

The Pecos Settlement—Manage Conjunctively, Or Else!

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Editor's Note: The following paper represents a transcription of the speaker's remarks made at the conference. Remarks were edited for publication by the editor. The speaker did not review this version of his presentation and the editor is responsible for any errors.

Thank you for the introduction, and as Hilary Brinegar mentioned, I manage the Pecos River for the Interstate Stream Commission. The Pecos is a little river that demands a lot of attention given its size. It shares many problems of western rivers many times its size including: Interstate Compact disputes; listed aquatic species under the Endangered Species Act; senior surface rights that are being intercepted by upstream junior groundwater pumping; and the Pecos is extremely susceptible to changes in climate and drought. With these problems has come a lot of knowledge. The Pecos Basin played a major role in developing the tools for hydrologic analysis and, in fact, could be considered the birth place of a significant portion of modern hydrology with a great many hydrologists contributing substantial knowledge to the hydrogeology of the Pecos River.

Today I want to talk about issues affecting the Pecos and how the Pecos Settlement was designed to deal with those issues. If we look at historical compact noncompliance, this is where we started getting into trouble. The Pecos Compact was signed by the states in 1948 and was approved by President Harry Truman in 1949. You can see from the graph in Figure 1 that we got into trouble almost immediately. We had some good years in the late 1950s, but by the early 1960s, we headed below the blue line, which is our net zero deficit with deliveries to Texas. Down we went with roughly 10,000 acre-feet a year under-delivered to Texas. Part of that was because the Compact was based upon climatic conditions that did not hold

true into the future. Another factor was increased groundwater pumping that was depleting the river resulting in reductions in the base-flow return between the Roswell and Artesia areas. The bright side is that we now have much better management of groundwater resources, mostly due to the administrative efforts of the Pecos Valley Artesian Conservancy District (PVACD). However, we did mess with Texas, and as you know, Texas does not like that. Texas sued us in 1974 and New Mexico lost. New Mexico was given a \$14 million fine, and we must abide by the Court's 1988 Amended

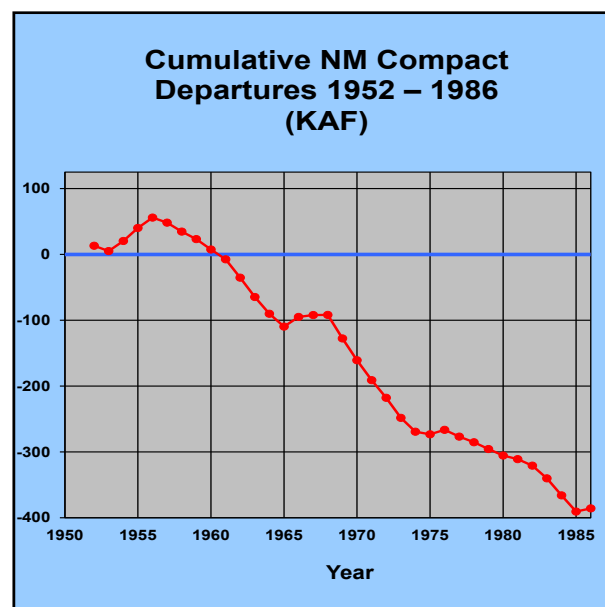


Figure 1. Historical Compact Noncompliance

Decree, which defines how the accounting will be done with the Federal River Master overseeing all deliveries to Texas.

It turns out that \$14 million was a pretty good deal for all the water we got to use. Steve Reynolds, State Engineer at the time, was an advocate of saying that it was a good deal—and it probably was, but the \$14 million payment was not what was most significant. This Supreme Court litigation forever changed the playing field of water accounting and management on the Pecos River. Fort Sumner Dam is located between Fort Sumner and Santa Rosa, and in general terms, about half of the flow that comes out of the Fort Sumner Dam is gaged just below Fort Sumner on the Pecos (Fig. 2). About half of that must go to Texas, and about half of the tributary flood inflows come in over that whole reach from Fort Sumner to the state line. It is more nuanced than that, of course, but in round numbers, that is what we must deliver to Texas. According to the amended decree, New Mexico cannot under-deliver to Texas again. We must make that delivery. If we miss our goal in a year, we must make that up by March of the next year in water to Texas. That is a pretty hard thing to do when we don't have water in the reservoirs as has been the case for the past couple years. New

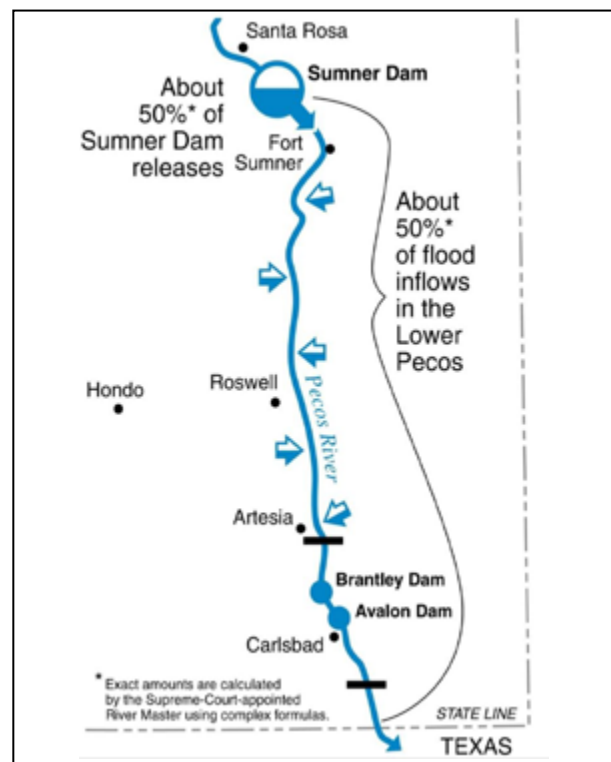


Figure 2. Pecos River Compact Compliance

Mexico quickly figured out how we were going to do this in order to stay in compliance.

During the 1990s, the New Mexico Legislature graciously appropriated in the neighborhood of \$30 million to the Interstate Stream Commission (ISC) and State Engineer to acquire water rights. We delivered to Texas from that and stayed in compliance, but just barely. Figure 3 shows that we kept bumping along, but when we got to what we used to think of as a severe drought in the early 2000s, we were on the verge of going into a net deficit with Texas again. We brought the water interests together and worked very hard on what we could do to protect New Mexico's position and to protect water for New Mexico water users.

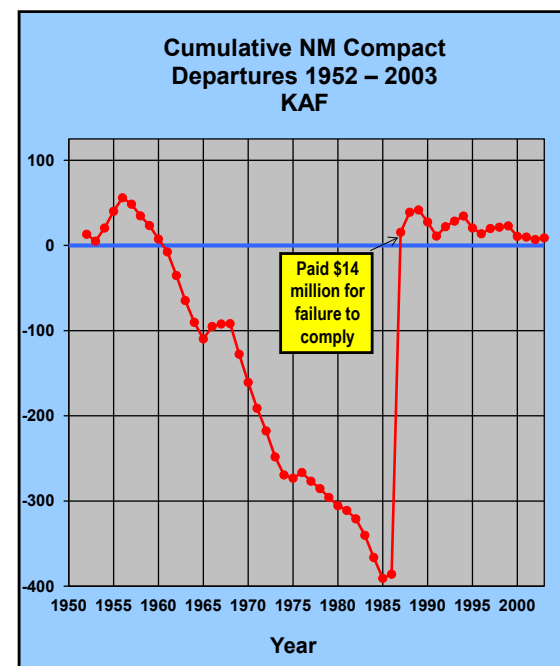


Figure 3. Compact Compliance Post-Decree

The ISC pulled the water interests and partners together and contracted with the best people that we could find to do hydrologic analyses and modeling of the system. The result was the 2003 Pecos Settlement. It was fortuitous that it happened when it did because of the state's financial position at the time. There was enough money to actually implement a plan and I don't know if that would have been the case if this had happened in the past few years. The money would not have been available to implement a plan like we did in the Pecos Settlement. The Settlement was signed by the parties of the Settlement in March of 2003: the State Engineer, the ISC, the U.S. Bureau of Reclamation, Carlsbad Irrigation District, and the

Pecos Valley Artesian Conservancy District. The parties of the ad hoc committee that was assembled to work on this was much broader and included water interests throughout the basin including industry, oil and gas, the Farm and Livestock Bureau, counties, municipalities, and so on. It was a very broad spectrum group, but only those who signed the Settlement have obligations tied to the Settlement.

The Settlement was finally implemented in 2009. It took six years for the ISC to gather water rights, drill wells, and connect wells with pipelines. The State Engineer worked on the Carlsbad Irrigation District adjudication and other things on which they were committed to in this Settlement. This was done with much hard work, and it wasn't cheap. To date, the State has contributed \$100 million. There was also no guarantee that this would work. We did the best planning we could do and gave it our best shot.

The objectives of this Settlement include: permanent compliance with the Pecos River Compact and Decree; increased and stable water supply for the Carlsbad Irrigation District (CID wanted a bit more water as it felt that its senior water rights had been compromised from upstream groundwater pumping); reduced likelihood of a priority call affecting groundwater users in the Roswell Basin (thus giving upstream users more security and confidence in the use of their water); and to bring the basin back into hydrologic balance (we knew we were over-depleting the basin in order to meet the requirements of both getting enough water to CID and still delivering water to Texas).

As we move forward to achieve the Settlement objectives, we look at the key hydrologic elements. We retired irrigated land up to 6,000 acres within the CID, and 11,000 acres in the Roswell Basin. There was a Settlement minimum pumping capacity of 15,750 acre-feet/year to implement and we did so in 2009: 4,500 acres in CID and 7,500 acres within the Roswell Basin.

What are we going to do with those water rights? We will not use them when there is water in the river, but the wells in the Roswell Basin will be used to pump water into the river and the water will be delivered to CID and Texas when needed. We own 4,500 acres of water rights that we purchased in the CID, and we reallocate those rights to farmers or for state-line deliveries

depending on climatic conditions, and the amount of credit that we have with the State of Texas. The Settlement also tells us when we are going to pump, what our minimum supply is, and what time of year we should turn our pumps on our well fields. As I mentioned, we have spent over \$100 million at this point and it requires about \$2 million a year to run the program.

How does this work? How can we take water out of the ground and pump it into the river? It would seem like doing this would dry up the river because the surface and groundwater are connected. The nice thing about Pecos River hydrology is its unique hydrologic conditions that let us get away with this. It allows for this effectively conjunctive management of groundwater and surface water resources. We have a productive artesian aquifer that comes out of the Sacramento and Guadalupe mountains, moves down, and discharges into the Pecos River. The pumping accelerates the rate at which that water arrives at the river when we use it on a temporal basis and dependent on demands. This is unlike the Rio Grande where if you pump from the alluvial and Bolson aquifers, you have an almost immediate effect on the river. On the Pecos River, you don't have the same type of impact.

As for our well fields, we have two. One is located near Lake Arthur with five wells and a design capacity of about 10,000 gallons per minute. Our major well field is near Seven Rivers and discharges directly into Lake Brantley. It has a design capacity of about 20,000 gallons per minute. The Lake Arthur well field was designed as a complementary well field because we cannot use it year round. We cannot pull water down from Lake Arthur to the Brantley Reservoir during summer irrigation season because the losses are too high—it isn't efficient during the summer, however, it works great during the winter.

How has this worked out since 2009? The year of 2009 was great: no pumping was required, but we still signed an agreement mid-year and agreed not to pump. The following year, 2010, was also a good year with no pumping required as there was flow in the river and it was about an average water year. Keep in mind that the flow on Pecos River is about 100,000 acre-feet a year on average, about an order of magnitude less than the Rio Grande, which is again about an order of magnitude less than the Colorado River. The first year that augmentation pumping was needed was in 2011. We had a new

system, we had not used it for system compliance yet, and then we were hit with one of the driest years on record. By the time we got everything working, we were able to produce about 13,000 acre-feet that first year. We also pumped all year in 2012—about 19,000 acre-feet between the two well fields. In 2013 we pumped a bit over 12,000 acre-feet, but were able to stop pumping on September 13 due to the remarkable storms we received.

How much are we pumping relative to what is in the basin? Figure 4 shows total Roswell Basin pumping for water year 2011, which is November 1 through October 31, and the numbers for water year 2012. Of the total water pumped, about 3 percent in 2011 and about 5 percent in 2012 was Settlement pumping. We only do a small portion of the pumping in the area, but since we pump in localized areas, there are local impacts to the water table, and we hear about that.

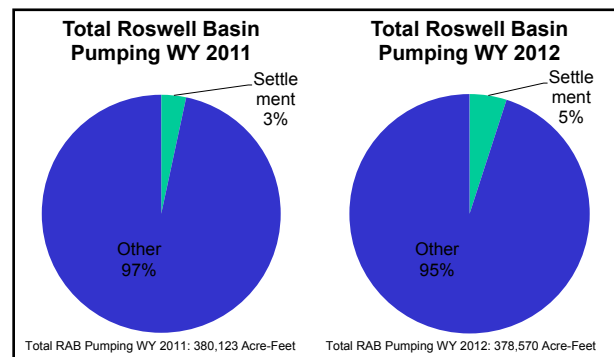


Figure 4. Settlement Pumping Proportion in Roswell Basin

We have heard a lot about the current drought, but it was remarkable to me how quickly things turned around. The years 2011-2012 were the hottest and driest 24-month period in 117 years of record. Looking at Santa Rosa Lake Gage, we saw 174 days in 2011 and 286 days in 2012 with record low daily flows. There were over 160 days of low flow in the first six months of 2013. There was zero flow at Near Artesia Gage for 24 days and the first zero daily flow since 1964.

The graph in Figure 5 shows Pecos River flow above the Santa Rosa Reservoir gage in percentiles. Yellow represents the fifth percentile and you can see that in 2011, we got below that percentile, and after some periods of rain, we have a lot of flows below that percentile. You can see when the rain came in during September, but look how quickly it goes back down again into record low territory. The system has been really stressed.

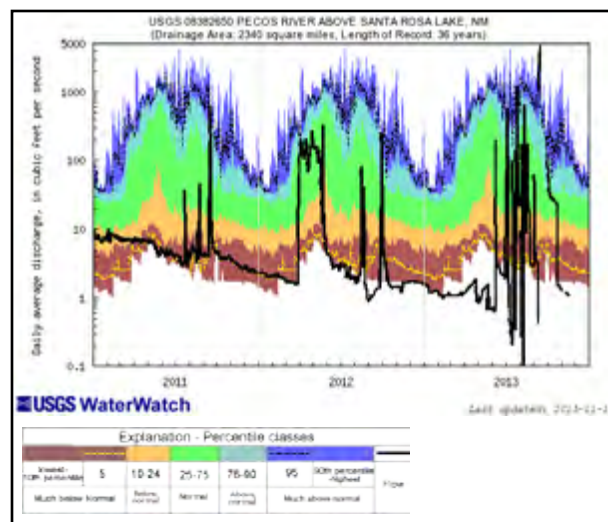


Figure 5. Pecos River Above Santa Rosa Reservoir

Figure 6 shows what has happened to base inflows. This is from above Artesia. We were in the 70,000 to 80,000 a year range until around 1945. You can see the drop that coincided to our under-deliveries to Texas. The line flattens out and then basically follows the climatic conditions. You can see a tailing off in this most recent drought and when we got to about 12,000 acre-feet of base inflow. It is painful and it is making it very difficult for CID to figure out how much water to put out. The take away message from that is that augmentation cannot make up for lack of surface flows. When we have years with basically no water in the river, we just can't make our required deliveries. The drought is beyond what was evaluated in the Settlement design. The Settlement targets water supplies not achievable from March 2011 to September 2013. Of course, CID is not happy about this either. It still had to do a priority call based on what was in the Settlement, and we are trying to do the best with what we have available. This might suggest that we need to make some changes to the Settlement to account for extreme climatic conditions.

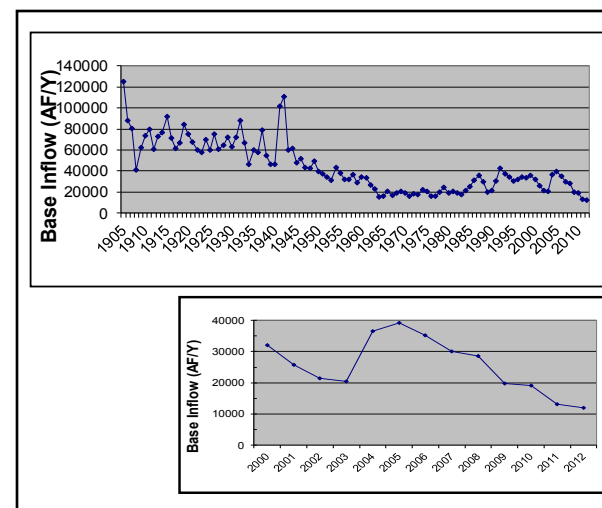


Figure 6. Base Inflows — Acme to Artesia

Anyway, this brings us to the bright side of the discussion. How are we doing on our Compact compliance? New Mexico has accrued significant cumulative credit since the Settlement signing. Remember that we started in 2003, acquired water rights soon after, and we almost immediately had credits (Fig. 7). Some of that was due to favorable climatic conditions, but some was also due to acquiring rights within CID, and which went to Texas. In 2012, we ended with a total credit of 102,000 acre-feet.

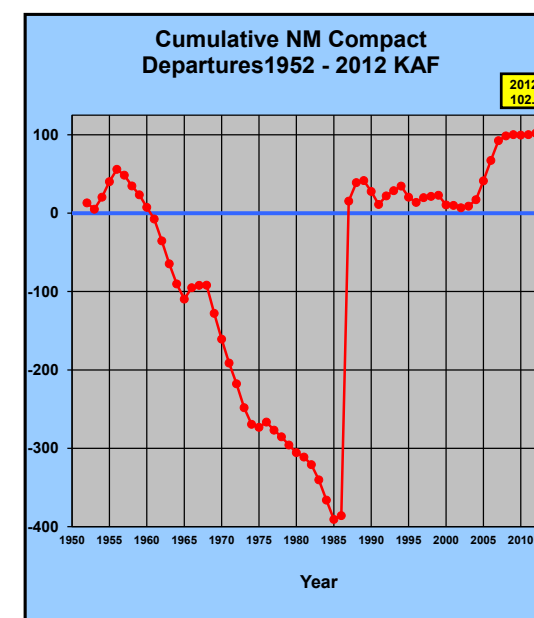


Figure 7. Compact Compliance Post-Settlement

That brings us to the use and deficits for this year. It looks like we will only have between 5,000 to 10,000 acre-feet of deficit this year, so we will still have a healthy credit with Texas. I don't have an exact number because the USGS is still rebuilding hydrographs after having to replace many of the gages from that extraordinary storm event the week of September 8th. The storms brought much needed moisture to the Pecos Basin in particular. Pecos reservoirs went from essentially empty to conservation storage limits in less than a week. ISC stopped augmentation pumping on September 13, 2013. This credit allows New Mexico a lot of flexibility. It is very important to have that credit so that we can use the water that we have in New Mexico, especially in dry years.

Figure 8 shows what a blessing the September storms were to the Pecos. This is Rocky Arroyo on September 12, peaking at 25,000 cfs. In a small drainage like that, it was truly remarkable. Reservoirs went from empty to conservation storage levels in less than a week. Santa Rosa gained 90,000 acre-feet in two weeks, which raised it 44 feet. Fort Summer had 34,000 acre-feet in two weeks, which raised it about 26 feet. Lake Brantley also got 34,000 acre-feet, which raised it up 22 feet. This allows CID to start with full reservoirs in 2014, and that is the first time that has happened since 2010.

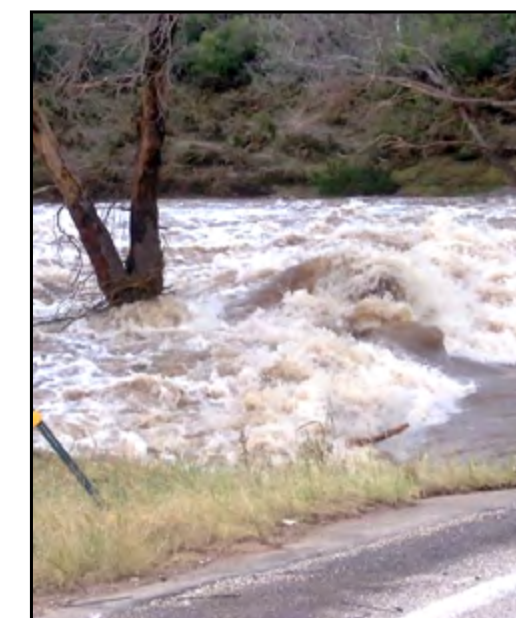


Figure 8. Rocky Arroyo on September 12, 2013

Figure 9 shows our well fields at South Seven Rivers; those of you who know the area and the streams know it isn't very impressive. Before June 2013, we were thrilled with the rains and even had enough rain to leave a little puddle. We were elated about that. The photo on the top is the same location, but after the September storms. You can see the same road and features from the picture on the bottom. The gravel bank came down the river from the South Seven Rivers arroyo. It doesn't look that impressive from this view, but it is 20 feet high. The amount of sediment that moved is simply astounding.



Figure 9. Storm Effects on the South Seven Rivers; before June 2013 (top) and after October 2013 (bottom)

Is the Settlement working as a conjunctive management tool? I think the overall opinion is yes. We have a large Pecos Compact credit, which gives us a lot of operational flexibility. We have been able to supply a significant additional amount of supply to CID. It isn't as much as they would like, and not as much as we would like to provide them, but this extraordinary drought was beyond what anyone had contemplated when designing the Settlement and some of the estimates

weren't near realistic in years as dry as 2010 to 2013. Perhaps we need to make changes in the Settlement for adapting to extreme conditions. This goes back to some of my earlier thoughts. How do we accommodate senior water users in years when the water just isn't there? However, the September rains were amazing, and we turned our well fields off on September 13, which allowed us to take care of some maintenance and do some other work.

Thank you for your attention.