to "[c]oordinated management of surface water rights and groundwater rights."[88] This creates an odd dividing line between the Santa Cruz AMA, where ground and surface waters are managed together, and the Tucson AMA downstream, where they are not.[89] Any benefits from improved water management in the Upper Santa Cruz thus do not necessarily flow past the Tucson AMA.

Unfortunately, the structure of the GMA makes it extremely difficult for "safe yield" to actually be achieved within the AMAs, in part because existing rights are grandfathered into the system.[90] The brunt of the regulations thus fall on new users of groundwater, and as a result, the GMA probably will not be able to achieve safe yield in the AMAs anytime soon, let alone restore the depleted water tables on which both surface water and vegetation depend.[91] The GMA does gradually reduce groundwater use through conservation measures, supply augmentation, and retirement of existing agricultural water rights; however, these reductions are ineffective. Conservation measures required under the GMA are criticized as being too lenient to effectively move the AMAs toward safe yield;[92] supply augmentation from the Central Arizona Project ("CAP") is at best a partial solution due to uncertainties with regard to Colorado River water supplies, Indian water rights, and the high cost of CAP water.[93] Finally, the retirement of agricultural water, which is achieved by requiring developers to purchase agricultural water rights to supply new developments while reducing the quantity of the purchased rights which actually can be used, only occurs as the result of development. It seems reasonable to expect that the environmental impacts of new development probably will exceed the environmental benefits of reduced groundwater use.

Given its origins, this lack of recognition for environmental values in the GMA is unsurprising. With the legislature under pressure to regulate groundwater, representatives of the major water users in the state—irrigators, cities, and mines—were told that if they could work out a plan, it would be passed without amendment. The result of a year-long series of closed-door meetings was the

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86. WATER RESOURCES RESEARCH CENTER, UNIVERSITY OF ARIZONA, WATER IN THE TUCSON AREA: SEEKING SUSTAINABILITY 92–93 (1999).

87. *See* ARIZ. REV. STAT. ANN. § 45-562.

88. *See id.* § 45-411.04 (A)–(B).

89. *See id.* § 45-411.04 (C)–(D).

90. *See generally* Robert J. Glennon, *"Because That's Where the Water Is": Retiring Current Water Uses to Achieve the Safe-Yield Objective of the Arizona Groundwater Management Act*, 33 ARIZ. L. REV. 89 (1991).

91. *See id.* at 90, 105.

92. *See id.* at 95.

93. *See id.* at 98–100.

GMA.[94] None of the other water interests, such as Indian tribes, environmentalists, or small water users, were represented. In this sense, the GMA has simply continued the tradition of the prior appropriation system, regarding groundwater (a public resource) as something best exploited by the few, for private gain.

B. The Law of the River

The laws governing the Colorado River as a whole have resulted from the same sort of pressures that confront the Santa Cruz. The Colorado has long been at the center of an intense political, legal, and economic tug-of-war between agricultural, municipal, industrial, environmental, tribal, state, and federal interests, a struggle that spills across a myriad of jurisdictional, cultural, economic, and historical boundaries.

More than a century of political dispute has generated an enormous body of conflicting laws and regulations to govern the Colorado. Known collectively as "The Law of the River," it is a complex and confused mixture of interstate compacts, treaties, regulations, Supreme Court decisions, federal laws, state statutory and common law, federal and private contracts, and unwritten understandings. At its heart, however, is the Colorado River Compact of 1922, the result of congressionally-authorized negotiations between Arizona, California, Nevada, Wyoming, Colorado, Utah, and New Mexico.[95]

The Compact divides the Colorado watershed into the Upper and Lower Basins, with the dividing line at Lee's Ferry, Arizona. Colorado, Wyoming, Utah, and New Mexico lie completely within the Upper Basin; California and Nevada lie completely within the Lower Basin. Arizona is split between the two, but lies almost entirely within the Lower Basin.[96] The Compact allocates to the Upper and Lower Basins in perpetuity the right to an annual beneficial consumptive use of 7.5 million acre-feet ("maf") of water each.[97] In addition, the Lower Basin can increase its beneficial consumptive use (out of any surplus) by 1 maf per year.[98] The Compact also allows for an allocation to Mexico,[99] and subsequently, in 1944, the United States and Mexico signed a treaty obligating the United States to deliver to Mexico at least 1.5 maf per year.[100]

The division of the Colorado under the Compact highlights a basic problem with the Law of the River—legally, more water is presumed to exist than

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94. *See id.* at 90–91.

95. *See* Eric L. Garner & Michael Oulette, *Future Shock? The Law of the Colorado River in the Twenty-First Century*, 27 ARIZ. ST. L.J. 469, 470–71 (1995).

96. *See* Colorado River Compact of 1922, art. II(f)–(g), *reprinted in* RAY L. WILBUR & NORTHCUTT ELY, THE HOOVER DAM DOCUMENTS A17 (1948).

97. *See id.* art. III(d).

98. *See id.* art. III(b).

99. *See id.* art. III(c).

100. *See* Treaty Respecting Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Feb. 3, 1944, U.S.-Mex., 59 Stat. 1219.

actually does. At the time the Compact was negotiated, the Reclamation Service (now the Bureau of Reclamation) optimistically estimated the flow of the river at Lee's Ferry to be at least 16.8 maf, based on measured flows from 1896 to 1921.[101] Other estimates were even more optimistic; one study, based on 1906 to 1921 flows, computed the average flow as 18.1 maf.[102] By contrast, the documented flow of the river from 1931 to 1983 has averaged only 13.8 maf, and a tree-ring study of river flows for the past 400 years suggests an annual average of only 13.5 maf.[103] By contrast, the Compact and the 1944 treaty together assume the existence of at least 17.5 maf.

As a result, the Colorado is chronically over-allocated and demand for water has nowhere to go but up.[104] While Upper Basin states plan ways to increase the use of their apportionment, the Lower Basin is already facing huge shortfalls. The enormous growth of Southern Nevada, for example, has meant that demand for water far outstrips available supply.[105] Excessive groundwater use in Las Vegas has already led to subsidence in the city center ("the Strip" has fallen several feet in the past two decades).[106] California's needs are even more extreme. While it is only guaranteed 4.4 maf under the Compact, California has historically used an average of more than 5 maf and over 5.3 maf in 1996.[107] Mexico's meager share already must supply the fast-growing cities of Tijuana and Mexicali, as well as a significant part of the more than 530,000 irrigated acres in the Mexicali Valley.[108] Mexico already faces serious water supply shortfalls, a problem that can only get worse as groundwater levels grow dangerously low in some areas.[109]

Arizona, which historically has been unable to use its full apportionment of 2.8 maf, upped the ante in 1996 by implementing the Arizona Water Bank. Using the Bank, the state can store surplus CAP water underground, either via recharge or "in-lieu" CAP/groundwater exchange programs,[110] allowing Arizona to use close to its full apportionment of Colorado River water.[111] This change has forced California to reduce its dependence on surplus Colorado River water.

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101. *See* FRADKIN, *supra* note 20, at 188.

102. *See* Garner & Oulette, *supra* note 95, at 472.

103. *See id.*

104. *See* REISNER, *supra* note 68, at 294–96.

105. *See* Mike Davis, *Las Vegas Versus Nature, in* REOPENING THE AMERICAN WEST 55 (Hal K. Rothman ed., 1998).

106. *See id.*

107. *See* DALE PONTIUS, COLORADO RIVER BASIN STUDY: REPORT TO THE WESTERN WATER POLICY REVIEW ADVISORY COMMISSION 13 (1997). *See also* MORRISON ET AL., *supra* note 16, at 10.

108. *See* Douglas L. Hays, *The All-American Canal Lining Project: A Catalyst for Rational and Comprehensive Groundwater Management on the United States-Mexico Border*, 31 NAT. RESOURCES J. 803, 808 (1991).

109. *See id.*

110. *See* PONTIUS, *supra* note 107, at 37.

111. *See generally* Margaret B. LaBianca, *The Arizona Water Bank and the Law of the River*, 40 ARIZ. L. REV. 659 (1998).

Under pressure from the other Basin states and Secretary of the Interior Bruce Babbitt,[112] the major California users agreed to offset municipal needs with agricultural water and reduce overall use of Colorado River water to at least 4.8 maf by 2015.[113] Secretary Babbitt since has implemented interstate water banking regulations on the Lower Colorado, which allow California and Nevada to use the Arizona Water Bank as well, and permit limited in-state marketing of banked water.[114] However, by making it possible for all three states to store surplus flows, the use of Colorado River water may actually increase under the new regulations.

This system ensures that water will rarely, if ever, reach the Delta. Indeed, under the 1944 treaty, instream use enjoys the lowest possible priority.[115] The Delta is both legally and physically the last to receive river water—in a system with no water to spare. In practical terms, this means that any water that will reach the Delta in the future will have to come from existing users in the United States and Mexico.

C. Disconnections

The political, economic, and legal pressures that govern the Colorado watershed have created a use-it-or-lose-it, zero-sum competition for the rights to a limited resource. With the economic and political stakes already so high, it is

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112. Babbitt essentially has used his powers under the Boulder Canyon Project Act, 43 U.S.C. §§ 617–617u (1994), which allow him to determine surplus and shortage conditions on the Colorado, to threaten California users with a loss of needed surplus water unless they renegotiate California's water usage. Under the 1931 Seven Party Agreement, Southern California cities essentially were last in line for water; if surplus water was cut off, they stood to lose half their supply of Colorado River water. The Seven Party Agreement is reprinted in MILTON N. NATHANSON, UPDATING THE HOOVER DAM DOCUMENTS I-27 (1978).

For a step-by-step overview of this story, see generally McClurg, *supra* note 21. *See also* Michael Gardner, *State Gets a Warning on Water Squabble*, SAN DIEGO UNION-TRIB., Mar. 18, 1999, at A3; Tony Perry, *Three Agencies Reach Truce on Colorado River Water Utilities*, L.A. TIMES, Aug. 5, 1999, at A1; Tony Perry, *Three Feuding Water Agencies Reach Accord on Details of Landmark Pact Resources*, L.A. TIMES, Oct. 16, 1999, at A22.

113. The "Quantification Agreement," which was recently negotiated by California's largest water users, amends the priority structure under the Seven Party Agreement, setting limits on agricultural water use, implementing several ag-to-urban water transfers, and improving the priority position of the metropolitan users vis-a-vis agriculture generally. *See* COACHELLA VALLEY WATER DISTRICT, KEY TERMS FOR QUANTIFICATION SETTLEMENT AMONG THE STATE OF CALIFORNIA, IID, CVWD, and MWD, Oct. 15, 1999, § I, *available at* <http://www.cvwd.org/wateriss/Key_Terms.htm>.

114. *See generally* Offstream Storage of Colorado River Water and Development and Release of Intentionally Created Unused Apportionment in the Lower Division States, 64 Fed. Reg. 58,986 (1999) (to be codified at 43 C.F.R. § 414).

115. *See* Frank S. Wilson, *A Fish Out of Water: A Proposal for International Instream Flow Rights in the Lower Colorado River*, 5 COLO. J. INT'L. ENVTL. L. & POL'Y 249, 266 (1994).

difficult to insert environmental concerns meaningfully into the process. In this adversarial context, only those interests with the greatest political and economic influence, and the most to lose, are likely to be well served by the Law of the River.

It is equally difficult to see environmental interests making major headway on Colorado River issues in the courts. While litigation opportunities exist, environmental law as a whole reflects the same boundaries and disconnections that pervade legal treatment of the natural world. Human activities within the watershed may well implicate various provisions of the Clean Water Act, Clean Air Act, National Environmental Policy Act, Endangered Species Act, and perhaps others, but litigation on these grounds has resulted and will continue to result in a site-by-site, medium-by-medium, or species-by-species approach that cannot hope to achieve comprehensive resource management on a system as complex as the Colorado. Artificial jurisdictional boundaries and inconsistent state environmental standards only complicate this situation. Moreover, the enormously powerful interests at stake create an almost impassable litigation terrain.

Even access to the legal system, at least with regard to watershed-level issues, is fraught with legal barriers. For example, the Supreme Court's decision in *Lujan v. Defenders of Wildlife*[116] dismissed several theories of standing premised on ecological connections. As one critic noted, *Lujan* "discarded the idea that a person is harmed by a threat to a species in another part of the world as 'pure speculation and fantasy.' '[P]ure speculation and fantasy' is thus the Court's frank view of Carson's web of life."[117]

The Court currently discounts any theory of standing that is not based on direct, legally cognizable injuries. However, precise and certain notions of causation are too simplistic to cope with the complicated interconnections and relationships that frequently underlie ecological problems,[118] particularly where causes and effects are separated in time.[119] Tracing the delicate interconnections within a watershed as large as the Colorado would require the recognition of just such apparently attenuated relationships.

The laws governing the Colorado watershed—whether the law of prior appropriation, the GMA, or the Law of the River—are founded on a fundamental disconnection between the economic visions for the Southwest and what nature can actually support. By defending this disconnection, however, the legal system is forced into the untenable position of ignoring the most fundamental principles

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116. 504 U.S. 555 (1992).

117. Peter M. Manus, *Natural Resource Damages from Rachel Carson's Perspective: A Rite of Spring in American Environmentalism*, 37 WM. & MARY L. REV. 381, 411 (1996) (footnote omitted).

118. *See* Peter M. Manus, *One Hundred Years of Green: A Legal Perspective on Three Twentieth Century Nature Philosophers*, 59 U. PITT. L. REV. 557, 650 (1998).

119. *See* Manus, *supra* note 117, at 416–17.

of hydrology and ecology.[120] In the long term, this threatens not only the environment, but also, as the stories of the Santa Cruz river and the Colorado Delta demonstrate, the welfare of society at large. Unfortunately, however, more than a century of investment has created a system of property rights and resource use from which it will be difficult to retreat.

The challenge, then, is to determine how an ecologically informed ethic can be integrated with the established system of property rights and water management. Reconceiving our relationship to the Colorado will require a larger change in values, a recognition of systemic disconnections and an attempt to overcome them. "Much of this latter task will require a communal act of remembering. It will entail reminding the community, repeatedly and forcefully, that private property is a changeable cultural creation, justifiable only so long as it contributes to our overall well-being."[121] Ecological restoration offers a forum within which this 'communal act of remembering' could occur.

IV. RESTORATION

A. Why Should We Restore the Colorado Watershed?

There are many justifications for an effort to restore the Colorado River watershed. Economically, there will be benefits in terms of the quality and quantity of water supplies, the improvement of rangeland and farmland, decreased flood damage and more stable stream channels, restoration of the severely damaged Upper Gulf fisheries, cultural and economic restoration for Native American tribes in the region, tourism in the restored Delta, and improved recreational opportunities throughout the Colorado River watershed. Improved relations with Mexico and closer working relationships between the Compact states would be another benefit. Ecologically, riparian ecosystems play critical roles in the life cycles of a disproportionate number of species; watershed restoration thus can be expected to provide the most "bang for the buck" in environmental terms.[122]

However, an additional, compelling reason to engage in environmental restoration is related to the process of restoration itself. To restore something is to bring it back into existence, to bring it back to a prior condition. A successful act of restoration thus implies an understanding of how something was, an understanding of how it came to be different, and a deliberate choice to put it back to (or at least closer to) where one found it. Environmental restoration, as both a process and a result, offers a means to address many of the problems that we have identified.

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120. *See* Freyfogle, *supra* note 5, at 649.

121. *Id.* at 650.

122. *See* MARK K. BRIGGS, RIPARIAN ECOSYSTEM RECOVERY IN ARID LANDS: STRATEGIES AND REFERENCES 4–5 (1996).

As a *result*, restoration offers a means to reverse the process of degradation, rather than merely protecting disconnected remnants of intact ecosystems. Restoration is ultimately an act of hope and faith that ecological degradation is not a one-way street—that we can take control over our environmental destiny, reattach people to the landscape, and live sustainably within the natural order.

As a *process*, restoration is two things. First, it is a tool to make connections—to come to terms with how human activity impacts and is shaped by the environment. Second, it requires a necessary and fundamental shift in values—from an ethic of exploitation and the passive acceptance of ecological degradation to one of ecological stewardship and control over the collective destiny. Thus, *how* we achieve ecological restoration is at least as important a question as *why* we do it; we benefit from the process just as much as from the result.

Unfortunately, the potential benefits of this process are frequently lost in the modern regulatory context. A great deal of environmental work, including restoration efforts, occurs within the bureaucratic processes of local, state, and federal governments. As a result, public participation frequently occurs only after decisions have been made.[123] This situation is necessarily divisive, with supporters and critics organized around a developed plan, instead of working together to understand a problem and develop mutually acceptable solutions. As a result, the learning and changes in perspective that might have occurred as a result of the restoration effort, the process benefits, disappear.

With this in mind, the Sonoran Institute uses community-based approaches to accomplish environmental restoration.[124] As a matter of both pragmatism and principle, SI's work belies a belief that by bringing different stakeholders to the table, more lasting and effective conservation results can often be achieved. By helping people to develop and articulate their love for the land, and make decisions about their environmental destiny, SI has learned that people can be inspired to protect and improve the health of the environment above and beyond the requirements of legal mandates.

B. What is Community-Based Environmental Restoration?

The term "community" can be troublesome, particularly when used in the context of watershed management. In this Article, "community" refers to a "community of place." A "community of place" is described as "the social,

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123. *See* Timothy P. Duane, *Community Participation in Ecosystem Management*, 24 ECOLOGY L.Q. 771, 773 (1997).

124. Community-based conservation and restoration has been undertaken successfully by a variety of organizations throughout the world. *See generally* LIZ CLAIBORNE & ART ORTENBERG FOUNDATION, THE VIEW FROM AIRLIE: COMMUNITY-BASED CONSERVATION IN PERSPECTIVE (1993); STEWARDSHIP ACROSS BOUNDARIES (Richard L. Knight & Peter B. Landres eds., 1998); NATURAL CONNECTIONS: PERSPECTIVES IN COMMUNITY-BASED CONSERVATION (David Western & R. Michael Wright eds., 1994).

economic and environmental relationships that exist among people within a certain geographic area or place."[125] The term does not necessarily imply a homogeneous community because geography only partly describes the associations that many experience as community.

Community-based environmental restoration focuses on a specific geographic locale with which residents identify, including both human communities and adjoining uninhabited areas or public lands. The connection to or identification with a shared place is the predominant organizing force fostering these efforts. Community-based restoration efforts are often motivated by multiple goals that include not only ecological improvement, but also the increased social cohesion or "sense of community" that comes from shared work, and the economic benefits that can result from ecological restoration.

Community-based restoration efforts often share common characteristics. Typically, these shared characteristics are that volunteer participants initiate and provide leadership for the effort; participants are involved in an individual capacity rather than as a designated representative of a specific constituency, agency, or interest group; participants actively recruit broad and inclusive involvement of both resident and non-resident participants; and local knowledge is integrated with the expertise of scientists and professional natural resource managers.

Finally, the most effective community-based restoration efforts integrate a local orientation with an emphasis on the overall health of a specific watershed. Scale of the watershed is perhaps the most critical factor. For example, the Santa Cruz watershed is a meaningful scale for community-based action, while the watershed of the entire Colorado River is larger in scale than a community-based effort would address. However, several communities within the watershed of the Colorado as a whole might, by working together with state and federal resource managers, address issues on this larger scale.[126]

C. Getting to—and Staying at—the Table

In the adversarial approach to resource use, the view that most players take of public decisionmaking is as a process to be manipulated for private gain. Community-based efforts must transcend this approach. Some parity in this process is essential—the entire community must be represented, not merely powerful interests.

The key to this is uncertainty.[127] It is here that the power of environmental groups or historically marginalized populations (such as indigenous communities), when judiciously exercised, can be particularly effective. By leveraging their

125. BARB CESTERO, SONORAN INSTITUTE, BEYOND THE HUNDREDTH MEETING: A FIELD GUIDE TO COLLABORATIVE CONSERVATION ON THE WEST'S PUBLIC LANDS 10 (1999).

126. *See id.* at 9–11.

127. *See* Duane, *supra* note 123, at 774.

political or legal power, environmental or indigenous interests can bring recalcitrant, powerful stakeholders to the table ready to work collaboratively—even if for no better reason than to avoid expensive and uncertain adversarial conflicts.[128] A potential endangered species listing or critical habitat designation, for example, may create enough uncertainty to give powerful stakeholders an incentive to participate fairly.

A certain civility, trust, and respect for diverse perspectives also must develop. It is not enough to have only intellectual capital, grounded in good science, to resolve conflicts of values, interests, and relationships. People must also trust each other and care about meeting each other's needs to reach successful agreements in good faith. *Information* does not resolve social conflicts, *people* do.[129]

Here, traditional use of the legal and political process can generate perverse effects.[130] Once the process of trust is initiated, it tends to follow the model of a feedback loop: "trust and cooperation generate further trust and cooperation, while mistrust and defection generate further mistrust and defection."[131] As a result, initial relationships often will be fragile, since any group can exit the process and use the political or legal system to undo or block collective progress for its own advantage. This underscores the importance of uncertainty to the creation of a collaborative effort—uncertainty which can also be used to keep people at the table.

Relationships of trust and social and institutional contexts for community discussion develop only over long periods of time. These are significant long-term benefits of a community-based restoration effort; by reaching understanding on environmental issues, an improved level of dialogue and civility can develop within the community, improving its capacity to deal with conflicts in the future.[132]

D. Making Connections

An SI analysis of riparian restoration programs has shown, not surprisingly, that the successful projects most often are the ones which carefully identify the causes of environmental degradation and work to reduce or eliminate them.

> Our analysis of successful and unsuccessful projects indicates that riparian revegetation has a greater chance of being effective if the causes of site degradation are addressed....

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128. *See id.*

129. *See id.* at 775.

130. *See* Robert A. Kagan, *Political and Legal Obstacles to Collaborative Ecosystem Planning*, 24 ECOLOGY L.Q. 871, 873 (1997).

131. Duane, *supra* note 123, at 777.

132. *See id.*

> One of the inherent weaknesses of riparian revegetation is that it often does not address the causes of degradation.... [I]t is likely that whatever is preventing or slowing the natural establishment of riparian vegetation will also prevent artificial establishment.[133]

Indeed, studies of the process of revegetation in riparian areas indicate that in many cases addressing the causes of degradation is all that is required. Once the cause of environmental damage is eliminated, natural revegetation can occur with spectacular rapidity, even in the absence of replanting or other interventions.[134] As a result, successful restoration projects require a clear and detailed understanding of the area's history, as well as current environmental conditions and human impacts.[135]

Particularly with regard to riparian ecosystems, restoration also requires communities to develop a more sophisticated understanding of how local environments are connected to conditions upstream, downstream, or throughout the watershed. An effort cannot be effective unless it incorporates not only local causes and effects, but also larger systems.[136] This is all the more essential in the Colorado watershed, where the ecological health of any one place may be impacted by activity undertaken across state and international boundaries. The restoration process thus requires a community to make connections beyond political and property boundaries, identifying ecological relationships within the boundaries of the watershed. The community must also connect with local, state, and federal resource managers to achieve its goals.[137]

E. Developing Different Values

The same studies quoted above show that it is equally crucial for restoration projects to begin with a clear objective in mind: "The objective of the recovery effort must be stated as clearly as possible from the onset. It is meaningless to evaluate the condition of a degraded riparian area and develop a recovery plan for it without understanding what the end result of the recovery will look like."[138] Community-based restoration efforts thus require the community to participate in identifying a vision for the future of the area; this in turn requires the community to identify the ways in which the environment is important to them in terms of economic, social, cultural, philosophical, aesthetic, moral, or ecological values. This is important for several reasons.

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133. Mark K. Briggs et al., *Trial and Error: Assessing the Effectiveness of Riparian Revegetation in Arizona*, 12 RESTORATION & MGMT. NOTES 160, 164 (1994).

134. *See* BRIGGS, *supra* note 122, at 45 (providing several excellent examples of this phenomenon).

135. *See id.* at 118.

136. *See* Robert W. Adler, *Addressing Barriers to Watershed Protection*, 25 ENVTL. L. 973, 977 (1995).

137. *See id.* at 1091.

138. BRIGGS, *supra* note 122, at 118.

First, a clearer understanding of environmental benefits and a greater appreciation for the landscape are likely to increase people's attachment to the land, their understanding of its unique character, and, thus, their willingness to invest in it. There is a strong sense that people become more attached to specific places than to abstract notions of environmental health.[139] By coming together and developing a better understanding of their landscape, individuals become better stewards of the landscape.

As individual landowners gather to share their knowledge, values, and visions, they are more likely to learn more about the health of their home regions. They are more likely to notice the many signs of landscape decline—eroding soil, declining water quality, stunted trees, disappearing wildlife—and to accept responsibility for the ecological problems they share. They also are more likely to understand the steps that might heal the land, and why these steps are worth taking.[140]

This process is essential if a restoration effort is to achieve lasting results. Where the members of a community have been involved in the process of restoration, they are more likely to take ownership of the result. This is particularly crucial when efforts are undertaken on private land; if landowners do not appreciate the benefits of restoration, they are unlikely to maintain an area in a healthy state once restoration has occurred.

Second, it is far easier for a community to combat bad ideas that may arise in the future if its position is based on a more advanced understanding of the local environment and a clear vision of the desired future. As Eric Freyfogle noted:

> Good land use is best understood as an art, tailored to the uniqueness of each place and sensitive to the possibilities and limits set by nature. One does not learn this kind of land use from a book or in a school. It arises more often from experience, from the lessons learned over time by attentive land stewards—by farmers, timber owners, golf-course managers, miners, builders, and homeowners' associations.[141]

Once people feel that they are responsible for coming up with an answer to their problems, as opposed to lobbying some third party, they may also behave differently.[142] As Daniel Kemmis suggested, this relocation of responsibility to a community can be used to revive local citizenship: "A politics of citizens working out the problems and the possibilities of their place directly among themselves implies a revival of the old republican notion of citizenship based upon civic virtue; it rejects the federalist use of procedures to 'supply the defect of better

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139. *See* Adler, *supra* note 136, at 1000.
140. *See* Freyfogle, *supra* note 5, at 655.
141. *Id.* at 654.
142. *See* DANIEL KEMMIS, COMMUNITY AND THE POLITICS OF PLACE 113 (1990).

motives.'"[143] Changed values can become a powerful means of governing the behavior of private property owners; adherence to community norms is part of the sense of obligation that is inherent in property ownership.

"To own land...is to be charged [with the] responsibility for using it within the bounds of community norms governing right and wrong land use. Owning land means managing it appropriately, treating it properly, and abiding by local forms of propriety."[144]

These changes imply a more fundamental change in the relationship of the community to the environment—a new ethic of land and resource use.

F. The Results of Restoration

The results of restoration, then, can be measured in two distinct ways. First, there are tangible and intangible benefits to the community in terms of economic values from restored resources (tourism, recreation, and so forth), improved public health from reduced environmental risks, improved environmental understandings, a changed relationship to the environment, an improved capacity to communicate and overcome conflicts, greater participation and investment in decisionmaking about resource use, and a greater shared sense of vision for the future. Second, restoration can advance the health of ecosystems, improve resource management, increase preservation of intact ecosystems, and reduce externalities imposed on those "downstream" of environmentally aware communities.

Successful community-based restoration is ultimately a process of making connections. It forces us to face the history of our relationship to the environment, to understand the impacts of our activities, and to confront the future—to develop a vision and decide on a course of action which moves us in the right direction. By engaging in this process, a community can begin to take control of its destiny.

V. CONCLUSION

As the problems with the management of the Colorado River watershed demonstrate, the legal system as a whole is not always well suited to addressing complex natural resource problems. Rationalizing land and water use in the Santa Cruz River Valley and throughout the Colorado River watershed, and ultimately restoring the Colorado River Delta, will require extensive cooperation and collaboration on local, regional, national, and international scales. By helping communities understand the multiple, layered ways in which these two problems are connected—hydrologically, ecologically, historically—we take the first steps toward a solution that will overcome the disconnections which pervade our relationship with the Colorado River watershed. Community-based environmental

143. *Id.* at 123.

144. *See* Freyfogle, *supra* note 5, at 639.

restoration offers a powerful tool for exploring, understanding, and building consensus for dealing with complex problems, and a means for improving environmental health in the places we inhabit, reversing a dangerous and continuing trend toward ever-increasing ecological degradation.

As fantastic as Friar Marcos' vision of Cíbola seems today, the visions we have pursued in the Southwest have in truth been no less fanciful. We, like Coronado before us, have been searching for Cíbola, never seeing the beauty of what we have before us. We have made the desert bloom with our crops, we have grazed it with our cows, and we have mined it for precious metals. We have built our own Seven Cities of Gold—Denver, Salt Lake City, Las Vegas, Phoenix, Tucson, San Diego, and Los Angeles—with the waters of the Colorado and the wealth extracted from its lands. As Marc Reisner suggested, we now need to understand our overproud civilization in the Southwest for what it is—a "beachhead"—a mere foothold in a beautiful, dry land that is threatened by our failure to respect the limits of our environment.[145]

The wealth of the Colorado does not lie hidden in its hills, or even locked away in the promise of endless new subdivisions and shopping malls. If we can restore and sustain what we have already taken, then finally we will have found the real Cíbola—a sustainable future for the Southwest.

145. *See* REISNER, *supra* note 68, at 3.