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Casenote: Salvaged Water: The Failed Critical Assumption Underlying the Pecos River Compact

by

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CASENOTE

Salvaged Water: The Failed Critical Assumption Underlying the Pecos River Compact

INTRODUCTION

In early December 1948, after decades of interstate battle, representatives of New Mexico and Texas signed the Pecos River Compact.[1] The Compact apportioned the waters of the Pecos River between upstream New Mexico and downstream Texas pursuant to an empirical formula that embodied the results of extensive hydrologic study of the Pecos River Basin. The Compact negotiators believed that the agreement codified in the Compact would protect each of the state's historically adverse interests. Indeed, it seemed to accomplish the impossible. While purporting to secure all pre-agreement water development in New Mexico's Pecos basin, the Compact simultaneously forbade New Mexico from increasing post-agreement depletions.[2] This dual purpose seems completely at odds with itself because, as everyone knew, the protected *pre*-agreement groundwater development in the Roswell basin would inevitably cause the same *post*-agreement depletions forbidden by the Compact.

The negotiators, however, apparently knew what they were doing. By compacting, the states could better induce Congress to appropriate large sums toward stream improvement projects. Such projects included increased and improved surface storage, runoff control, flood protection and channel improvements.[3] But the most important project was salt cedar eradication. Salt cedars, known as the "water vampires"[4] of the West, transpired tens of thousands of acre-feet of Pecos water into the air each year. They had first infected the Pecos Basin around 1915, and by

1. N.M. Stat. Ann. §72-15-19 (Michie 1978) [hereinafter Pecos River Compact or Compact].

2. "Pre-agreement" means pre-1947; "post-agreement" means post-1946. January 1, 1947 is a critical date under the Compact because the physical state of the river as of that date defines the Compact's "1947 condition." The Compact provides that New Mexico will not deplete by man's activities the flow of the Pecos reaching Texas "below an amount which will give to Texas a quantity of water equivalent to that available to Texas under the 1947 condition." Pecos River Compact Art. III(a), *supra* note 1.

3. S. Doc. No. 109, 81st Cong., 1st Sess. xv (1949) [hereinafter S. Doc 109].

4. *Hearing on S.J. Res. 49 Before the Subcomm. on Irrigation and Reclamation of the Senate Committee on Interior and Insular Affairs*, 88th Cong., 1st Sess. 9 (1963) (statement of Sen. Anderson of New Mexico) [hereinafter *Hearing on SJR 49*].

1950, they were sucking the life's blood of the Pecos from tens of thousands of acres of bottomland—and they were spreading.[5] If the states did nothing, warned the engineers, the salt cedars would eventually choke the river dry.[6]

It was decided that a compact between Texas and New Mexico, with the federal funds it could attract, was the only way to save the Pecos. The Compact, it was hoped, would enable the states to "salvage"[7] the substantial quantity of water wasted each year by salt cedars. And best of all, the engineers were confident that the amount salvaged would better than offset the post-agreement depletion expected to result from pre-agreement groundwater development in the Roswell Basin. This sanguine projection became the key assumption upon which the rationality of the Pecos River Compact depended, i.e., both states could go on consuming at their 1947 levels, despite the progressive depletion caused by groundwater pumping, so long as the salt cedars were eliminated from the basin.

Unfortunately, despite a massive salt cedar eradication program, the water shortages continued in the Pecos Basin. As a result, the Carlsbad Irrigation District (CID), a federal reclamation project with relatively senior water rights, complained of constant water shortages to the New Mexico State Engineer Office (SEO), and demanded a priority call.[8] And in 1974, after years of receiving less water than it bargained for, Texas sued in the Supreme Court of the United States to enforce the terms of the Compact.[9] The Court ultimately approved a Special Master's report finding that New Mexico had accumulated from 1950 to 1983 a total water debt to Texas of 340,100 acre-feet.[10]

The water shortages experienced by CID and Texas evidence the apparent failure of the "salvaged-water" assumption; i.e., salvaged water failed to offset the post-agreement "baseflow depletion"[11] in the Roswell Basin. Sustained future compliance with the Compact will therefore presumably require New Mexico to correct for this failure, either by reducing its water consumption or by increasing the water supply in the Pecos Basin.[12] In order to devise an adequate solution, however, state policy-

5. *See, e.g., Hearing on S.J. Res. 155 Before the Subcomm. on Irrigation and Reclamation of the Senate Committee on Interior and Insular Affairs*, 84th Cong., 2nd Sess. 9 (1956) (statement of R. Tipton) [hereinafter *Hearing on SJR 155*].

6. *See, e.g.*, S. Doc. 109, *supra* note 3, at 79–83.

7. Article II(h) of the Compact defines "water salvaged" to mean "that quantity of water which may be recovered and made available for beneficial use and which quantity of water under the 1947 condition was nonbeneficially consumed by natural processes."

8. *See* State *ex rel.* Reynolds v. Pecos Valley Artesian Conservancy District, 663 P.2d 358 (1983) [hereinafter PVACD].

9. Texas v. New Mexico, 421 U.S. 927 (1975).

10. Texas v. New Mexico, 482 U.S. 124 (1986).

11. "Baseflow depletion" is explained below.

12. Rescission of the Compact due to mistake of material fact would be another option. However, I assume that New Mexico did not raise this issue before the Supreme Court and, as a result, it is now precluded from asking the Court to rescind the Compact.

makers must consider all major causes of the problem. The purpose of this article, therefore, is to help policymakers understand the importance of the salvaged-water assumption to the compact negotiators, as well as the likely consequences of its apparent failure.

THE RISE AND FALL OF THE SALVAGED-WATER ASSUMPTION

Brief Hydrologic Description

The salvaged-water assumption involved the stretch of the Pecos River between Acme and Artesia, New Mexico (Figure 1). Along this stretch, groundwater from the Roswell Basin enters the River as baseflow. In order to help policymakers gain at least a cursory understanding of the relationship between baseflow and groundwater pumping in the Roswell Basin, I offer the following brief explanation.

The Roswell Basin lies between the Sacramento Mountains on the west and the Pecos River on the east. Two major aquifers, one above the other, exist in the layered rocks within the basin (Figure 2).[13] The lower, or "artesian," aquifer consists of water-saturated, interconnected cavities within the San Andres limestone.[14] As in all aquifers, water flows through the artesian aquifer from areas of recharge, where water enters the aquifer, to those of discharge, where water exits.

Infiltration of precipitation and surface runoff recharge the lower aquifer where the San Andres formation outcrops over large areas in the eastern foothills of the Sacramento Mountains.[15] From its outcrop area, the formation dips slightly to the east toward the Pecos River, so that its uppermost sections typically lie hundreds of feet below the river's surface waters.[16]

Under natural conditions, the artesian aquifer discharges via large springs in the northern part of the basin and upward leakage to the shallow aquifer.[17] However, beginning around the turn of the century, when the surface waters of the Pecos were already overappropriated, farmers in the arid Roswell Basin made a marvelous discovery: when their wells penetrated the artesian aquifer, water came rushing up to the sur-

13. *See, e.g.*, G. Welder, Geohydrologic Framework of the Roswell Ground-Water Basin, Chaves and Eddy Counties, New Mexico 10 (U.S. Geological Survey Technical Report No. 42, 1983) [hereinafter Welder I]; R. Mower et al., An Appraisal of Potential Ground-Water Salvage Along the Pecos River Between Acme and Artesia New Mexico (U.S. Geological Survey Water Supply Paper No. 1659, 1964) [hereinafter Mower]; H. Thomas, Causes of Depletion of the Pecos River in New Mexico (U.S. Geological Survey Water Supply Paper No. 1619-G, 1963).

14. *See* sources cited *supra* note 13.

15. *Id.*

16. *Id.*

17. *Id.*

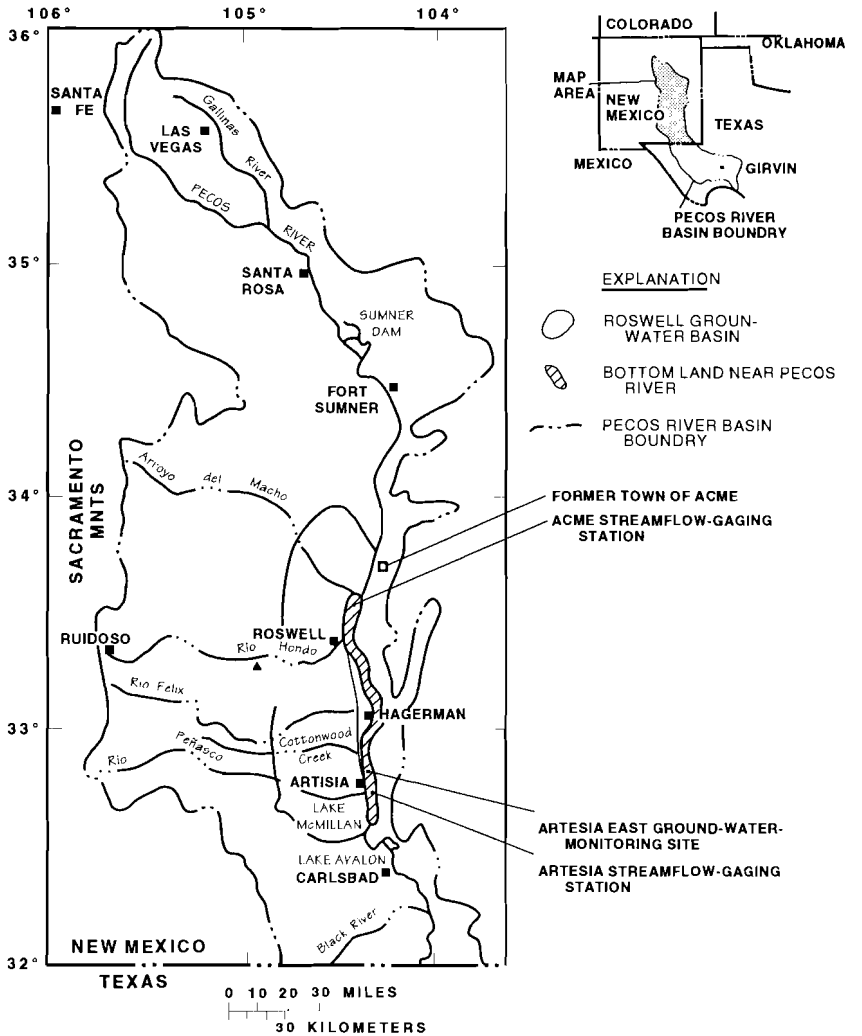

FIGURE 1 Location of the Pecos River drainage basin, reach of the Pecos River between the Acme and Artesia streamflow-gaging stations, and the Roswell groundwater basin

face under abundant pressure, spouting tens of feet into the air in some areas.[18] These "flowing wells" brought into production thousands of acres of irrigated cropland, and also quickly captured much of the natural discharge that had previously reached the Pecos River.[19]

18. Pecos River Commission, A Report of a Decade of Progress, 1950–60, at 99 (1961) [hereinafter Decade].
19. *Id.*

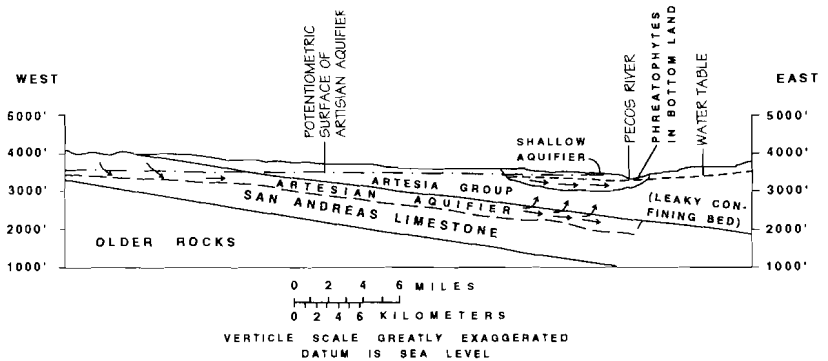

FIGURE 2 Generalized geohydrologic section showing relation of the aquifiers of the Roswell groundwater basin to the Pecos River and direction of the groundwater flow

The "shallow aquifer" exists above the artesian aquifer in the Pecos valley fill, which consists of water-permeable layers of sand, gravel and clay deposited over time by the Pecos River.[20] A semipermeable layer of rock separates the lower and shallow aquifers over much of the Roswell Basin. Just as water flowed upward under pressure to produce surface springs and flowing wells, water also slowly "leaks" under natural conditions from the artesian aquifer, through the semipermeable layer, to recharge the shallow aquifer under natural conditions. Intensive groundwater development in the lower aquifer eventually decreased artesian pressure, like a slow leak in car tire, so that upward leakage virtually ceased in some areas, and even reversed in others.[21]

The shallow aquifer discharges under natural conditions where the water table intersects the Pecos River bed, historically giving the river a perennial "base flow" fed by groundwater inflow between Acme and Artesia.[22] However, intensive groundwater development of the shallow aquifer from the late 1920s to the eve of the Compact-signing and beyond, began slowly to alter the natural recharge-discharge balance—just as similar development in the artesian aquifer had.[23] Wells in the shallow aquifer began capturing groundwater which would otherwise reach the river as base flow. And in some areas, the pumping would eventually drop the water table below the Pecos River bed, inducing flow from the channel into the ground where groundwater had once, under natural conditions, flowed into the river.[24] Therefore, because the Compact negotiators fully

20. Mower, *supra* note 13, at 27.
21. Welder I, *supra* note 13, at 10.
22. *See* sources cited *supra* note 13.
23. *Id.*
24. Welder I, *supra* note 13, at 18.

understood the general relationship between base flow depletion and groundwater pumping, they anticipated that the existing pre-agreement groundwater development in the Roswell Basin could increasingly reduce the flow of the Pecos River with each passing year.

Salvaged-Water: The Critical Assumption Underlying the Pecos River Compact

The assumption that salvaged water would completely offset the anticipated baseflow depletion induced by groundwater pumping in the Roswell Basin blossomed at winter's end, 1948. In March of that year Royce Tipton presented the Report of the Engineering Advisory Committee to the Pecos River Commission (PRC) in Santa Fe.[25] Tipton, the consulting engineer who chaired the Engineering Advisory Committee of8 the PRC, had substantial experience in solving interstate water battles.[26] He believed that if he could teach basic hydrologic "facts" to the warring states, prejudice and suspicion would transmute into rational agreement.[27] As part of his educational program, Tipton estimated the flow to Texas under several different "conditions" to demonstrate the effects of various past and future changes on the Pecos.[28]

For example, the "1947 condition" assumed constant 1947 levels of salt cedar transpiration and base flow depletion.[29] Under this condition, an average of 165,000 acre-feet of dependable flow would reach Texas each year.[30] Tipton then generated the "1947-A condition" by mathematically salvaging the water transpired by some 15,000 acres of salt cedar encrusting the delta of McMillan Lake. He estimated these salt cedars wasted 55,000 acre-feet each year.[31] The projected salvage of this water spiked the dependable average flow to Texas up to 198,000 acre-feet per year.[32] However, Tipton further estimated that the gain from salvaged water would all but vanish when the full impact of pre-agreement groundwater pumping in the Roswell Basin finally reached the river in 40 to 50 years (i.e., 1987–97).[33]

Following Tipton's presentation the states exchanged offer for counteroffer. Texas wanted New Mexico to deliver to Texas each year an undiminished flow represented by the 1947-A condition.[34] This, of course, was impossible. The engineering report showed the water supply under 1947 conditions could never sustain the state-line flow projected by the

25. *See* S. Doc. 109, *supra* note 3.
26. *Hearing on SJR 155*, *supra* note 5, at 8.
27. S. Doc. 109, *supra* note 3, at 131.
28. *See id.* at xxv – xxxii. Because Tipton was chairman of the Engineering Advisory Committee, I attribute the Committee's findings to him for convenience.
29. *Id.* at xxv.
30. *Id.* at xxvi.
31. *Id.* at xxvii.
32. *Id.* at xxvi.
33. *Id.* at xxxiii.
34. *Id.* at 79.

1947-A condition, and that groundwater pumping in New Mexico would reduce it still further.

New Mexico's counteroffer was more realistic, as well as vague and self-serving. For New Mexico, any acceptable compact would have to perform two functions: allocate the water of the Pecos River between the states in perpetuity, as well as "protect all existing beneficial uses insofar as possible on the basis of conditions as we find them today."[35] However, by "today's conditions," New Mexico referred not to the static "1947 condition" of the engineering report. Instead, New Mexico's offer comprehended a dynamic system: "[I]t is evident that the 1947 water supply will be decreased, other things being equal, by current depletions in the Roswell ground-water basin, the effect of which will not be reflected in the base flow of the river for years to come."[36] New Mexico therefore proposed that "all future changes in flow not caused by changed beneficial use shall be charged or credited to the two states on an equitable basis to be worked out."[37] In other words, the states would somehow share whatever net gains and losses resulted from nature, salvage and increased baseflow depletion.

At the close of the meeting, the PRC instructed the engineering committee to analyze each state's offer, and to estimate the ultimate effect of shallow groundwater development in the Roswell Basin on the base flow of the river.

At the next meeting, in November 1948 in Austin, Tipton introduced the Pecos Commission to the Supplement to Report of January 1948. Governor Jester of Texas opened the meeting, admonishing the states to "join hands" and solve the Pecos problem before it was too late.[38] Tipton was more blunt. If the states did not sign a compact, he predicted, the "terrific toll" of water taken by nature would surely increase, resulting in "two patients dead—one, the Carlsbad Irrigation District [in New Mexico], and the other, a part of the area below Red Bluff [in Texas]."[39]

In support of his dire prediction, Tipton introduced the PRC to the "do-nothing condition," which "envisioned a situation where the two States do not join hands and where nature is allowed to take her course,"[40] i.e., rampant salt cedar growth and transpiration. Under this condition, annual average shortages to CID would skyrocket from 5,300 acre-feet under the 1947 condition to over 12,500 acre-feet; and the average flow to Texas would dwindle to below 135,000 acre-feet per year, 30,000 acre-feet less than it would receive under the 1947 condition.[41] Assuming that irrigation requires three acre-feet per acre, inaction would cost CID and Texas

35. *Id.*
36. *Id.*
37. *Id.*
38. *Id.* at 78.
39. *Id.* at 79.
40. *Id.* at 81; *see also id.* at 141.
41. *Id.* at 141.

at least 2,400 and 10,000 irrigated acres, respectively. After prominently displaying the stick, Tipton disclosed the carrot. Under the "1947-B condition," which assumed fully depleted base flow and the elimination of salt cedar transpiration at McMillan delta, the flow to Texas would be "restored" to 165,000 acre-feet, and shortages to CID would drop to 4,000 acre-feet.[42] This hypothetical condition, which only federal dollars precipitated by the Compact could produce, promised a quantity of salvaged water sufficient to insulate Texas completely from New Mexico's existing groundwater development.

In light of the new information, the PRC asked Texas to respond to New Mexico's counteroffer given in Santa Fe. Predictably, Texas found New Mexico's offer too "vague and indefinite for Texas to consider as a compact basis."[43] As for the protection of current water development, Texas could not agree to protect New Mexico's "junior" rights, as Texas was not asking for like protection.[44] Texas further demanded that New Mexico "must be responsible for and assume the burden for the taking of underground water that affects the base flow of the [Pecos]."[45] After listening to Texas's comments, John Bliss, New Mexico's Pecos River Commissioner, requested additional time to confer with CID. The meeting temporarily adjourned.

Two days latter, John Bliss, New Mexico's Pecos River Commissioner, presented the PRC with the nine principles that would ultimately form the basis of the Pecos River Compact. Principles 1, 2 and 4, which evolved into Articles III(a), (c) and IV of the Compact, respectively, read as follows:

1. New Mexico shall agree not to deplete by man's activities, the flow of the Pecos River at the New Mexico-Texas State line below an amount which would give to Texas the quantity of water equivalent of the 1947 condition as reported by the engineering advisory committee in its report of January 1948 and supplements thereto, adopted November 11, 1948 . . . .
2. Water salvaged by reducing the present-day consumption of water by nature shall be apportioned 38 percent to Texas and 62 percent to New Mexico, the Texas share to be delivered and measured at the New Mexico-Texas State line.
4. Both States shall agree to promote the authorization and construction of a federally financed project to bypass salt cedars or otherwise eliminate the nonbeneficial consumptions at the head of Lake McMillan . . . .

Pursuant to principle 1, New Mexico agreed to the artificially stagnant "1947 condition"—presumably because it was reasonably confi-

42. *Id.*
43. *Id.* at 96.
44. *Id.*
45. *Id.*

dent that salvaged water would offset the future increases in base flow depletion it knew were inevitable. Accordingly, New Mexico insisted that principle 4 be incorporated into the Compact. Texas, having nothing to lose, agreed to all nine principles; except it wanted 45 percent of the salvaged-water windfall.[46] Tipton adroitly intervened and persuaded the states simply to split the difference—57 percent to New Mexico, 43 percent to Texas.[47] After agreeing that many details required working out, the negotiators adjourned the meeting.

On December 3, 1948, the states sowed the nine principles, along with the underlying critical assumption, into a binding compact. The Compact appeared to give both states what they wanted. In keeping with New Mexico's request that the Compact protect present development as well as apportion water, one of the Compact's express purposes is to "make secure and protect present development within the states. . . ."[48] "Present development" necessarily includes pre-agreement groundwater development in the Roswell Basin. The Compact further protects New Mexico by not holding it responsible for diminished flows caused by nonbeneficial consumption.[49] This provision undoubtedly motivated both states to pursue federal salvage projects because, as both states then understood, unharnessed nonbeneficial consumption would literally suck the river dry.

The Compact gave Texas what it wanted by incorporating Bliss's principle 1 into Article III(a). Pursuant to this section, New Mexico cannot "deplete by man's activities" the flow reaching Texas below what Texas would have received under 1947 conditions. In keeping with Texas's demand, the Compact implicitly forbids increased post-agreement depletions of base flow through groundwater pumping. While explaining Article III(a), Tipton put it this way: "The only way Texas would receive less water [under the Compact] than she would be receiving under the "1947 condition" would be by the action of nature, in other words, an increase in nonbeneficial consumption by nature with no salvage."[50] The Compact therefore respects Texas' demand that New Mexico alone bear the burden of increased base flow depletion.

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46. *Id.* at 98.

47. *Id.* at 98–100.

48. Pecos River Compact Art. I, *supra* note 1.

49. *Id.* Article II(e) of the Compact specifically mentions salt cedar transpiration as an example of nonbeneficial consumption. Article III(a) allows only man-made depletions to be charged against New Mexico.

50. S. Doc. 109, *supra* note 3, at 116. Furthermore, Article II(e) of the Compact defines "deplete by man's activities" to mean "to diminish the stream flow of the Pecos river at any given point as a result of beneficial consumptive use of water within the Pecos river basin above such point." Article II(b) defines "Pecos river basin" to mean "all of the contributing drainage area of the Pecos river and its tributaries . . . " Because groundwater pumping in the Roswell basin occurs within the Pecos River basin, and because it "diminishes the stream flow" by depleting base flow, it necessarily constitutes a man-made depletion.

The Compact demonstrates this further in Article VI(e), which provides:

> Water salvaged shall be measured at or near Avalon Dam in New Mexico and to the quantity thereof shall be added a quantity equal to the quantity of salvaged water depleted by man's activities above Avalon Dam.

Tipton explained that "if there is any depletion by man's activities in New Mexico of that salvaged water—that could be a surface diversion . . . ; it could be depletion of ground water that is now contributing to the flow of the stream—that man-made depletion shall be added to the indicated quantity of the water salvaged. . . . Then that quantity is divided between the two States, 43 percent going to the State of Texas."[51] The Compact thus holds New Mexico responsible for replacing the salvaged water it consumes in excess of its share, whether by increased base flow depletion or surface water diversion.

In his testimony before the United States Senate's Committee on Interior and Insular Affairs in 1963, New Mexico's Pecos River Commissioner, T. E. Lusk, further elaborated on the relationship between base flow depletion, salvaged water, and the 1947-condition.[52] He stated:

> The report of the Engineering Advisory Committee to the Pecos River Commission . . . reflects the negotiators were well aware there would be increased depletions of flows of the Pecos River as a result of ground water pumping . . . .
>
> This pumping was already established in the basin but the effect of the ground water withdrawal was not then fully reflected in the river flows. Since the pumping was established before 1947 it is part of the usage guaranteed to New Mexico by the Pecos River Compact.
>
> The report of the Advisory Committee also reflects recognition that water being nonbeneficially consumed by phreatophytes [mostly salt cedar] in 1947 could be saved by eradicating and controlling these plants to offset the foreseen effects of ground water pumping on the Pecos River flows.

51. S. Doc. 109, *supra* note 3, at 125 (emphasis added).

52. *See Hearing on SJR 49*, *supra* note 4, at 32. SJR 49 articulated the perceived threat that if "vegetative growth" in the Pecos basin "is not controlled, such growth will consume practically the entire flow of the Pecos River within the next 50 years." *Id.* at 2. In Pub. L. No. 88-594, 78 Stat. 942 (1964), Congress eventually appropriated $2.5 million for the initial "eradication and suppression" of salt cedars, with provision for more funds as needed for yearly maintenance of the cleared areas.

> The water that could be saved under the provisions of Senate Joint Resolution 49 should be enough to offset the effects of pumping to whatever extent these effects are thus far reflected in river flows and the increase in nonbeneficial use which has developed since 1947, thus restoring river flows to the 1947 condition.[53]

In accordance with Article VI(e), Lusk went on to state that

> any water salvaged by reason of activities authorized by Senate Joint Resolution 49 would not be subject to apportionment in accordance with article III(c) unless the amount salvaged exceeds the total by which ground water pumpage already established in 1947 and increases in nonbeneficial consumptive use have reduced the flow of the Pecos River since 1947.[54]

THE SALVAGED-WATER MIRAGE

The water coveted by Lusk et al. finally appeared within reach when in 1964 Congress enacted Public Law No. 88-594.[55] The enactment came just in time, probably delaying by 10 years Texas's suit against New Mexico; for from 1949 to 1964, New Mexico chronically underdelivered to Texas.[56] Not surprisingly, during the same time period, the average annual base flow of the Pecos between Acme and Artesia decreased from around 40,000 acre-feet to less than 20,000 acre-feet.[57] However, the United States Geological Survey (USGS) in 1964 estimated that elimination of salt cedars in the same reach of river would salvage approximately 28,000 acre-feet—more than enough water to restore the waning base flow.[58] The salvaged-water assumption seemed as viable as ever.

In 1967 the United States Bureau of Reclamation began what it termed the "suppression and eradication" program—a term undoubtedly borrowed from the military jargon of the Vietnam War. By late 1975 the Bureau had root-plowed[59] about 19,000 acres of salt cedar in the Acme-

53. *Hearing on SJR 49, supra* note 4, at 32..

54. *Id.*

55. *See supra* note 51.

56. *See* Texas v. New Mexico, 482 U.S. 124 (1986).

57. G. Welder, Hydrologic Effects of Phreatophyte Control, Acme-Artesia Reach of the Pecos River, New Mexico, 1967–1982 (U.S. Geological Survey Water Resources Investigations Report No. 87-4148, 1988) [hereinafter Welder II]; *see also Hearing on SJR 155*, note 5, at 7 ("Basin water supply complicated by decreasing inflow from . . . ground-water pumping resulting in depletion of 20,000 acre-feet annually. . . .").

58. Mower, *supra* note 13.

59. Welder II, *supra* note 57, at 16, 43. The "mowing" of salt cedar areas from March 1967 to June 1972 failed to stop salt cedar transpiration because of vigorous regrowth. The Bureau did not eliminate regrowth by root plowing in the Acme-Artesia reach until late 1975. *Id.* at 16.

Artesia reach, where the USGS now predicted a gain of some 19,000 acre-feet in salvage.[60] Because base flow had stabilized at around 20,000 acre-feet beginning in 1964, it should have almost doubled if the anticipated salvaged-water gain were realized.[61] Instead, the USGS detected no measurable increase in base flow attributable to the eradication program—not a single drop. The annual base flow simply continued to fluctuate, as it had before the eradication program began, around 20,000 acre-feet per year.[62]

CONCLUSION

The optimistic men who negotiated the Pecos River Compact following the end of World War II believed strongly in America's ability to understand complex natural systems, and through such understanding, improve them through engineering. The clearest manifestation of that belief is the salvaged-water assumption that made the Compact possible. The negotiators believed that eradication of salt cedars would offset the entire post-agreement base flow depletion caused by groundwater pumping in the Roswell Basin. It was a simple matter of balance. Nature, however, agreed only with the latter half of the equation: groundwater pumping did indeed cause a substantial post-agreement base flow depletion, but salvaged water never materialized to offset that depletion. The result of this miscalculation was, and will likely continue to be, chronic water shortages on the Pecos. New Mexico will likely succeed in substantially reducing or eliminating such shortages only if it delivers to Texas a quantity of water comparable to that which salt cedar eradication apparently failed to produce.

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60. Welder II, *supra* note 57, at 15, 43. The Bureau's initial salvage prediction of 28,000 acre-feet was based on elimination of 28,000 acres of salt cedar. *See* Mower, *supra* note 13.

61. Welder II, *supra* note 57, at 44.

62. Welder hypothesized that the salt cedars may have transpired water that would have been lost to the atmosphere both before and after salt cedar eradication—either through transpiration by the vegetation that replaced the eradicated salt cedar, as well as evaporation from bare unshaded ground. *Id.* at 44.