

EVIDENCE SUBMITTED IN SUPPORT OF THE PETITION FILED BY  
ENVIRONMENTAL STEWARDSHIP APPEALING THE ADOPTION OF  
DESIRED FUTURE CONDITIONS BY GROUNDWATER MANAGEMENT AREA 12

*Submitted by Curtis Chubb, Ph.D.*

While waiting for a friend at the baggage claim area of Austin-Bergstrom last month, I looked down and saw a series of gold lines which converged in a large blue area. As I admired the artwork in the floor, I realized that I was looking at all of the Texas Rivers coursing their way to the Gulf of Mexico. The Colorado was there going right through Austin; the Brazos was there cutting through the heart of Texas. I wondered who had the vision to commission artwork celebrating the importance we attach to our rivers – in the past, now, and in the future. Because of that vision, many of those arriving at the Austin airport will understand the value we place on our rivers.

In fact, Texas Rivers are why Environmental Stewardship (ES) decided to expend the time and money required to file a petition. The petition challenges the reasonableness of the Desired Future Conditions (DFCs) established by the five groundwater conservation districts operating within Groundwater Management Area 12 (GMA 12).

My comments center on the petition hearing held by the Texas Water Development Board (TWDB) on March 7 and are listed below.

Comment One:

A large percentage of the effort exerted by GMA 12 to counter the petition appeared to have been misdirected. Nowhere in the petition does ES suggest that groundwater flow to rivers be implemented as the sole DFC.

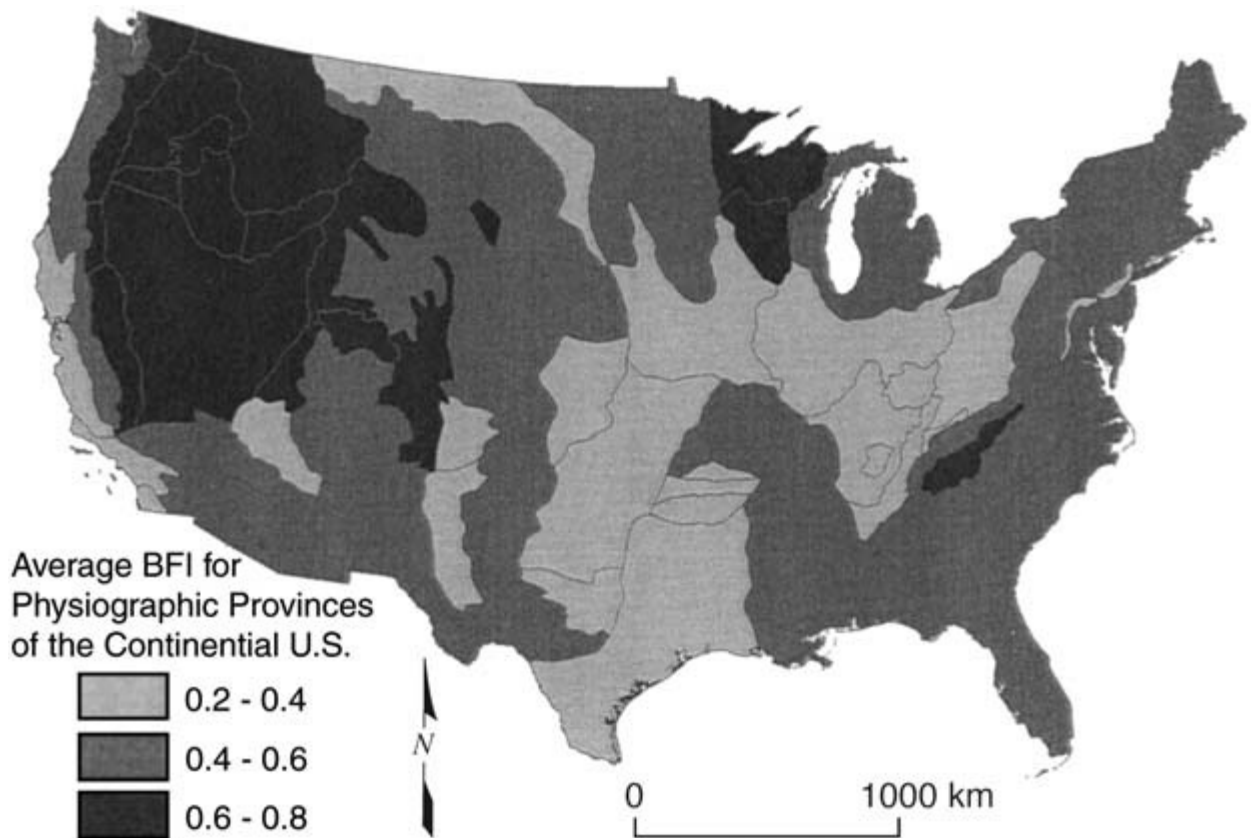
Yet, GMA 12 hammered away at the uncertainty associated with modeling of groundwater contributions to surface flows, while elevating their choice of drawdowns as DFCs. It was as if I was in a parallel universe for a while.

They might have been thinking that since they could not mount an effective counter-argument to the importance of groundwater contributions to surface water flows, they would attempt misdirection and obfuscation.

Comment Two:

There are innumerable references in the literature confirming that aquifers contribute significant amounts of water to rivers including the Brazos and Colorado Rivers. In fact, that is the definition for base flow index: BFI means the fraction of stream flow attributed to groundwater.

The following figure from *The Science and Practice of Environmental Flows and the Role of Hydrogeologists* by Marios Sophocleous (*Ground Water* 45: 393–401, 2007) not only depicts the significant contribution of groundwater to river flows, but also highlights that BFI measurements have been performed for years and are accepted by the scientific community – in contradiction to the assertions and insinuations made by GMA 12.



*Figure Legend.* Average base flow index (BFI—fraction of streamflow attributed to ground water; adapted from Becker, M.W. - *Ground Water* 44: 306–318, 2006). Map created from USGS data (Wolock, D.W. - USGS Open-file Report 03-311, 2003) and physiographic regions of the continental United States.

Comment Three:

I believe the petitioner's main concern is that the voluminous amount of information supporting groundwater's significant contribution to surface water flows should have been a major consideration during deliberations leading to the adopted DFCs. It was not a major consideration.

In addition to the abundance of literature detailing the groundwater-surface water nexus as discussed above, information about the nexus was presented orally and in writing at GMA 12 and individual groundwater district meetings; some of which is summarized in the petition appendices.

Based on what I heard at many of the meetings (joint and individual district), the subject of groundwater and surface water interconnectivity was either not or minimally considered. It was as if it was a foregone conclusion that since the GAMs were deemed to be less than 100% accurate for modeling groundwater discharge to the surface, the subject could not be considered. If this type of thinking was common in the field of scientific investigation, the world would still be flat.

There are references that suggest GAMs can be used to address the interaction between groundwater and surface water. Examples of previous studies include one performed by HDR Engineering Services for Region G Water Planning Group that was cited at the hearing – they studied rivers and streams overlying the central Carrizo-Wilcox Aquifer using GAMs for simulation.

However, the most impressive and in-depth study of the nexus is entitled 'Groundwater-Surface Water Interactions in Texas' and was published by the University of Texas Bureau of Economic Geology (BEG) in 2005. The study included simulations of groundwater-surface water interactions in GAM and WAM models with reference to the central Carrizo-Wilcox GAM.

Interestingly, the BEG report states that the original model of the Central Carrizo Wilcox aquifer predicted that under projected future pumping scenarios, the Colorado could change from a gaining to a losing stream (the reference is to Dutton, 1999 – I could not access the report).

Some of BEG's main conclusions about GAMs being used to simulate groundwater discharge to surface water follow:

- GAMs can simulate groundwater discharge to surface water, although there are limitations associated with the one square mile grid cell and time scales;
- GAMs incorporate groundwater-surface water interactions by using different MODFLOW modules;
- GAMs may be useful in assessing impacts of future increased pumpage on groundwater-surface water interactions; and
- Studies should be conducted to test the validity of simulated baseflow response to increased pumpage using more detailed site specific simulations and field-based measurements.

The petitioner ES recognized the GAM limitations and focused on "trends" only. The trends are too consistent to be ignored – over pumping of groundwater depletes rivers.

In the concluding remarks of the BEG study, the following is included: “A variety of studies may be conducted to address the gaps in our knowledge of groundwater-surface water interactions and to provide baseline data to better assess the degree of connectivity between groundwater and surface water.”

The first suggested study in the BEG report was how to monitor the groundwater-surface water interactions: “The most direct approach to assessing groundwater-surface water interactions is through collocated monitoring of groundwater and surface water.” The description of the process depicts it as straightforward and doable. Again: never seriously discussed at GMA and district meetings.

And to top it all off, the Post Oak Savannah Groundwater Conservation District (a member of GMA 12) used GAMs to quantitate the “discharge from the aquifers to the springs” for their management plan. Also, they state in their management plan that “the District will assess current conditions and develop updated GAM-based estimates of groundwater discharge to surface water...” (See Section 16 of their management plan).

So, what caused the about-face about the reliability of GAMs and the ensuing intense attacks on the applicability of GAMs for estimating groundwater outflow to surface waters? My guess: to obfuscate the fact that GMA 12 failed to consider groundwater-surface water interactions in their haphazard march to the adopted DFCs.

The way I look at it is: For groundwater to discharge into a stream channel, the altitude of the water table in the vicinity of the stream must be higher than the altitude of the stream's surface. And the adopted DFCs of hundreds of feet in water level drawdown adopted by Post Oak Savannah and Lost Pines Groundwater Conservation Districts will most definitely reduce the amount of groundwater discharge to the rivers.

It is unreasonable that GMA 12 did not seriously address the groundwater-surface water interactions during the DFC process. And one can argue that the DFCs are unreasonable because GMA 12 made no attempt to even consider how to monitor the groundwater-surface water interaction; which as the BEG report illustrates is a simple process.

The different interpretations of the reliability of GAMs support my conclusion that the unbiased experts housed within TWDB should be responsible for both the modeling work and data interpretation. As if to highlight the inconsistencies of opinions offered by hydrogeologists working for different groups, the End Op hydrogeologist stated that the Simsboro Aquifer could supply groundwater “for as long as our country has been founded” (just about 235 years). That conclusion is not supported by other hydrogeologists. Groundwater management needs more control by the state.

Comment Four:

I really couldn't conjure up much sympathy when GMA 12 stated that they had to work hard to "balance competing concerns" when determining the DFCs. As they repeatedly pointed out, they had to meet as a group thirteen times during a five-year period. My rebuttal: one meeting every six months is not onerous.

Actually, the joint meetings could have been reduced to, say, two and the money spent on attorneys and hydrogeologists be redirected to TWDB for studies about aquifer recharge. Why do I say this? Because my opinion is that in spite of all their hand waving and self-congratulating, they simply reverse-engineered the DFCs to match their predicted amount of pumping – there is no evidence that they seriously considered anything else besides predicted amounts of future pumping.

In fact, GMA 12 admitted at the End Op hearing that they had reverse engineered the DFCs when one of their attorneys said, "The petitioner used 'reverse engineering' as a derogatory. But really, whatever you call it, they [GMA 12] were following the law." This statement alone should render the adopted DFCs unreasonable.

Comment Five:

Although I do not know if Texas has legally acknowledged the connection between surface flow and groundwater, I do know that New Mexico has. In fact, the State of New Mexico has the right to limit groundwater pumping if it has the potential to deplete a stream system. Another example of a state controlling groundwater pumping to maintain river flows was when groundwater pumping in the Republican River Valley of Nebraska was limited to preserve the Republican River's flow.

I also know that the U.S. Supreme Court ruled in *Cappaert v. United States* (1976) that "groundwater and surface water are physically interrelated as integral parts of the hydrologic cycle."

Based on statements made by GMA 12 at the ES petition hearing, I conclude that they do not fully understand that water is continuously transiting through the hydrologic cycle. It is as if they don't understand that aquifers contribute water to rivers. They may have considered this narrow focus to one part of the hydrologic cycle as important to buttress the reasonableness of their DFCs – but it can also be viewed as ignorance of the hydrologic cycle.

In fact, some say because of the continuity of the hydrologic cycle, it is difficult to distinguish groundwater from surface water which has stimulated some legal

experts to push for states to unify the laws regulating the two. Robert Glennon explains the difference in *Water Follies*: "Groundwater and surface water are not separate categories of water any more than liquid water and ice are truly separate. The designations 'groundwater' and 'surface water' merely describe the physical location of the water in the hydrologic cycle."

The purpose of the above review of the hydrologic cycle is to raise questions about GMA 12's assertion that the current environmental flows studies in Texas do not involve groundwater districts.

Since GMA 12 likes to cite 'selective' sections of the Texas Water Code to buttress their arguments, so will I to buttress mine.

If the state did not consider groundwater discharge to surface flow as a component of environmental flows, why would they require each 'basin and bay area stakeholders committee' to have a groundwater conservation district representative for the current environmental flows effort? (Texas Water Code 11.02362)

After listening to GMA 12 howl that surface water was not their concern (GMA 12 attorney quote: "Won't find any requirements for groundwater districts to set aside flows for surface water."), I contacted a member of one of the environmental flows groups on the day after the ES petition hearing. The person said: "One of the tasks of the Colorado-Lavaca River BBASC work plan, currently a work in progress, will be studies of the impact of groundwater pumping on stream flows at various sites on the Colorado." Furthermore, the person said, "The interaction between groundwater pumping and depletion of springs was the reason the Edwards Aquifer Authority was created to limit groundwater pumping to protect the flows from Comal and San Marcos springs." So, I predict that the Legislature will once again have to pass legislation to herd the groundwater districts to the right playing fields of enlightenment.

HB 1763 (passed in 2005) added the following requirement for groundwater district management plans: "...3) include estimates of the following... (D) for each aquifer, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers;..." (Texas Water Code 36.1071)

The state also ensured that the groundwater districts knew that the state wanted groundwater-surface water interactions to be considered during the DFC process by including in Chapter 36 the following: "Before voting on the proposed desired future conditions of the aquifers under Subsection (d-2), the districts shall consider: ... (4) other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water..." (Texas Water

Code 36.108) There is no evidence that this specific request was honored besides the utterance of a few words.

And then there are the seven criteria used by TWDB (you) to make findings and recommended revisions regarding the reasonableness of the DFC. The state and TWDB again emphasized the importance they assigned to the groundwater-surface water nexus by specifically including it as Criterion Number 3: “the environmental impacts including, but not limited to, impacts to spring flow or other interaction between groundwater and surface water.” (Texas Administrative Code Title 31, Part 10, Rule 356.45)

GMA 12 did not accomplish their duty under Texas Water Code 36.108, and they did not meet the criterion advanced in Texas Administrative Code 356.45. Simply stating that GAMs couldn't be used to study spring flow does not constitute considering interaction between groundwater and surface water.

Anyone with any understanding of water knows there is a link between groundwater and surface water – and that link is a critical consideration for anyone studying how to maintain environmental flows in Texas Rivers. Now, I feel like I am howling just as the GMA 12 people did at the petition hearing.

GMA 12 kept on saying that surface water is controlled by the state, groundwater is controlled by the groundwater districts, and never the twain shall meet. I disagree with that conclusion. The state in the form of TWDB already controls groundwater districts by setting the amount of groundwater that districts can permit for pumping in the form of MAG – the actual end game of the DFC process. If the state/TWDB wanted to ensure that the groundwater contribution to environmental flows was preserved, the MAG would definitely be a candidate tool for achieving that goal.

I have to agree with ES' statement made during the rebuttal period: “GMA 12 had lots of meetings and lots of things were said; but all were pushed aside and not considered.”

#### Comment Six:

A major problem with groundwater districts is that they are operated as 'fiefdoms' with little or no interest in the opinion of landowners. Sure, they pay lip service and spotlight that they hold meetings; but they usually ignore anyone's opinion except their own and their hired guns. Now, in light of SB 332 and the recent Texas Supreme Court ruling in the Day case, the districts will now understand that it is not their groundwater to give away; the groundwater is owned by the landowners. They may now realize that they just can't issue edicts – they have to explain their actions.

The arrogance of the GMA 12 districts is illustrated by their process used to adopt the DFCs that are being challenged – it was primarily behind closed-doors. And they did not have to explain the justifications for their DFCs – and they did not explain the justifications for their DFCs.

Now because of the enlightened action of the 2011 Legislature, the Texas Water Code has been amended to require GMA 12 in the future to include the following in a DFC “explanatory report” (Texas Water Code 36.108):

- Provide the policy and technical justifications for each desired future condition;
- Include documentation that the factors under Subsection (d) were considered by the districts and a discussion of how the adopted desired future conditions impact each factor;
- List other desired future condition options considered, if any, and the reasons why those options were not adopted; and
- Discuss reasons why recommendations made by advisory committees and relevant public comments received by the districts were or were not incorporated into the desired future conditions.

If the groundwater districts were functioning as agencies truly concerned about groundwater management, all of the new requirements would have been implemented voluntarily without requiring the full force of Texas law.

In addition, if the groundwater districts had acted in good faith, instead of flexing their self-perceived power and stonewalling, they would have met with the petitioner ES and discussed how the DFCs were decided and maybe, just maybe, listened to the valid arguments concerning the critical nature of groundwater contribution to our rivers.

GMA 12 played a power game and in the process failed to be open to new ideas about the DFCs. Since the process was impugned, the product is impugned – the DFCs are unreasonable.

*In closing*, thank you for reading the above – I have been studying and writing about groundwater for sixteen years. Although I sometimes agree with Simon Bolivar when he said, “I have plowed the oceans,” I also agree with Barbara Jordan’s quote which is displayed behind her memorial statue at Austin-Bergstrom:

“I’ve always felt that as long as you are alive,  
you should be doing something that makes a difference....  
You don’t have to do big, gigantic things.  
Just do things incrementally that make a difference.”



TWDB's help is needed to ensure that the DFCs protect Texas Rivers and in the process 'protect the aquifers' – a phrase never used by GMA 12 during their presentations at both hearings. Their only concern = how much they need to drawdown our groundwater levels to fulfill the pumping permits they issue. We need help.

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