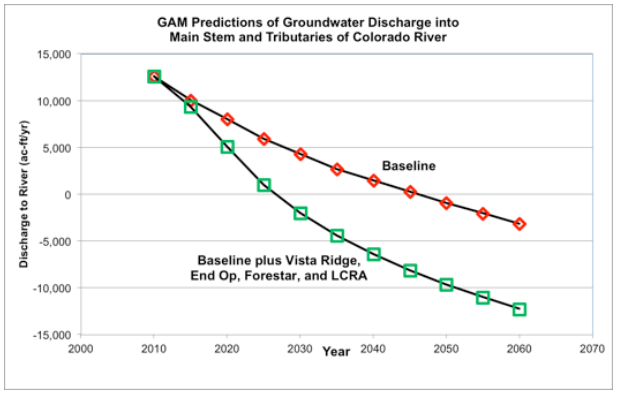
GMA-12 DFCs
Supplementary Comments
Rice Report

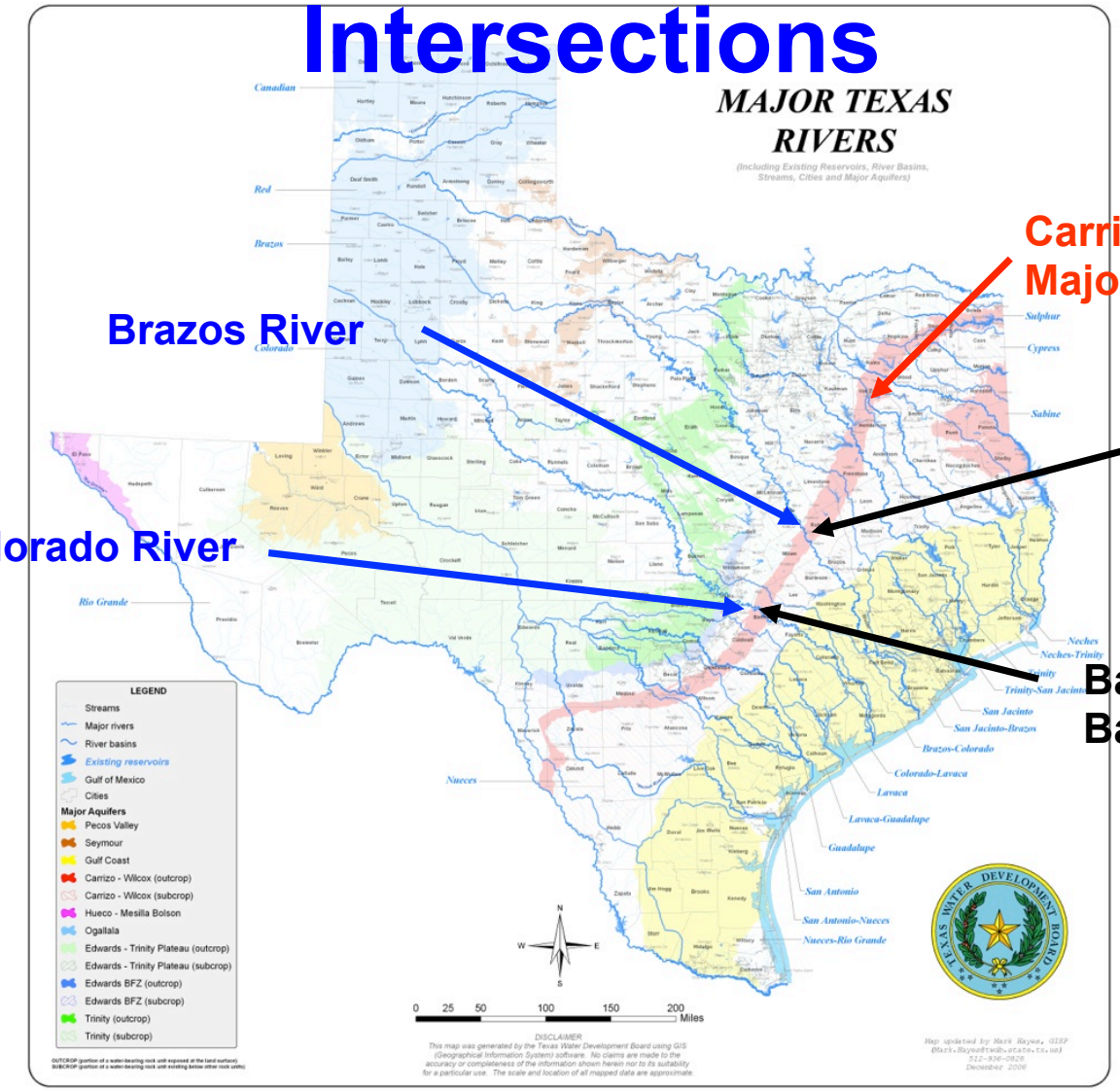


Presented to
GMA-12
March 24, 2016, Milano, Texas

Environmental Stewardship
A Sustainable Ecosphere
TM

Environmental-Stewardship.org

Ground & Surface Water Intersections



Carrizo-Wilcox Major Aquifer

Brazos River

Milam/ Robertson Counties

Colorado River

Bastrop, TX Bastrop County

ES Observation

- Observation from ES June 18, 2015 comments demonstrated that the GAM results indicate that the two most significant contributors of groundwater for pumping of the Simsboro aquifer are from:
  - **1) a reduction in outflows to surface waters, and**
  - **2) the flow of groundwater out of other aquifers within the districts (Vertical Flow).**

Hydrologists Claims

- Water budgets produced for evaluation of hydrological conditions do not reflect the expectations expressed by the hydrologists, that:
  - **Most of the water pumped comes from storage, and**
  - **There is very little leakage between aquifers.**

New Rice Report

- ES submits a new GAM analysis by George Rice
  - **"GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA"**
  - **Dated March 22, 2016.**

New Rice Report

▲ The report examines the effects of pumping on groundwater and surface water in:

- **Lost Pines Groundwater Conservation District (LPGCD),**
- **Post Oak Savannah Groundwater Conservation District (POSGCD), and**
- **surrounding counties.**

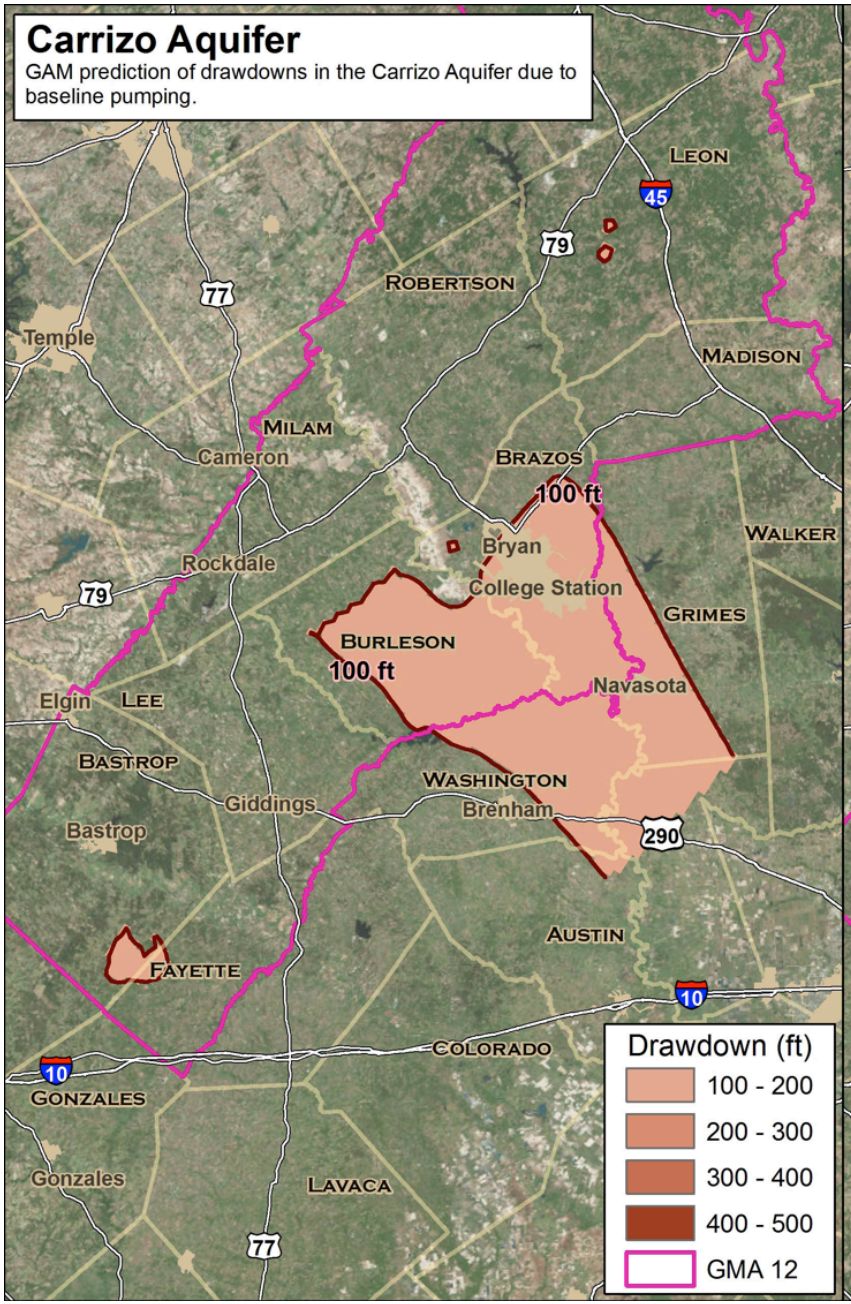
New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.

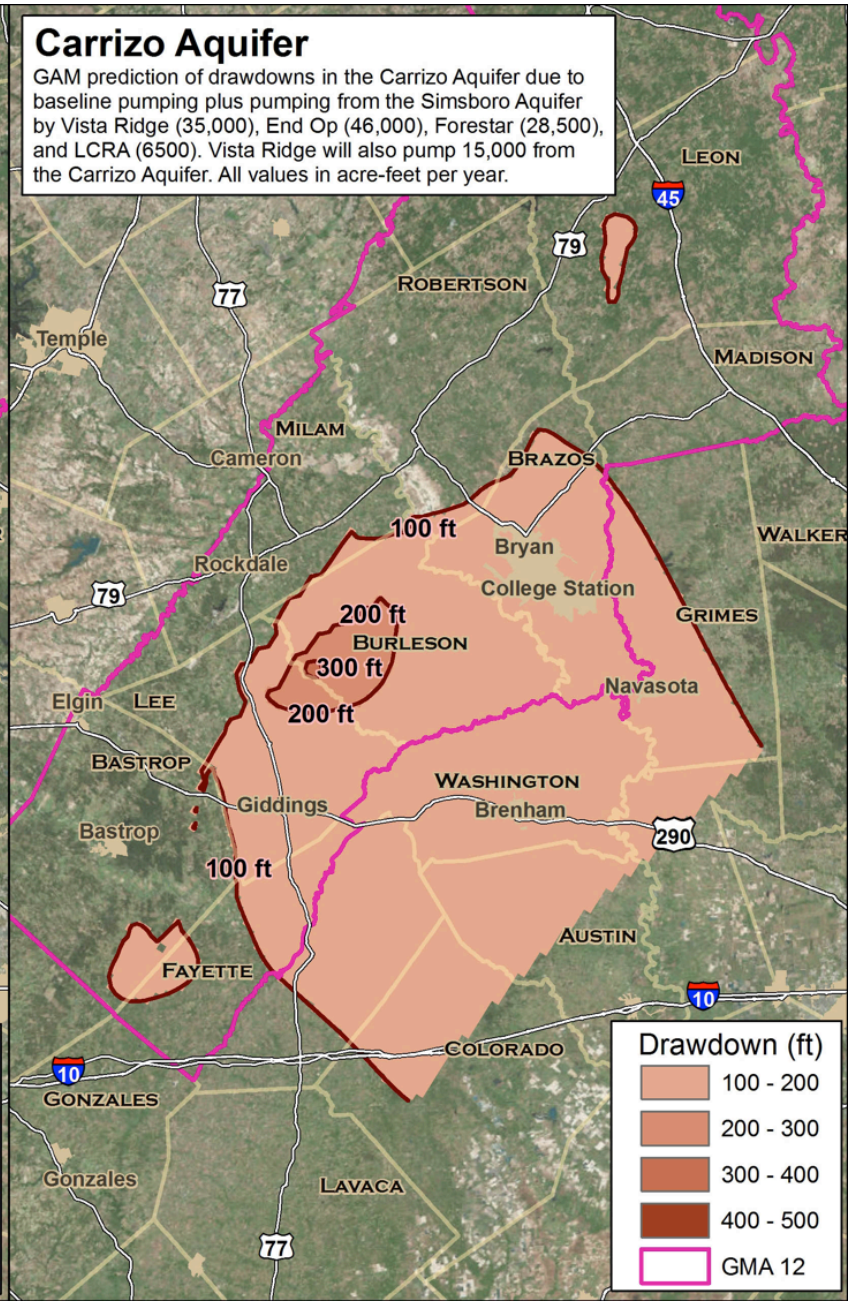
New Rice Report

▲ Two GAM simulations were performed.

- **The first simulated baseline pumping alone.**
- **The second simulated baseline pumping, plus proposed or existing pumping by**
  - **Vista Ridge (VR), End Op L.P. (End Op), Forestar Real Estate Group (Forestar), and the Lower Colorado River Authority (LCRA).**

New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.


Carrizo Aquifer
GAM prediction of drawdowns in the Carrizo Aquifer due to baseline pumping.
LEON
ROBERTSON
MADISON
MILAM
Cameron
BRAZOS
WALKER
GRIMES
Temple
Rockdale
Bryan
College Station
BURLESON
100 ft
Navasota
Elgin
LEE
BASTROP
WASHINGTON
Giddings
Brenham
Bastrop
FAYETTE
AUSTIN
COLORADO
GONZALES
Gonzales
LAVACA
45
79
77
290
10
Drawdown (ft)
100 - 200
200 - 300
300 - 400
400 - 500
GMA 12


Carrizo Aquifer
GAM prediction of drawdowns in the Carrizo Aquifer due to baseline pumping plus pumping from the Simsboro Aquifer by Vista Ridge (35,000), End Op (46,000), Forestar (28,500), and LCRA (6500). Vista Ridge will also pump 15,000 from the Carrizo Aquifer. All values in acre-feet per year.
LEON
ROBERTSON
MADISON
MILAM
Cameron
BRAZOS
WALKER
GRIMES
Temple
Rockdale
Bryan
College Station
100 ft
200 ft
BURLESON
300 ft
200 ft
Navasota
Elgin
LEE
BASTROP
WASHINGTON
Giddings
Brenham
Bastrop
100 ft
FAYETTE
AUSTIN
COLORADO
GONZALES
Gonzales
LAVACA
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290
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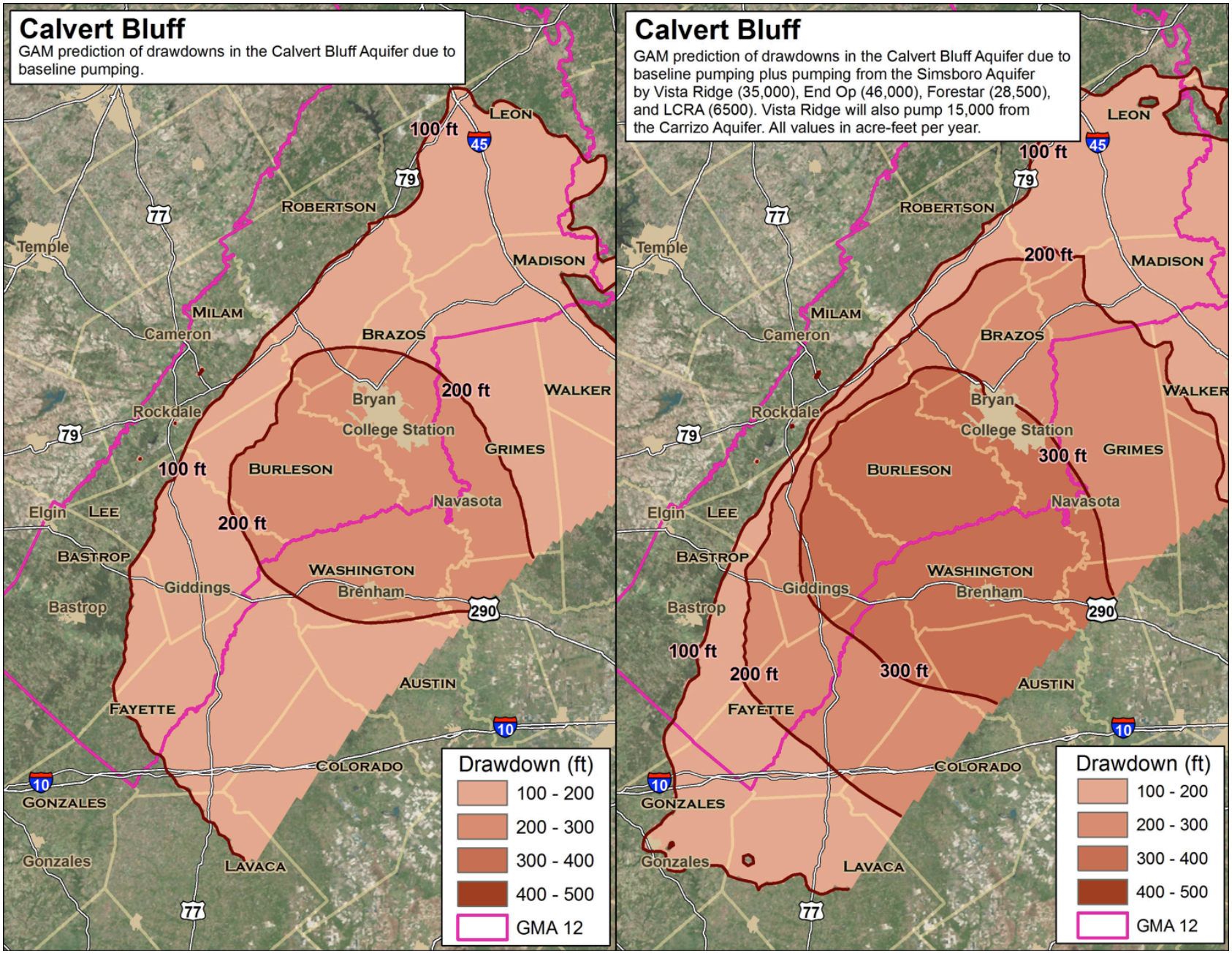
Drawdown (ft)
100 - 200
200 - 300
300 - 400
400 - 500
GMA 12


Calvert Bluff
GAM prediction of drawdowns in the Calvert Bluff Aquifer due to baseline pumping.
100 ft
200 ft
100 ft
200 ft
Drawdown (ft)
100 - 200
200 - 300
300 - 400
400 - 500
GMA 12
Calvert Bluff
GAM prediction of drawdowns in the Calvert Bluff Aquifer due to baseline pumping plus pumping from the Simsboro Aquifer by Vista Ridge (35,000), End Op (46,000), Forestar (28,500), and LCRA (6500). Vista Ridge will also pump 15,000 from the Carrizo Aquifer. All values in acre-feet per year.
100 ft
200 ft
300 ft
100 ft
200 ft
300 ft
Drawdown (ft)
100 - 200
200 - 300
300 - 400
400 - 500
GMA 12
LEON
ROBERTSON
MADISON
MILAM
Cameron
BRAZOS
WALKER
Bryan
College Station
GRIMES
BURLESON
Navasota
Rockdale
Temple
Elgin
LEE
BASTROP
Bastrop
Giddings
WASHINGTON
Brenham
AUSTIN
FAYETTE
COLORADO
GONZALES
Gonzales
LAVACA
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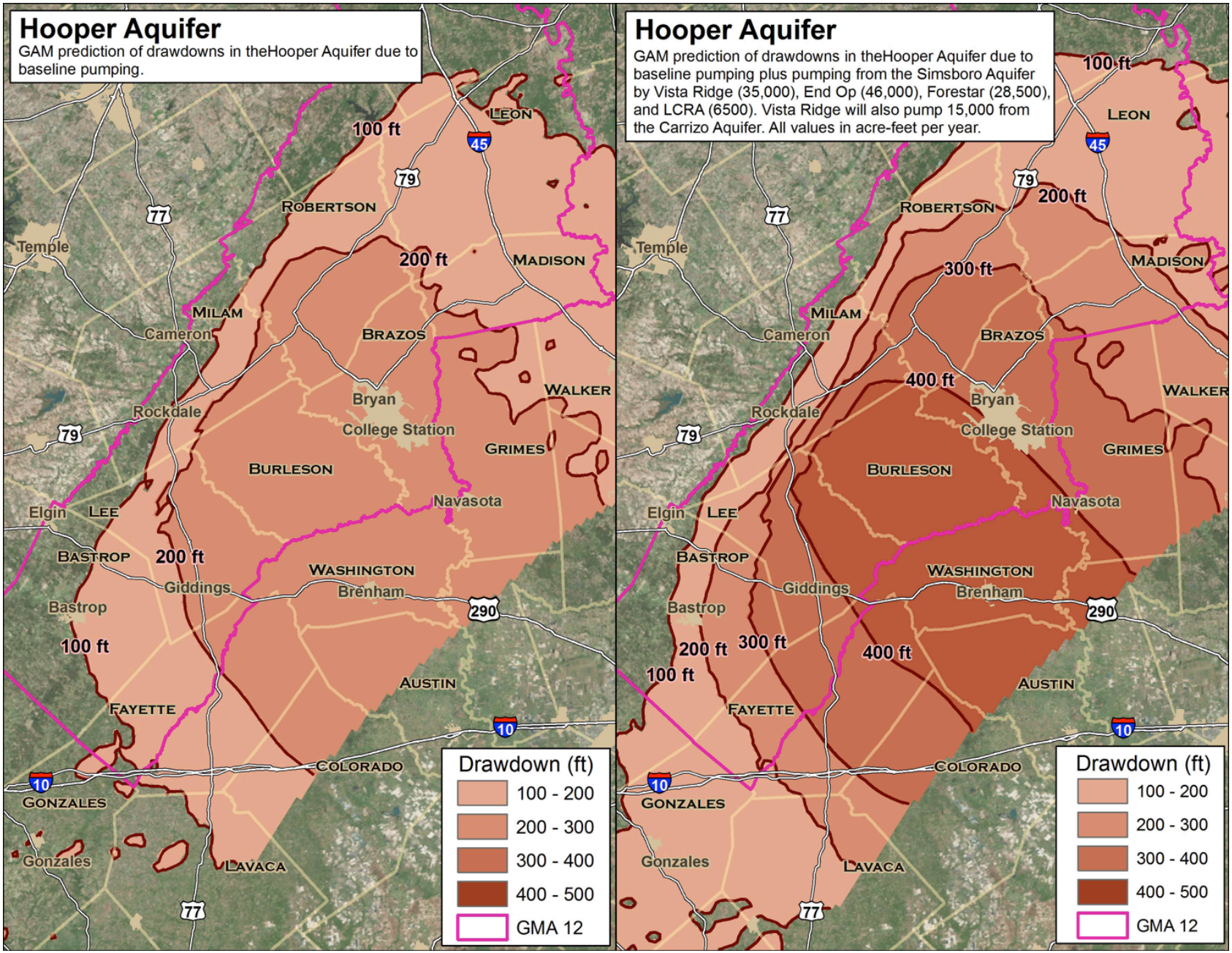
290
10


Hooper Aquifer
GAM prediction of drawdowns in theHooper Aquifer due to baseline pumping.
100 ft
200 ft
LEON
ROBERTSON
MADISON
MILAM
Cameron
BRAZOS
WALKER
Bryan
College Station
Rockdale
GRIMES
BURLESON
Navasota
Elgin
LEE
BASTROP
200 ft
WASHINGTON
Giddings
Brenham
Bastrop
100 ft
AUSTIN
FAYETTE
COLORADO
GONZALES
Gonzales
LAVACA
Temple
45
79
77
290
10
Drawdown (ft)
100 - 200
200 - 300
300 - 400
400 - 500
GMA 12
Hooper Aquifer
GAM prediction of drawdowns in theHooper Aquifer due to baseline pumping plus pumping from the Simsboro Aquifer by Vista Ridge (35,000), End Op (46,000), Forestar (28,500), and LCRA (6500). Vista Ridge will also pump 15,000 from the Carrizo Aquifer. All values in acre-feet per year.
100 ft
200 ft
300 ft
400 ft
LEON
ROBERTSON
MADISON
MILAM
Cameron
BRAZOS
WALKER
Bryan
College Station
Rockdale
GRIMES
BURLESON
Navasota
Elgin
LEE
BASTROP
WASHINGTON
Giddings
Brenham
Bastrop
AUSTIN
FAYETTE
COLORADO
GONZALES
Gonzales
LAVACA
Temple
45
79
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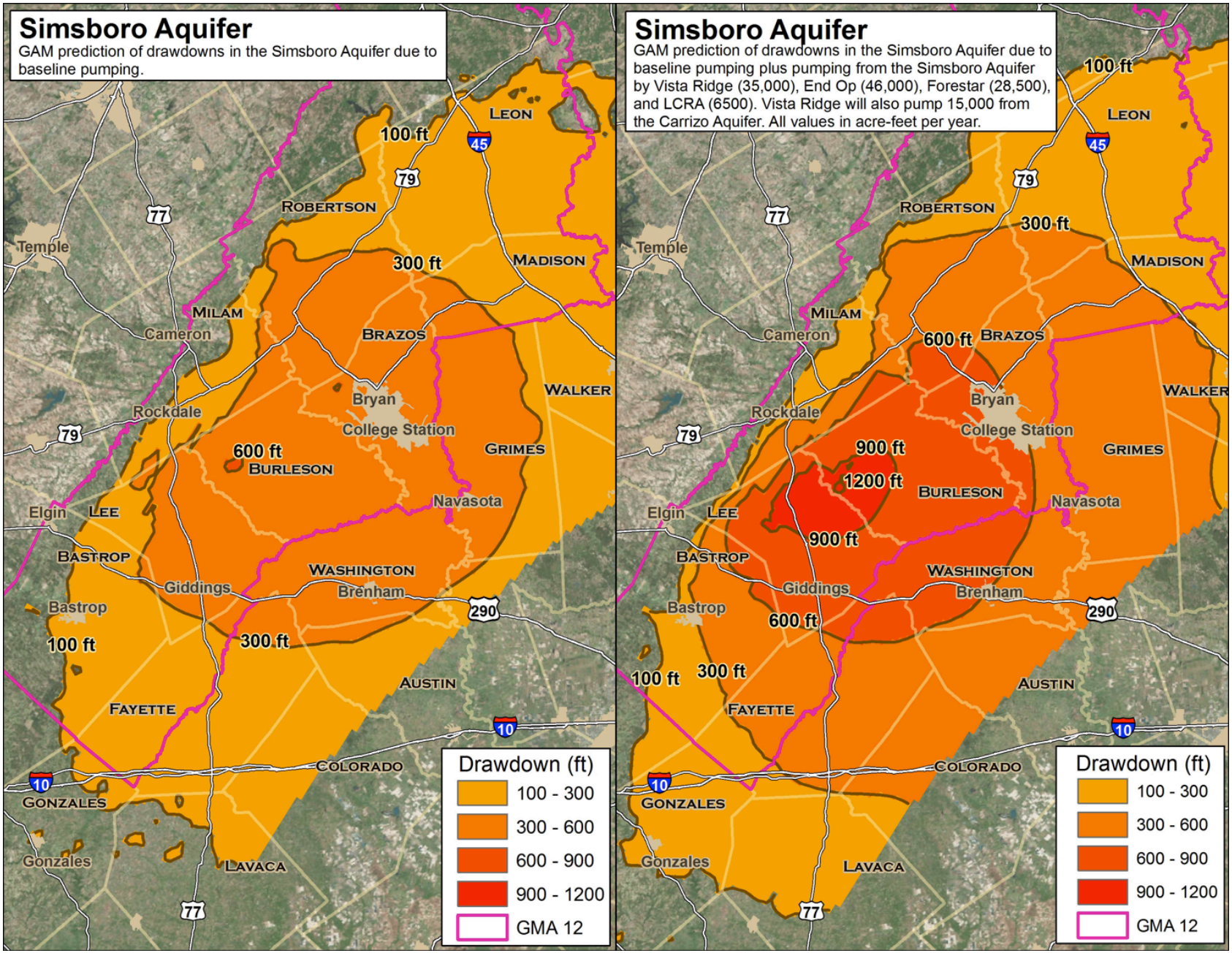
10
Drawdown (ft)
100 - 200
200 - 300
300 - 400
400 - 500
GMA 12


Simsboro Aquifer
GAM prediction of drawdowns in the Simsboro Aquifer due to baseline pumping.
100 ft
300 ft
600 ft
LEON
ROBERTSON
MADISON
MILAM
BRAZOS
WALKER
GRIMES
Temple
Cameron
Rockdale
Bryan
College Station
BURLESON
Navasota
Elgin
LEE
BASTROP
WASHINGTON
Giddings
Brenham
Bastrop
FAYETTE
AUSTIN
COLORADO
GONZALES
Gonzales
LAVACA
45
79
77
290
10
Drawdown (ft)
100 - 300
300 - 600
600 - 900
900 - 1200
GMA 12
Simsboro Aquifer
GAM prediction of drawdowns in the Simsboro Aquifer due to baseline pumping plus pumping from the Simsboro Aquifer by Vista Ridge (35,000), End Op (46,000), Forestar (28,500), and LCRA (6500). Vista Ridge will also pump 15,000 from the Carrizo Aquifer. All values in acre-feet per year.
100 ft
300 ft
600 ft
900 ft
1200 ft
LEON
ROBERTSON
MADISON
MILAM
BRAZOS
WALKER
GRIMES
Temple
Cameron
Rockdale
Bryan
College Station
BURLESON
Navasota
Elgin
LEE
BASTROP
WASHINGTON
Giddings
Brenham
Bastrop
FAYETTE
AUSTIN
COLORADO
GONZALES
Gonzales
LAVACA
45
79
77
290
10
Drawdown (ft)
100 - 300
300 - 600
600 - 900
900 - 1200
GMA 12

New Rice Report

▲ Demonstrates that the GAM predicts:

- **Significant communication between the Simsboro, Hooper, Carrizo and Calvert Bluff aquifers in the Carrizo-Wilcox Group.**
- **Significant drawdown from anticipated pumping of the Simsboro aquifer in the**
  - **Simsboro, Hooper Carrizo and Calvert Bluffs aquifers**
  - **Regionally in counties outside GMA-12 (as far away as Gonzales, Lavaca, Colorado, Austin, Grimes, and Walker counties).**

New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.

New Rice Report

▲ Demonstrates that the GAM predicts:

Table 3
GAM Predictions of Average Drawdowns in the Simsboro Aquifer from 2000 to 2060 Due to Baseline Pumping and Pumping by Vista Ridge, End Op, Forestar, and LCRA

GCD	DFC (ft)	Baseline drawdown (ft)	Drawdown due to additional pumping (ft)	Baseline plus additional drawdown (ft)
LPGCD	256	209	296	505
POSGCD	318	279	238	517

New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.

New Rice Report

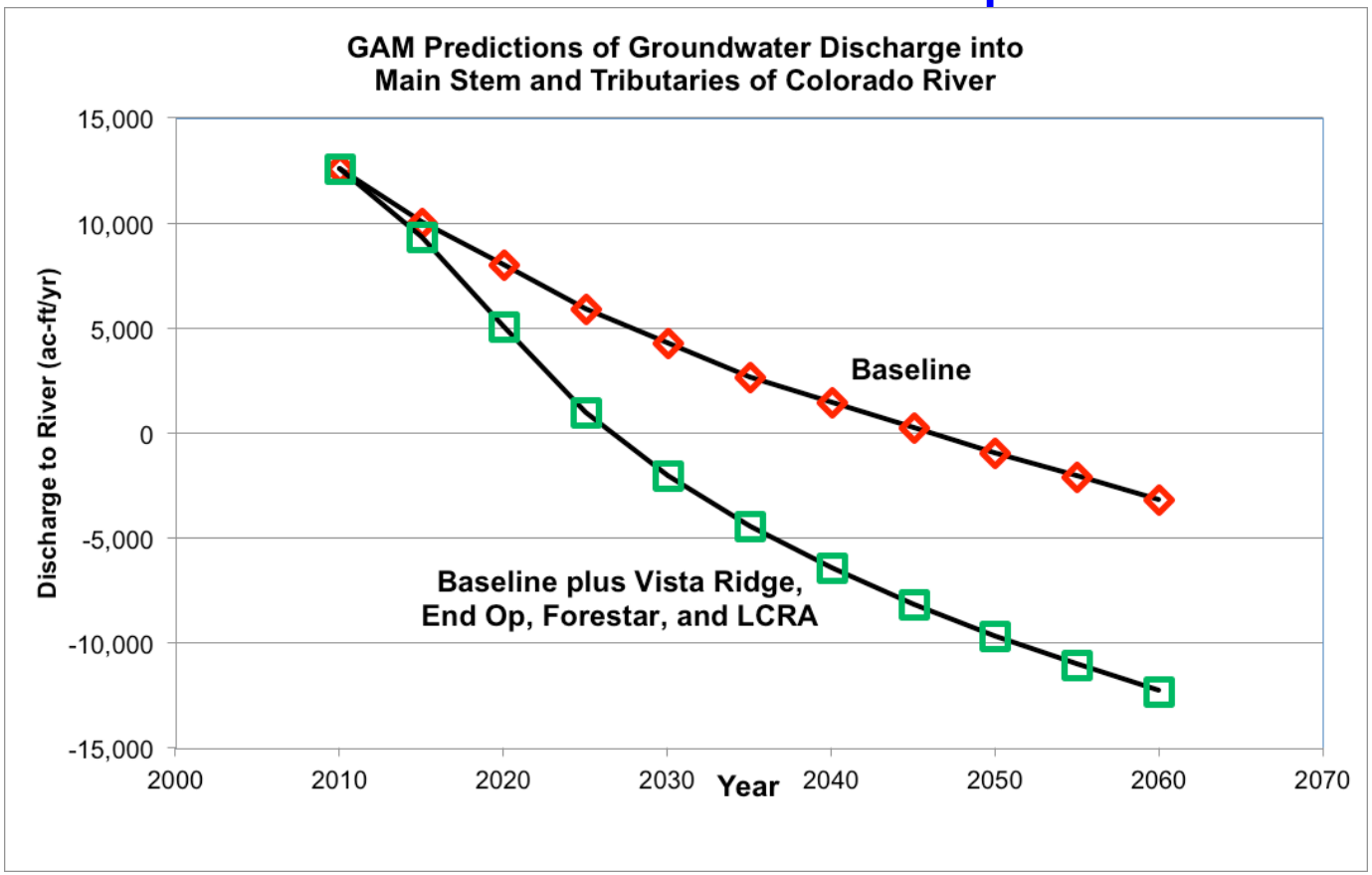
▲ Demonstrates that the GAM predicts:

- **Baseline plus additional pumping will exceed current and proposed DFCs in the Simsboro Aquifer by 2060.**

New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.

New Rice Report

▲ Demonstrates that the GAM predicts:



New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.

New Rice Report

▲ Demonstrates that the GAM predicts:

- **Significant reduction in outflow from the Carrizo-Wilcox Aquifer Group to the Colorado River and its tributaries.**
  - **During times of drought more than half the flow of the Colorado River may be due to groundwater discharge.**
  - **Most of the discharge appears to come from the Simsboro aquifer.**

New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.

New Rice Report

▲ Demonstrates that the GAM predicts:

- **Significant reduction in outflow from the Carrizo-Wilcox Aquifer Group to the Colorado River and its tributaries.**
  - **Baseline pumping in LPGCD will reduce outflows by an estimated 16,000 ac-ft/yr during the planning period thereby reducing river flow.**
  - **Baseline pumping in LPGCD plus additional pumping will reduce outflows by and estimated 26,000 ac-ft/yr during the planning period thereby reducing river flow.**

New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA.

Rice Report Confirms

- Current GAM reliably predicts trends
  - **Less discharge to river with more pumping**
  - **Less discharge to river with longer duration**
  - **Less discharge to river when pumping nearer to river**
- Current GAM does not reliably quantify trends.
  - **Predicted quantity of discharge to river does not agree with empirical data.**

New Exhibit 2016 – Rice, George. March 22, 2016. GAM Predictions of the Effects of Baseline Pumping Plus Proposed Pumping by Vista Ridge, End OP, Forestar, and LCRA. Appendix 1.

ES Requests

▲ ES Requests:

- **The information requested in March 27, 2015 letter be provided in order to understand and manage potential impacts of vertical leakage on exempt well owners.**
- **Exempt well owners in the other aquifers in the Carrizo-Wilcox Aquifer Group be notified when permit applications are being considered for the Simsboro and other aquifers that communicate.**

ES Requests

▲ ES observes that:

- **Reduced outflows during drought conditions may have significant ecological impact on the Colorado River, its tributaries, and terrestrial environment.**

▲ ES Requests:

- **GMA-12 Representative instruct the Consultants to seek assistance from TPWD to better understand environmental impacts related to decreased outflows to surface waters and the terrestrial environment as predicted by the GAM.**

ES Recommends

▲ ES Recommendation:

- **The GMA-12 Districts consider the Carrizo-Wilcox Aquifer Group as a single communicating aquifer such that:**
  - **the DFCs for the individual aquifers are combined and evaluated together for purposes of:**
    - **considering the impact of pumping on the aquifers,**
    - **management policies and actions necessary to protect against exceedance of the DFCs, and**
    - **estimating and minimizing impacts of reduced discharges to surface waters, and domestic wells.**

ES Questions

▲ Questions:

- **Are the proposed DFCs for all Districts constrained by the MAG volumes resulting from the currently adopted DFCs?**
- **Will the proposed DFCs, if adopted, lead to a recalculation of MAG that would likely result in an increase in MAG? Is this the intent?**
- **Is this the start of DFC creep?**

ES Requests

▲ ES observes that:

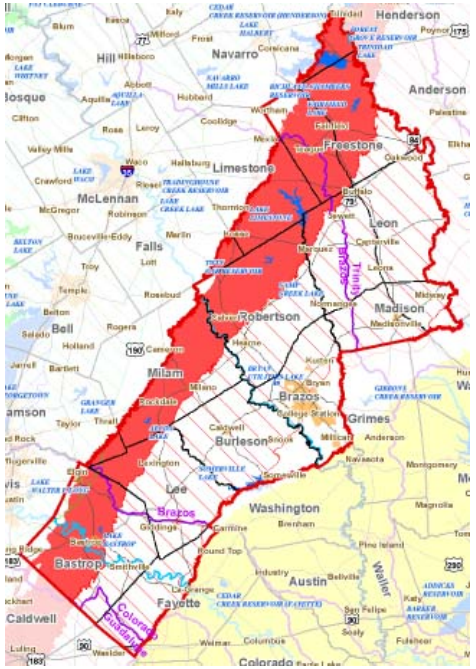
- **The implications is that the additional pumping will cause the DFCs in most, if not all, of the Carrizo-Wilcox Aquifers to be exceeded within a few decades if not sooner.**

▲ ES Requests:

- **GMA-12 Districts, as a part of Consideration 8, prepare a written management plan, specific to this situation, that the Districts agree to implement in order to avoid exceedances.**

It is GMA-12's Responsibility to the Citizens of our Region

- **To establish Desired Future Conditions** (DFC) for the aquifers in our region that protect the groundwater, surface water, and environmental resource of the area *in perpetuity*.
- **DFC's that:**
  - **Protect**
    - **the Aquifers**
    - **rivers & streams**
    - **Springs**
    - **Surface features (Trees, etc.)**
  - **Balance**
    - **Conservation and**
    - **Development**
  - **Provide needs of**
    - **Local Counties**
    - **Export where possible**



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Steve.Box@att.net