

The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance. The text is centered on the left side of the slide.

BALANCING ENVIRONMENTAL, MUNICIPAL, AND AGRICULTURAL NEEDS IN THE EDWARDS AQUIFER: ***A FARMER'S PERSPECTIVE***

ADAM YABLONSKI

COMANCHE CREEK FARMS

D'HANIS, TX



EDWARDS AQUIFER REGION

1615 N. St Mary's Street • San Antonio, Texas 78215 • 210.222.2204 • 1.800.292.1047 • www.edwardsaquifer.org

Drainage basins in the drainage area collect surface water runoff and funnel it into streams that cross the recharge zone.



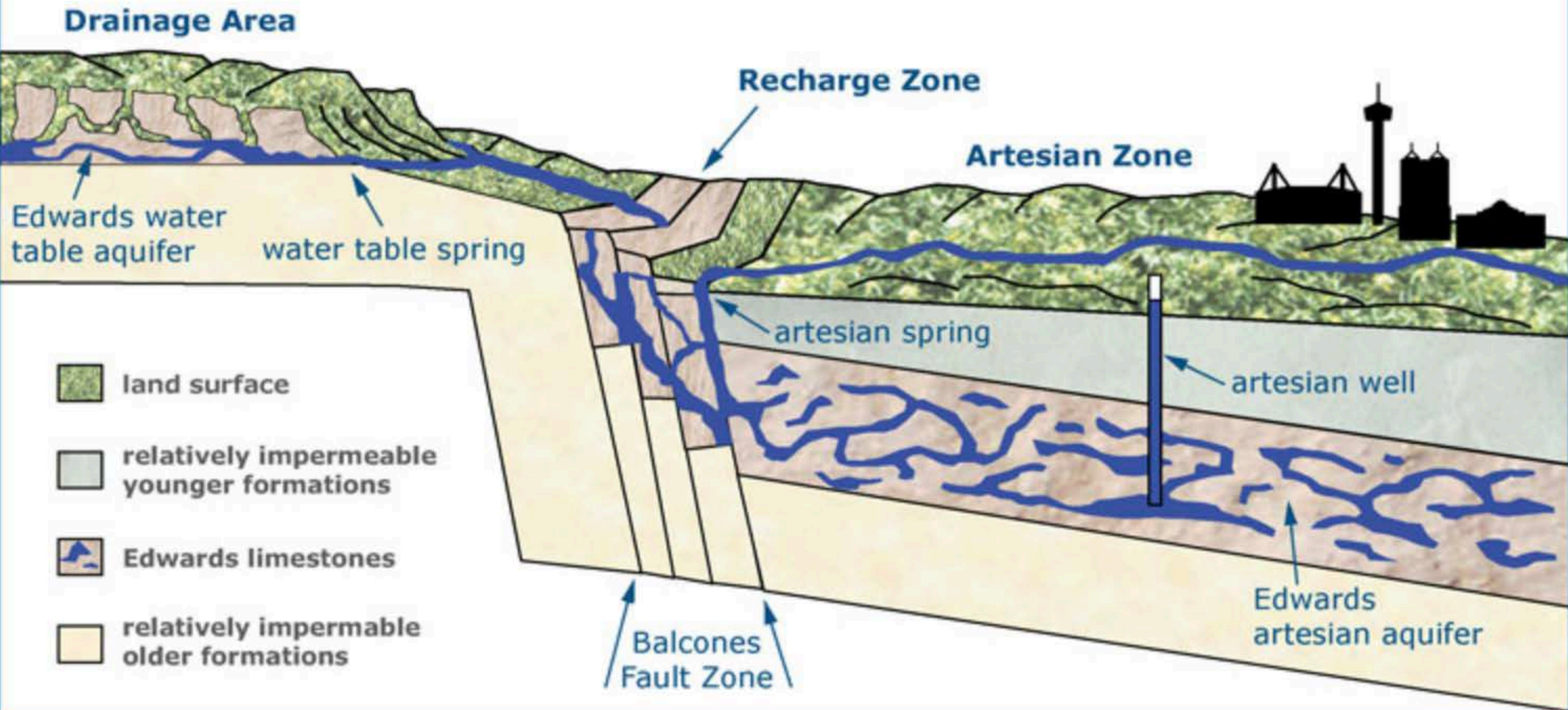
In the artesian zone, the water flows generally from west to east.

Water movement through the Edwards Limestone is generally slower south and east of the fresh water zone. This water remains in contact with the limestone and gypsum longer, allowing dissolved mineral concentrations to increase to over 1,000 milligrams/liter.

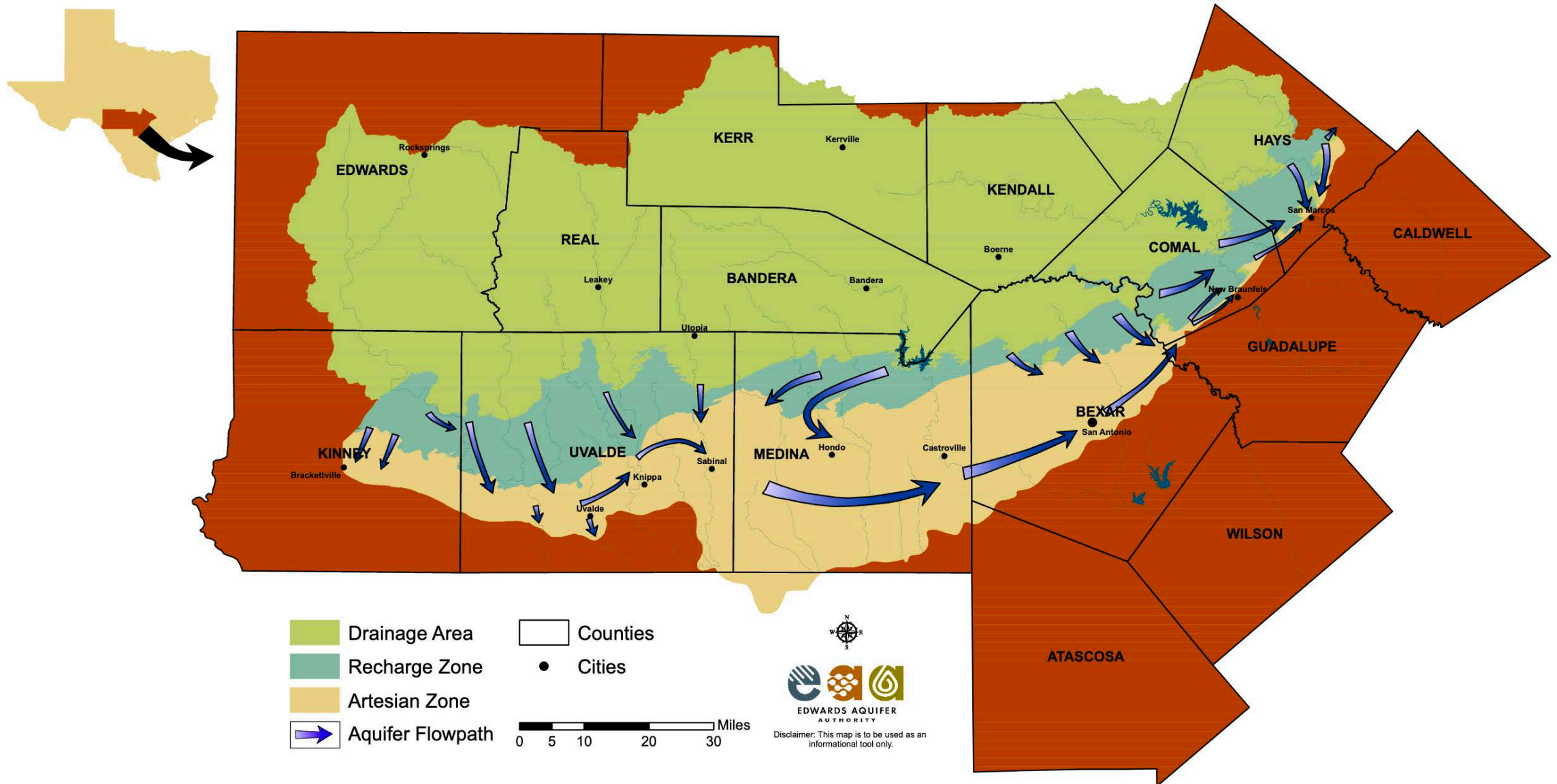
Drainage Area	County Lines
Recharge Zone	EAA Jurisdictional Boundary
Artesian Zone	San Antonio City Limits
	Major Rivers
	Minor Rivers
	Intermittent Streams



Typical Cross-Section of the Edwards Aquifer



General Aquifer Flowpath



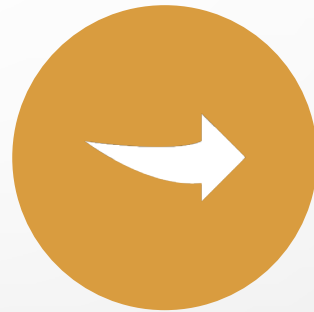
KEY EDWARDS AQUIFER CHARACTERISTICS



**RAPIDLY
RECHARGES**



**CLEAN, EASILY
ACCESSED WATER**

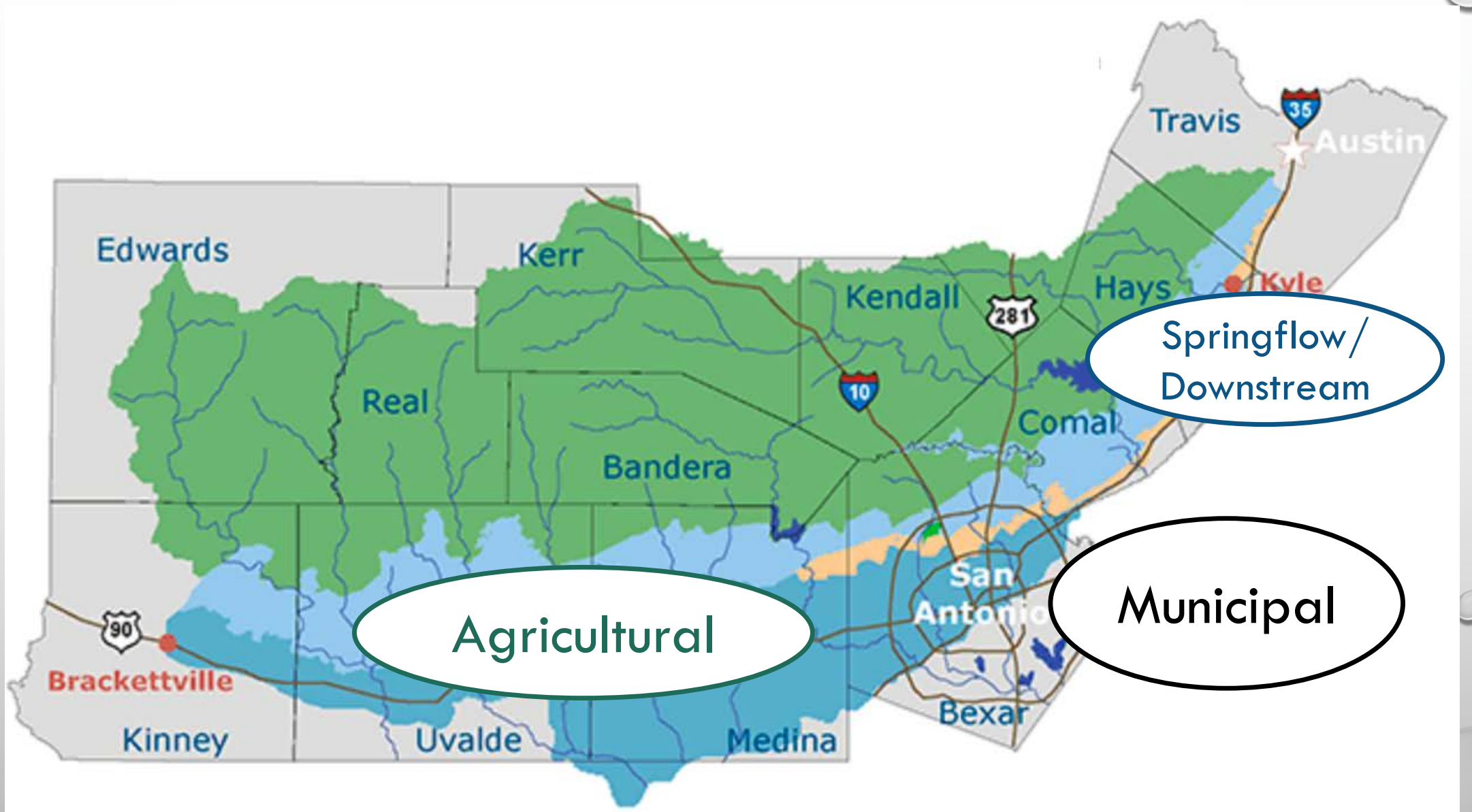


**HIGHLY
TRANSMISSIVE**



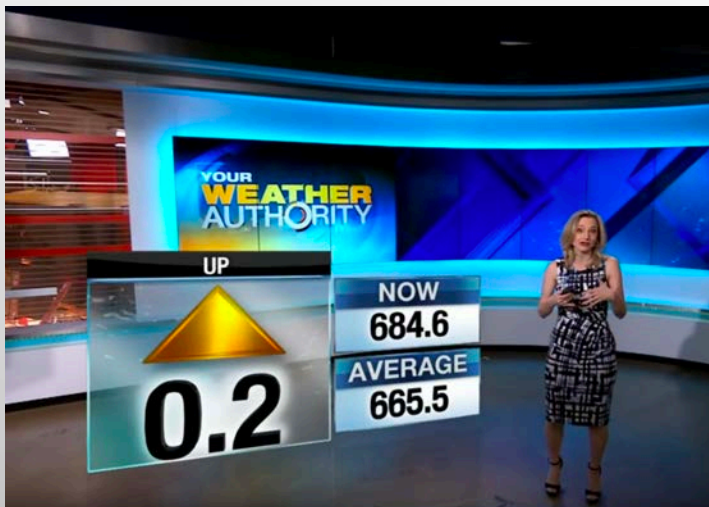
**BIOLOGICALLY
DIVERSE**

3 MAJOR INTEREST GROUPS



MUNICIPAL

- EDWARDS AQUIFER IS MAJOR SOURCE OF DRINKING WATER FOR ABOUT 2 MILLION PEOPLE
- SAN ANTONIO, NEW BRAUNFELS, SAN MARCOS (I-35 CORRIDOR)
- RAPIDLY GROWING POPULATION
- PUBLIC HAS A RELATIVELY HIGH AWARENESS OF WATER SOURCE, SUPPORTIVE OF AQUIFER PROTECTION
- RELATIVELY LOW PER CAPITA WATER USE, LESS THAN 140 GPD



STAGE 1 RESTRICTIONS
SAWS CUSTOMERS

Day Of The Week	Address Ending In
Monday: 0 or 1	
Tuesday: 2 or 3	
Wednesday: 4 or 5	
Thursday: 6 or 7	
Friday: 8 or 9	

Can water before 11am or after 7pm

Handheld watering allowed any day, any time

The graphic includes the abc 12 logo and a background image of a person watering a lawn.



SPRINGFLOW & DOWNSTREAM

- 2 MAJOR SPRINGS – COMAL SPRINGS AND SAN MARCOS SPRINGS
- RIVER-BASED RECREATION
- DOWNSTREAM CITIES AND INDUSTRIES RELY ON SPRINGFLOW TO FEED RIVERS
- ENVIRONMENTAL FLOWS



ENDANGERED SPECIES



COMAL SPRINGS RIFFLE BEETLE

Heterelmis comalensis



FOUNTAIN DARTER

Etheostoma fonticola



PECK'S CAVE AMPHIPOD

Stygobromus pecki



SAN MARCOS SALAMANDER

Eurycea nana



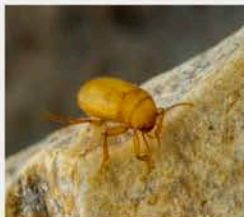
TEXAS BLIND SALAMANDER

Eurycea rathbuni



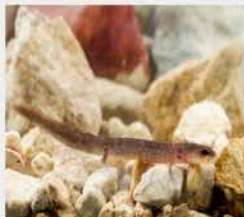
TEXAS WILD RICE

Zizania texana



EDWARDS AQUIFER DIVING BEETLE

Haideoporus texanus



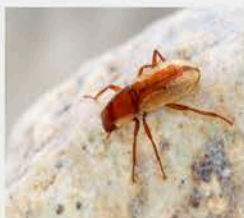
COMAL SPRINGS SALAMANDER

Eurycea sp.



TEXAS TROGLOBITIC WATER SLATER

Lirceolus smithii



COMAL SPRINGS DRYOPID BEETLE

Stygoparnus comalensis

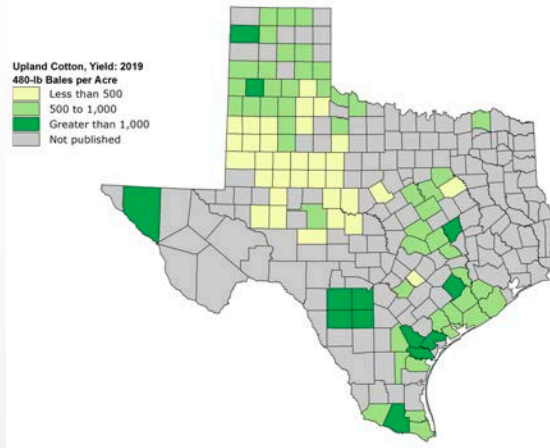


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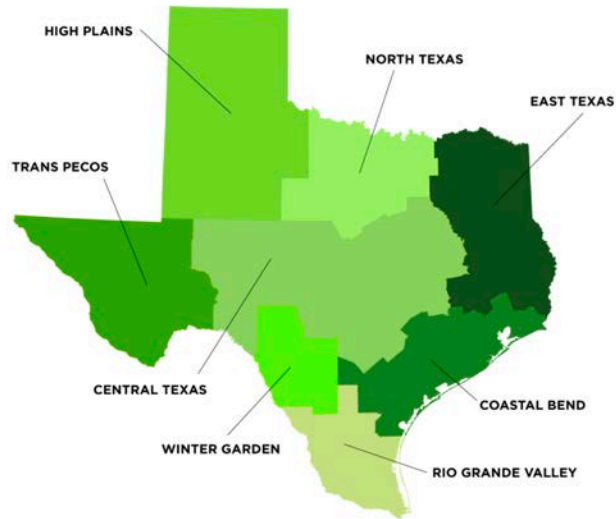
SAN MARCOS GAMBUSIA

Gambusia georgei

County Estimate Map - Upland Cotton

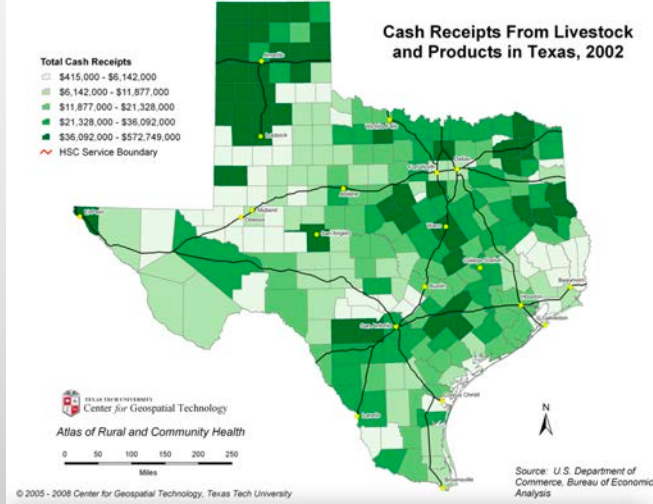
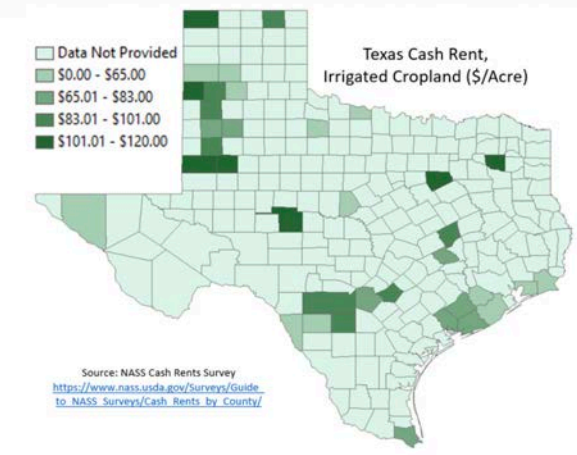


AGRICULTURE

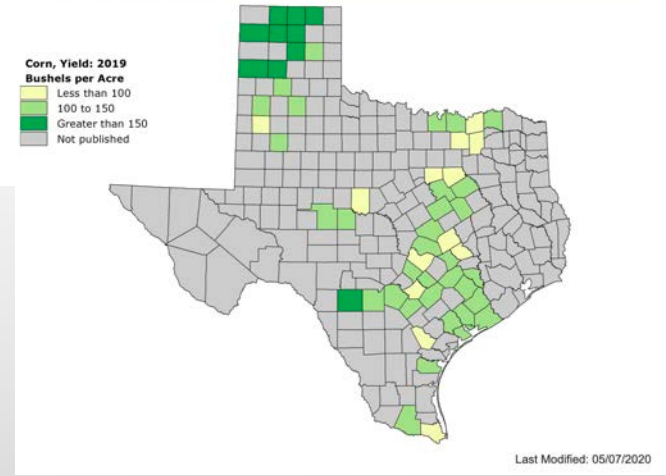


Irrigated Map

Posted on September 17, 2019 by tiffany.dowell | Full size is 723 x 592 pixels

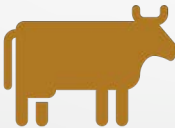


County Estimate Map - Corn



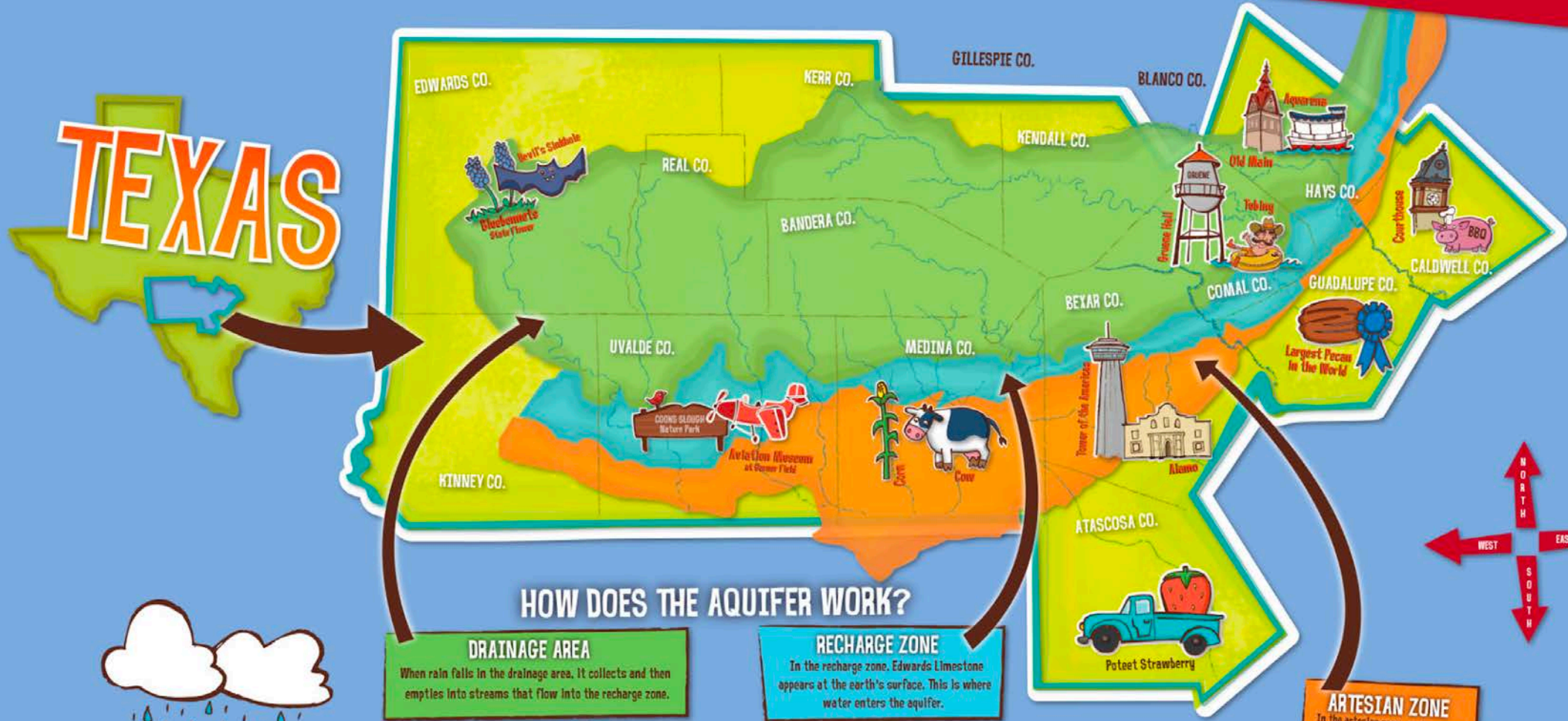
MAJOR IRRIGATED CROPS

- COTTON
- CORN
- WHEAT
- GRAIN SORGHUM
- OATS
- SUNFLOWERS
- SESAME
- HAY/GRAZING - CATTLE



	High Plains	N. TX	E. TX	Central	Coastal Bend	RGV	Winter Garden	Trans-Pecos
Artichokes						✓	✓	
Asparagus							✓	
Beets	✓					✓	✓	
Bell peppers	✓	✓	✓	✓	✓	✓	✓	✓
Broccoli						✓	✓	
Cabbage			✓			✓	✓	
Carrots	✓						✓	
Celery						✓		
Corn	✓		✓				✓	
Cucumbers			✓			✓	✓	
Field peas	✓		✓					
Green beans							✓	
Greens			✓			✓	✓	
Herbs	✓	✓	✓	✓	✓	✓	✓	✓
Lettuce	✓	✓	✓	✓	✓	✓	✓	✓
Mushrooms			✓	✓				
Okra						✓	✓	
Onions	✓		✓			✓	✓	✓
Potatoes	✓		✓					
Pumpkin	✓							
Radishes				✓				
Spinach	✓					✓	✓	
Squash			✓			✓	✓	
Sweet potatoes			✓					
Tomatoes			✓			✓		
Turnips			✓					

TEXAS



HOW DOES THE AQUIFER WORK?

DRAINAGE AREA

When rain falls in the drainage area, it collects and then empties into streams that flow into the recharge zone.

RECHARGE ZONE

In the recharge zone, Edwards Limestone appears at the earth's surface. This is where water enters the aquifer.

ARTESIAN ZONE

In the artesian zone, empty spaces in the limestone rock are filled with water that is under pressure. If there is a lot of pressure, water is forced to the surface through openings such as artesian springs and free-flowing wells. If there isn't enough pressure, water can be pumped to the surface using wells.



DRAINAGE AREA

RECHARGE ZONE

ARTESIAN ZONE

"THE EDWARDS ISSUE"

- GROUNDWATER IN TEXAS IS CONTROLLED BY "RULE OF CAPTURE" AS A PROPERTY RIGHT, SURFACE WATER IS PERMITTED BY THE STATE
- "DROUGHT OF THE 50'S" - DROUGHT OF RECORD, COMAL SPRINGS GOES DRY
- CITIES NEEDED WATER TO GROW, UNABLE TO DIVERSIFY THEIR WATER SOURCE
- RURAL LANDOWNERS WERE RESISTANT TO EFFORTS TO LIMIT THEIR PROPERTY RIGHTS
- SPRINGS COMMUNITIES AND DOWNSTREAM INTERESTS WANTED TO LIMIT PUMPING TO MAXIMIZE SPRINGFLOW
- LAWSUITS, POLITICAL BATTLES ENSUED

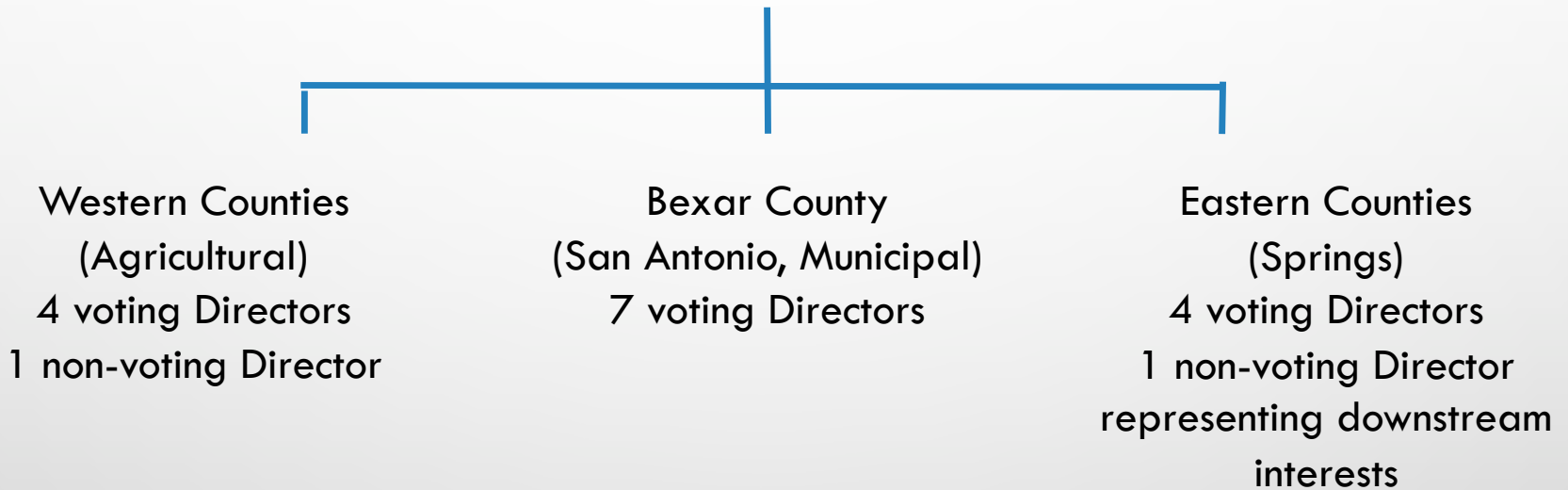


THREAT OF FEDERAL TAKEOVER

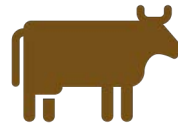
- 1991 SIERRA CLUB SUED U.S. FISH & WILDLIFE FOR ENDANGERED SPECIES ACT VIOLATIONS
- ORDERED USFWS TO ESTABLISH SAFE MINIMUM CONTINUOUS SPRINGFLOW LEVELS, AND TEXAS TO ESTABLISH A PLAN TO ENSURE THOSE SPRINGFLOWS
- "LAST CHANCE FOR ADOPTION OF AN ADEQUATE STATE PLAN BEFORE THE 'BLUNT AXES' OF FEDERAL INTERVENTION HAVE TO BE DROPPED"
- IN 1993 THE TEXAS LEGISLATURE CREATED THE EDWARDS AQUIFER AUTHORITY (EAA) AND A PERMITTING SYSTEM THAT DID AWAY WITH RULE OF CAPTURE IN THE REGION



Board of Directors



EDWARDS PERMITTING AND AGRICULTURE



Livestock and household use
is exempt



Irrigation permits were
issued based on historical
use



2 acre-feet issued per acre
1 acre-foot "unrestricted",
1 acre-foot "base"



Permitting and transfer
rules created a water
market



Aquifer management fees
capped at \$2 per acre-
foot pumped



"Finish out a crop" rule for
Critical Period
Management

CRITICAL PERIOD TRIGGERS, STAGES, AND WITHDRAWAL REDUCTIONS

The following Critical Period triggers and percent reductions apply to all Municipal, Industrial and Irrigation users authorized to withdraw more than 3 acre-feet.



San Antonio Pool

Critical Period is declared in the San Antonio Pool when the 10-day average of the rate of springflow at either the Comal or San Marcos springs, or aquifer reading at the J-17 Index Well in Bexar County drops below the Stage I trigger level. Likewise, a more restrictive stage of Critical Period is activated by any one of these triggers. However, the declaration of a less restrictive stage of Critical Period requires the 10-day averages of all three trigger levels to be above the activation thresholds of the particular stage in effect at the time.

TRIGGER (based on 10-day average)	CRITICAL PERIOD STAGE I	CRITICAL PERIOD STAGE II	CRITICAL PERIOD STAGE III	CRITICAL PERIOD STAGE IV	CRITICAL PERIOD STAGE V
Index Well J-17 Level (MSL)	<660	<650	<640	<630	<625
San Marcos Springs Flow (CFS)	<96	<80	N/A	N/A	N/A
Comal Springs Flow (CFS)	<225	<200	<150	<100	<45/40*
Withdrawal Reduction	20%	30%	35%	40%	44%

Uvalde Pool

The Uvalde Pool enters Critical Period at Stage II based on the 10-day average of aquifer level readings at the J-27 Index Well in Uvalde County.

TRIGGER (based on 10-day average)	CRITICAL PERIOD STAGE I	CRITICAL PERIOD STAGE II	CRITICAL PERIOD STAGE III	CRITICAL PERIOD STAGE IV	CRITICAL PERIOD STAGE V
Index Well J-27 Level (MSL)	N/A	<850	<845	<842	<840
San Marcos Springs Flow (CFS)	N/A	N/A	N/A	N/A	N/A
Comal Springs Flow (CFS)	N/A	N/A	N/A	N/A	N/A
Withdrawal Reduction	N/A	5%	20%	35%	44%

*San Antonio Pool only: In order to enter into Critical Period Stage V, the applicable springflow trigger is either less than 45 cfs based on a ten-day rolling average or less than 40 cfs based on a three-day rolling average. Expiration of Critical Period Stage V is based on a ten-day rolling average of 45 cfs or greater.

Definitions: (MSL) Mean Sea Level; (CFS) Cubic Feet Per Second

EFFECTS OF A WATER MARKET ON AGRICULTURE



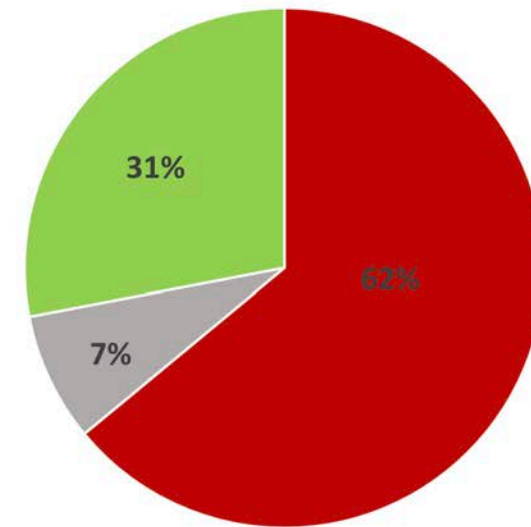
- AGRICULTURAL WATER IS THE CHEAPEST, MOST PLENTIFUL SOURCE OF WATER RIGHTS TO LEASE OR BUY
- CAN CONVERT "BASE" WATER TO "UNRESTRICTED" WATER BY INSTALLATION OF CONSERVATION EQUIPMENT
- CREATED ENHANCED ECONOMIC INCENTIVES TO CONSERVE WATER
- THE "WALMART RULE"
- OVER TIME, WATER LEAVES IRRIGATED AGRICULTURE AND DOESN'T COME BACK



EDWARDS AQUIFER PERMITS 2019

- 1,246 PERMIT HOLDERS AUTHORIZED TO PUMP 571,599 ACRE-FEET PER YEAR
- 166 MUNICIPAL PERMIT HOLDERS
- 282 INDUSTRIAL PERMIT HOLDERS
- 798 IRRIGATION PERMIT HOLDERS

2019 Regional Authorizations by Purpose of Use

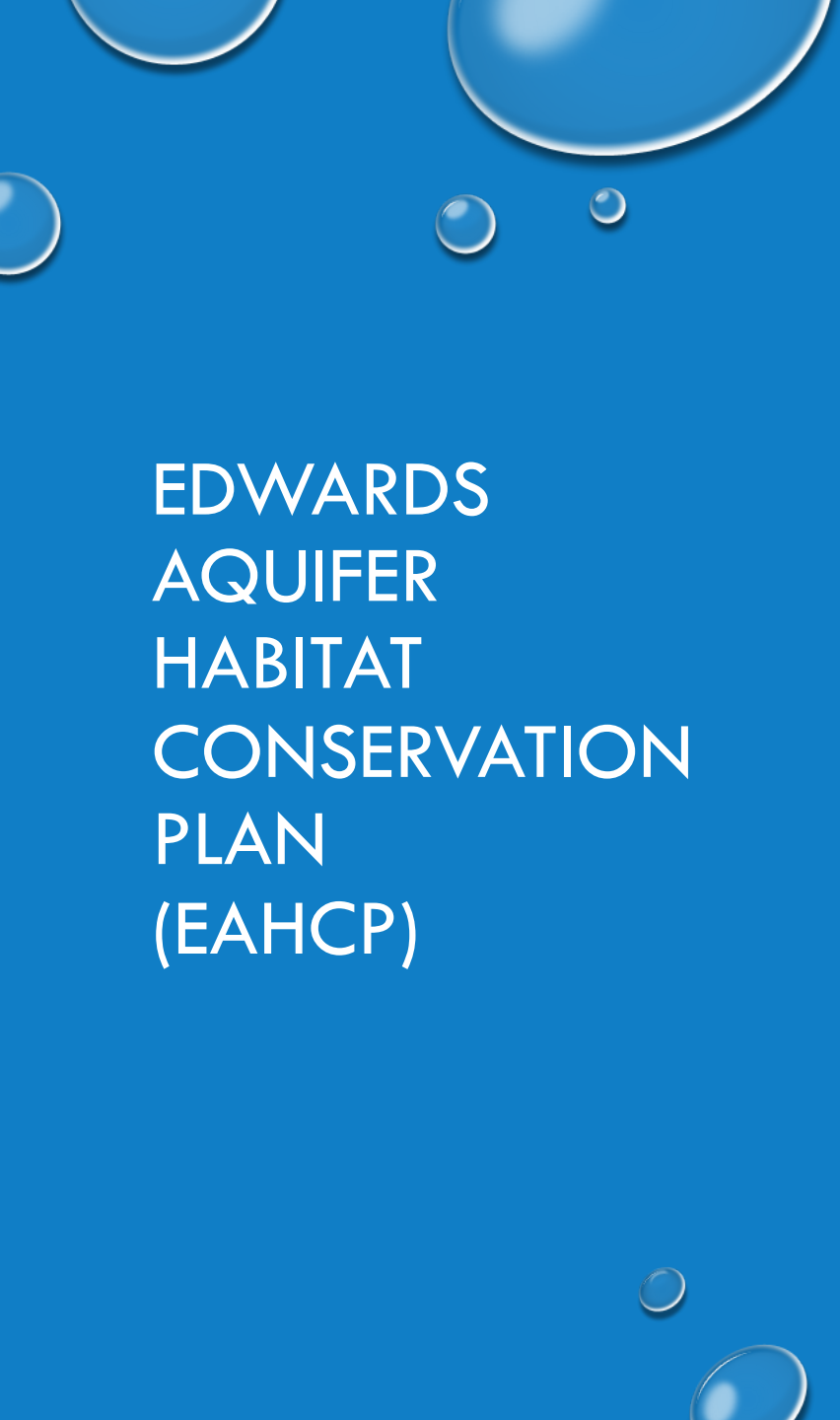


■ Municipal ■ Industrial ■ Irrigation

- 571,599 acre-feet: Municipal 356,010 acre-feet; Industrial 41,294 acre-feet; Irrigation 174,295 acre-ft.

EDWARDS AQUIFER RECOVERY IMPLEMENTATION PROGRAM (EARIP)

- IN 2007 ENDANGERED SPECIES STILL NOT FULLY PROTECTED DURING A REPEAT OF THE DROUGHT OF RECORD
- TEXAS LEGISLATURE ORDERED THE EDWARDS AQUIFER RECOVERY IMPLEMENTATION PLAN TO ENACT A PLAN BY DECEMBER, 2012
- MORE THAN 40 STAKEHOLDERS, REPRESENTING CITIES, INDUSTRIES, UTILITIES, ENVIRONMENTAL GROUPS, RIVER AUTHORITIES, STATE GOVERNMENTAL ENTITIES, CITIZENS, AND OTHERS
- CONSENSUS-BASED PROCESS
- CREATED THE EDWARDS AQUIFER HABITAT CONSERVATION PLAN (EAHCP), WHICH ALLOWED A 15-YEAR INCIDENTAL TAKE PERMIT (ITP) (2013 – 2028)



EDWARDS AQUIFER HABITAT CONSERVATION PLAN (EAHCP)

- HABITAT RESTORATION
- MINIMIZATION OF RECREATION IMPACTS
- REGIONAL MUNICIPAL CONSERVATION PROGRAM
- WATER QUALITY PROTECTION PROGRAMS
- BIOLOGICAL MONITORING, WATER QUALITY MONITORING, APPLIED RESEARCH
- REFUGIA
- PUMPING REDUCTIONS
- AQUIFER STORAGE AND RECOVERY (ASR)
- VOLUNTARY IRRIGATION SUSPENSION PROGRAM OPTION (VISPO)

VOLUNTARY IRRIGATION SUSPENSION PROGRAM OPTION (VISPO)

- PARTICIPANTS AGREE TO FORBEAR PUMPING FOR THE FOLLOWING CALENDAR YEAR WHEN WELL J-17 IS AT OR BELOW 635 FT ON OCTOBER 1, OTHERWISE CAN USE AS NORMAL
- STANDBY PAYMENT: \$54 PER ACRE-FOOT EVERY YEAR, WHETHER TRIGGERED OR NOT
- FORBEARANCE PAYMENT: AN ADDITIONAL \$160 PER ACRE-FOOT FOR YEARS IN WHICH FORBEARANCE IS REQUIRED
- TARGET ENROLLMENT: 41,795 ACRE-FEET. ALL "BASE" AND "UNRESTRICTED" WATER ELIGIBLE
- 5-YEAR CONTRACT

VOLUNTARY IRRIGATION SUSPENSION PROGRAM OPTION (VISPO)

- DESIGNED FROM THE GROUND UP TO BOTH SATISFY MODELED ENVIRONMENTAL SPRINGFLOW NEEDS AND TO APPEAL TO IRRIGATORS
- INITIAL REACTION WAS MIXED
- ADDED A NEW WRINKLE TO LANDLORD/TENANT AGREEMENTS
- WILL REDUCE REGIONAL AGRICULTURAL ACTIVITY WHEN TRIGGERED, BUT WILL ALSO PROTECT THE INDUSTRY AGAINST DEEP DROUGHT AND PUMPING RESTRICTIONS
- SLOWLY ACHIEVED FULL ENROLLMENT
- TRIGGER CONDITIONS IN OCTOBER 2014 CAUSED FORBEARANCE IN 2015
- OPEN TO ALL PERMITS, BUT 99% ARE IRRIGATION PERMITS AND 1% ARE MUNICIPAL/INDUSTRIAL

AQUIFER STORAGE AND RECOVERY (ASR)

- SAN ANTONIO WATER SYSTEM (SAWS) PUMPS WATER FROM EDWARDS AQUIFER AND STORES IN CARRIZO AQUIFER
- WHEN DROUGHT TRIGGERS ARE MET, SAWS WILL PUMP FROM STORES IN CARRIZO AQUIFER INSTEAD OF FROM EDWARDS AQUIFER
- THE SOURCE OF WATER PERMITS FOR THIS PROGRAM WAS INITIALLY THROUGH LEASES
- NOW THAT STORAGE TARGETS HAVE BEEN MET, PROGRAM HAS BEEN ADAPTED TO MOSTLY A FORBEARANCE MODEL, LIKE VISPO

AQUIFER STORAGE AND RECOVERY (ASR)

- FLAT FEE OF \$100 PER ACRE FOOT EVERY YEAR, WHETHER FORBEARANCE IS TRIGGERED OR NOT
- TRIGGERS WHEN 10-YEAR ROLLING RECHARGE AVERAGE IS LESS THAN 500,000 ACRE-FEET PER YEAR
- LESS LIKELY TO TRIGGER THAN VISPO
- 10-YEAR CONTRACT
- GOAL IS 50,000 ACRE-FEET, FULLY ENROLLED AT THIS TIME
- OPEN TO ALL PERMITS, BUT 95% ARE IRRIGATION, AND 5% ARE MUNICIPAL AND INDUSTRIAL
- OF 174,295 ACRE-FEET IRRIGATION PERMITS, ALMOST 89,000 ARE IN VISPO OR ASR
- IN THE FUTURE, ASR & VISPO MAY BE COMBINED IN SOME WAY

LESSONS LEARNED

Representation and engagement matter

Bring solutions to the table, not just objections

Voluntary, incentive-based conservation works, and can be the cheapest way to achieve a goal

Farmers will engage with a conservation program if it is designed with their needs in mind

The secret sauce is ...



Edwards Aquifer Recovery Implementation Program Participants
Dr. Robert L. Gulley, Program Manager
November 2011

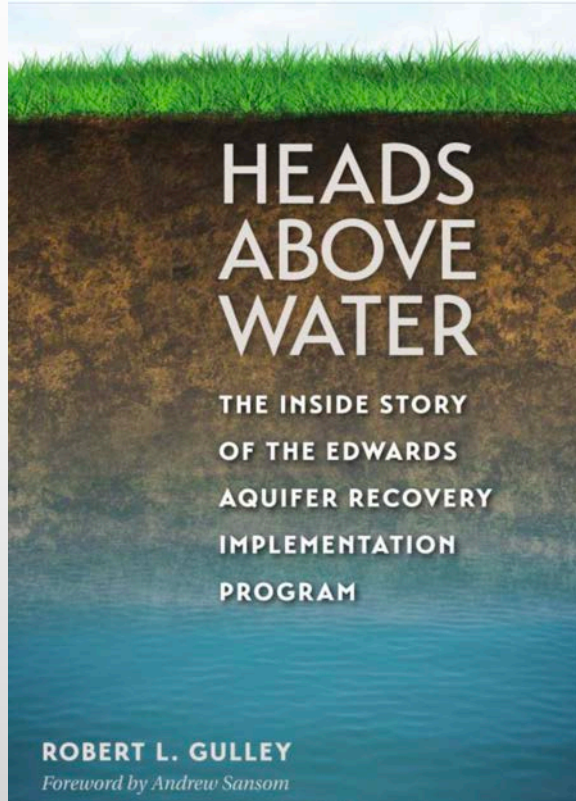
WE SUCCEEDED



2013 Partnership in Conservation
Award presented by U.S.
Secretary of the Interior Sally
Jewell

BUT THE STORY ISN'T OVER...

REFERENCES



www.edwardsaquifer.org

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