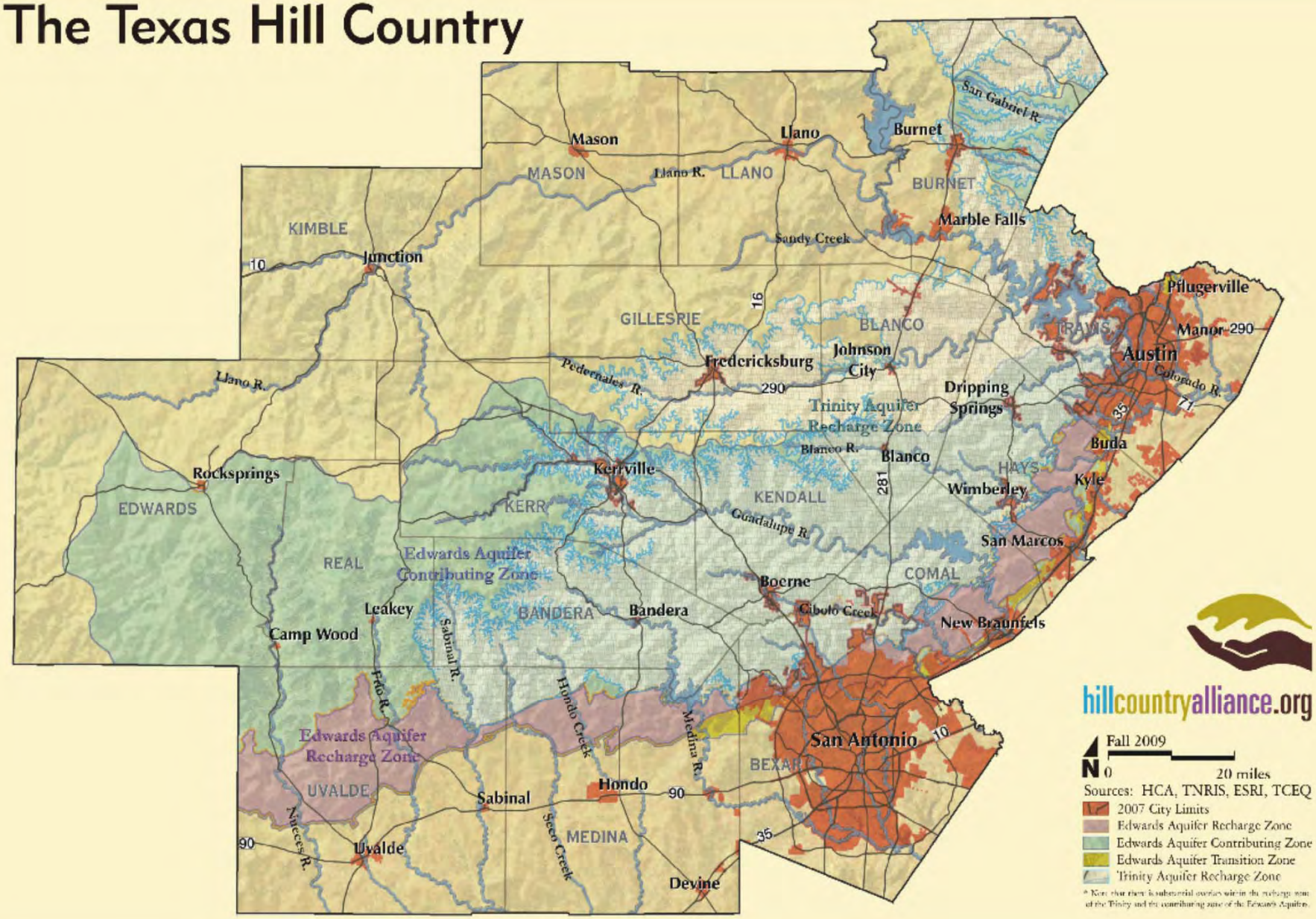
DEFINITION

GROUNDWATER SUSTAINABILITY:

"The development and use of groundwater in a manner that can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences."

Alley et al., USGS, 1999

The Texas Hill Country



1.7 MILLION Developed acres now

3 MILLION People here now

at this rate

1.7 MILLION Developed acres now

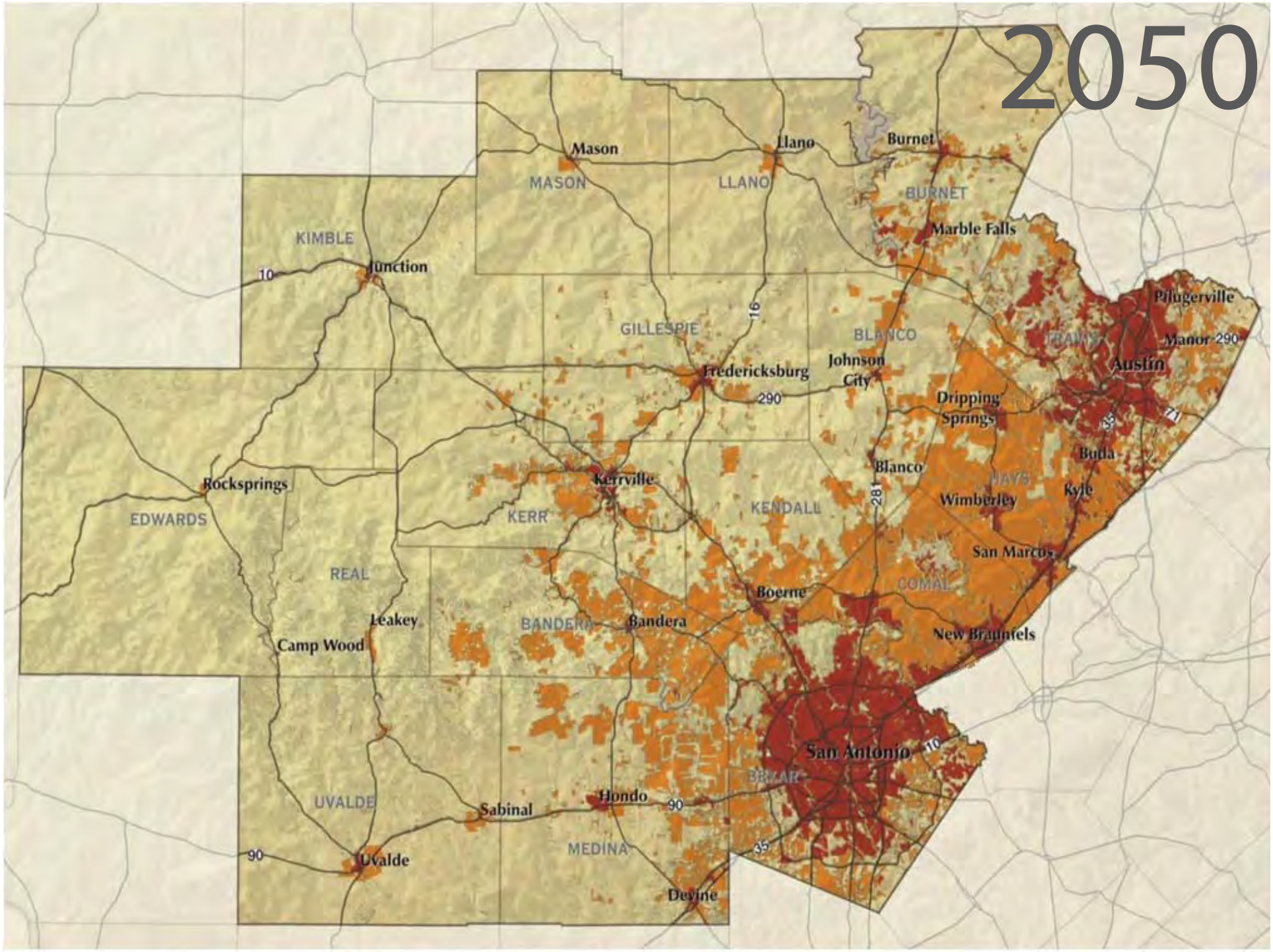
3 MILLION People here now

5.3 MILLION
People here in 2050

3.4 MILLION
Developed acres in 2050

at this rate

1.7 MILLION Developed acres now
3 MILLION People here now


2050
Mason
Llano
Burnet
MASON
LLANO
BURNET
Marble Falls
KIMBLE
Junction
10
16
GILLESPIE
BLANCO
Pflugerville
Manor
290
Austin
Fredericksburg
Johnson City
290
Dripping Springs
35
71
Buda
Blanco
Kyle
Rocksprings
Kerrville
281
Wimberley
EDWARDS
KERR
KENDALL
San Marcos
REAL
COMAL
Boerne
Leakey
BANDERA
Bandera
New Braunfels
Camp Wood
San Antonio
10
BEXAR
UVALDE
Sabinal
Hondo
90
MEDINA
35
90
Uvalde
Devine

Why do we keep doing this?

Why do we keep doing this?

Taxes
Rule of Capture
Few Development Rules
TCEQ Lacks Enforcement
Little Groundwater Regulation
Development Rights Come First
Poor Water Quality Protection Rules

Afraid of New Engineering Models
No Land Use Planning in Texas
Landowners Lack Incentives
Lack of County Authority
No Scenic Protection
Afraid of Change
Greed

Cost of Current Practices

Loss of Cultural Heritage and Scenic Beauty

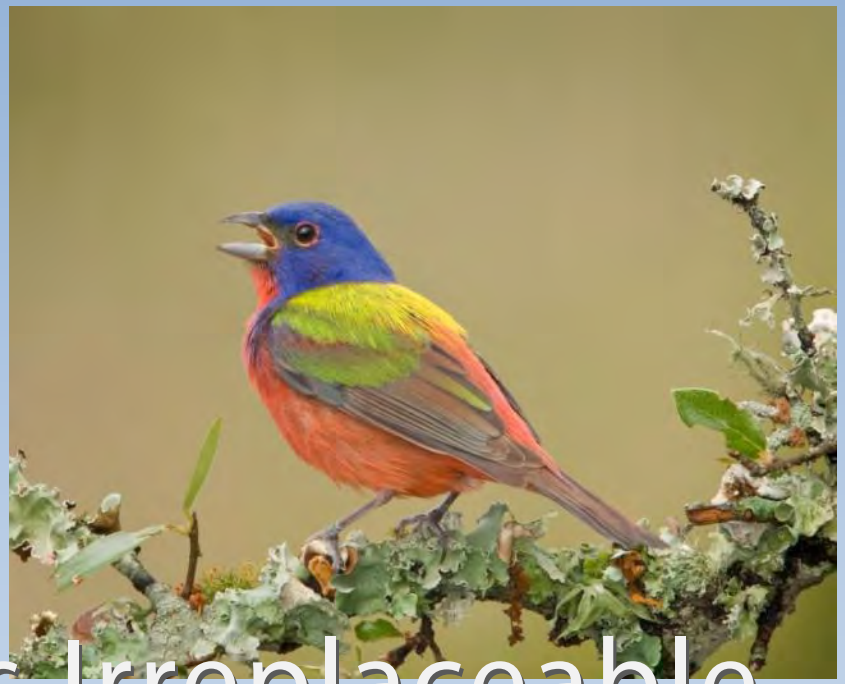
Loss of Water Quality and Supply

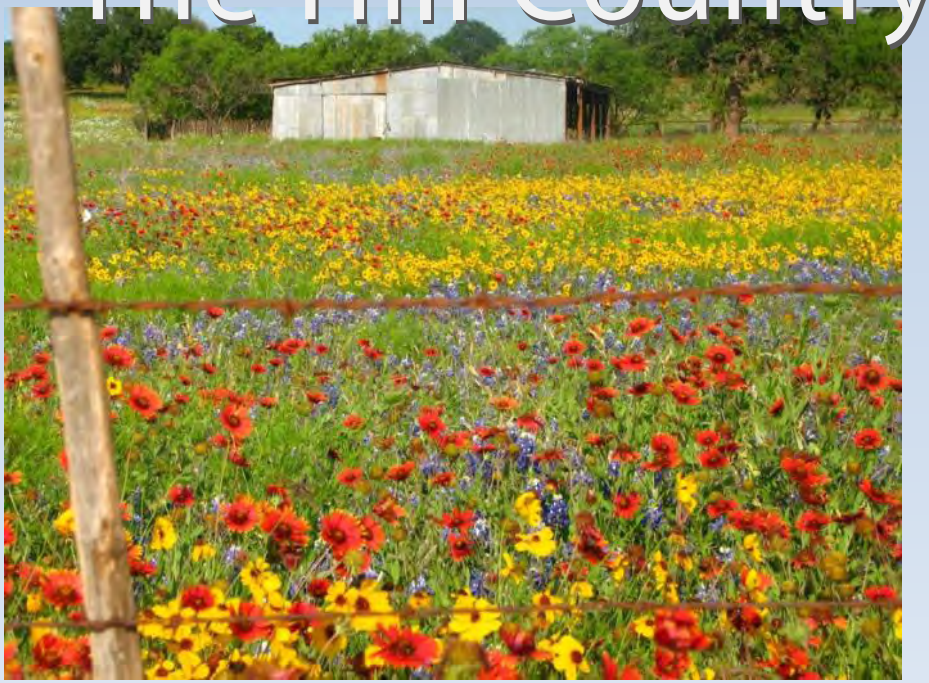
Loss of Flood and Erosion Control

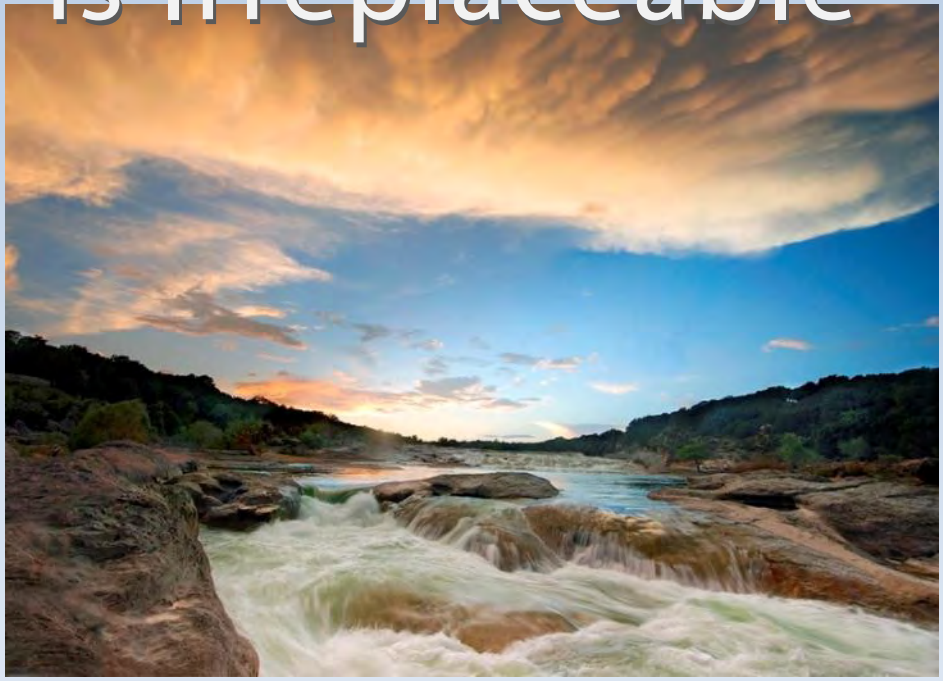
INCREASED TAXES– current residential development practices drain the tax base due to the costs of roads, schools, emergency response, and other services*

** For every dollar paid in taxes by rural residential residents it costs: $1.25 in Hays County and $1.10 in Bandera County. In both counties open space and agricultural lands are a net positive contributor to the tax base. American Farmland Trust has conducted more than 70 "Costs of Services" studies that convincingly show the overwhelming economic benefits of rural open space and the long term need to reduce costly, sprawling infrastructure and development.*

The Hill Country is Irreplaceable







Our Responsibility

Our Responsibility

Economic Sustainability
Heritage Ranchland
Clean Air and Water
Scenic Beauty
Soil Stability
Habitat
Well-Being
Eco-Tourism
Water Supply
Human Health
Food Production
Outdoor Recreation
Resource Utilization
Private Land Ownership

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Clean Air and Water
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Water Supply
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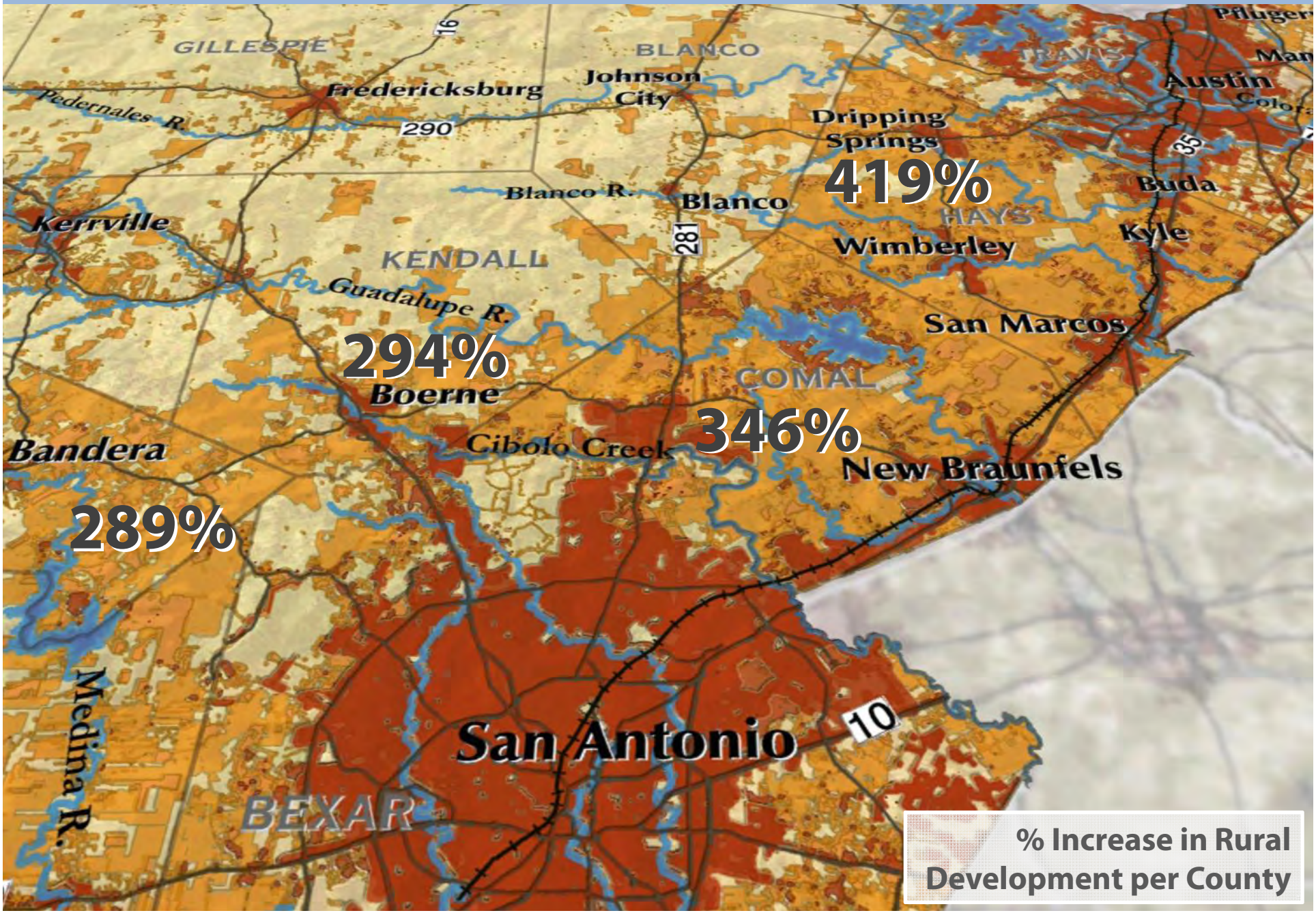
Resource Utilization
Private Land Ownership

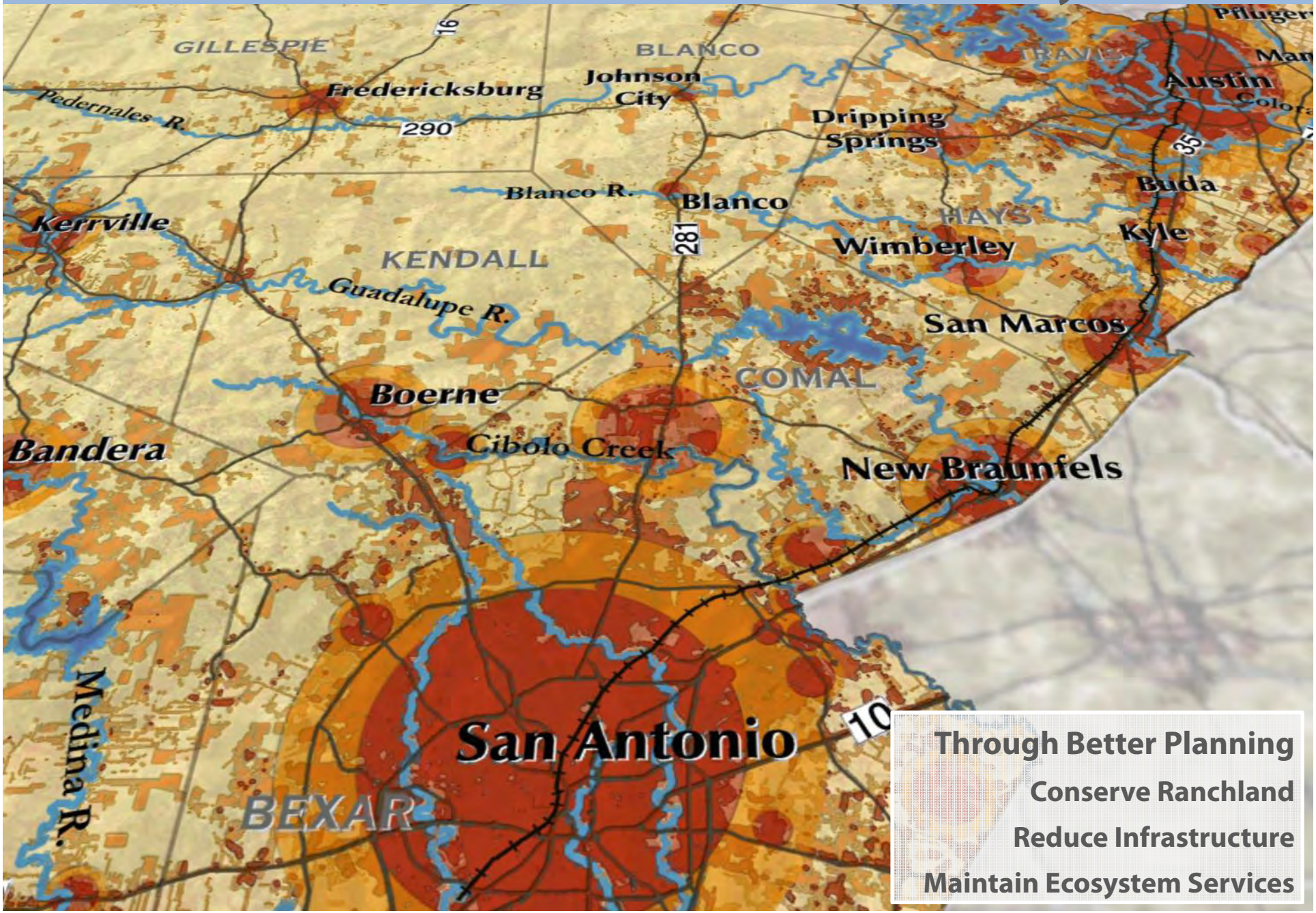
Cultural Heritage

Ecosystem Services

Where we are headed in 2050



A Better Way in 2050



Through Better Planning

Conserve Ranchland

Reduce Infrastructure

Maintain Ecosystem Services

Wimberley Valley Watershed Association
MISSION

- Engage the community in land and water stewardship at the Jacob's Well Natural Area through education, research and personal experience to sustain the health of our watersheds and aquifers.

- Advocate for clean, clear flowing streams and the equitable allocation of water for current and future needs of the Wimberley Valley.

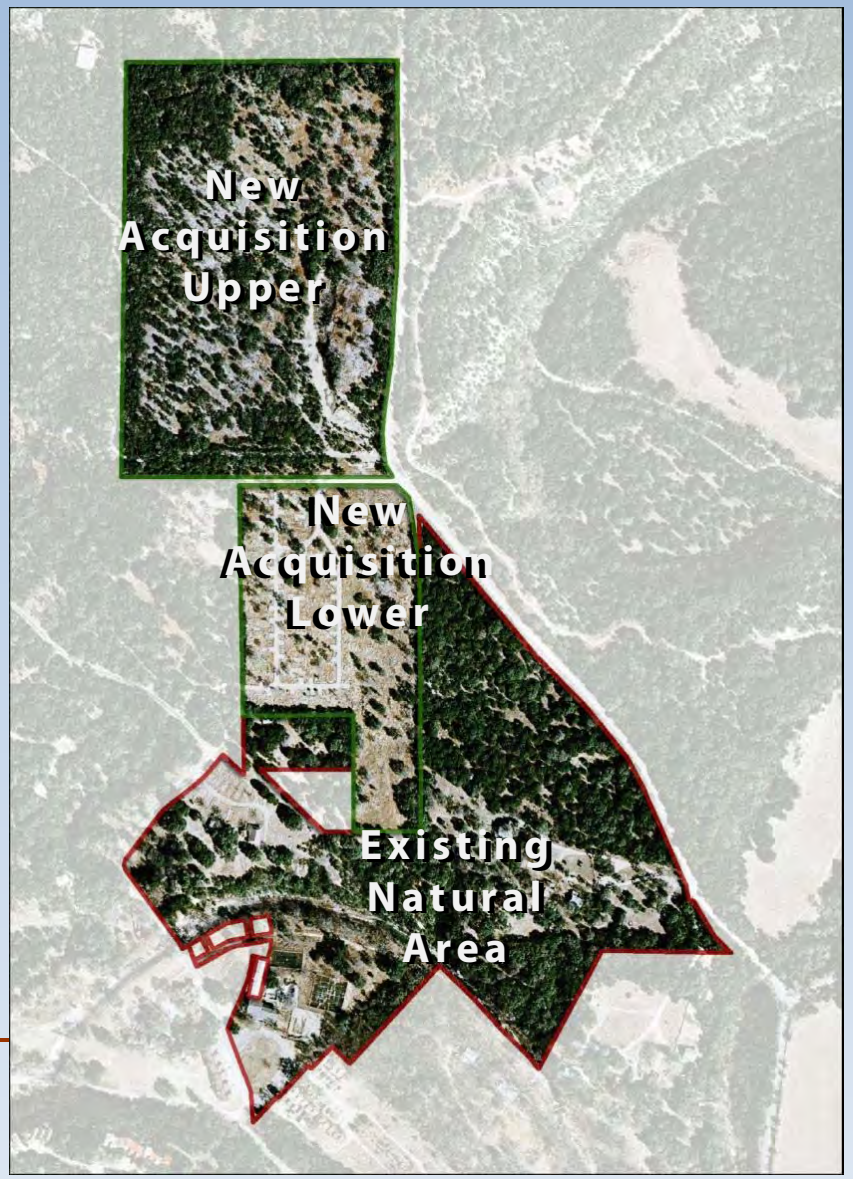
WVWA's guiding principles

- **Connect**—Connect communities to their environments through hands-on experiences designed to promote sound land and water management practices.
- **Conserve**—Promote water and land conservation that sustain Jacob's Well and Cypress Creek as essential elements of the Wimberley Valley's health and economic well-being.
- **Advocate**—Promote sustainable development practices through public and private investment and incentives for conservation that protect water quality, aquifer recharge and wildlife habitats.

Program Areas

Jacob's Well Natural Area

- Partnered with Hays County and The Nature Conservancy to permanently protect Jacob's Well Natural Area, establishing the first publicly-owned preserve in western Hays County



Jacob's Well Natural Area

- Trails constructed for public access to creek, spring, and education center
- Ongoing trail development, maintenance and erosion control
- Master planning
- Land restoration and visitor interpretation
- Invasive species management

Education & Outreach

- Expanded the JWNA School Program to five schools
- Conducted weekly public tours of JWNA site, school visits, and special tours
- Expanded interpretive materials for our exhibit space at JWNA Education Center
- Co-sponsored the Rainwater Revival
- Developed outreach plan to reach local and regional communities
- Hosted Speakers Series to connect the community with experts on land and water stewardship

- Expanded websites, email marketing, and presence on social media

Education & Outreach

Volunteer Program

- Coordinated two training sessions for JWNA volunteers
- Partnered with the Hays County Master Naturalists for habitat restoration and trails
- Trained school team that specializes in teaching 4th to 8th grade students
- Coordinated volunteers & experts to create a master list of wildlife populations at JWNA

Policy & Advocacy

- Filed legal appeal to a Desired Future Condition (DFC) that would allow 30 feet of additional drawdown in the Trinity aquifer
- Recruited nine scientific experts, landowners, and local government officials to present their support for the appeal
- Over 200 community members in attendance at DFC hearing; 135 letters of support for appeal filed by community members
- Initiated lawsuit against the Hays-Trinity Groundwater Conservation District in response to a new permit issued by the District for a golf course development that would allow pumping large volumes of water above Jacob's Well

Policy & Advocacy

- Built partner coalitions to promote sustainable management policies and collaborated with Hill Country Alliance and RSI to develop an Issue Paper on Hill Country Groundwater Supply
- Advocated for the creation of a Special Groundwater Management Area for Jacob's Well and the creation of stronger Ground-water Conservation Districts for managing the Trinity Aquifer
- Provided data and engaged with the Cypress Creek Project to produce a Watershed Characterization Report and obtain approval by TCEQ
- Increased visibility of Cypress Creek Decision Support System through trainings and public presentations

Land Stewardship

- Expanded & improved trail system
- Planted native trees & wildflowers
- Restoration Rangers helped plant native grasses, shrubs and trees at Blue Hole Regional Park

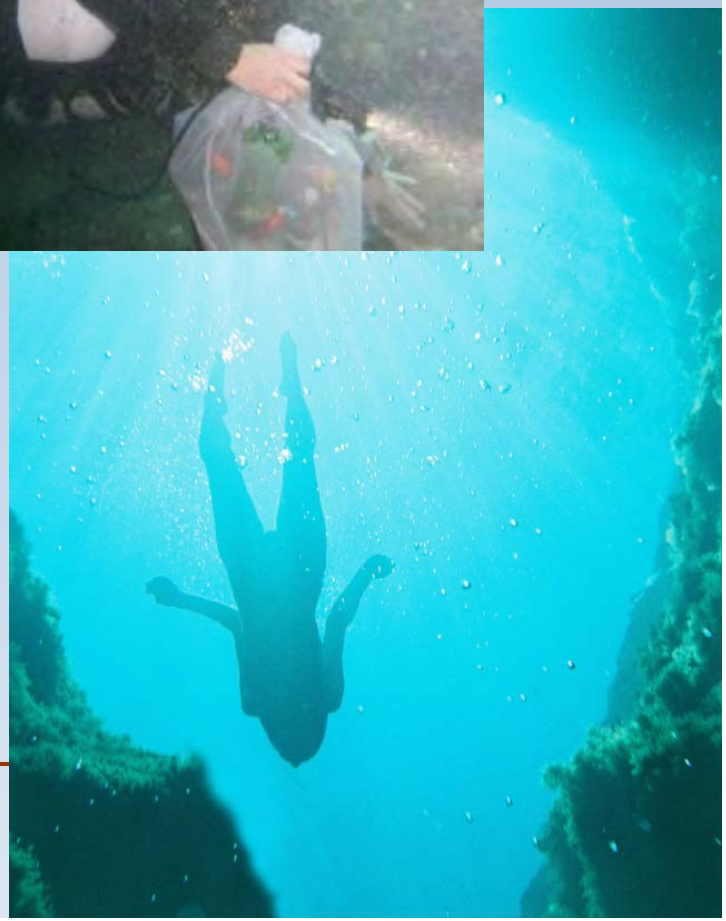
- Offered Riparian Landowners seminar with The Nature Conservancy
- Co-sponsored state-wide Texas Land Conservation Conference

Research & Monitoring

- Coordinated water quality monitoring through the Clean Rivers Program , producing data that is used in TCEQ's assessment of Texas' water bodies
- Partnered with Hays County to support monitoring
- Species inventory sampling at Jacob's Well
- Completed assessment of water and ecosystem services that support Jacob's Well spring flow

Research & Monitoring

- Survey, mapping, research support, and videography through the Jacob's Well Exploration Project
- Diurnal bacteria sampling at Blue Hole Regional Park



Ecosystem Services Study

Objectives

- Delineate a probable contributing area for Jacob's Well spring based on existing hydrogeologic studies
- Map ecosystem service provision in the probable contributing area using a combination of data collection, watershed modeling, and GIS analyses
- Develop a composite index map that shows the areas with highest overall ecosystem services provision to assist in prioritizing conservation efforts
- Performing economic value assessment of water-related ecosystem services in the study area

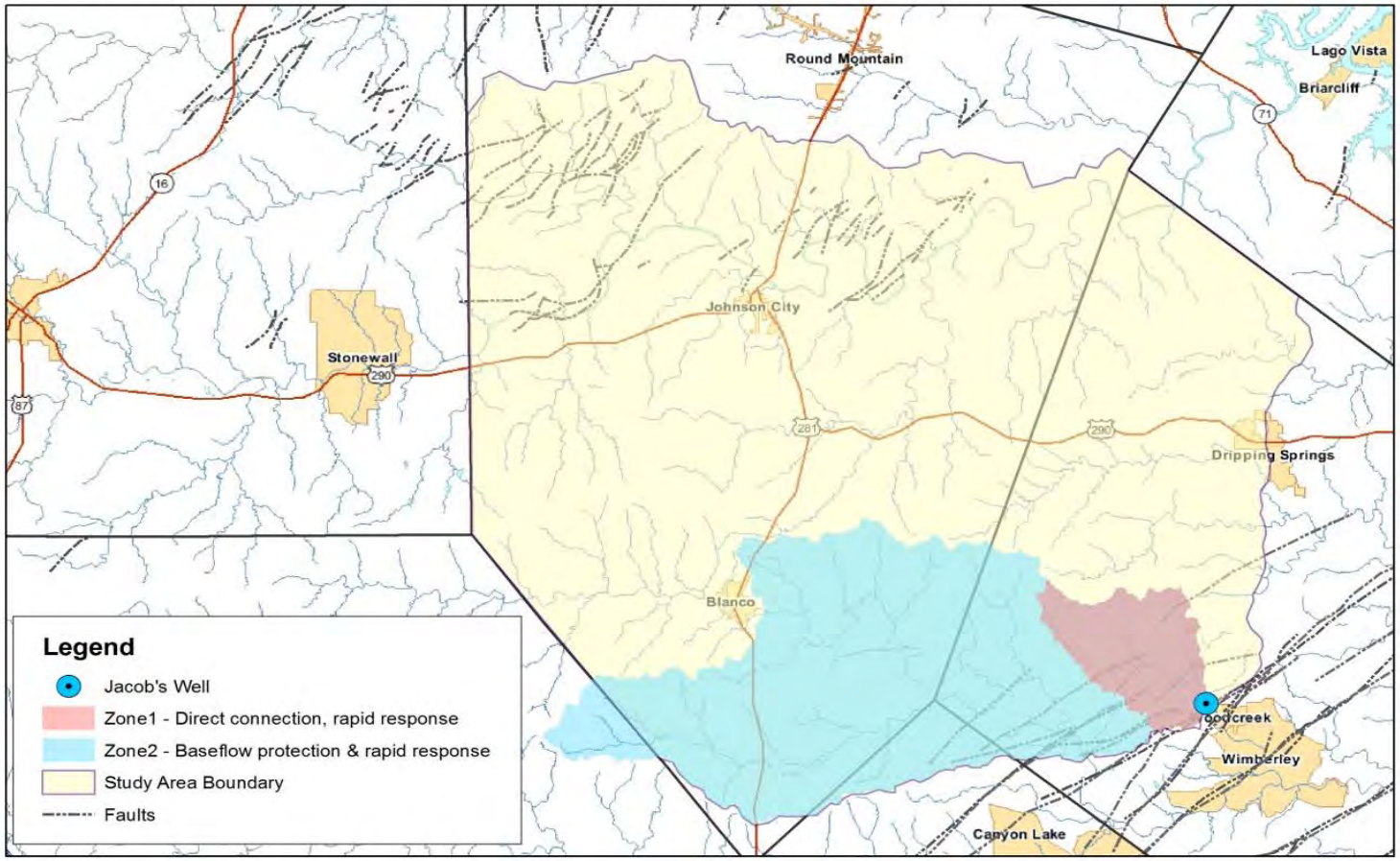
Ecosystem Services Study

Factors Considered

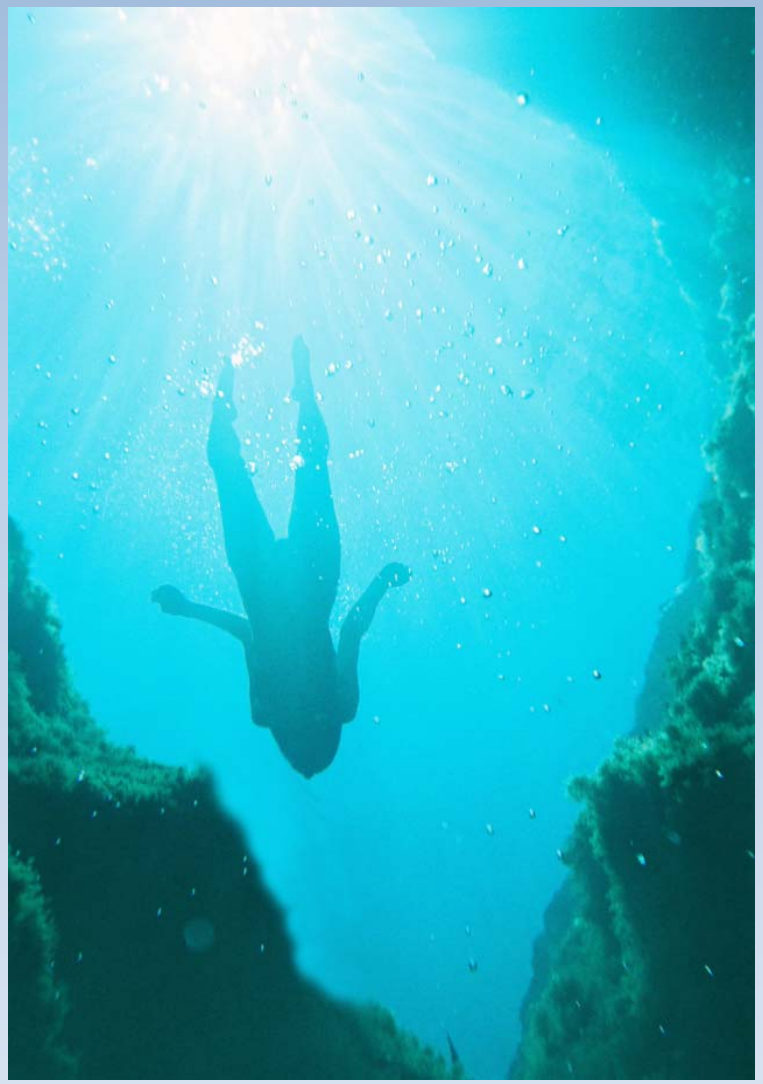
- Review of hydrogeologic studies & physical characteristics
- Proximity to cave passages leading to Jacob's Well
- Karst geology
- Known karst features (cave, seephole, spring)
- Average annual groundwater recharge (modeled)
- Proximity to riparian areas
- Land protection in place (public land, parks, conservation easements, etc.)
- Proximity to other protected or large undeveloped areas

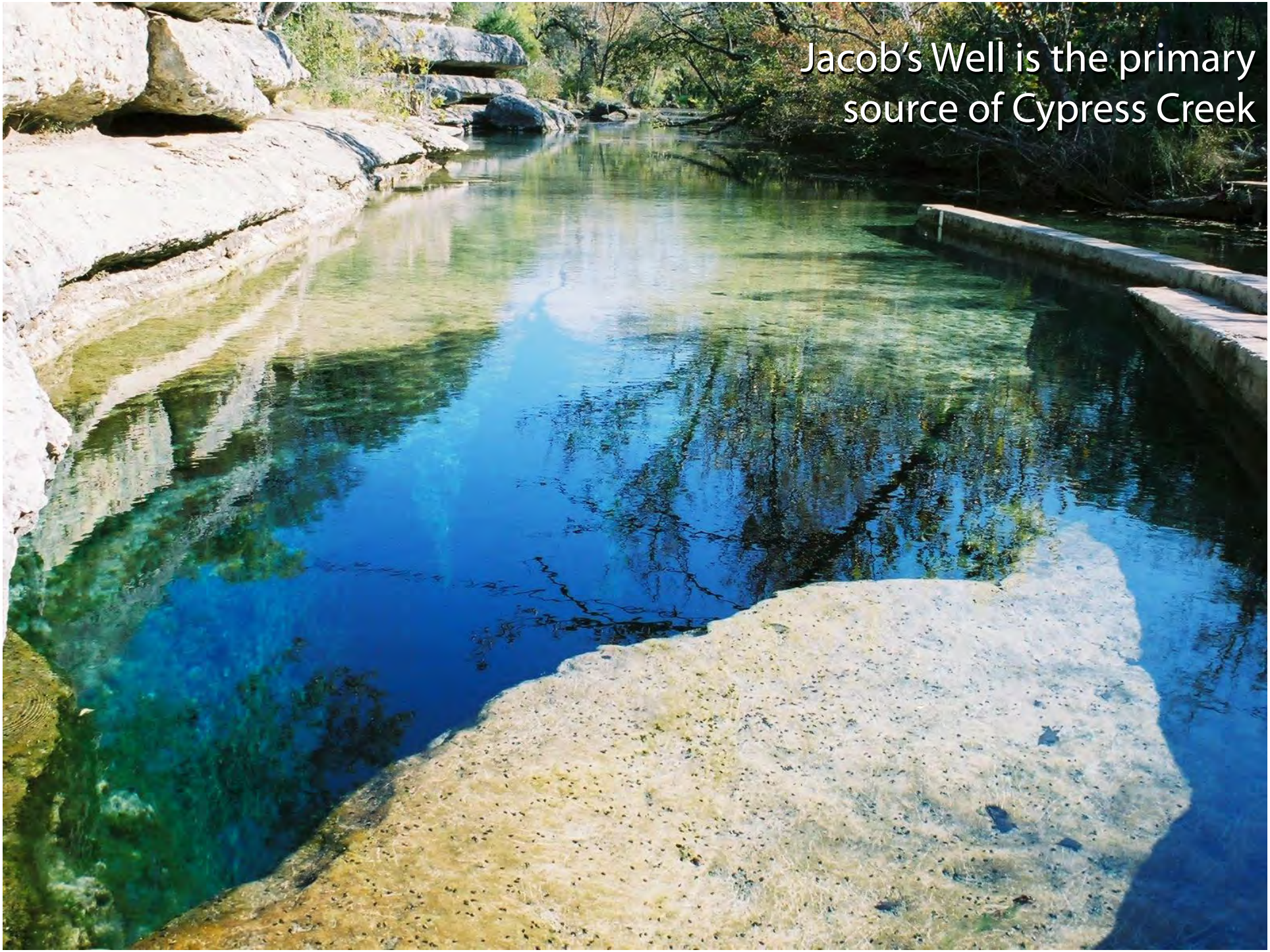
Ecosystem Services Study

Focus Zones



Jacob's Well Natural Area Acquisition Analysis




Jacob's Well is the primary
source of Cypress Creek

5-30-26

We do not inherit the land from our ancestors
We borrow it from our children.
Native American Proverb

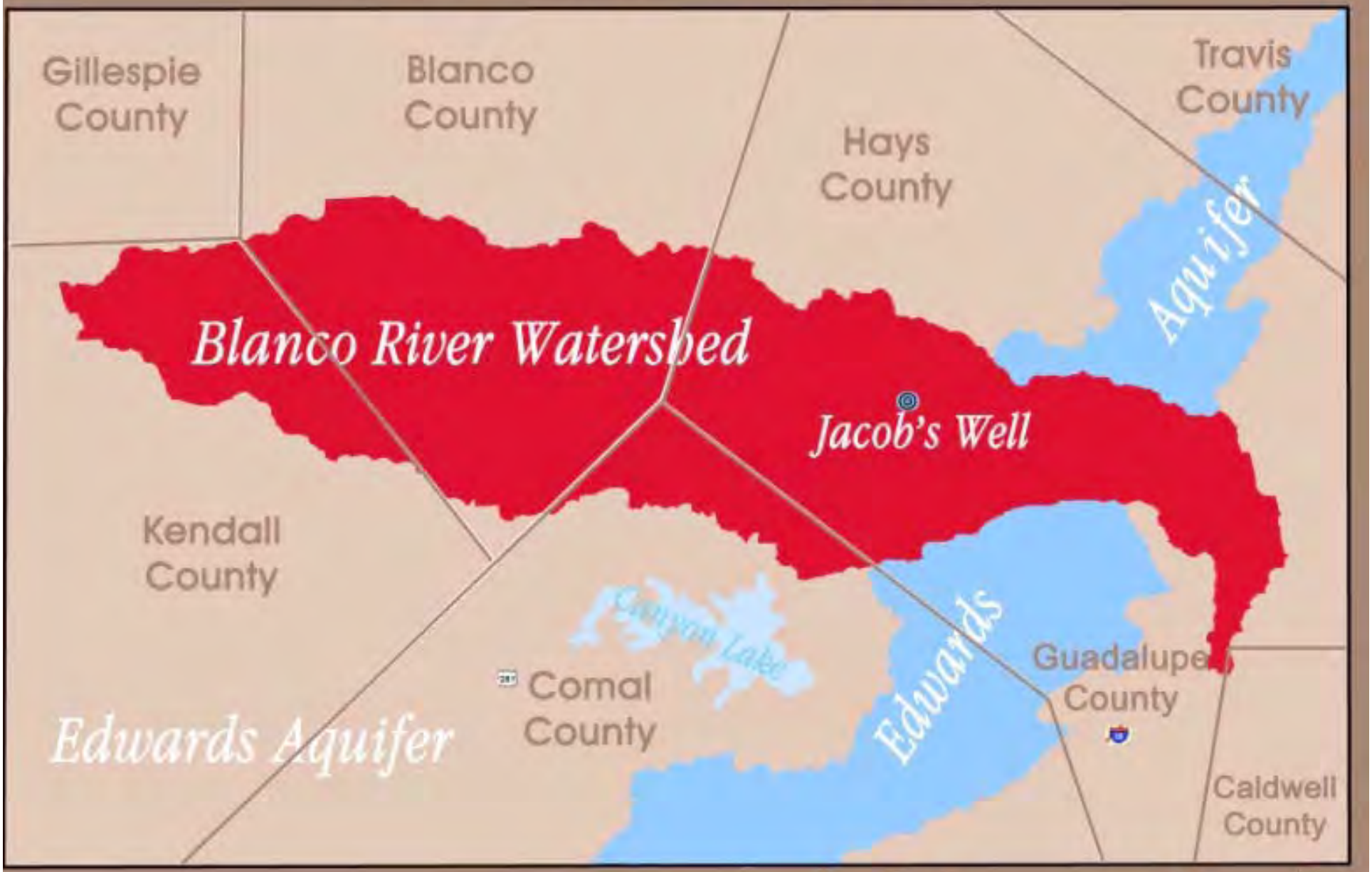
CYPRESS CREEK PROJECT

Partners

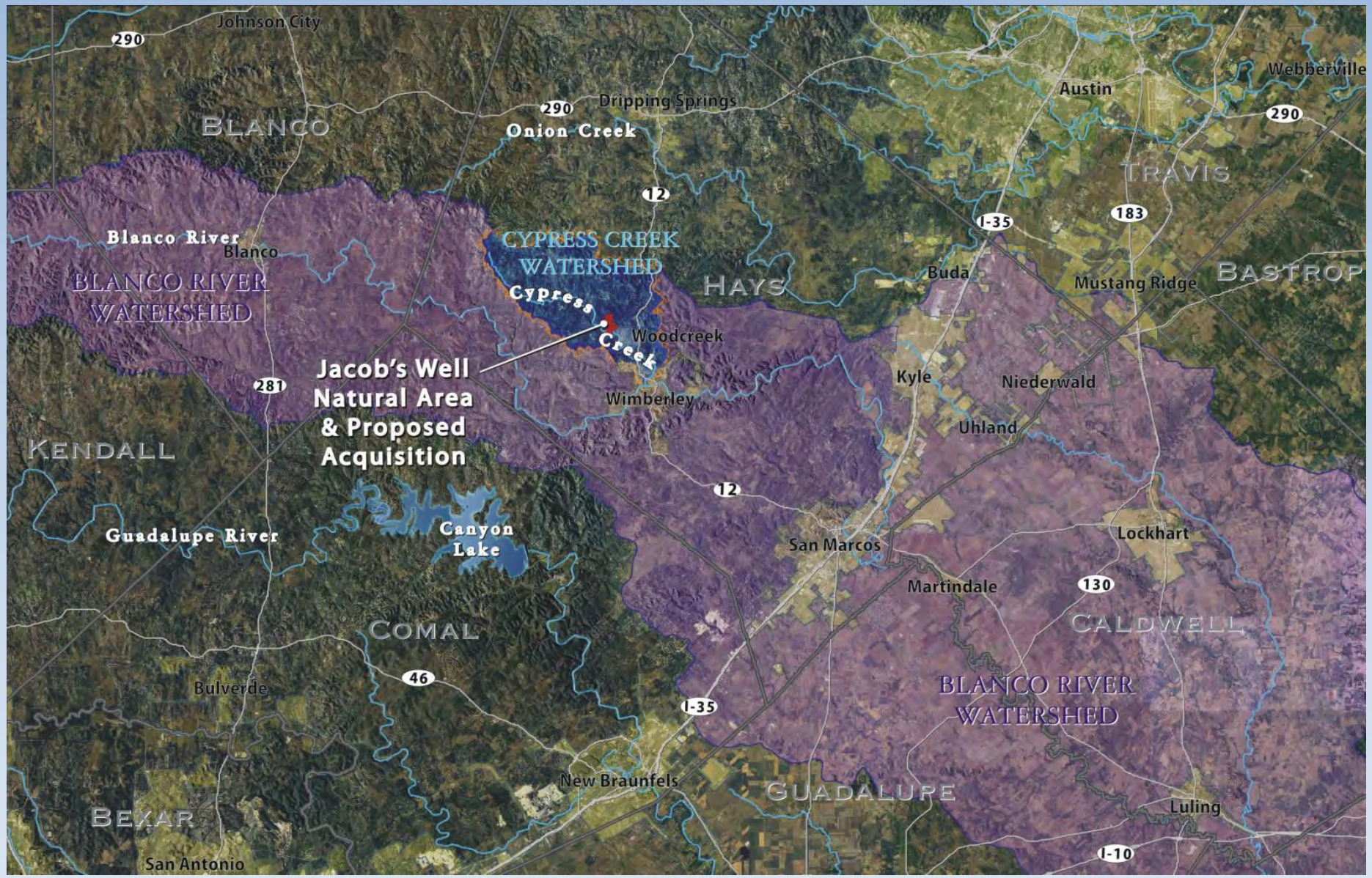
Strong community ties and partnerships are the backbone of the Cypress Creek Project and will ensure our long term success.

Where possible, the WVWA will work with existing partnerships to build on their networks, information, and efforts.

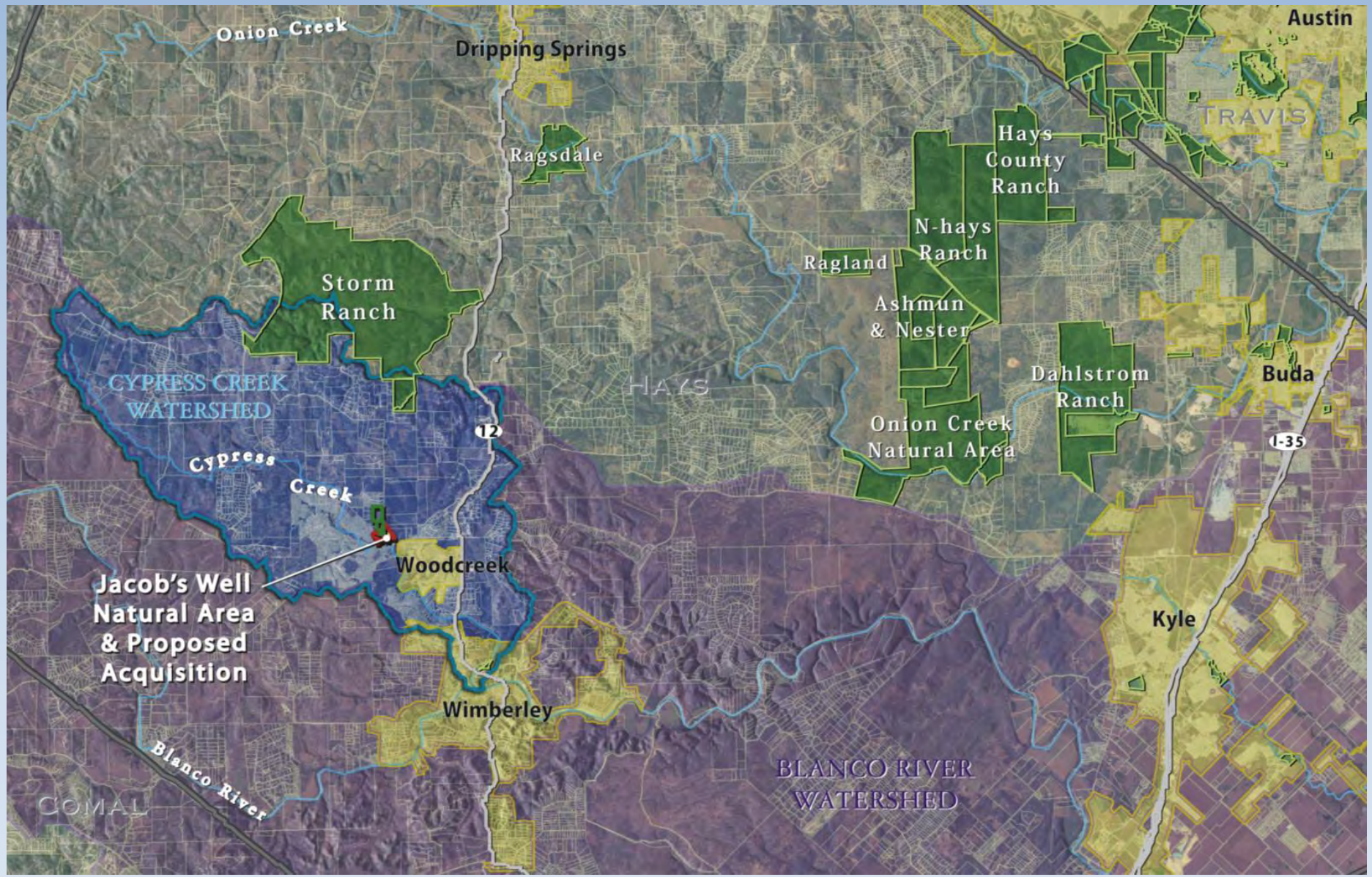
Blanco River Watershed



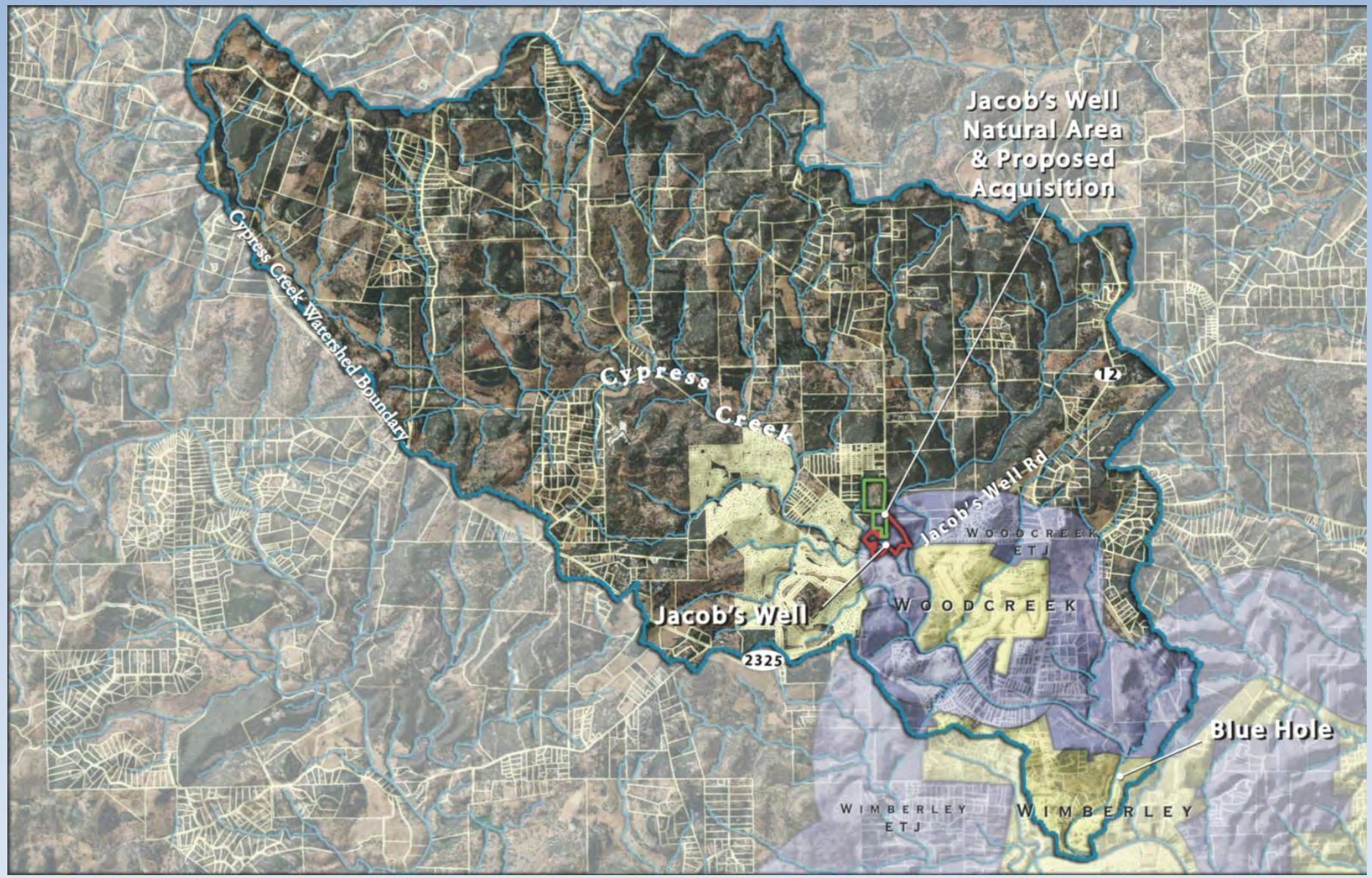
Regional Context



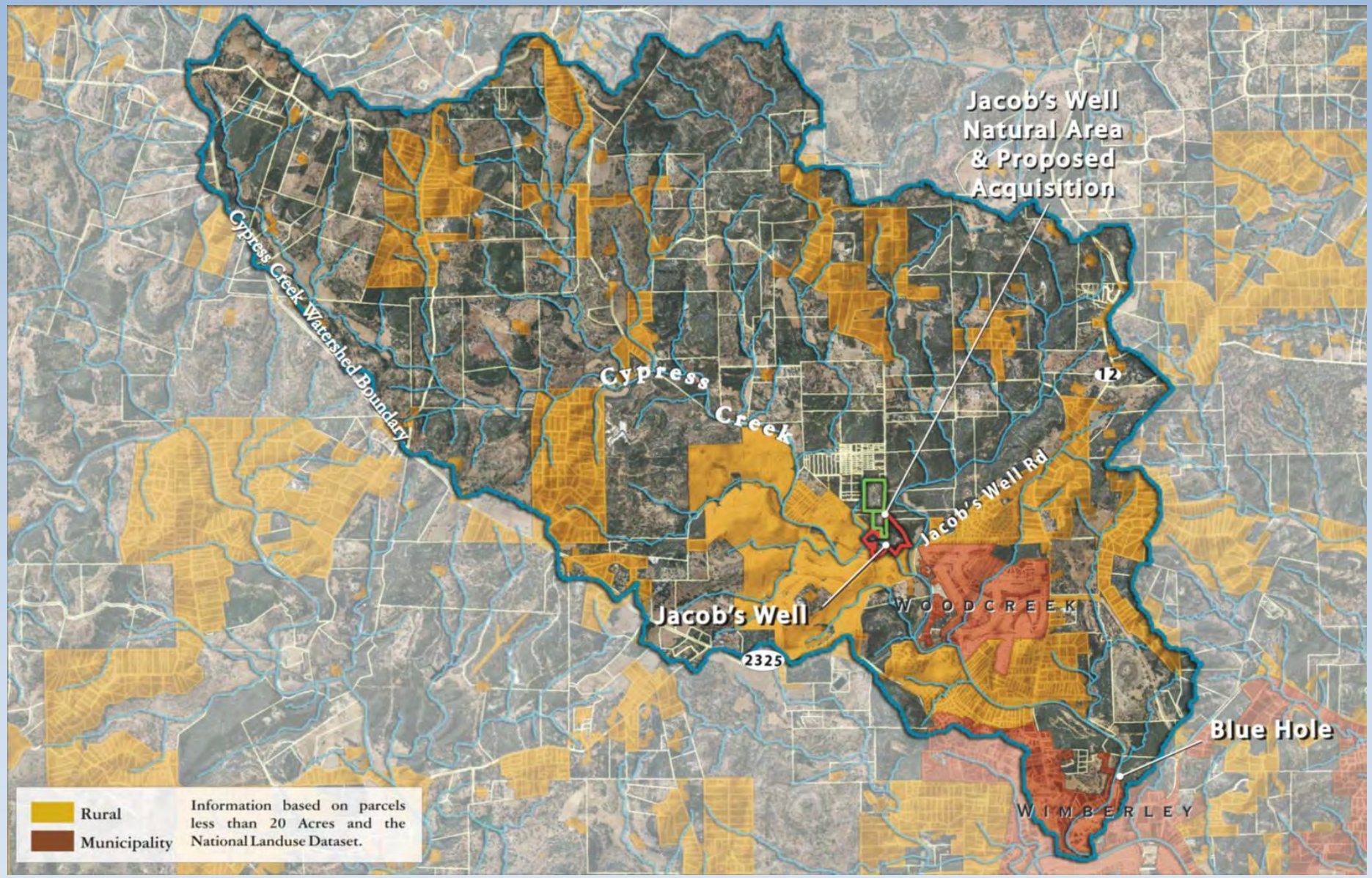
Open Space Context



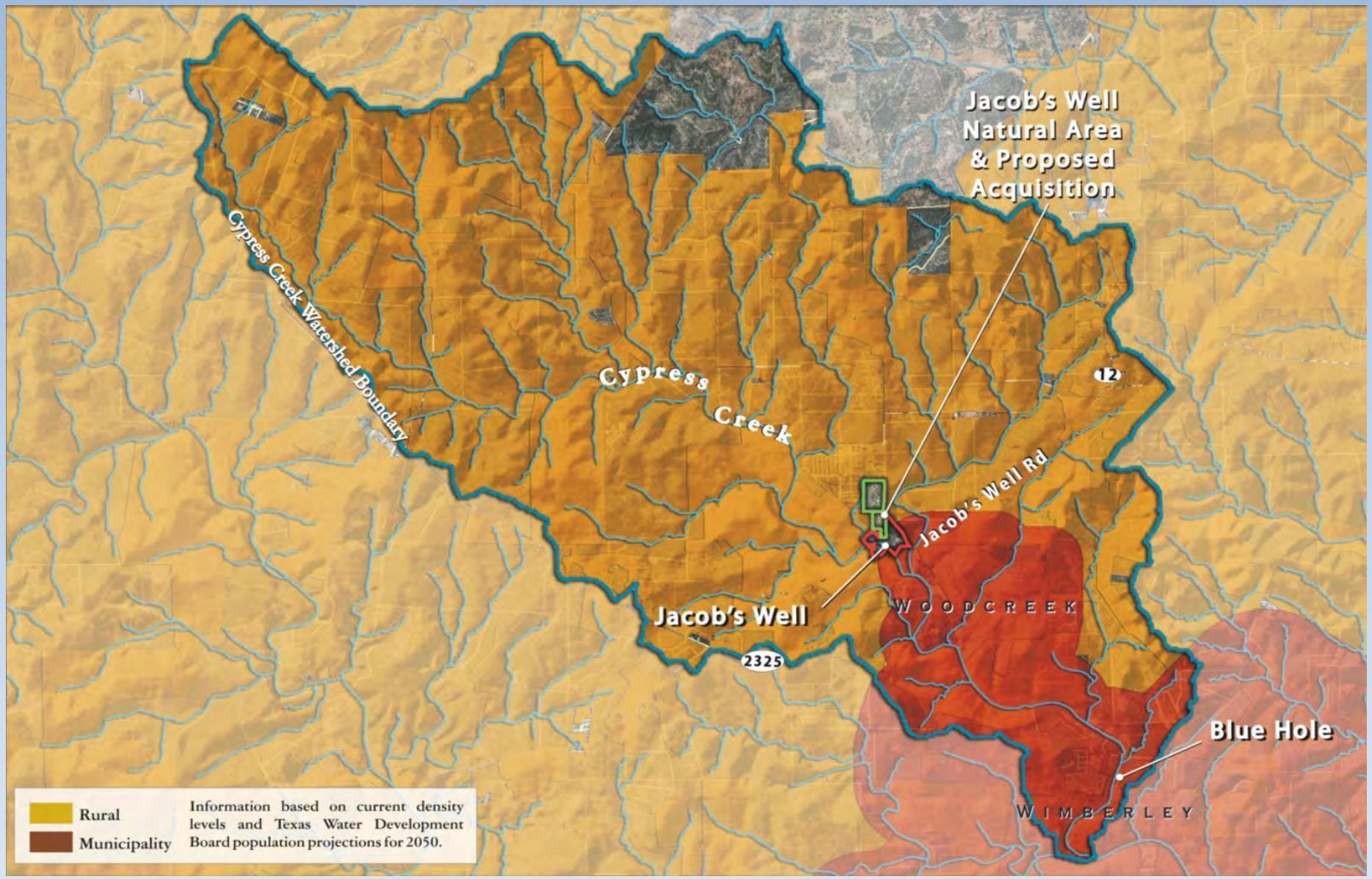
Cypress Creek Watershed Context



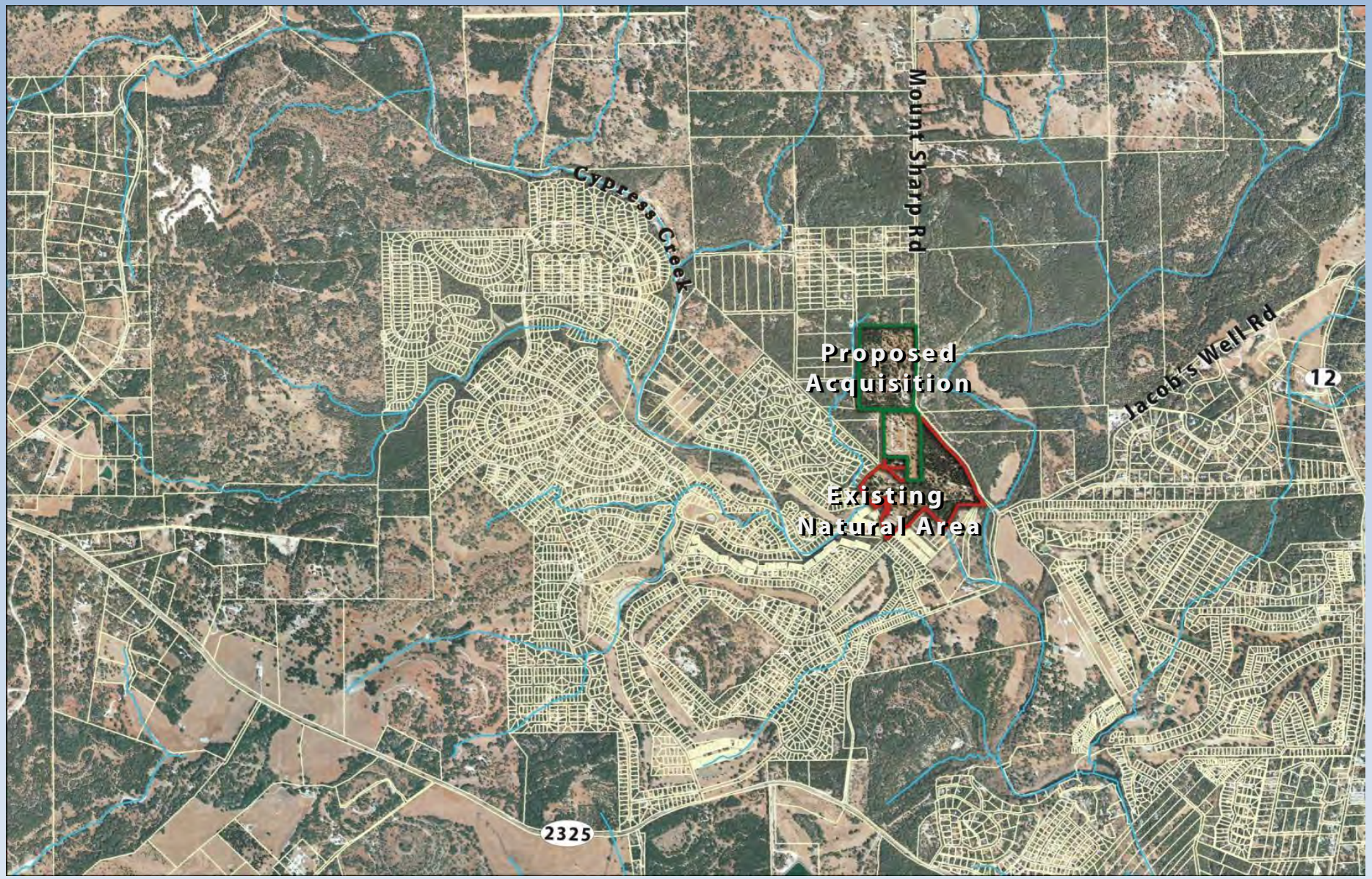
Cypress Creek Watershed Context- Current Development



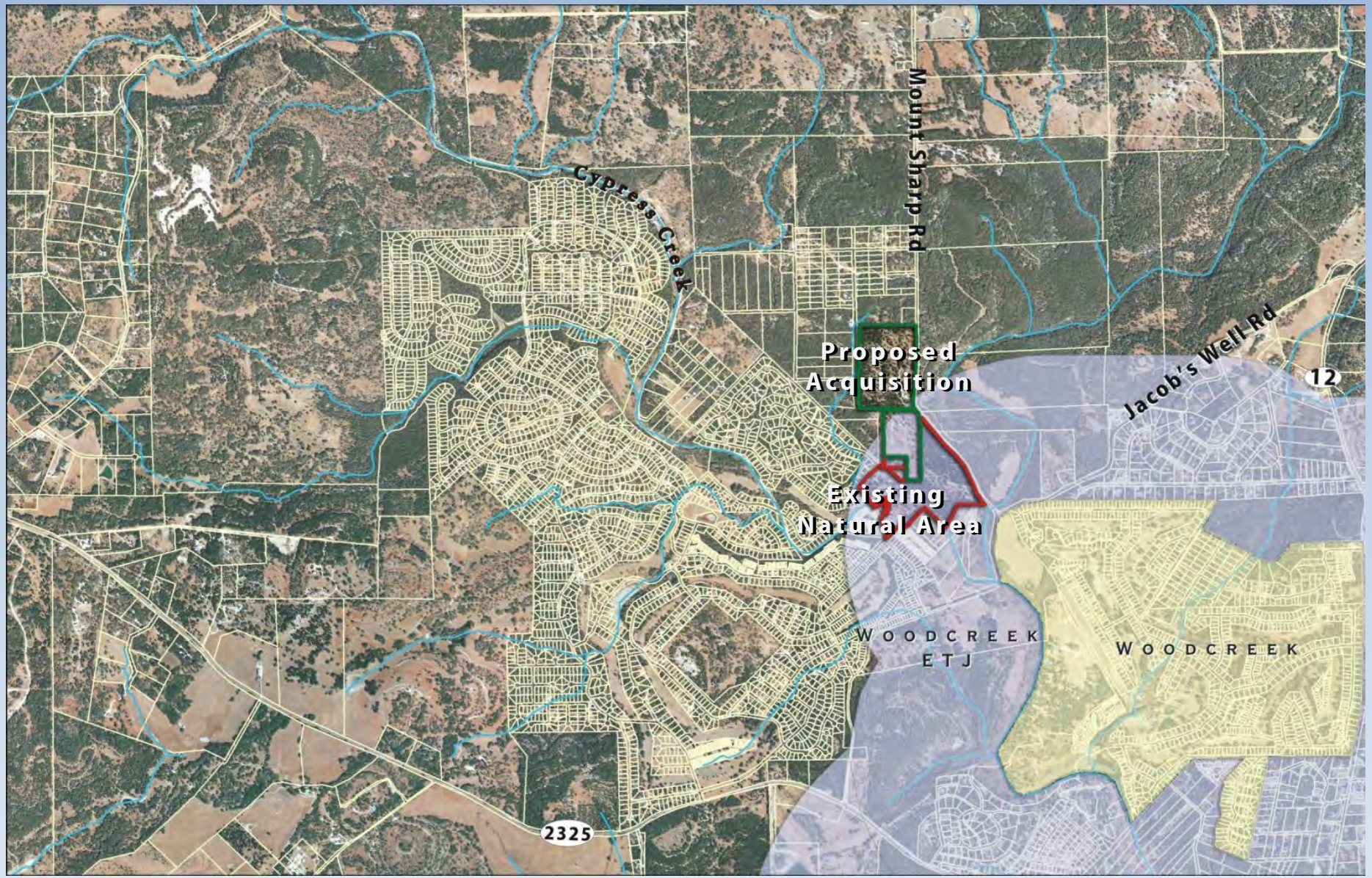
Cypress Creek Watershed Context- Business as Usual 2050



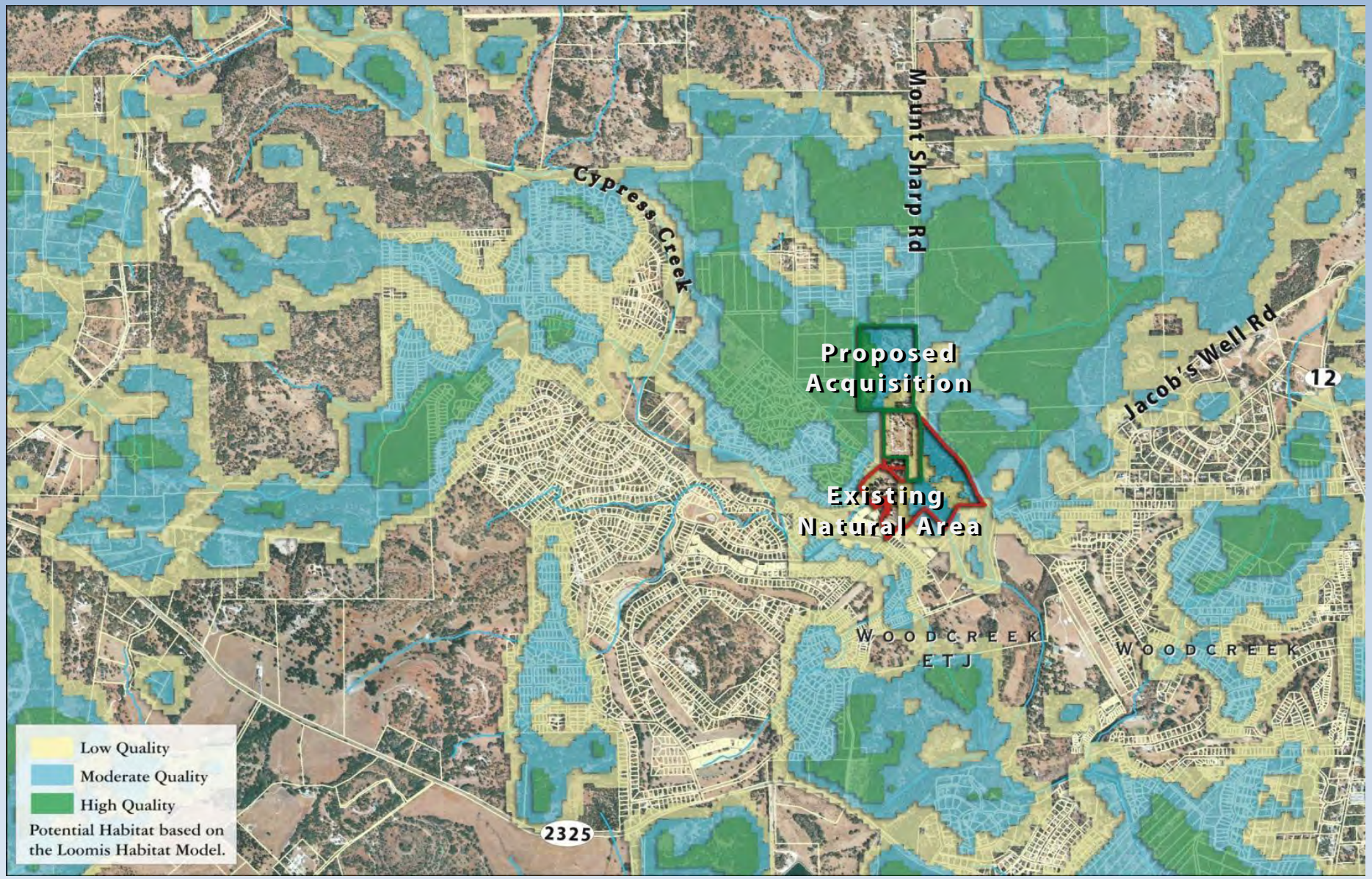
Jacob's Well Context



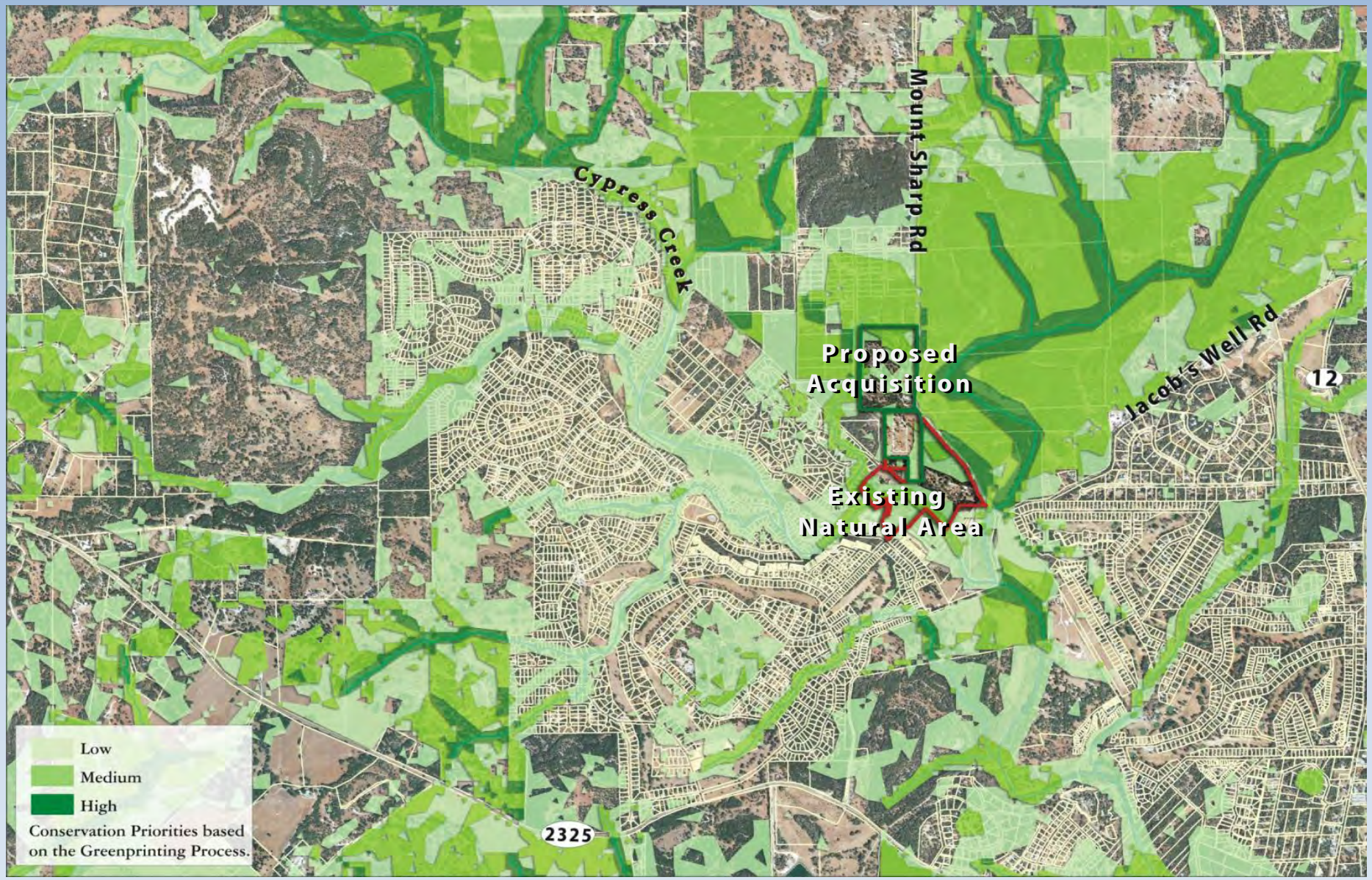
Jacob's Well Context - Jurisdiction



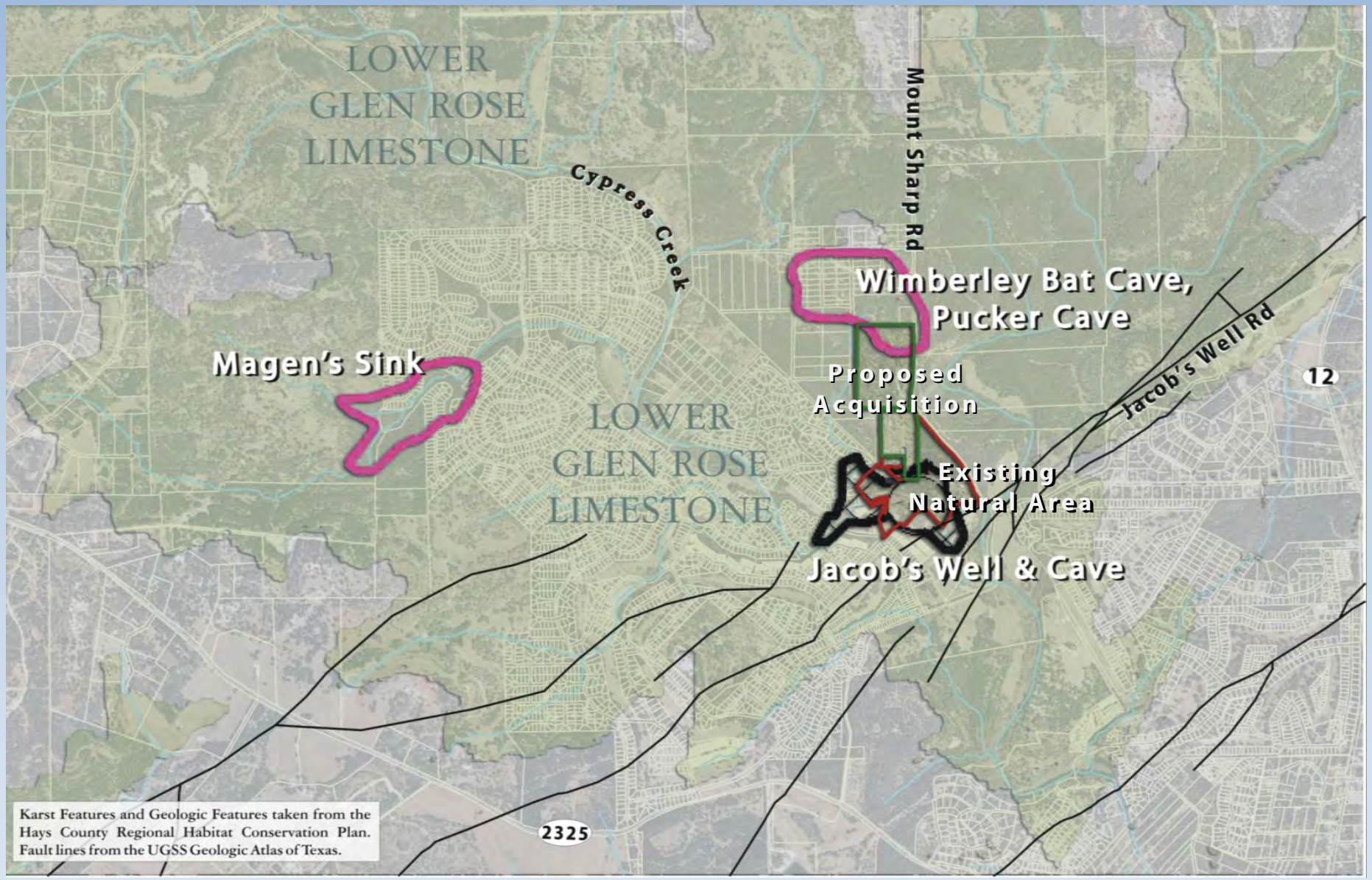
Jacob's Well Context – GCWA Potential Habitat



Jacob's Well Context – Greenprint Priorities

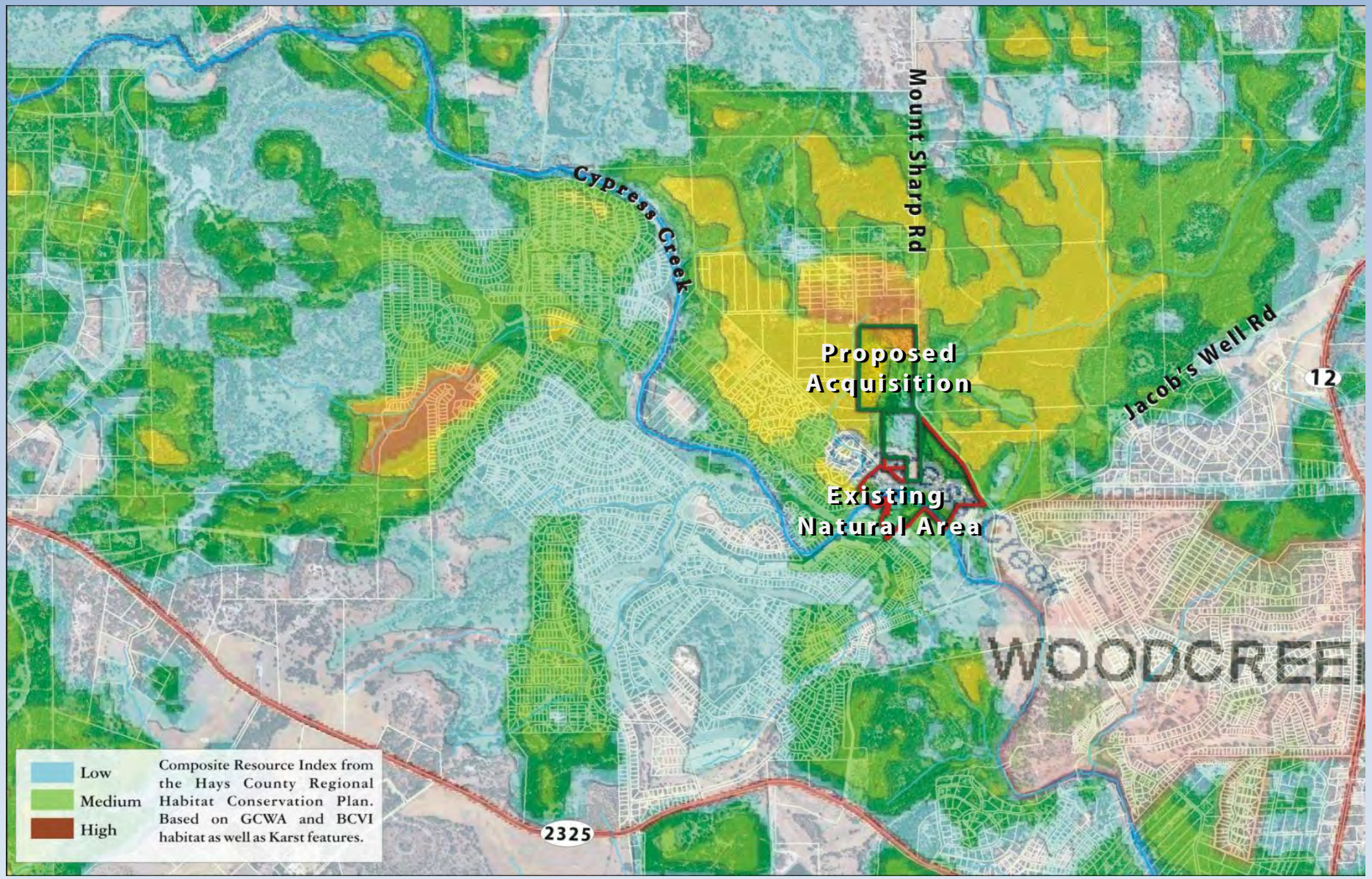


Jacob's Well Context – Karst and Geologic Features



Karst Features and Geologic Features taken from the Hays County Regional Habitat Conservation Plan. Fault lines from the UGSS Geologic Atlas of Texas.

Jacob's Well Context – Composite Resource Index (Hotspots)



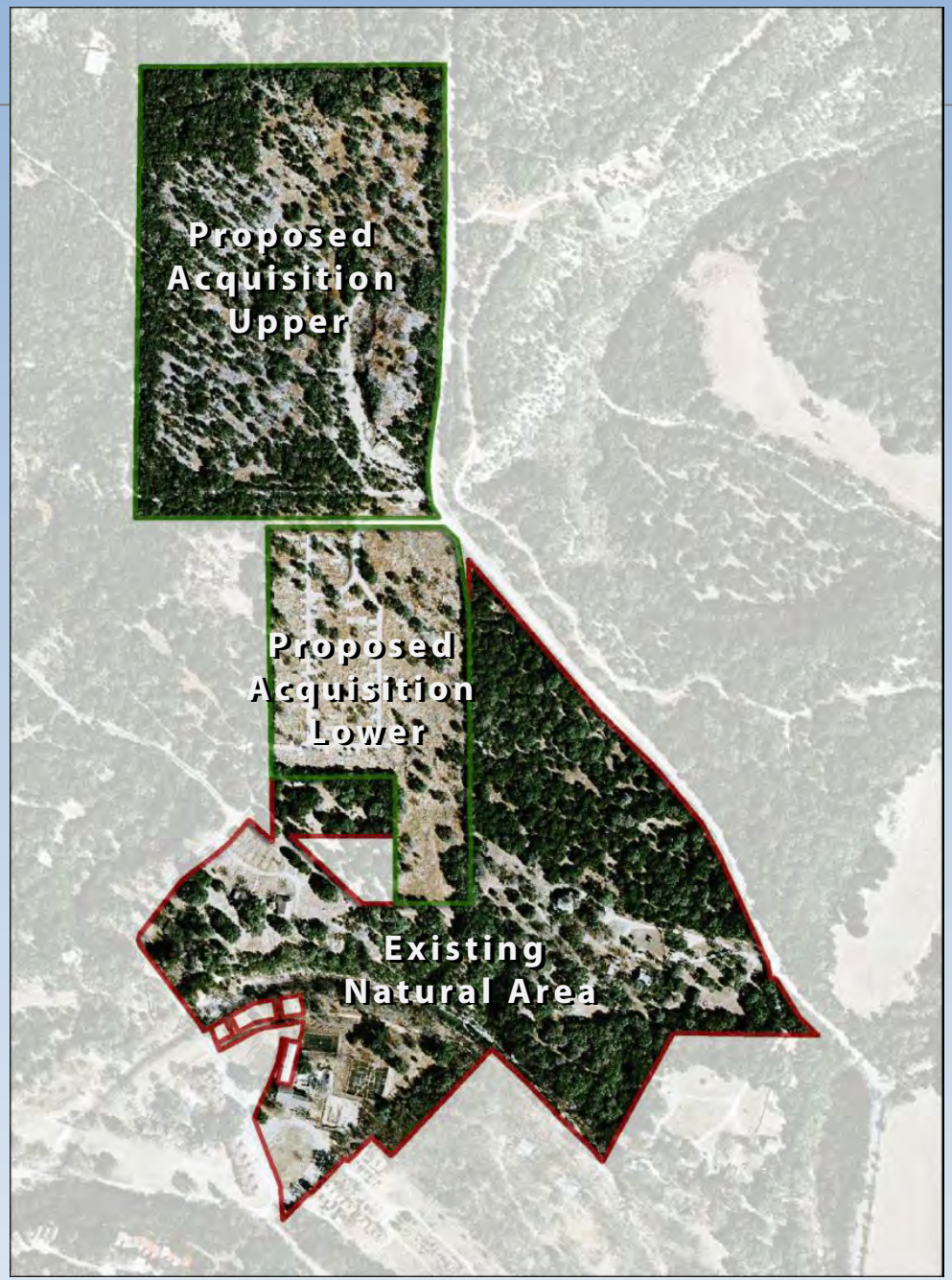
Properties of Interest

Existing Natural Area:
46.16 Ac

Proposed Acquisition Lower:
14.91 Ac

Proposed Acquisition Upper:
34.7 Ac

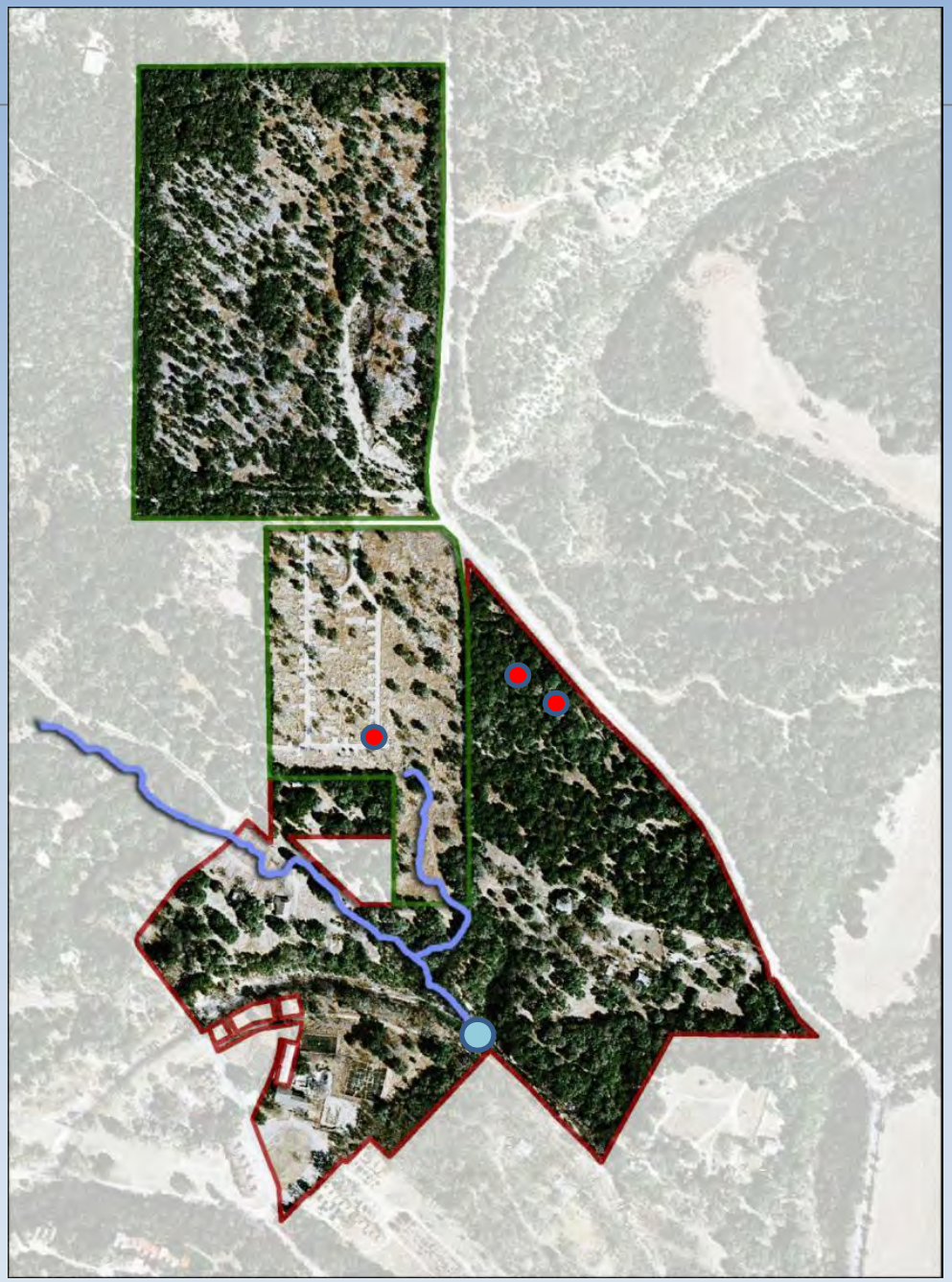
Note: Proposed acquisitions not yet surveyed.



Calculations are approximate

Sensitive Features

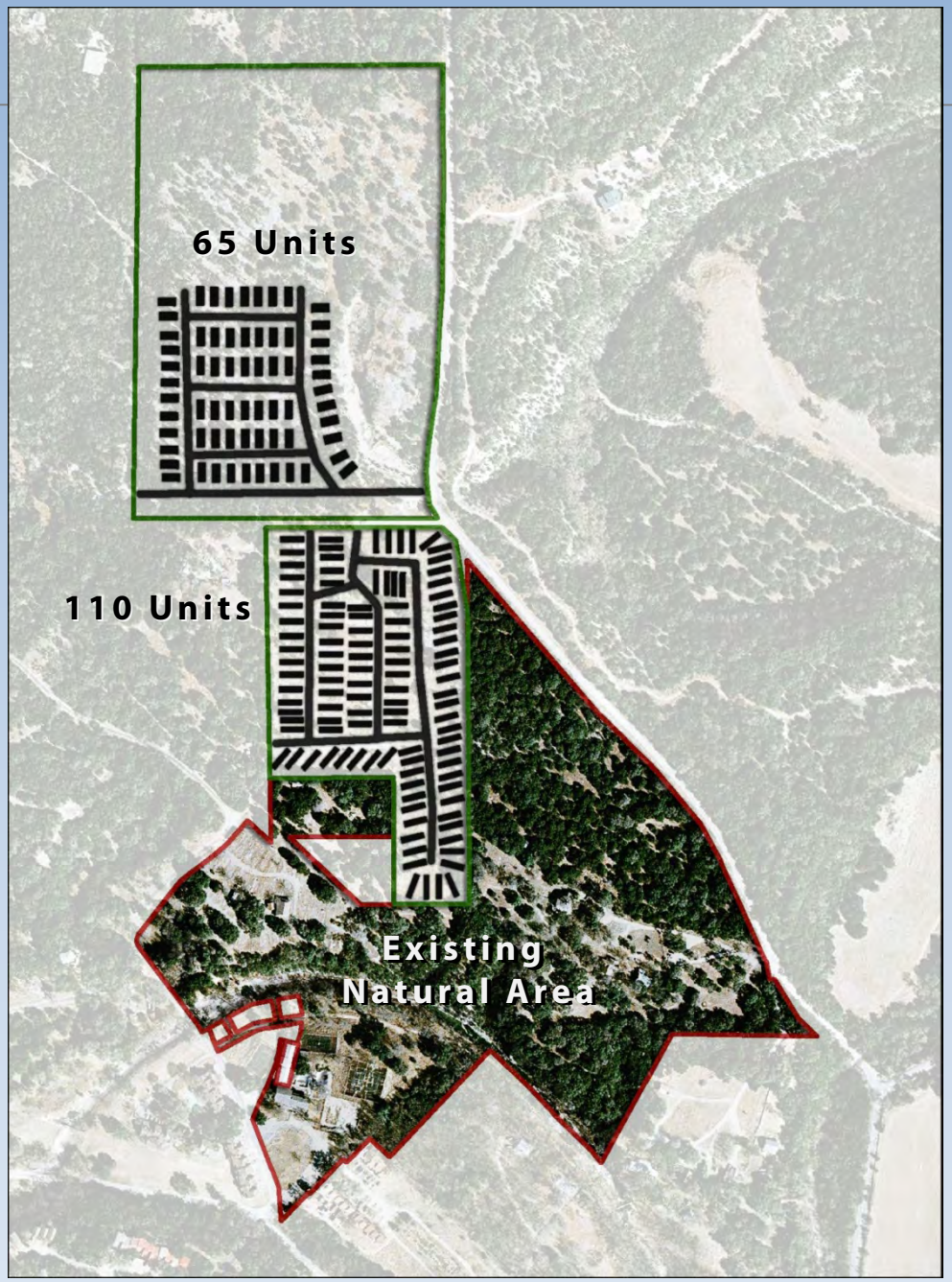
- Jacob's Well
- Mapped Cave
- Recharge Features



Potential Development

Proposed Acquisition Lower:
110 Units

Proposed Acquisition Upper:
65 Condominium Units

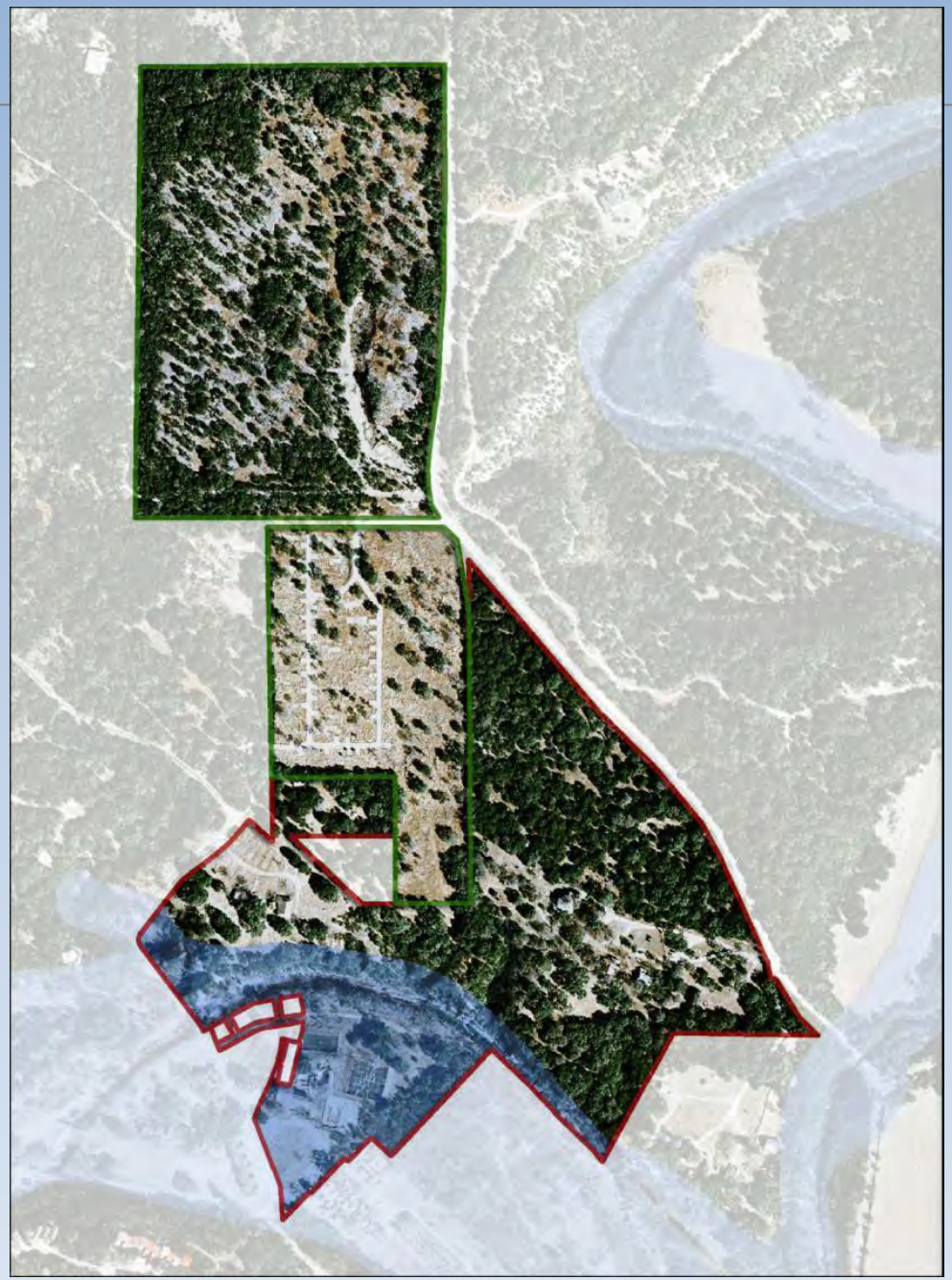


Floodplain

Existing Natural Area
  Floodplain: 12.76 Ac

Proposed Acquisition Lower
  Floodplain: 0 Ac

Proposed Acquisition Upper
  Floodplain: 0 Ac



Calculations are approximate

Slopes

Existing Natural Area
Slopes over 20%: 2.44 Ac
(outside 100yr Floodplain)

Proposed Acquisition Lower
Slopes over 20%: .5 Ac

Proposed Acquisition Upper
Slopes over 20%: .87 Ac

Calculations are approximate

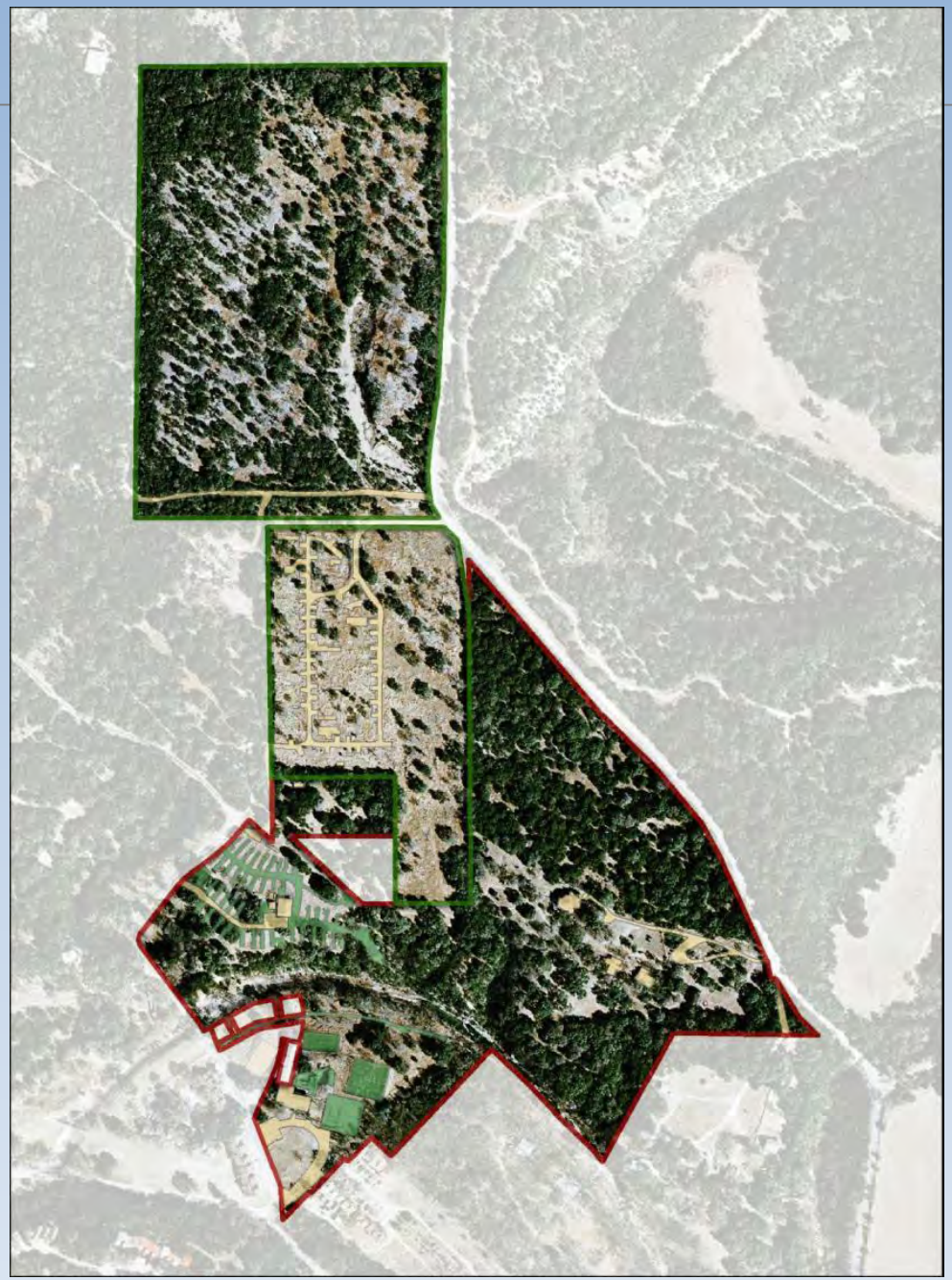
Impervious Cover

Existing Natural Area
Restored Impervious Cover: 2.87
Existing Impervious Cover: 1.52

Proposed Acquisition Lower
Impervious Cover: 1.55 Ac

Proposed Acquisition Upper
Impervious Cover: .26 Ac

Proposed Acquisition Total
Impervious Cover: 1.81 Ac



Calculations are approximate

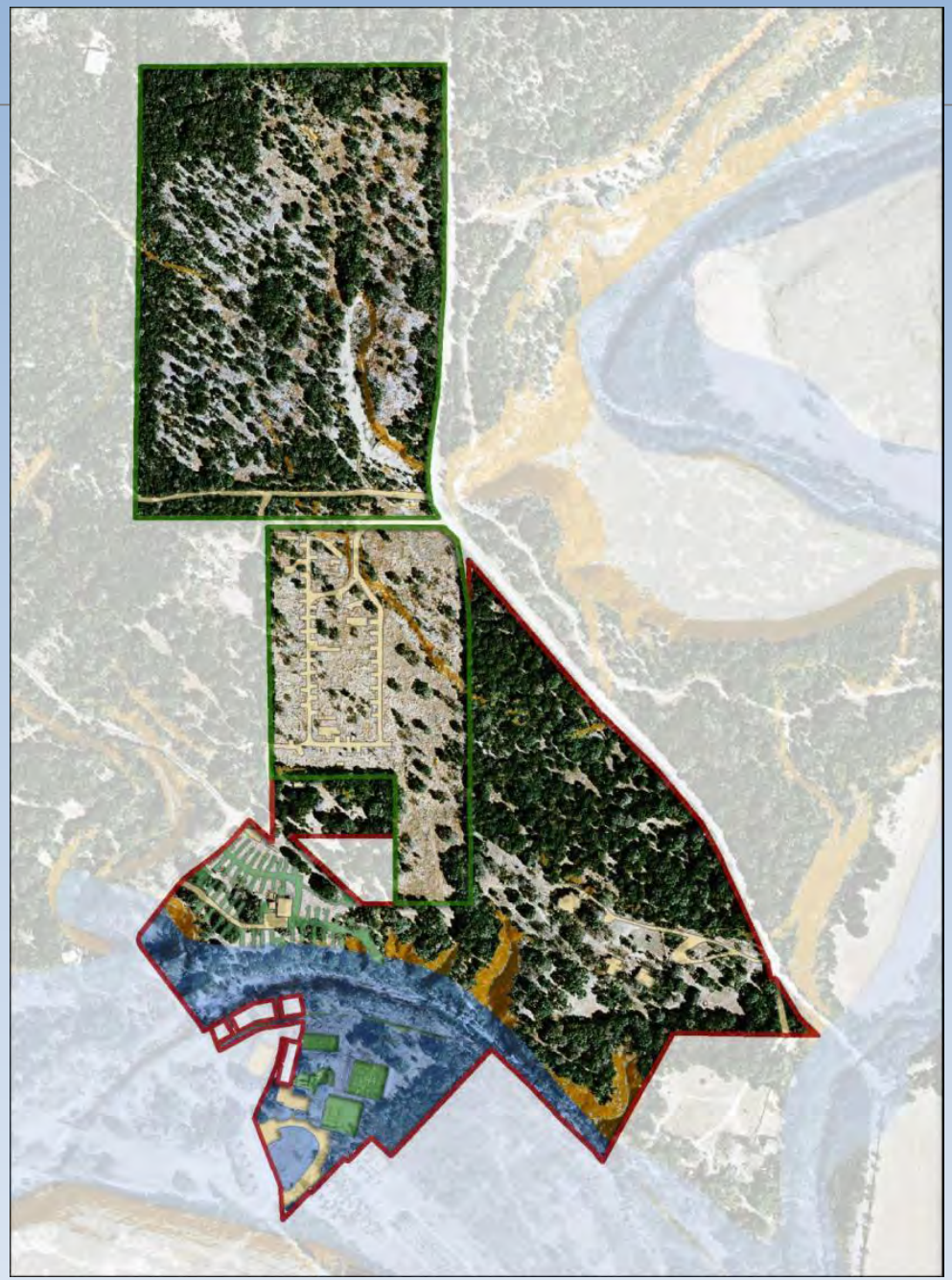
Net Site Area

Existing Natural Area
- Net Site Area: 30.96 Ac
- Allowable IC: 1.55 Ac (5%)
- Existing IC: 1.52 Ac (4.91%)

Proposed Acquisition Lower
- Net Site Area: 14.41 Ac
- Allowable IC: 0.72 Ac (5%)
- Existing IC: 1.55 Ac (10.76%)

Proposed Acquisition Upper
- Net Site Area: 33.83 Ac
- Allowable IC: 1.69 Ac (5%)
- Existing IC: 0.26 Ac (.77%)

Sum Proposed Acquisition
- Net Site Area: 48.24 Ac
- Allowable IC: 2.41 Ac (5%)
- Existing IC: 1.81 Ac (3.75%)



Calculations are approximate

WVWA Preserve

Total Area: 15.41 Ac

Floodplain: .87 Ac

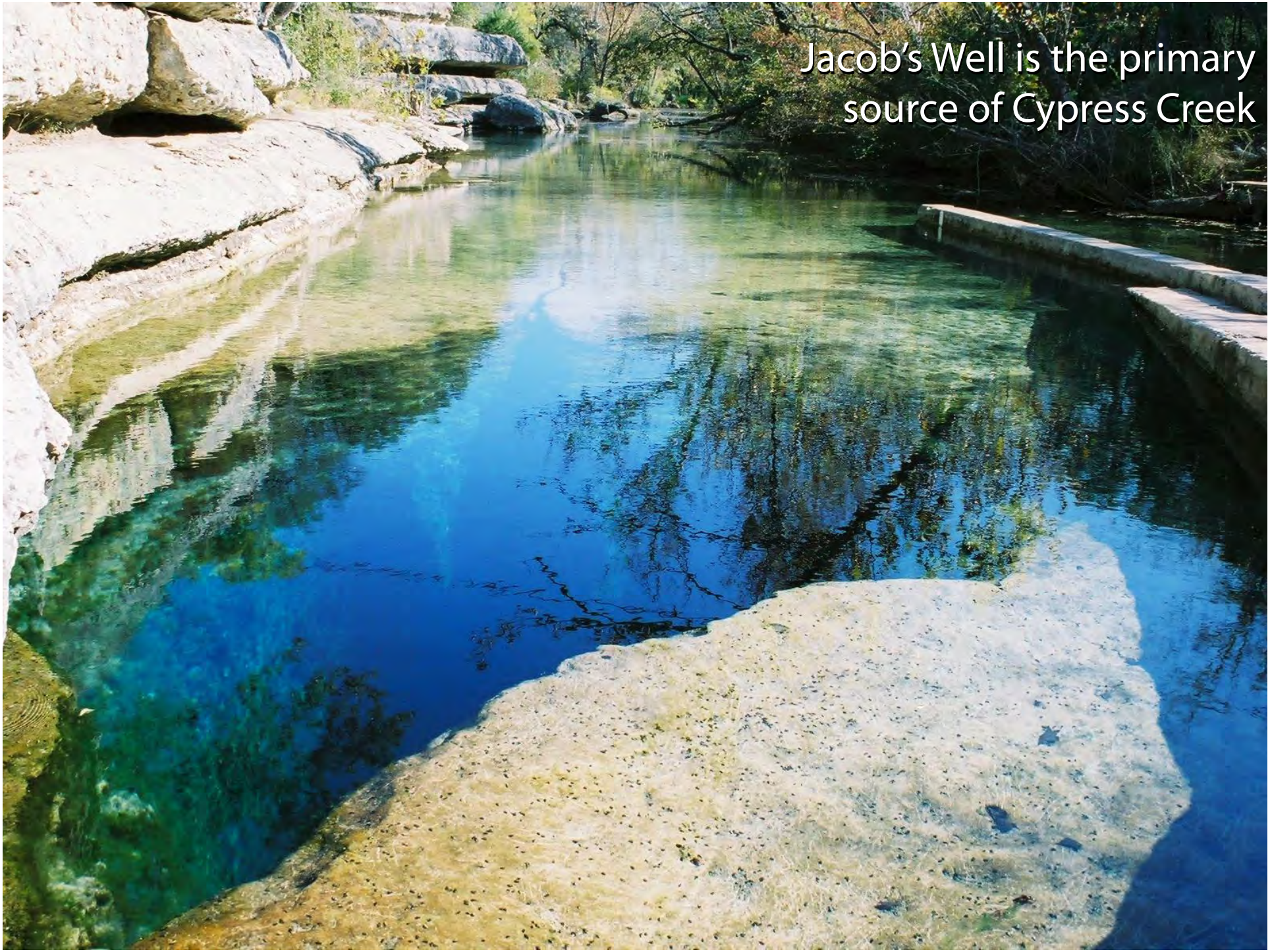
Slopes > 20%: 1.97 Ac

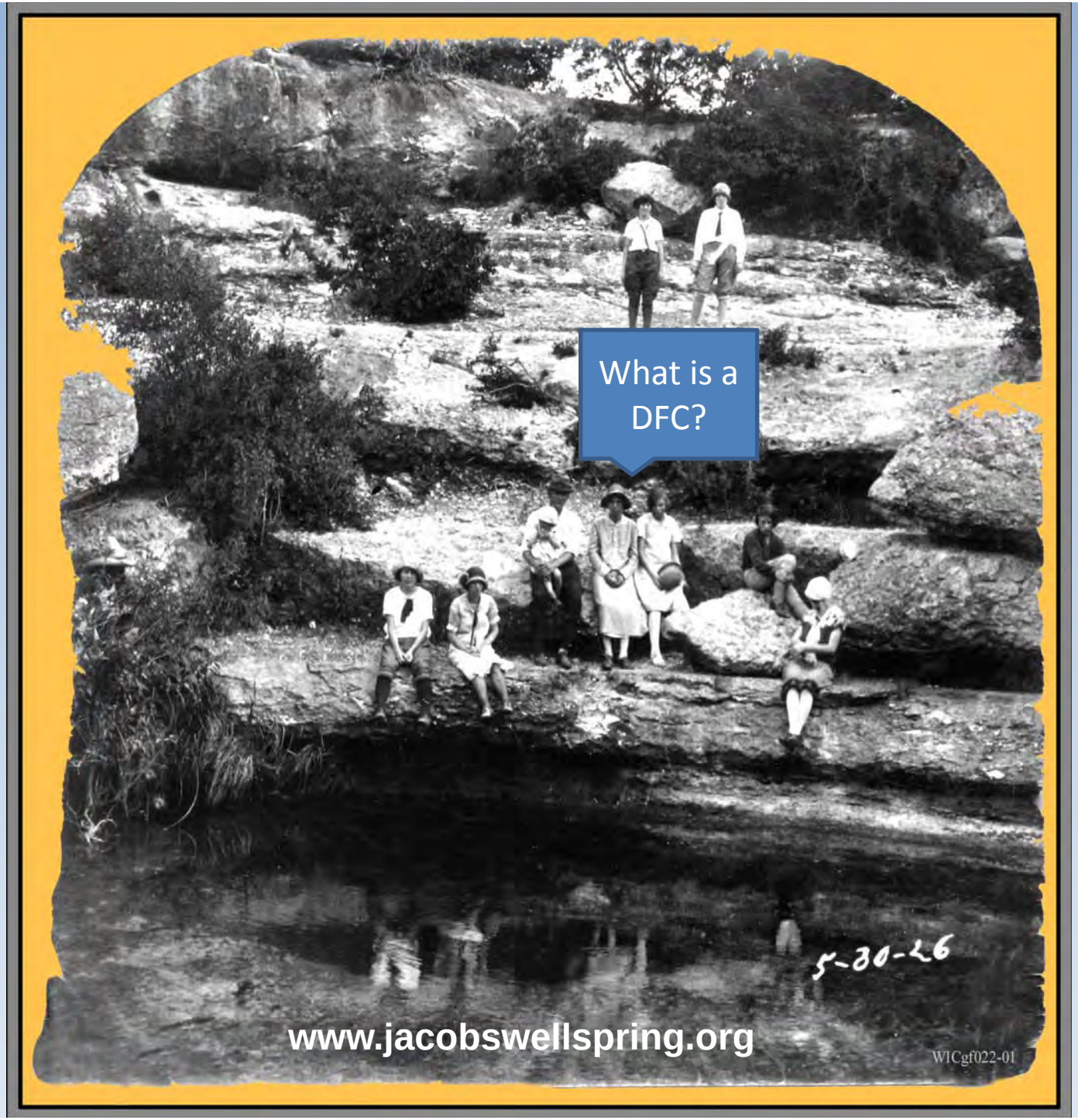
Net Site Area: 12.57 Ac
Allowable IC: .63 Ac (5 %)
Existing IC: .49 Ac (3.9 %)
Remaining IC: .14 Ac

Calculations are approximate

Conservation Value Summary

- **Jacob's Well has been in human use for thousands of years;**
- **It is an indicator of water quality and quantity for the area;**
- **The Cypress Creek Watershed is under substantial development pressure;**
- **If current trends continue, the cypress creek watershed will be built out with large lot subdivisions by 2050;**
- **The Blanco River and Cypress Creek Watersheds have few protected areas in Hays County;**
- **The Jacob's Well Potential Acquisition is a Green Print High Priority Area;**
- **The Acquisition Site contains important karst and recharge features;**
- **The Acquisition Site contains golden-cheeked warbler habitat;**
- **The Acquisition Site is a Hays County "Hot Spot" for Conservation; and**
- **The Jacob's Well Natural Area is an iconic watering hole of the Hill Country and a cultural identifier of the Wimberley area.**


Jacob's Well is the primary
source of Cypress Creek


What is a DFC?
5-30-26
www.jacobswellspring.org
WICgf022-01

Desired Future Conditions

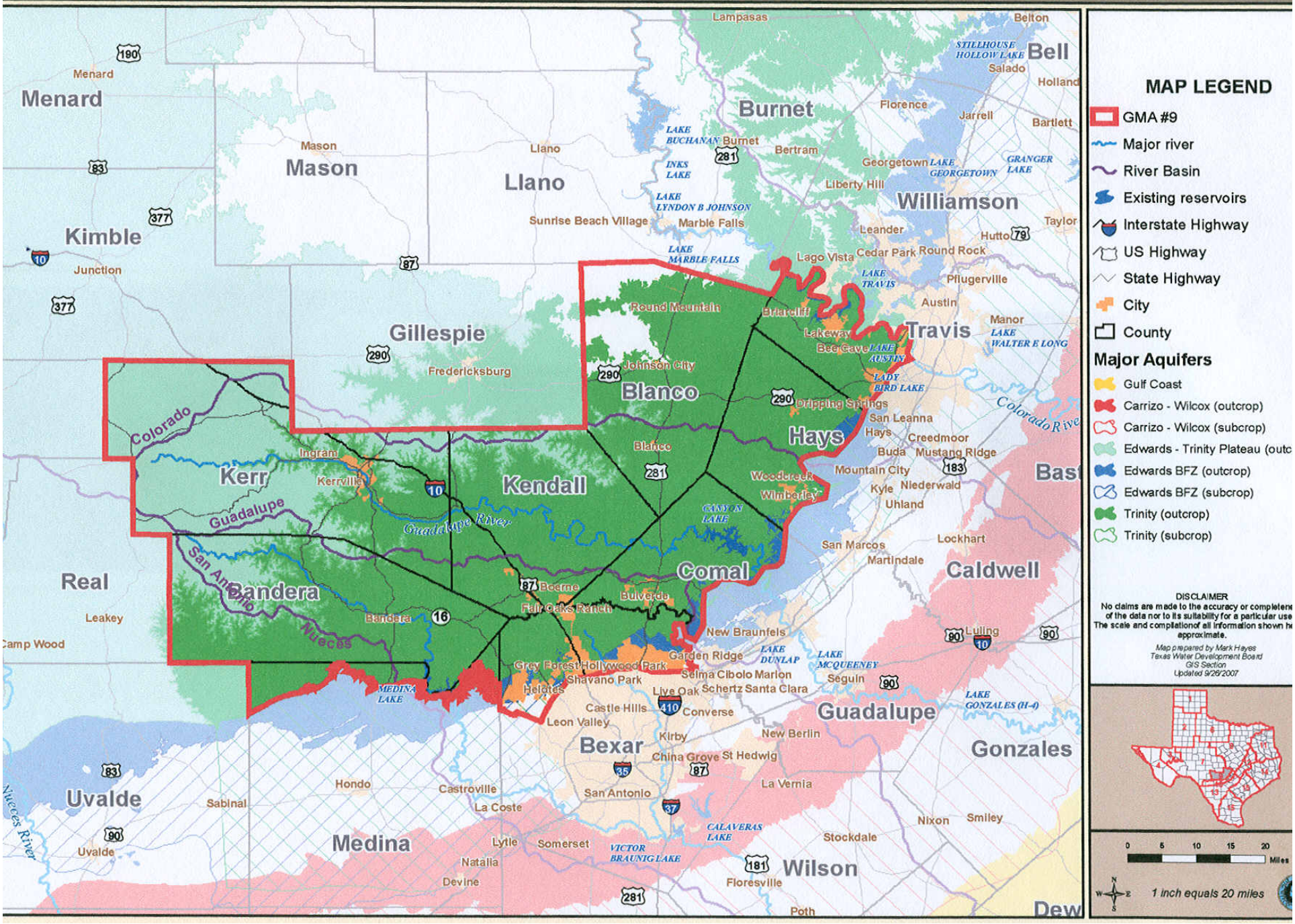
Planning for Tomorrow's Water, Today

A 30 ft. average drawn-down of the Trinity Aquifer in GMA-9 would lead to a major degradation of economic, ecological and quality of life conditions for the Wimberley Valley.

2008

2011

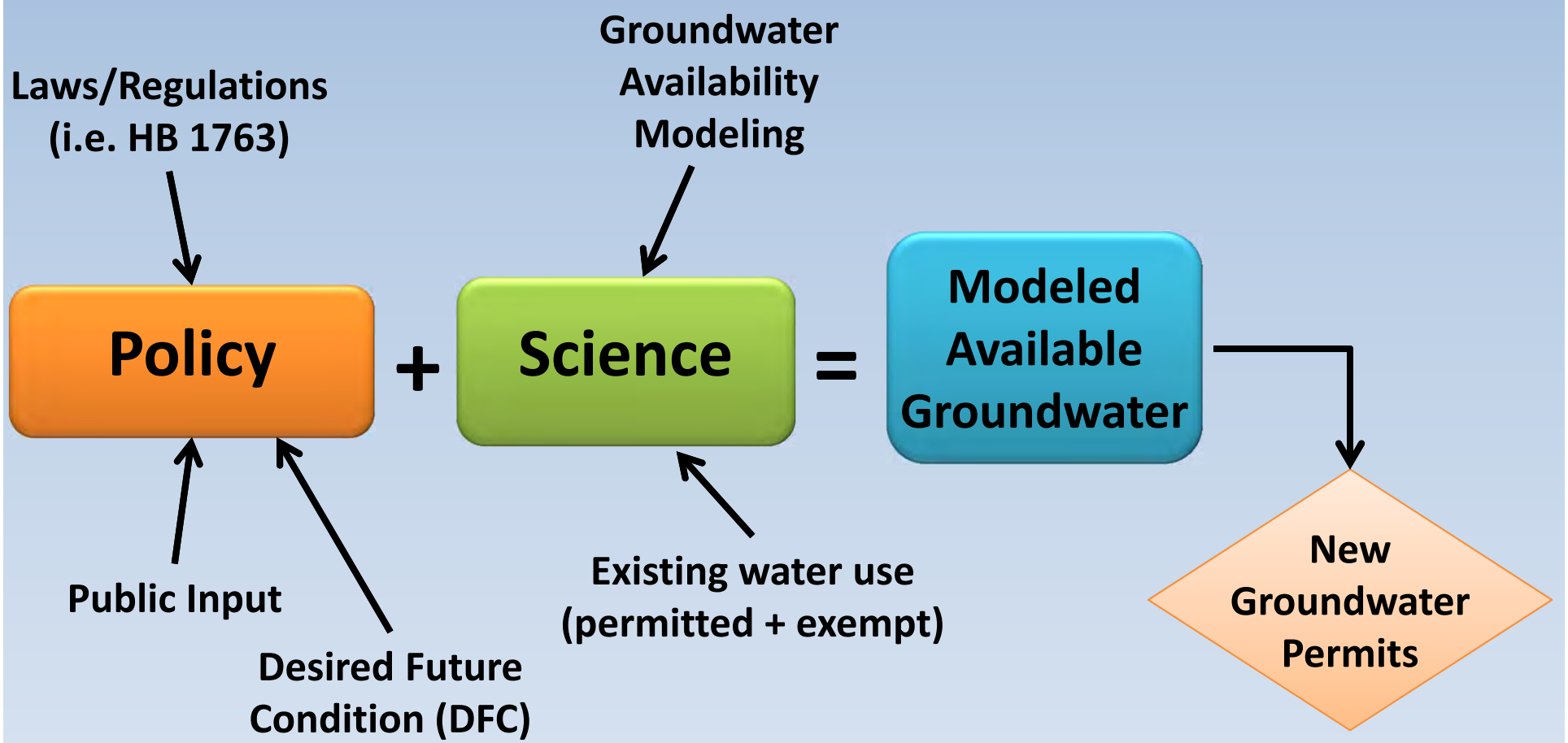
Groundwater Management Area #9

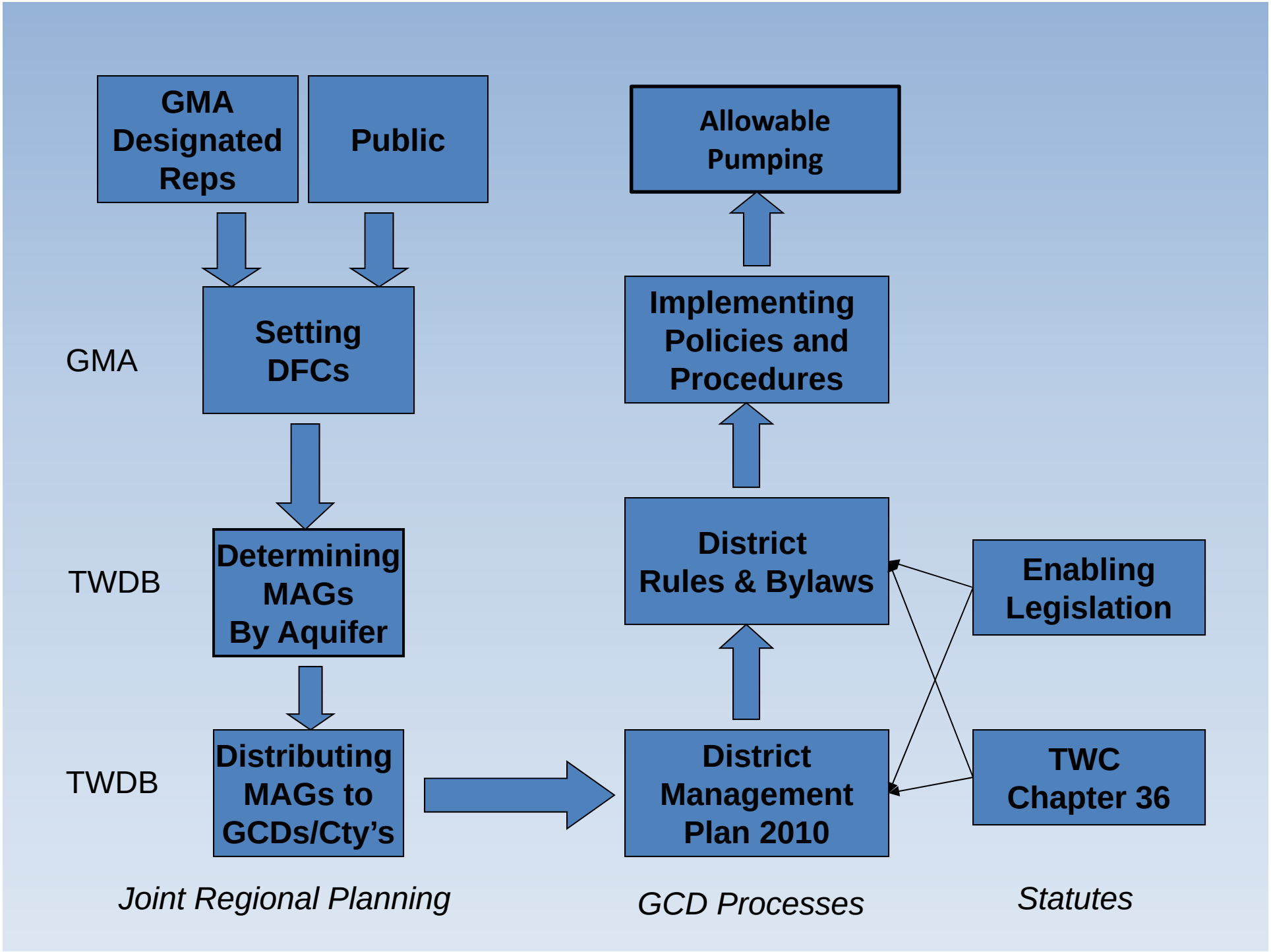


A Desired Future Condition is…

"the desired, quantified condition of groundwater resources…" (such as water levels, water quality, spring flows, or volumes)

Background to DFC Process




GMA Designated Reps
Public
Allowable Pumping
GMA
Setting DFCs
Implementing Policies and Procedures
TWDB
Determining MAGs By Aquifer
District Rules & Bylaws
Enabling Legislation
TWDB
Distributing MAGs to GCDs/Cty's
District Management Plan 2010
TWC Chapter 36
Joint Regional Planning
GCD Processes
Statutes

Public Support for Prudent Groundwater Management

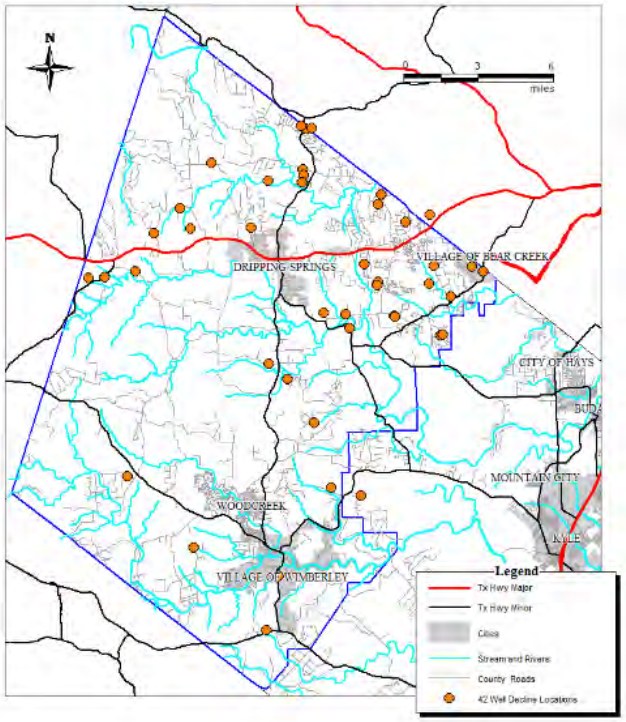
- "The most prevalent stakeholder comment received by GMA9 was the desire and need to manage the aquifers in such a way as to "***protect spring flow and base flow to creeks and rivers***." This sentiment was supported by a diverse group of stakeholders including: landowners, state and local government representatives, environmental organizations, recreational interests, local businesses, and wildlife organizations. [http://www.blancocountygroundwater.org/gma9/Background%20Information%20on%20Edwards%20DFC%20Appeal.pdf]

- The second concern most often heard was, in summary, *"do not rush into setting a DFC, give due consideration to all aspects of the aquifer system, and do what is best to provide for sustainable water for those who rely on groundwater from GMA 9."*
  [http://www.hillcountryalliance.org/HCA/DecidingFutureCondition]

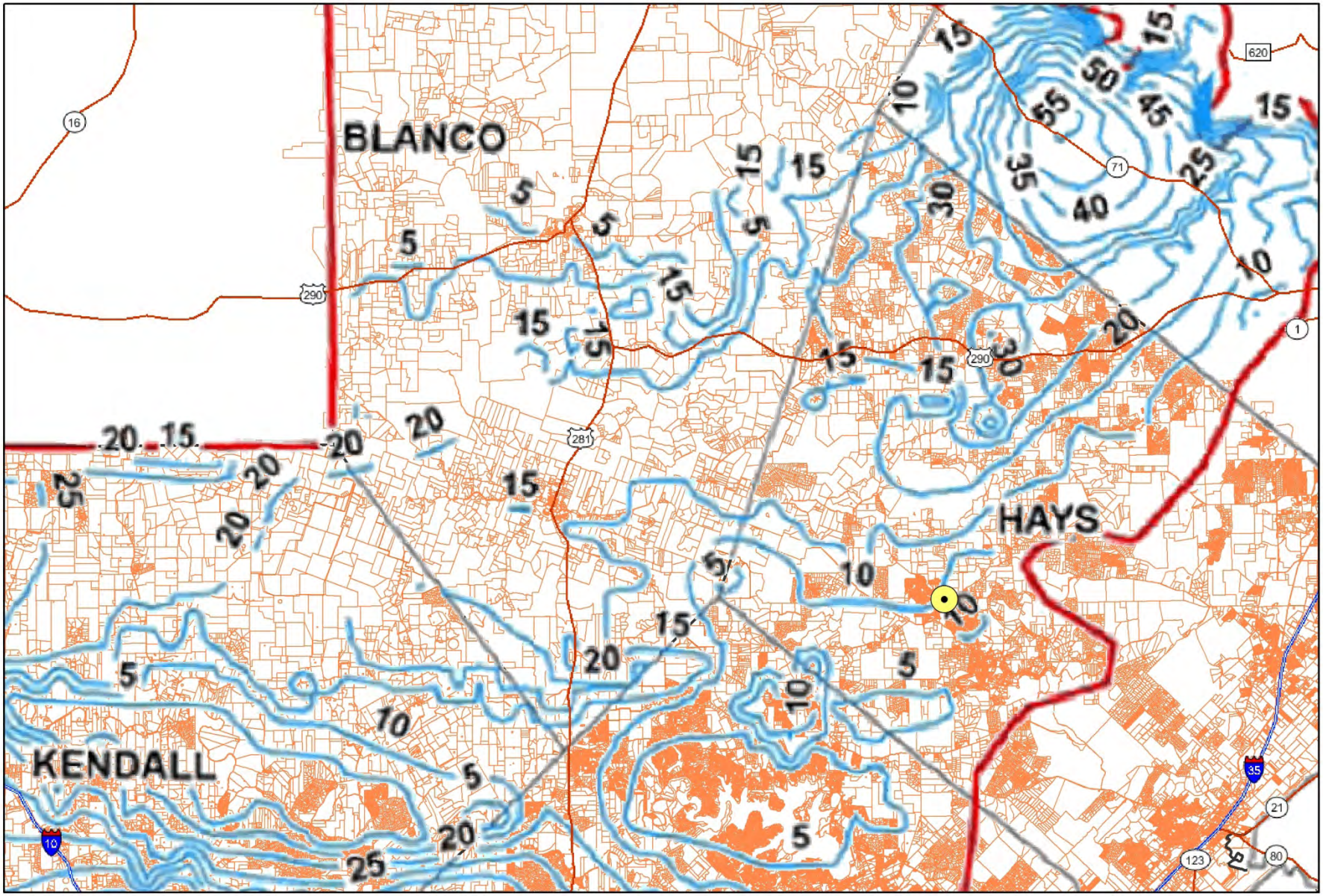
Local Conditions

In 2006, drinking wells went dry across the Hill Country in the Trinity Aquifer, and 2006 wasn't a particularly dry year (R. Slade 2006). 2006 streamflow was the lowest recorded in the history of gauges in this region – *but remember this wasn't a particularly dry period based on long term data.*

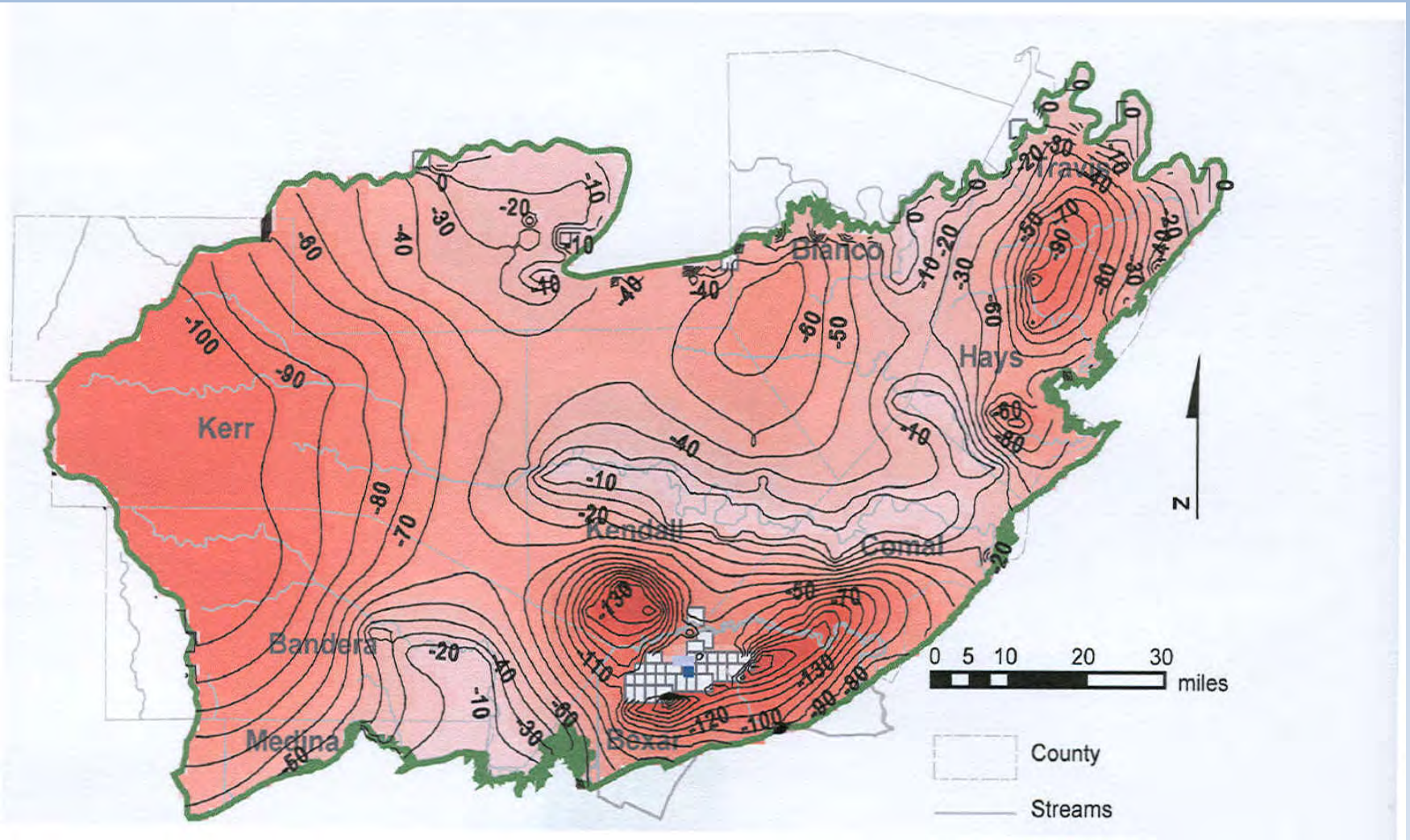
In 2009, 42 drinking-water wells were reported going dry



Aquifer declines under 30ft DFC (Scenario 6)



Middle Trinity – 30-35’ Decline



Summary of Petition to TWDB

- ***Aquifer mining is inherently unsustainable*** and goes against groundwater districts' stated management goals
- ***Aquifer mining is already occurring*** with current pumping
- The adopted DFC ***will have economic, property rights, and public health impacts*** for well owners, local economies and recreational users
- The adopted DFC ***will have environmental impacts*** on springs and baseflows

Summary of Petition to TWDB

- The GAM model can only show regional trends and ***is unable to accurately predict short-term, local impacts*** on individual springs and wells
- ***No systematic process exists for monitoring and applying*** a regional and multi-year average DFC that ***combines three very different aquifer systems*** into one average drawdown value
- ***Exempt users have been and will continue to be impacted*** by additional permitted pumping allowed by the adopted DFC

Local Economic Impacts

- Reduced stream flow could cause a significant drop in property values for properties along Cypress Creek
  - Up to **45% reduction** in value
  - Resulting in a **loss to landowners of *at least* $8.25 to $14.9 million**
  - Corresponding **losses in property tax revenues** (RSI 2010)
- Cypress Creek frontage value in real estate market is $1,000 per foot
  - Over $60 million value from Jacob's Well to Blanco River
  - Value of frontage along a dry creek is significantly less

Local Economic Impacts

- Public and private investment in **riverine parks and nature preserves would be jeopardized** by reduced flows.
  - Public investment in riverine preserves, Jacob's Well Natural Area, and Blue Hole Regional Park is over $13 million.
  - Existence of these parks depends on having enough clean water to encourage visitors and safe recreation

Local Economic Impacts

- Revenues from river recreation are multiplied by over 200% as spending in local economies (Cordell et al. 1990)
  - For every $1 spent to go tubing or eat at a restaurant on the river, over $2 gets spent in the local economy (jobs, tax revenue, other shopping, etc.)
  - River recreation in western Hays county dependent on baseflows to springs and creeks

Going Forward

- We as a community need to find ways to accommodate growth without losing our springs and rivers.
- WVWA recommends that local stakeholders, TWDB, GMA9, and the HTGCD lead a collaborative process to:
  - Define a management area for Jacob's Well and Cypress Creek
  - Bring together affected parties to adopt a DFC for that area that addresses
    - Economic and environmental importance of springs and rivers
    - Local impacts to existing well owners
    - Desired future conditions during drought periods
  - Develop the strategies needed for alternative water supply (rainwater, conservation, Lower Trinity, surface water, etc.) so the new DFC will be achievable
  - Ensure that GCDs have the necessary tools to manage the aquifer for sustained yield

John Ashworth

Hydrogeologist, formerly with
Texas Water Development Board

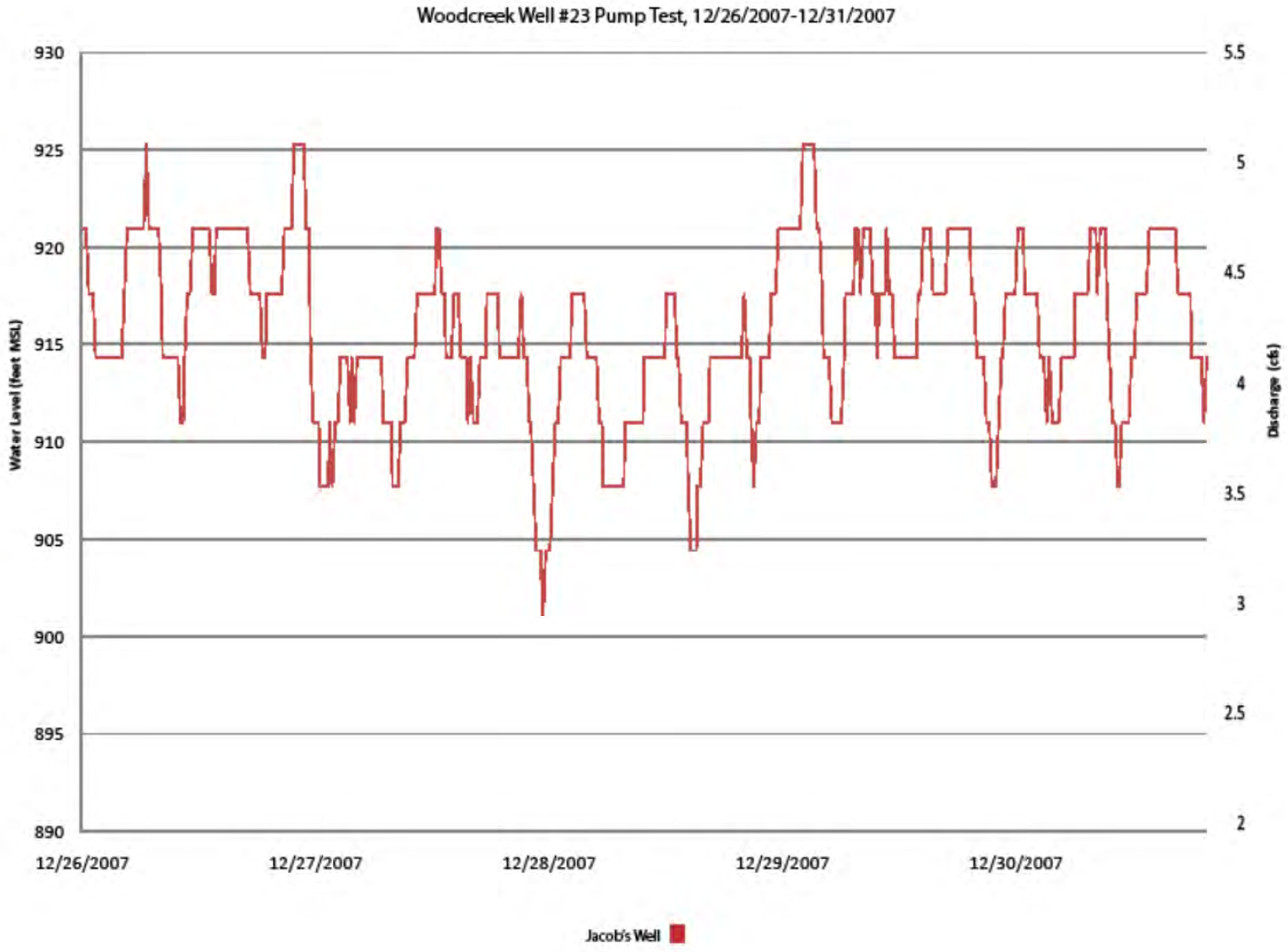
Regional Perspective

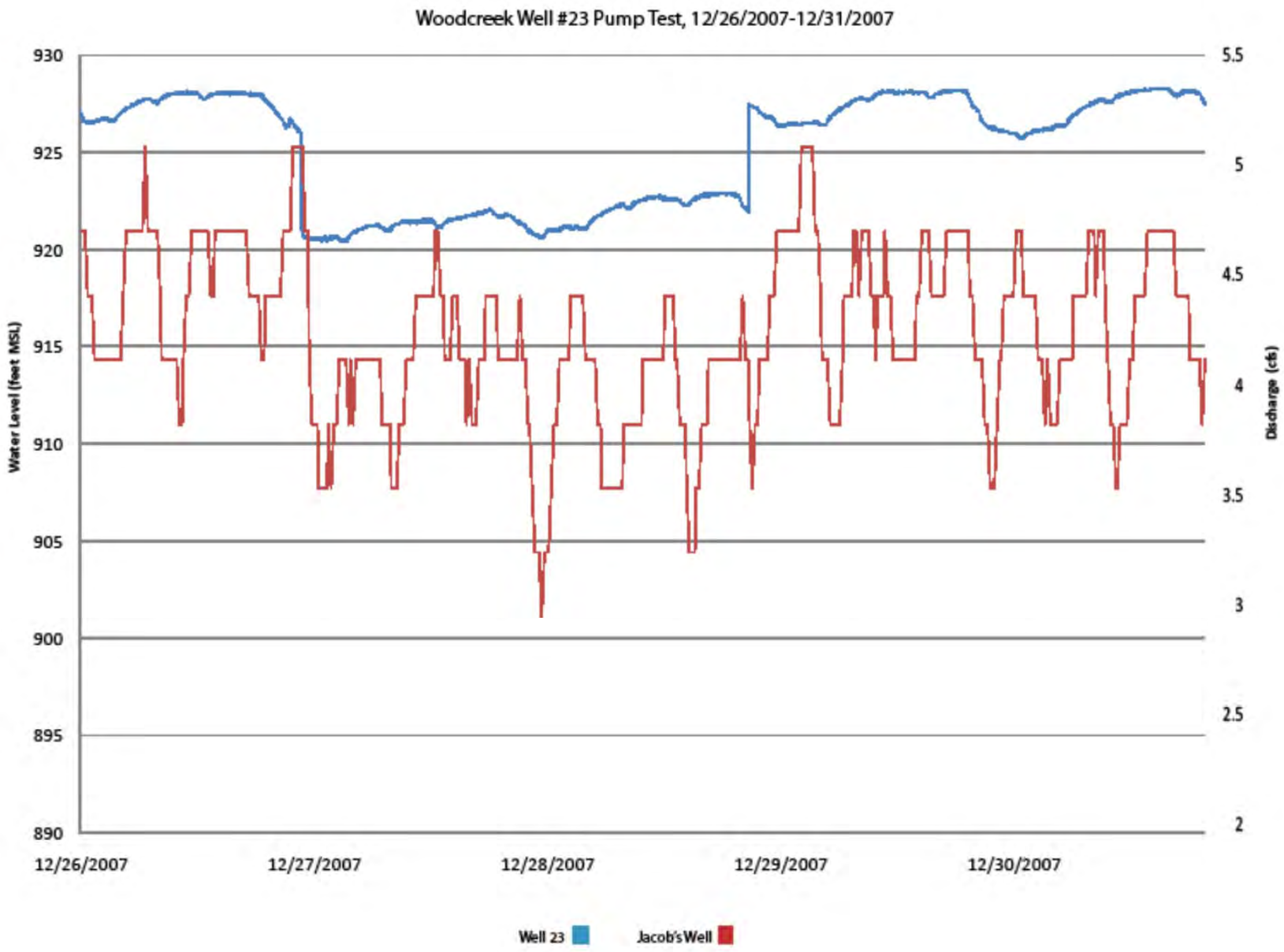
- Managing groundwater levels to maintain spring and base flows

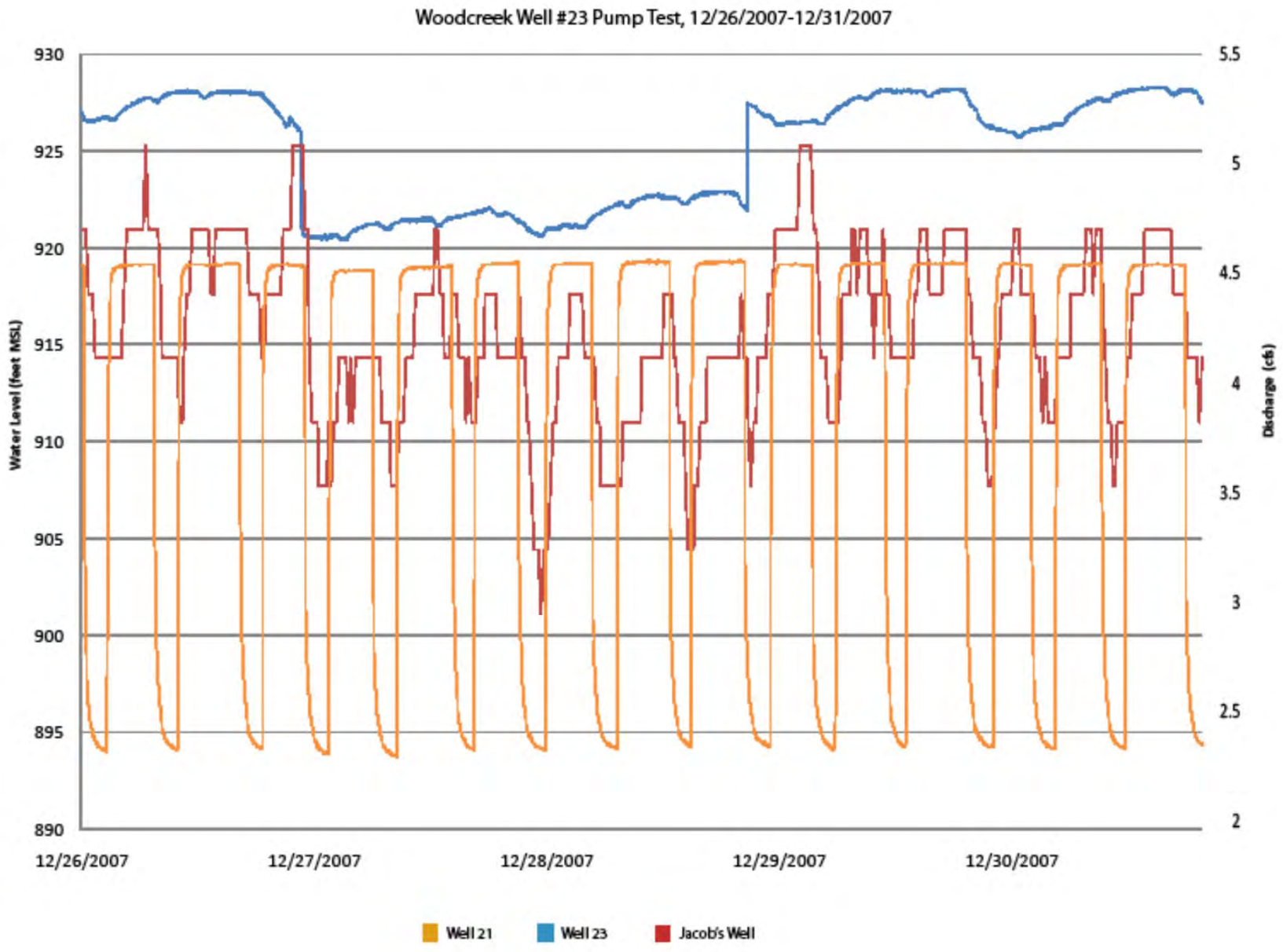
ERA	SYSTEM	GROUP	STRATIGRAPHIC UNIT		HYDROLOGIC UNIT	
Cenozoic	Quaternary		Alluvium		Alluvium	
Mesozoic	Cretaceous	Edwards	Segovia Formation		Edwards Group	
			Fort Terrett Formation			
		Trinity	Glen Rose Limestone	Upper Member	Trinity Aquifer System	Upper Trinity
				Lower Member		Middle Trinity
			Hensell Sand/Bexar Shale			
			Cow Creek Limestone			
			Hammett Shale			confining unit
			Sligo Formation			Lower Trinity
			Sycamore Sand/Hosston Formation			
Paleozoic			Undifferentiated Pre-Cretaceous rock			

- Current DFC combines 3 very different aquifer systems into a single average decline

Cypress Creek/Jacob's Well Hydrogeologic Study (December, 2008)

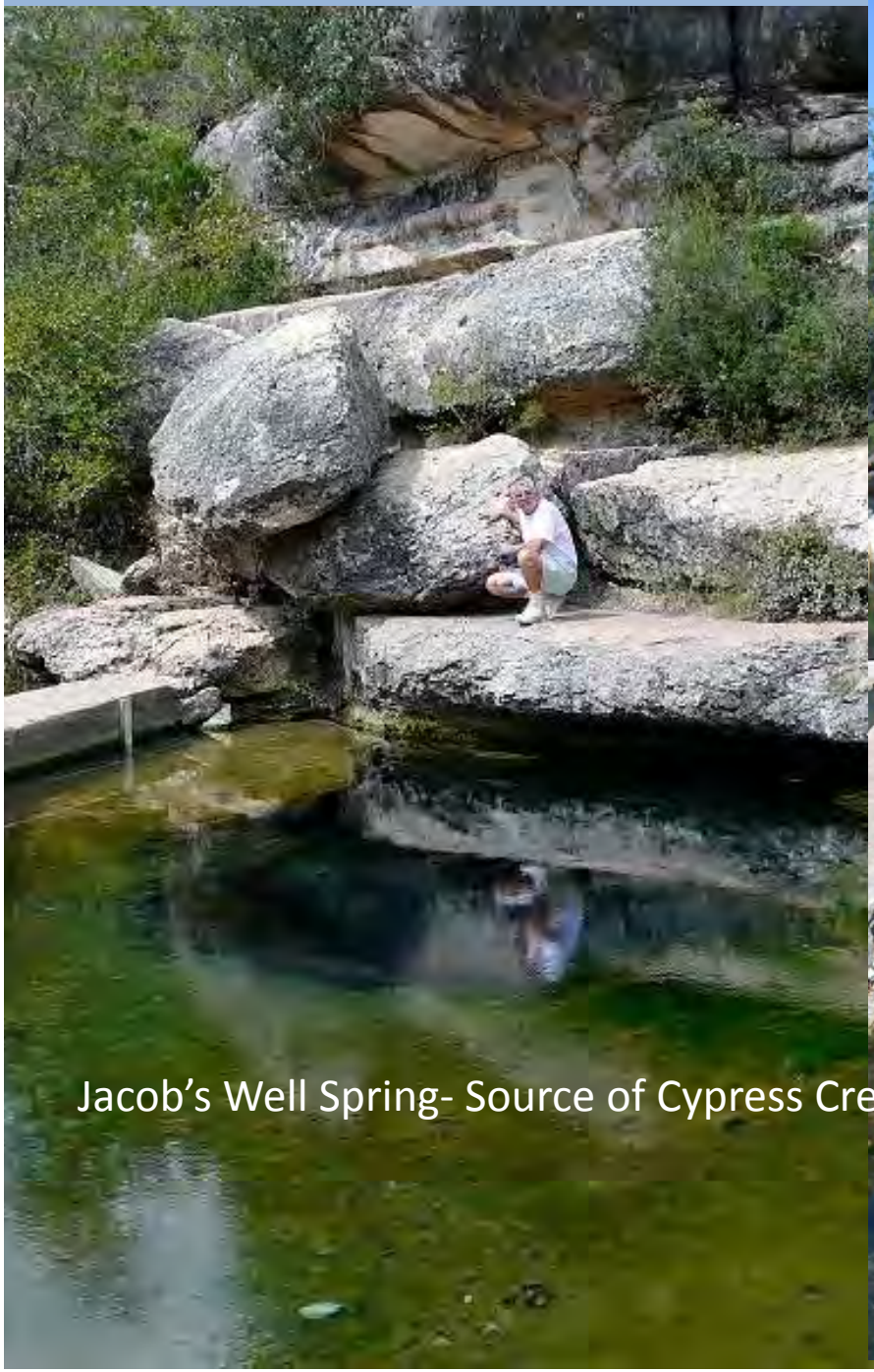

Woodcreek Well #23 Pump Test, 12/26/2007-12/31/2007
Water Level (feet MSL)
930
925
920
915
910
905
900
895
890
Discharge (cfs)
5.5
5
4.5
4
3.5
3
2.5
2
12/26/2007
12/27/2007
12/28/2007
12/29/2007
12/30/2007
Jacob's Well


Woodcreek Well #23 Pump Test, 12/26/2007-12/31/2007
930
925
920
915
910
905
900
895
890
Water Level (feet MSL)
5.5
5
4.5
4
3.5
3
2.5
2
Discharge (cfs)
12/26/2007
12/27/2007
12/28/2007
12/29/2007
12/30/2007
Well 23
Jacob's Well

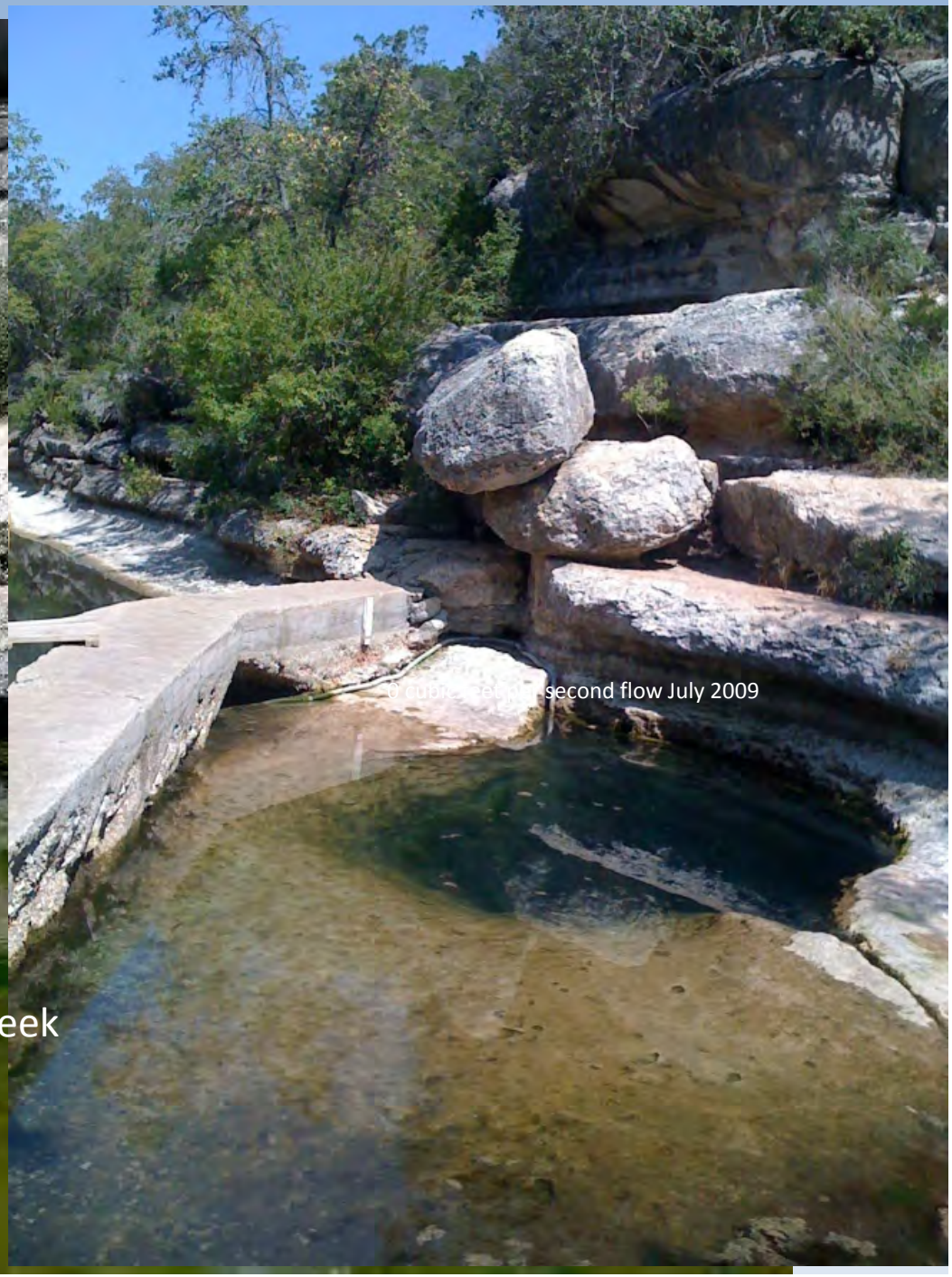

Woodcreek Well #23 Pump Test, 12/26/2007-12/31/2007
Water Level (feet MSL)
930
925
920
915
910
905
900
895
890
Discharge (cfs)
5.5
5
4.5
4
3.5
3
2.5
2
12/26/2007
12/27/2007
12/28/2007
12/29/2007
12/30/2007
Well 21
Well 23
Jacob's Well

Douglas A. Wierman, P.G.

Hydrogeologist, formerly with Hays Trinity Groundwater Conservation District



Jacob’s Well Spring- Source of Cypress Creek



0 cubic feet per second flow July 2009

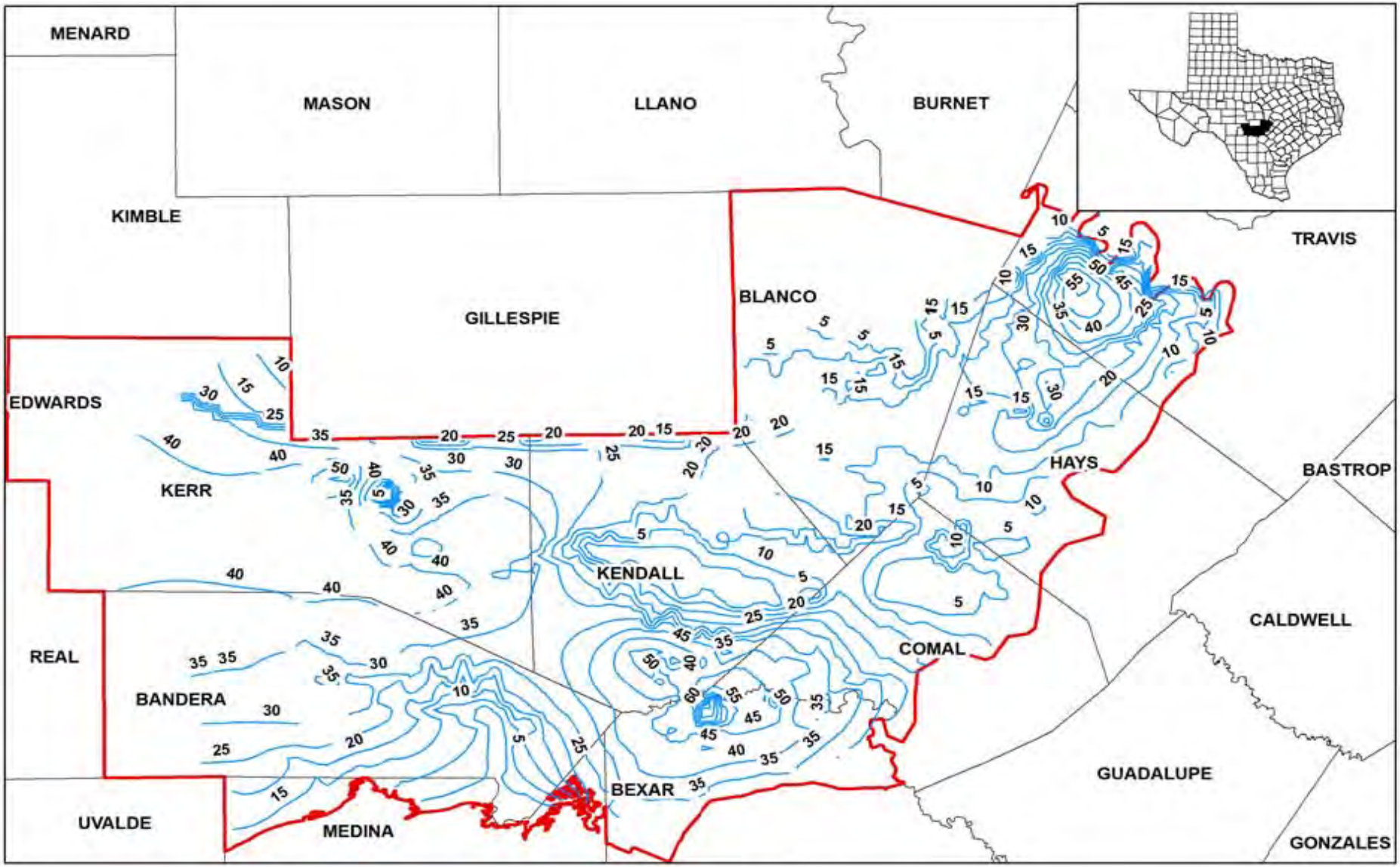
Presentation Topics

- Discussion of regional declines in water levels in the Hill County Trinity Aquifer
- Discussion of local Hays County water level declines/aquifer mining and impacts on sustainable aquifer development
- Quantification of impact of declining water levels on flow from Jacob's Well
- Exempt wells and their impact on sustainable aquifer development

Current Use and Modeled Available Groundwater for Scenario 6 – 30’ of Drawdown

- 2008 Baseline – ~5800 AFY
- 2010 MAG - ~9100 AFY
- MAG represents > 50% increase in pumpage

Data Sources:
GAM Task 10-031: Supplement to GAM Task 10-005
Draft GMA Run 10-050 MAG



Scenario 6 : Average (of 387 simulations and layer 2,3&4) 50 year drawdown (initial condition 2008)

Drawdown Contour (Trinity Only) | GMA 9 Boundary | County

N W E S

0 5 10 20 Miles

Note: The positive values are drawdowns. The negative values are increase in water level.

Water Level Trend Data Sources

- Texas Water Development Board, Report 379 Changes in Water Levels in Texas, 1995 to 2005
- BSEACD, Report #2010-0501 Spring 2009 Potentiometric Map of the Middle Trinity Aquifer in Groundwater Management Area 9, Central Texas
- HTGCD Water Level Monitoring Data http://haysgroundwater.com/monitored-wells-data

Texas Water Development Board

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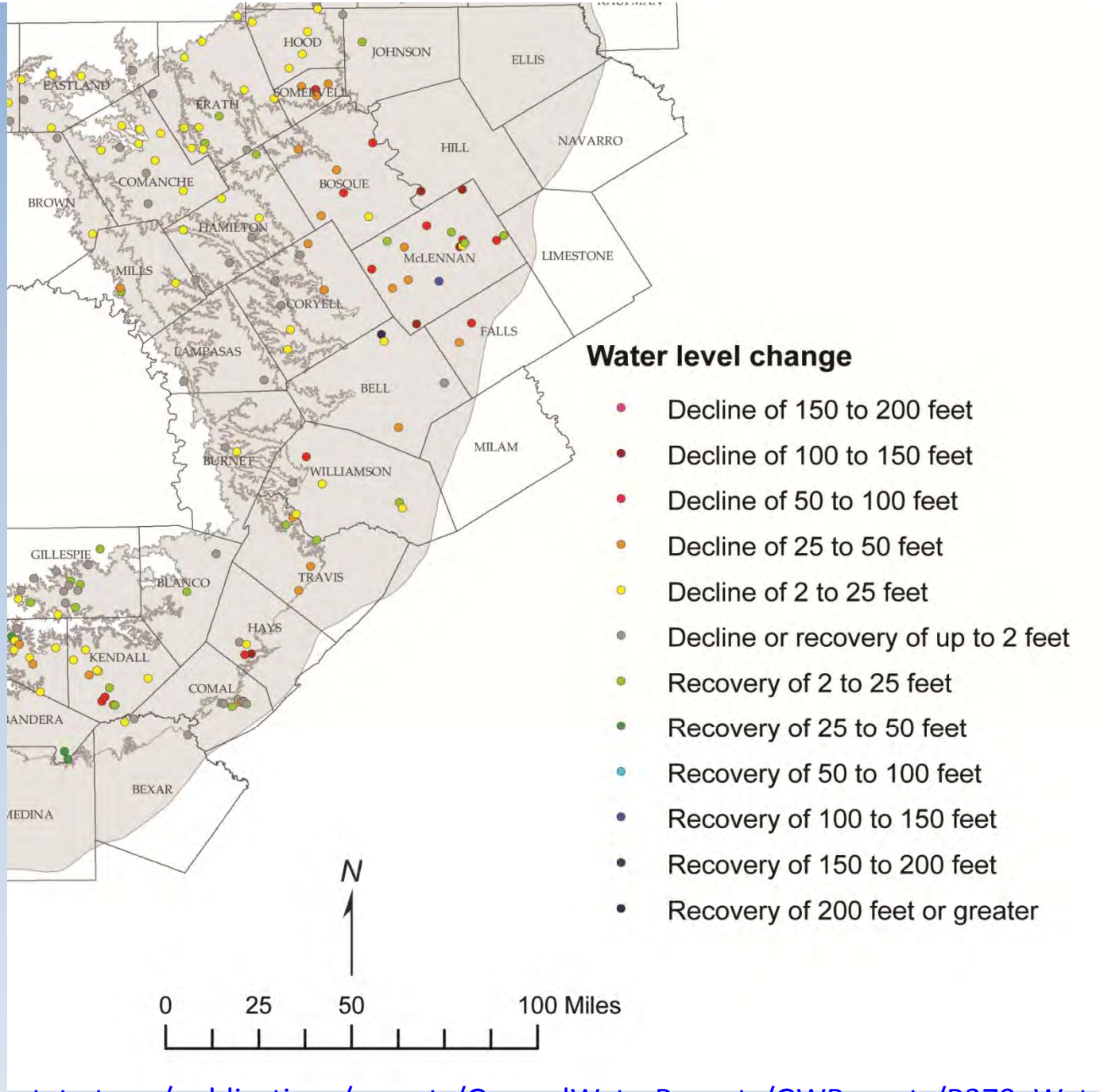
Changes in Water Levels in Texas, 1995 to 2005

by

Radu Boghici, P.G.

July 2011



http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWReports/R379_WaterLevels.pdf

SPRING 2009 POTENTIOMETRIC MAP OF THE MIDDLE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 9, CENTRAL TEXAS

Brian B. Hunt, P.G., and Brian A. Smith, Ph.D., P.G.,
Barton Springs/Edwards Aquifer Conservation District

A COLLABORATIVE REPORT WITH:

Ronald G. Fieseler, P.G. *Blanco-Pedernales Groundwater Conservation District*

Doug Wierman, P.G., and Wesley *Schumacher Hays-Trinity Groundwater Conservation District*

Micah Voulgaris *Cow Creek Groundwater Conservation District*

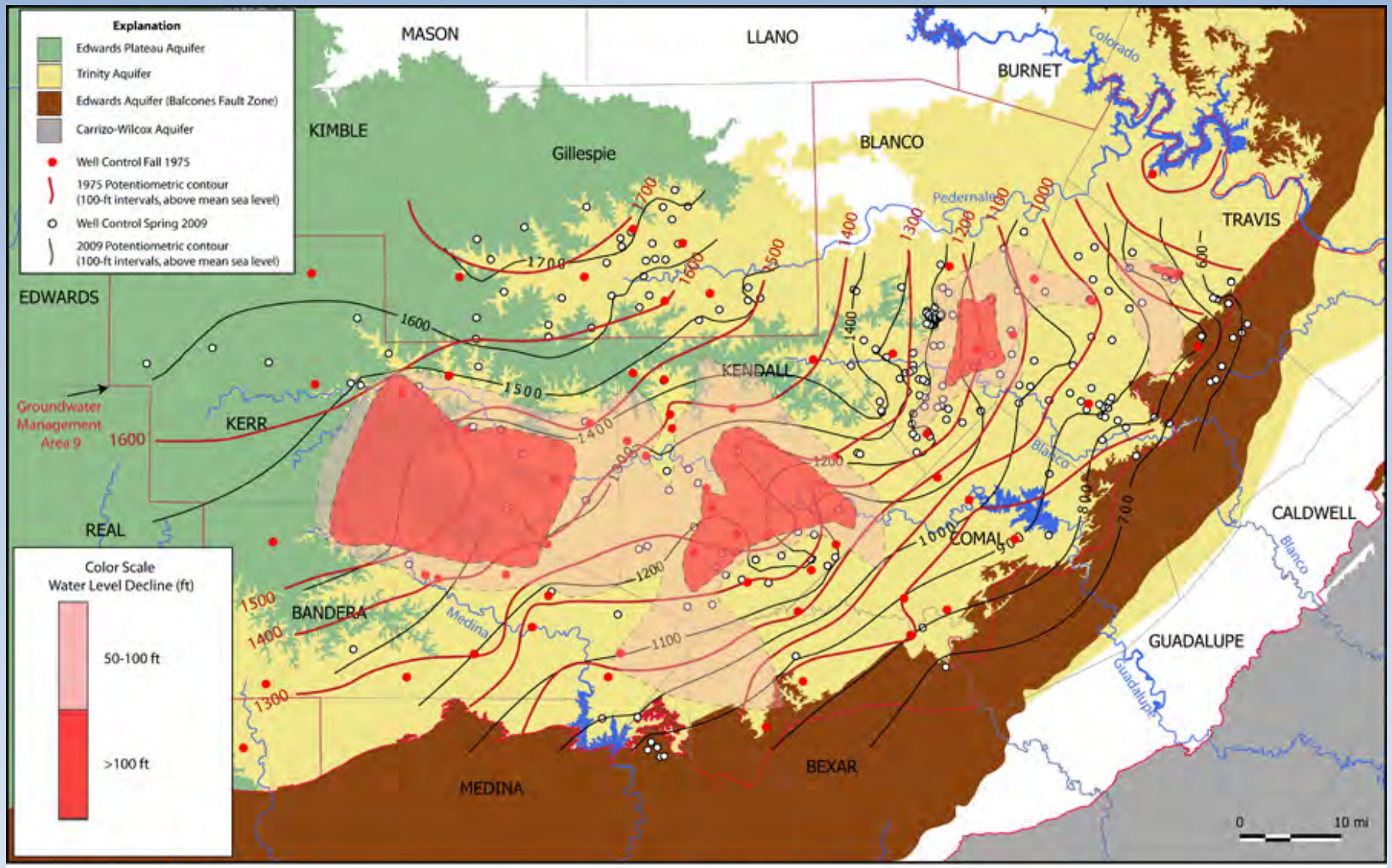
George Wissmann *Trinity Glen Rose Groundwater Conservation District*

Gene Williams *Headwaters Groundwater Conservation District*

David Jeffery, P.G. *Bandera County River Authority & Groundwater District*

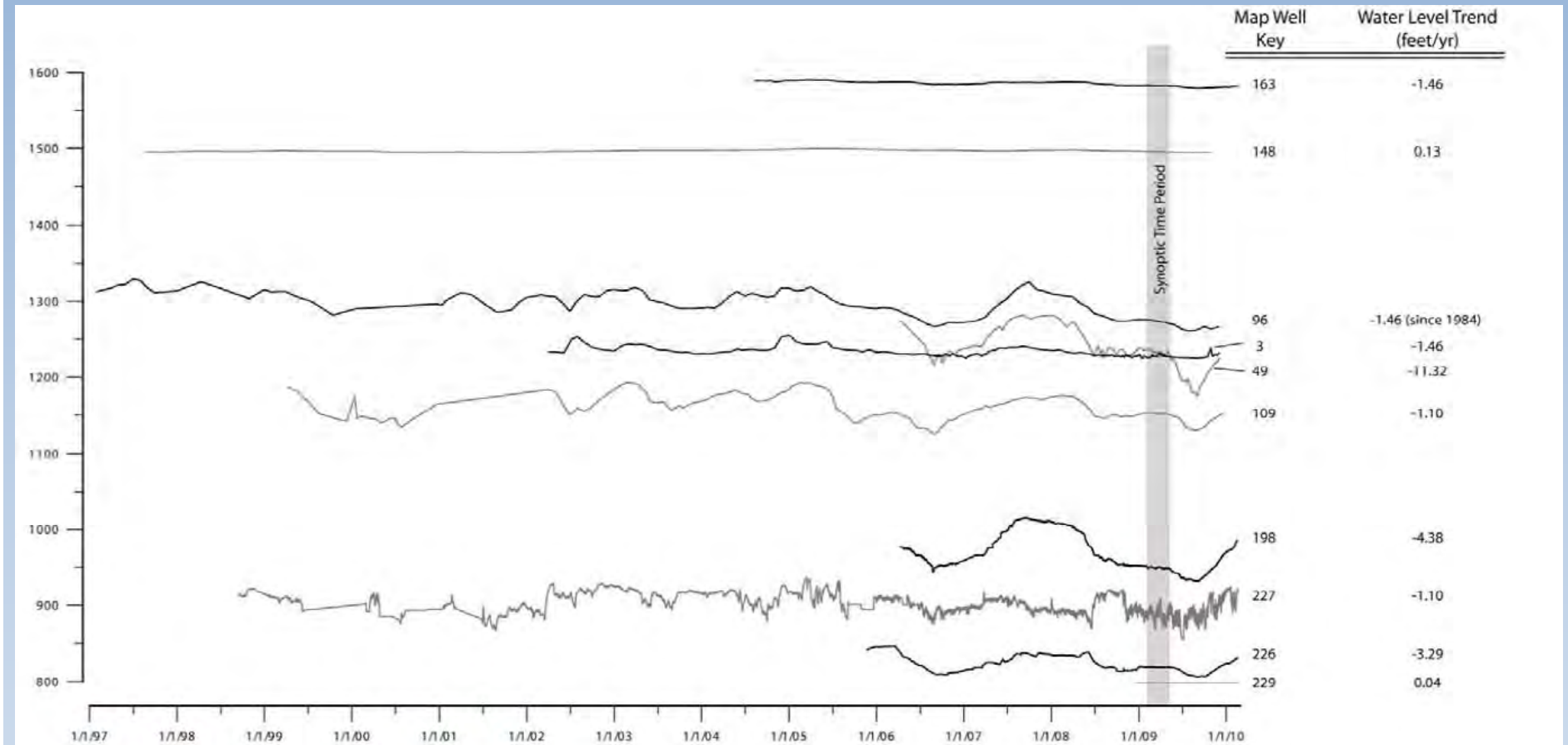
Paul Tybor, P.G. *Hill Country Underground Water Conservation District*

David Caldwell *Medina County Groundwater Conservation District*



Basemap data provided by the Texas Water Development Board: Major Aquifers of Texas, Major Rivers, and Groundwater Management Areas.

Combined Fall 1975 and Spring 2009 Middle Trinity Potentiometric Maps and net water-level decline map


Map Well Key
Water Level Trend (feet/yr)
Synoptic Time Period
163 -1.46
148 0.13
96 -1.46 (since 1984)
3 -1.46
49 -11.32
109 -1.10
198 -4.38
227 -1.10
226 -3.29
229 0.04
1600
1500
1400
1300
1200
1100
1000
900
800
1/1/97
1/1/98
1/1/99
1/1/00
1/1/01
1/1/02
1/1/03
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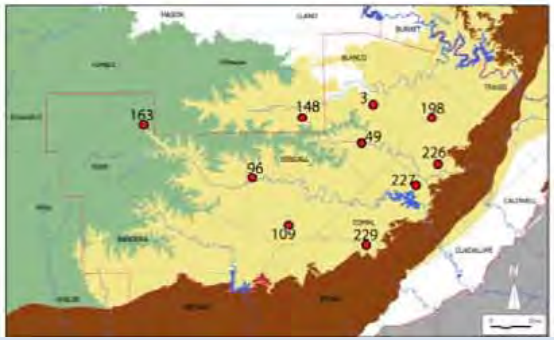
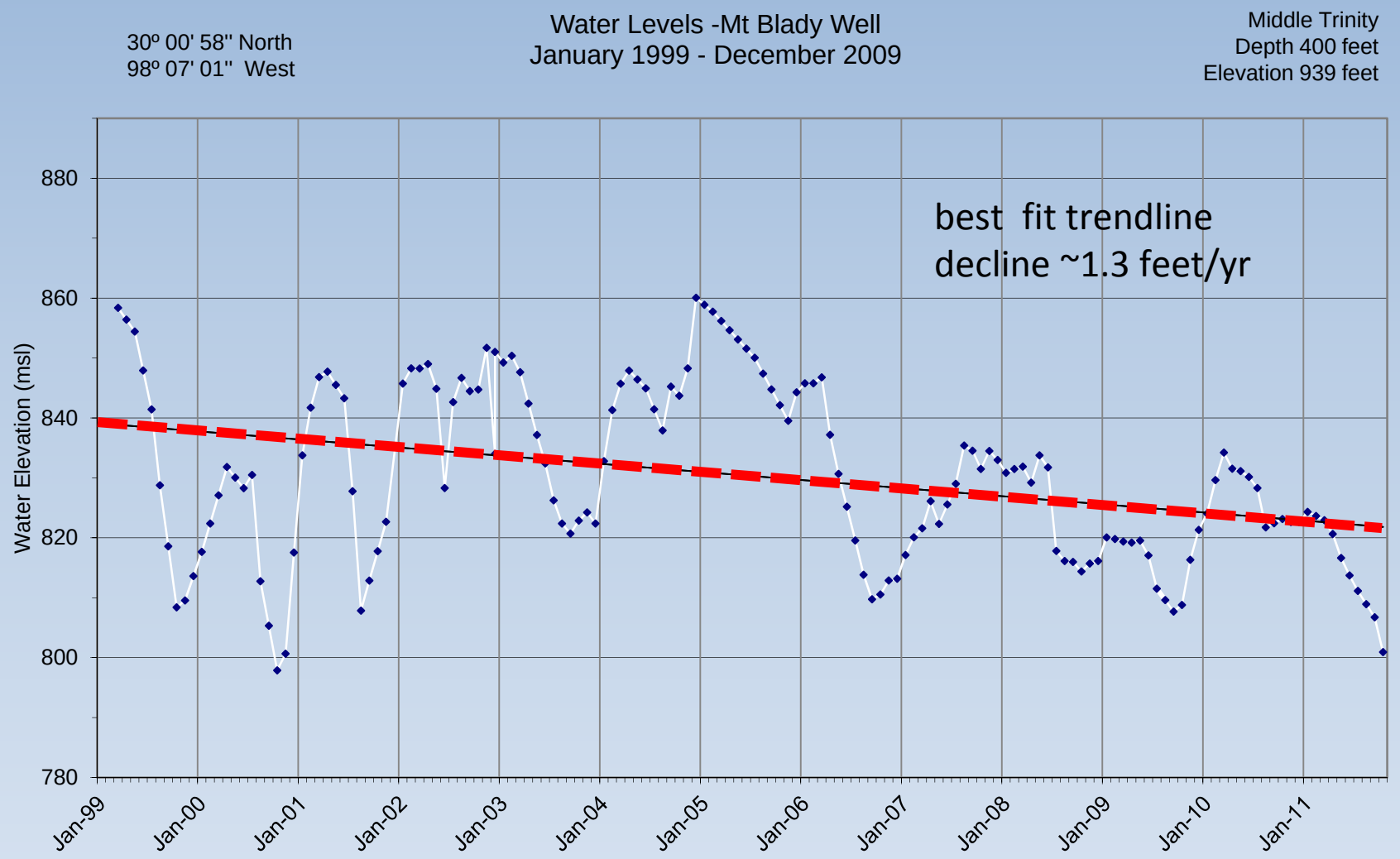
1/1/05
1/1/06
1/1/07
1/1/08
1/1/09
1/1/10

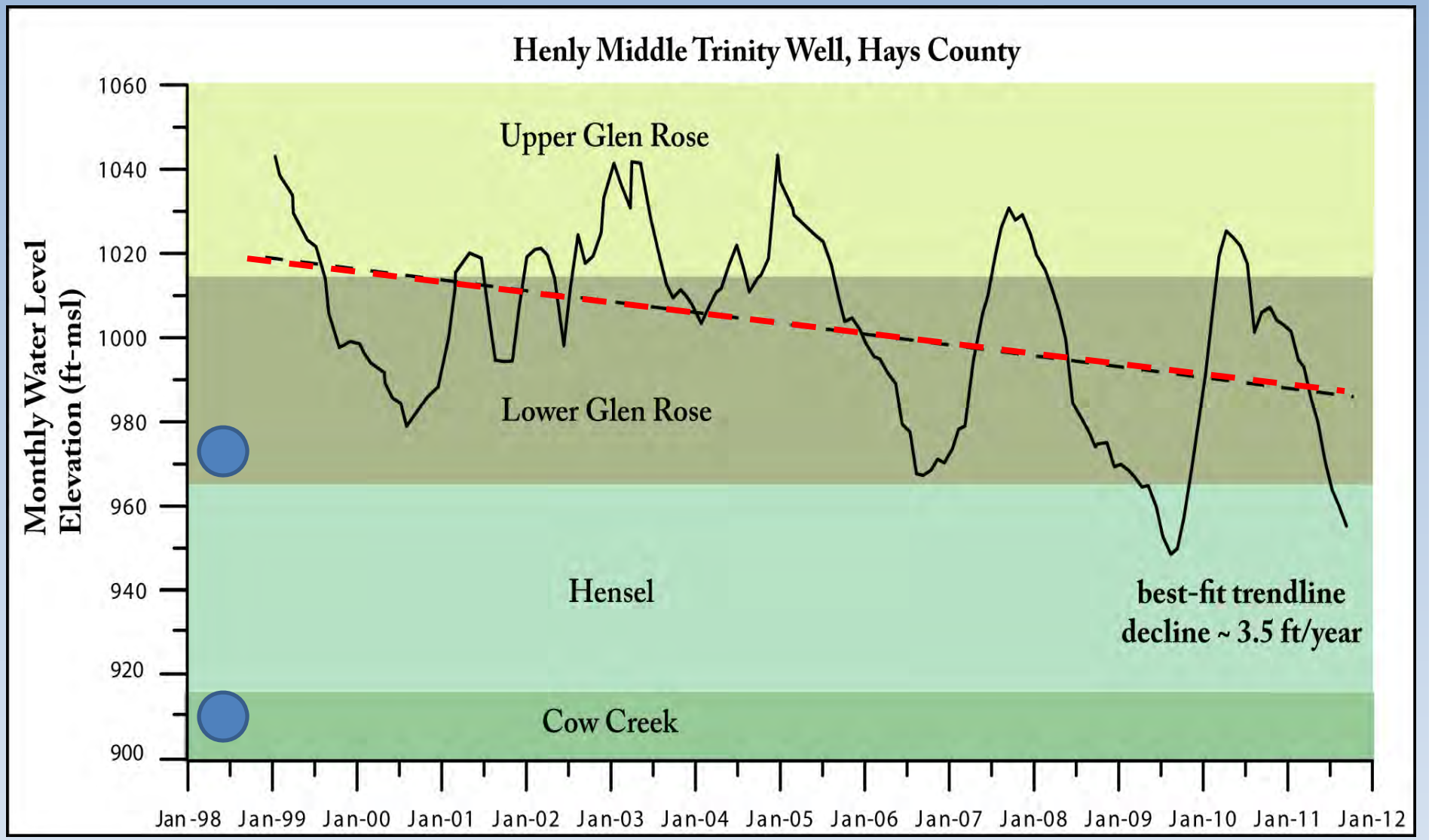

163
148
3
198
49
226
96
227
109
229

Water Level Monitoring Data

Hays Trinity Groundwater Conservation District Water Level Monitoring Program



Water Level Data Source: http://haysgroundwater.com/wellgraph?idWell=1299



Water Level Data Source: http://haysgroundwater.com/wellgraph?idWell=1289

Impact of Water Declines on the Flow from Jacob's Well

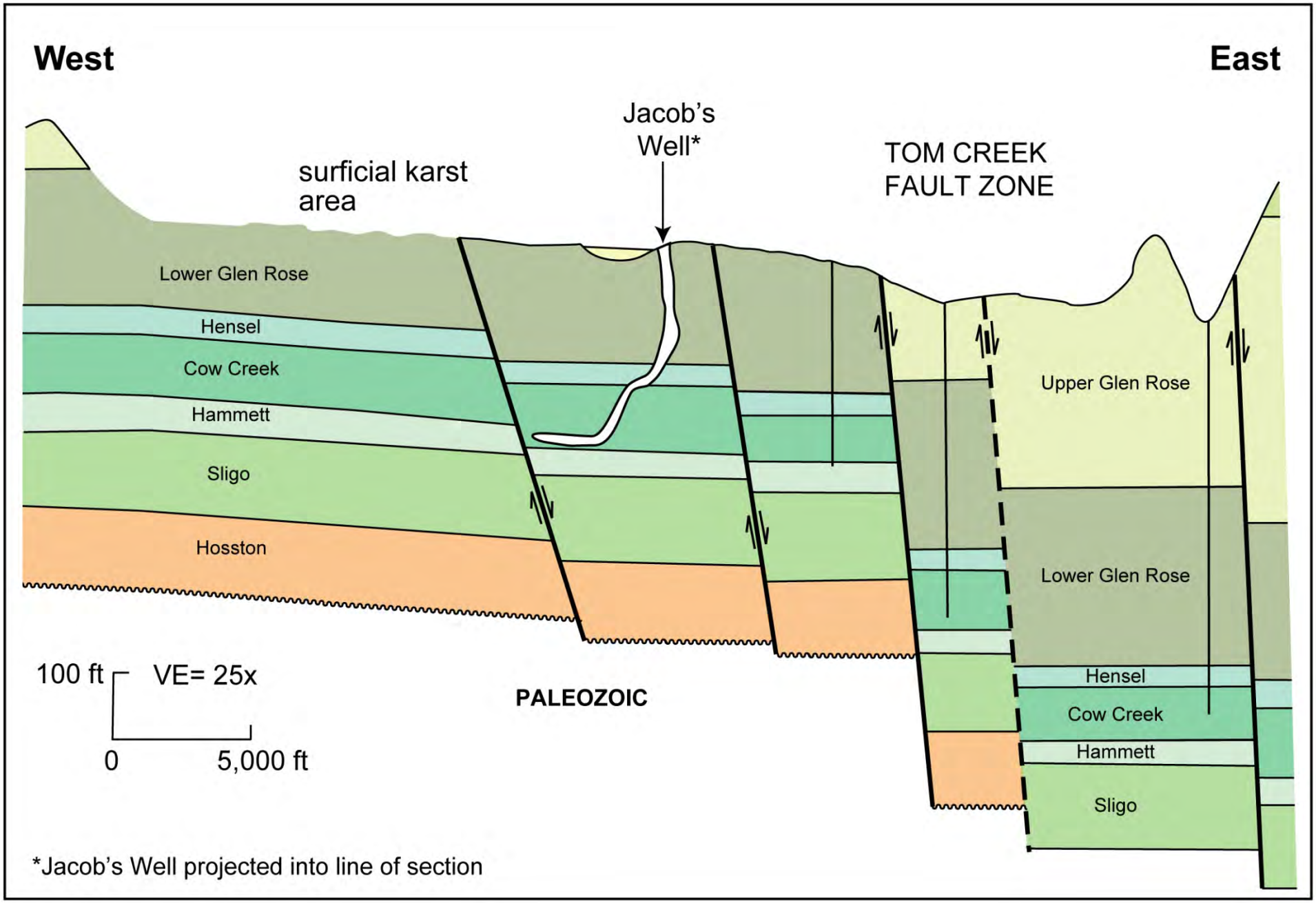
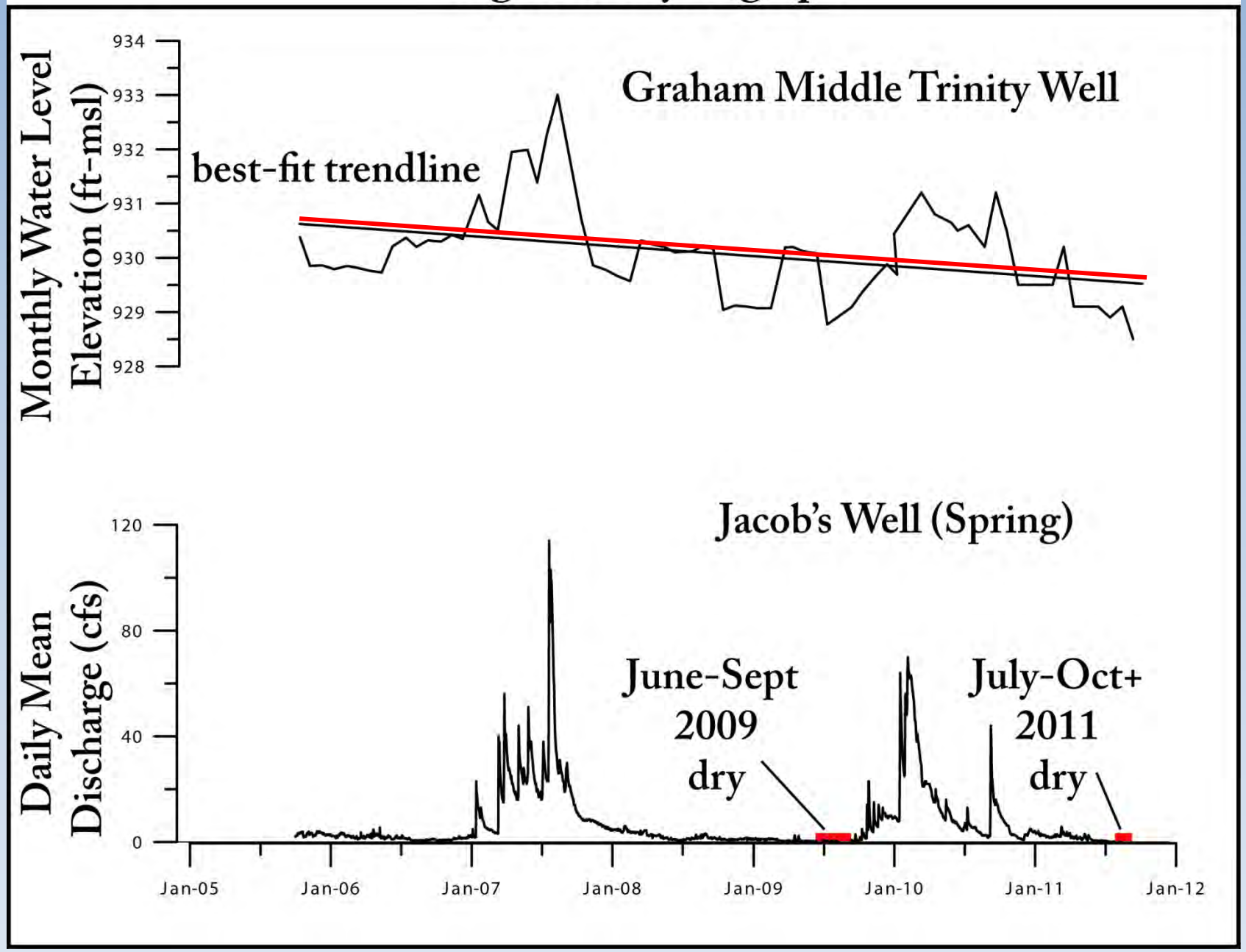
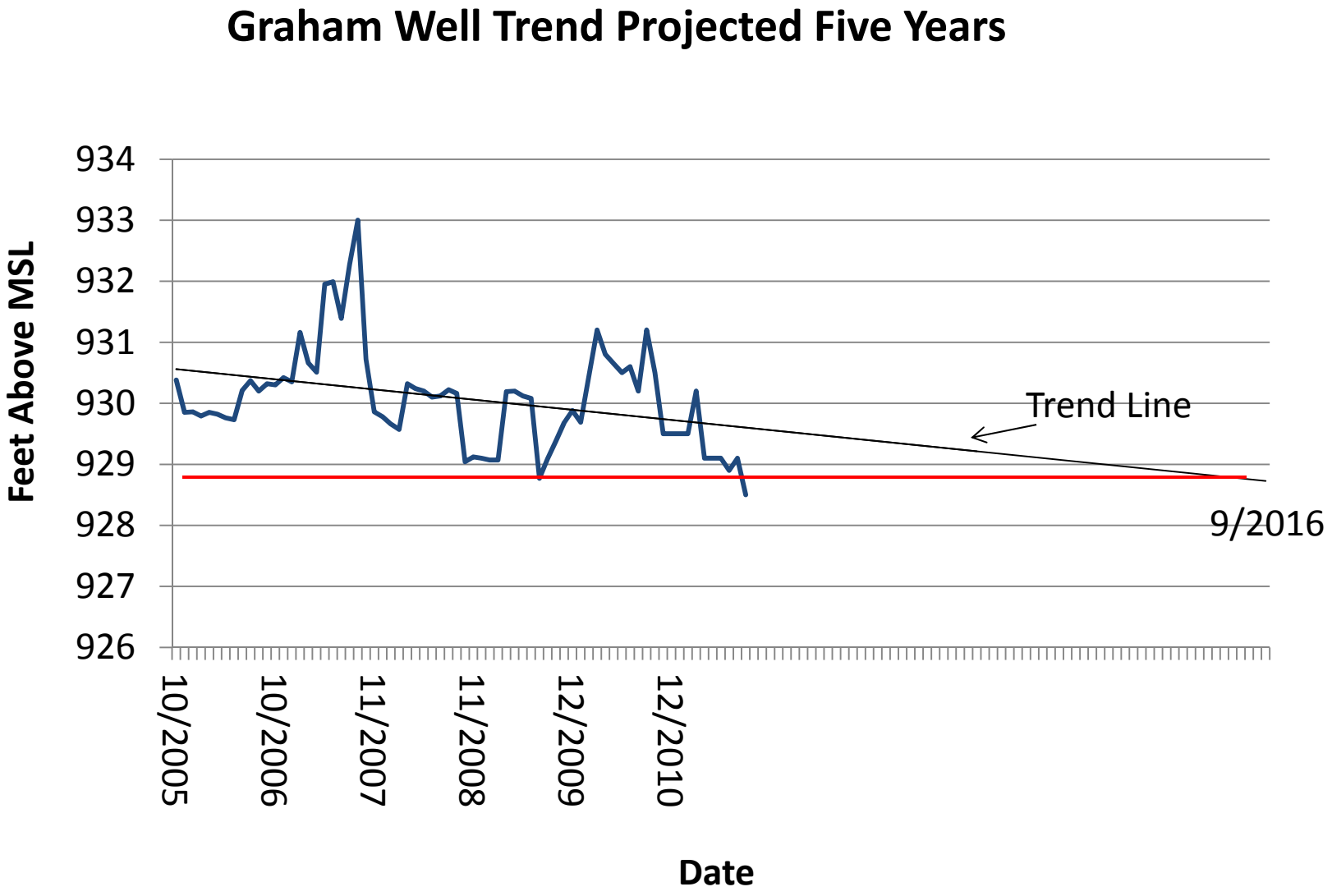

West
East
Jacob's Well*
surficial karst area
TOM CREEK FAULT ZONE
Lower Glen Rose
Hensel
Cow Creek
Hammett
Sligo
Hosston
Upper Glen Rose
Lower Glen Rose
Hensel
Cow Creek
Hammett
Sligo
100 ft
VE= 25x
0
5,000 ft
PALEOZOIC
*Jacob's Well projected into line of section

Figure 3. Hydrograph




Graham Well Trend Projected Five Years
Feet Above MSL
934
933
932
931
930
929
928
927
926
Trend Line
9/2016
10/2005
10/2006
11/2007
11/2008
12/2009
12/2010
Date

Summary of Water Level Trends at Current (~5800 AFY) Conditions

- Current Aquifer Depletion or Aquifer Mining
  - TWDB – generally declining levels
  - BSEACD/GMA 9 – ~1-4 feet/yr declines
  - HTGCD – ~1.3-3.5 feet/year declines

- The DFC for HTGCD predicts an average of 19 ft of drawdown in 50 years for the HTGCD

- However at these rates, a decline of 19 ft ***will be achieved in 5.5 – 19 years*** under current pumping rates and climatic conditions

- To achieve the DFC by 2060, current pumping would have to be *significantly decreased and alternative sources developed*

Summary of Jacob's Well

- Due to the unique hydrogeologic setting of, *2-3 feet of drawdown* in the vicinty of Jacob's Well and Cypress Creek causes flow to cease under current pumping conditions

- Increasing pumpage will likely turning Jacob's Well into an intermittent spring

Exempt Wells

- HTGCD enabling legislation exempts from regulation all domestic use wells using less than 25,000 gpd
- MAG allows for increase of exempt wells from 1484 AFY in 2010 to 4108 AFY in 2060, or a *280% increase*
- *Without any new permitted wells, pumping will increase from 5800 AFY to 8400 AFY and cause further mining of the aquifer*

Summary

- The DFC for the HTGCD portion of GMA 9 will have the following impacts:
  - Current pumping will reduce water levels to the 2060 MAG level in less than 20 years, and likely closer to 10 years
  - Water level declines of less than 3 feet cause Jacob's well/Cypress Creek to stop flowing
  - Projected current water level trends indicate Jacob's Well will become an intermittent spring
  - Due to exempt well growth, the DFC is unachievable without a reduction in total pumping (alternative supplies)

Rene A. Barker, P.G.
Hydrogeologist, Edwards Aquifer
Research & Data Center

PRESENTATION TOPICS

- Regional & Average Annual *Versus* Local & Short Term
- Model's "Scale of Application"
- Effects of 30-DFC on Surface Water & Edwards Aquifer

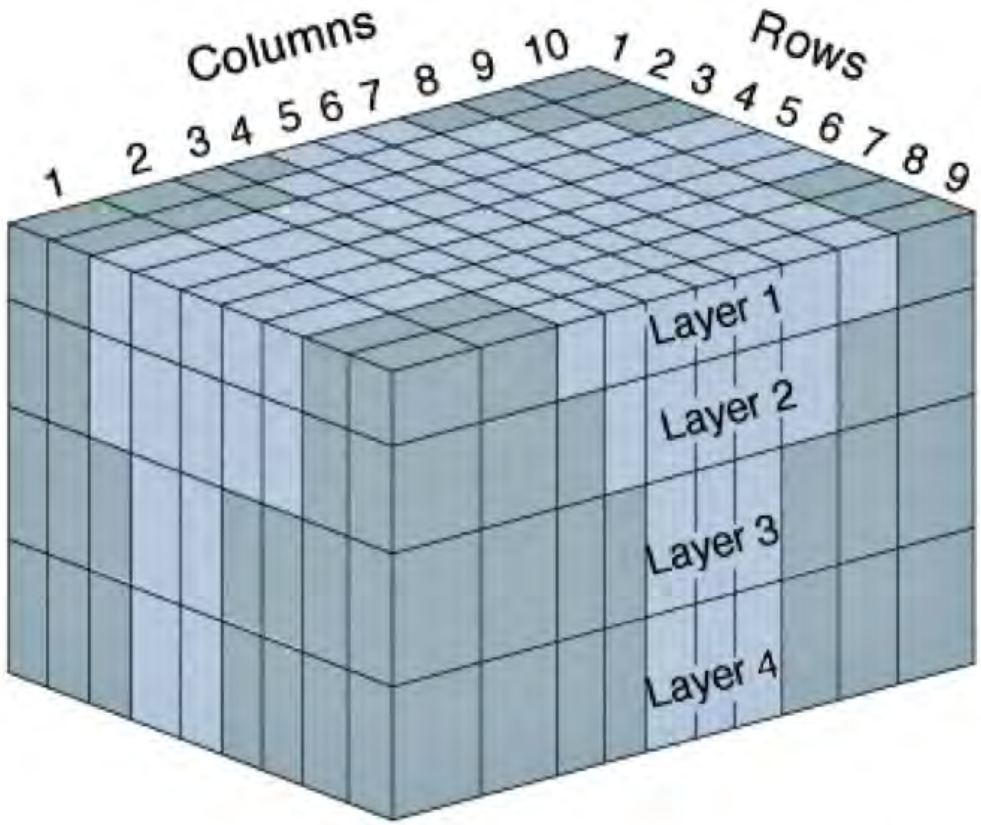
Groundwater Availability Model: Hill Country Portion of the Trinity Aquifer of Texas

by Ian C. Jones, Ph.D., P.G. • Roberto Anaya, P.G. • Shirley C. Wade, Ph.D., P.G.

Report 377
June 2011

Texas Water Development Board
www.twdb.state.tx.us

Three-Dimensional GRID SYSTEM

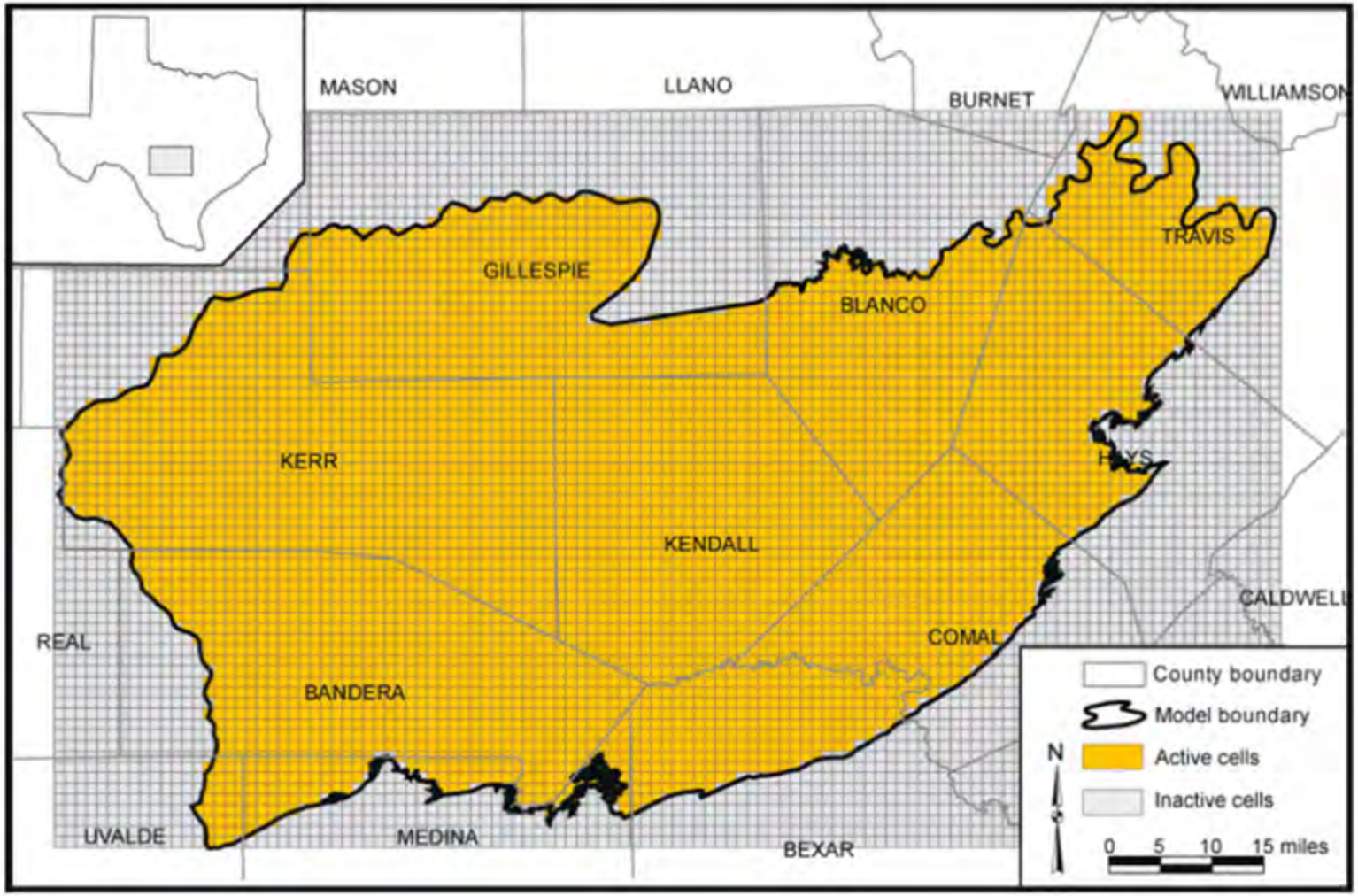


Separates Aquifer into MODEL CELLS

(1) Horizontal ROWS & COLUMNS

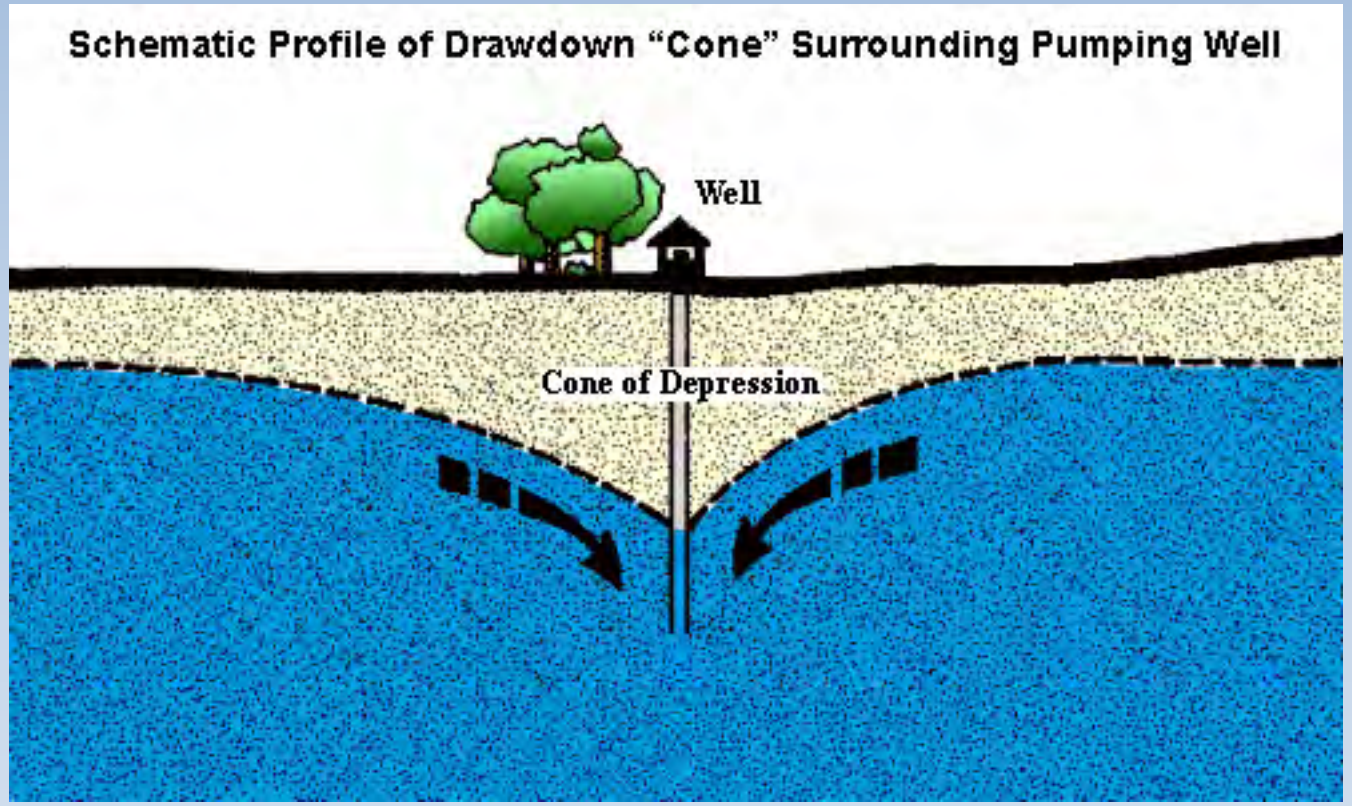
(2) Vertical LAYERS

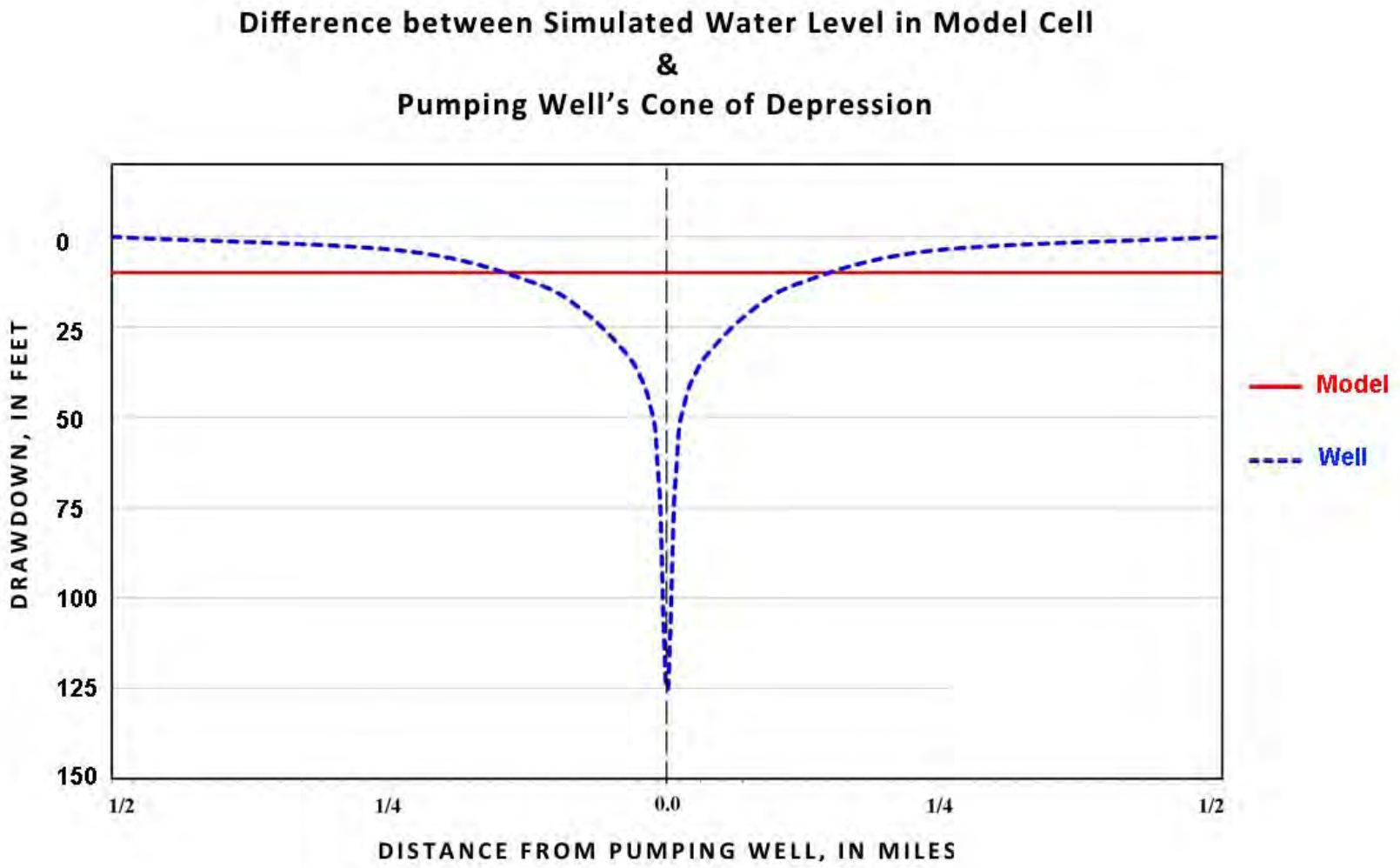
Model Grid for TWDB's Model (2011) of Trinity Aquifer



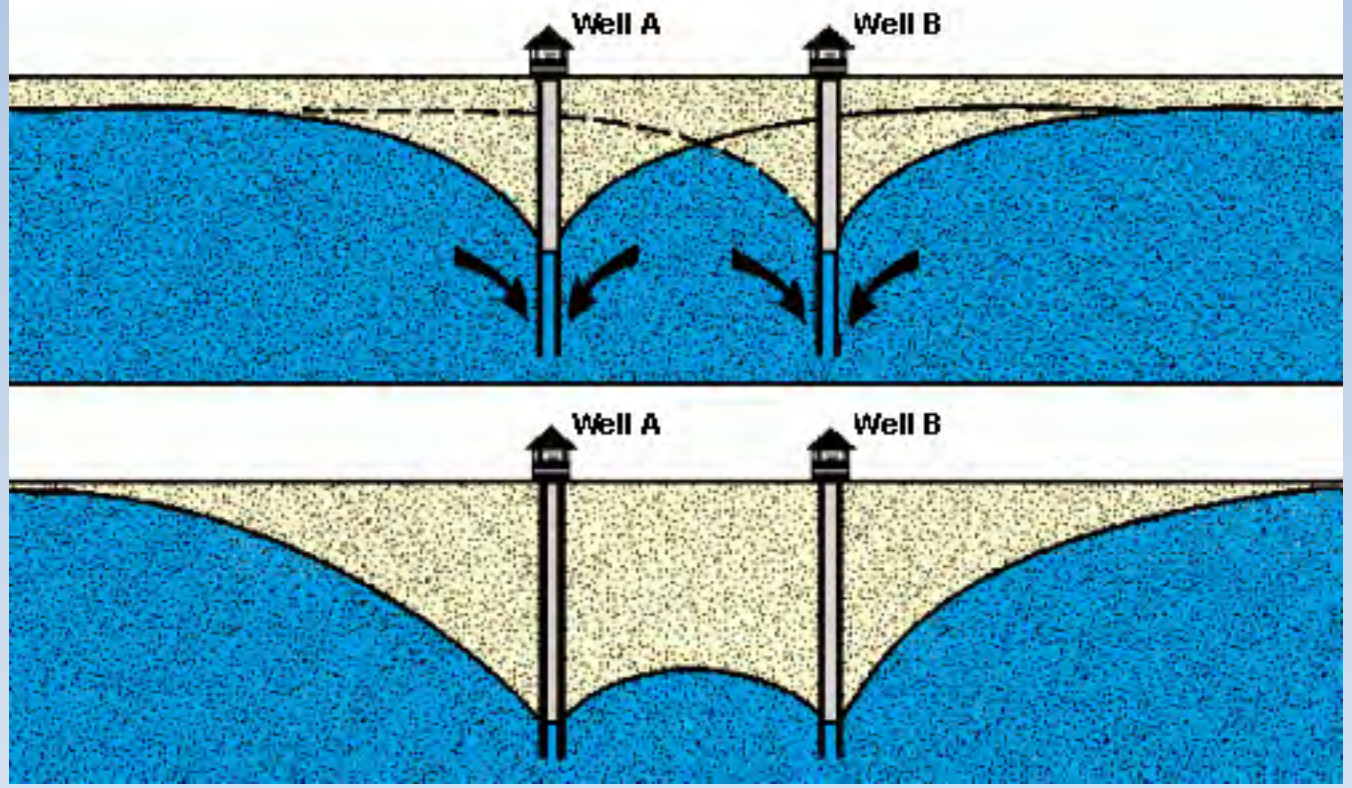
Middle Zone of Trinity Aquifer

Progression of Twelve Monthly TIMESTEPS through Simulated Year

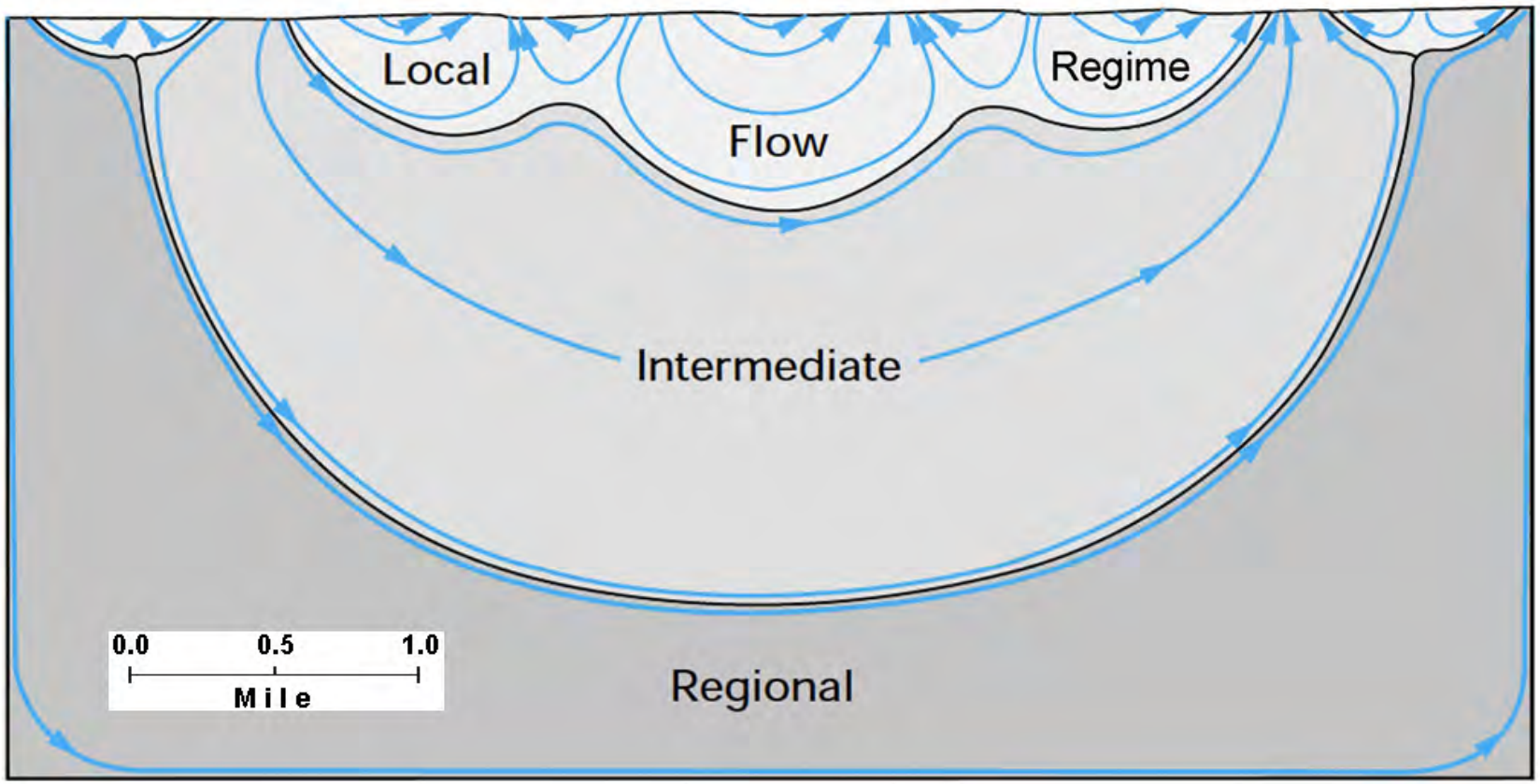

Schematic Profile of Drawdown "Cone" Surrounding Pumping Well
Well
Cone of Depression


Difference between Simulated Water Level in Model Cell
&
Pumping Well's Cone of Depression
DRAWDOWN, IN FEET
0
25
50
75
100
125
150
1/2
1/4
0.0
1/4
1/2
DISTANCE FROM PUMPING WELL, IN MILES
Model
Well

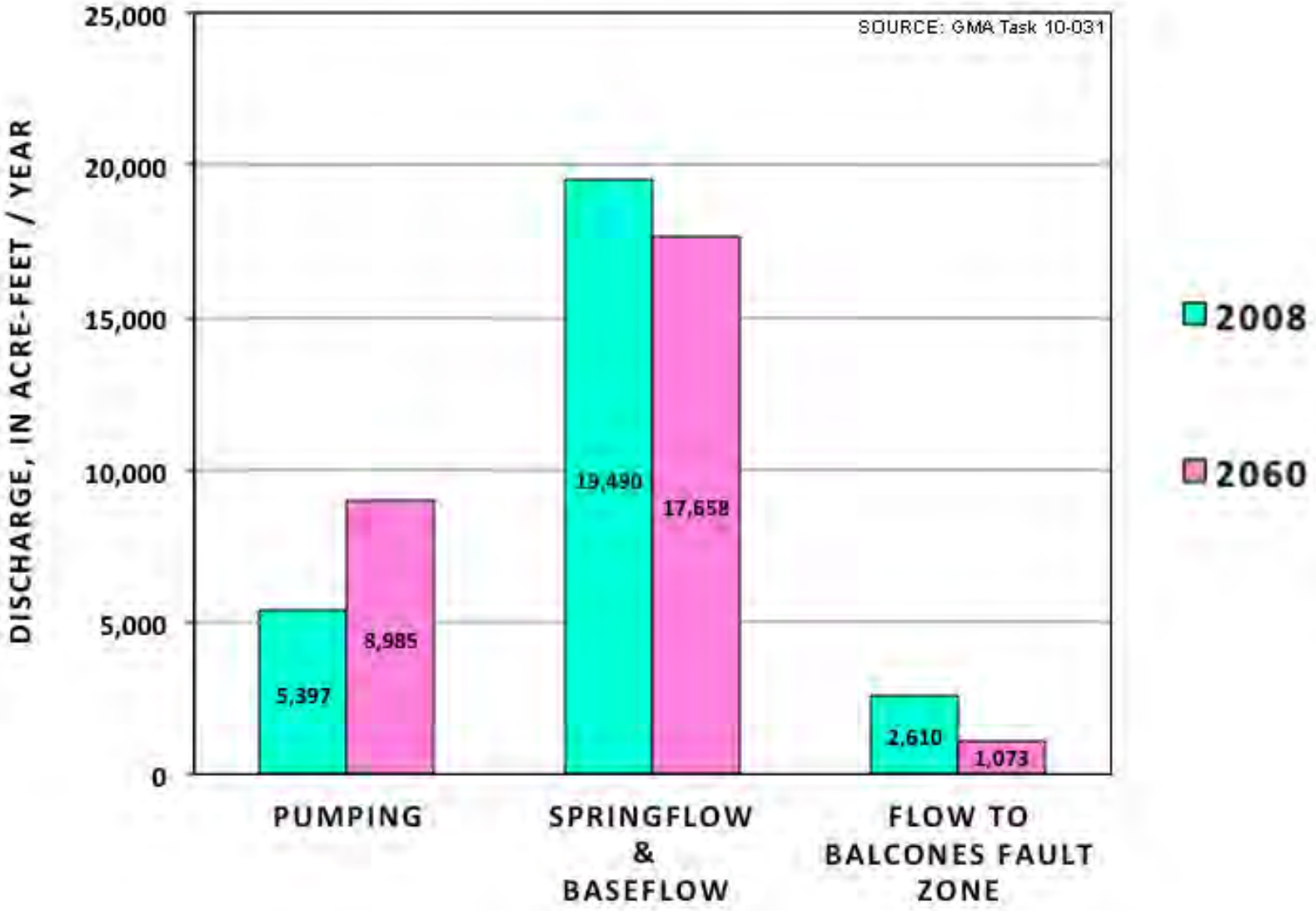
Well Interference Caused by Overlapping Cones of Depression Resulting from Insufficient Well Spacing



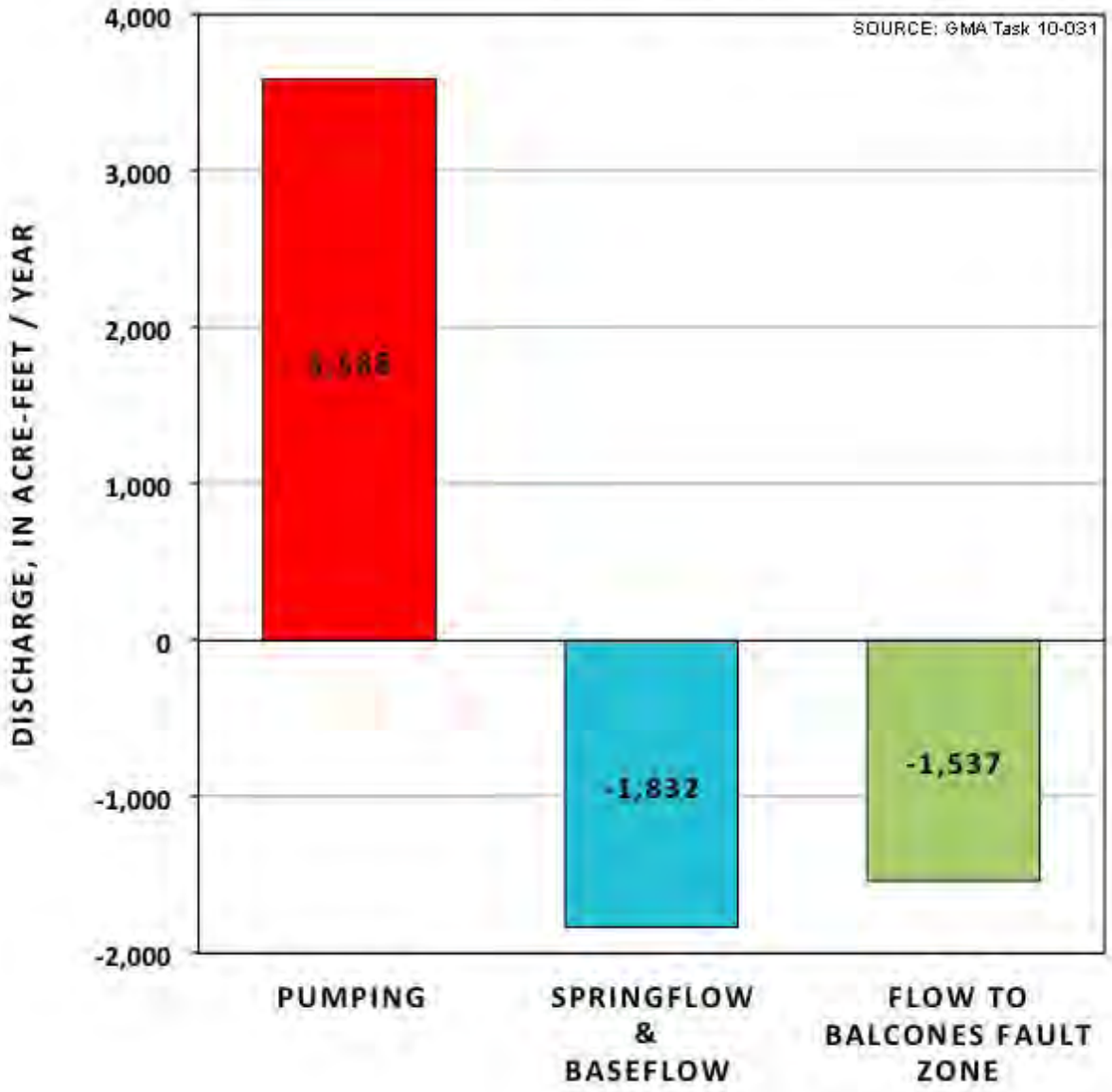
Schematic Perspective of Local, Intermediate and Regional Groundwater Flowpaths



Changes in Simulated Water Budget for Hays County Resulting from 30-Foot DFC 2008 - 2060

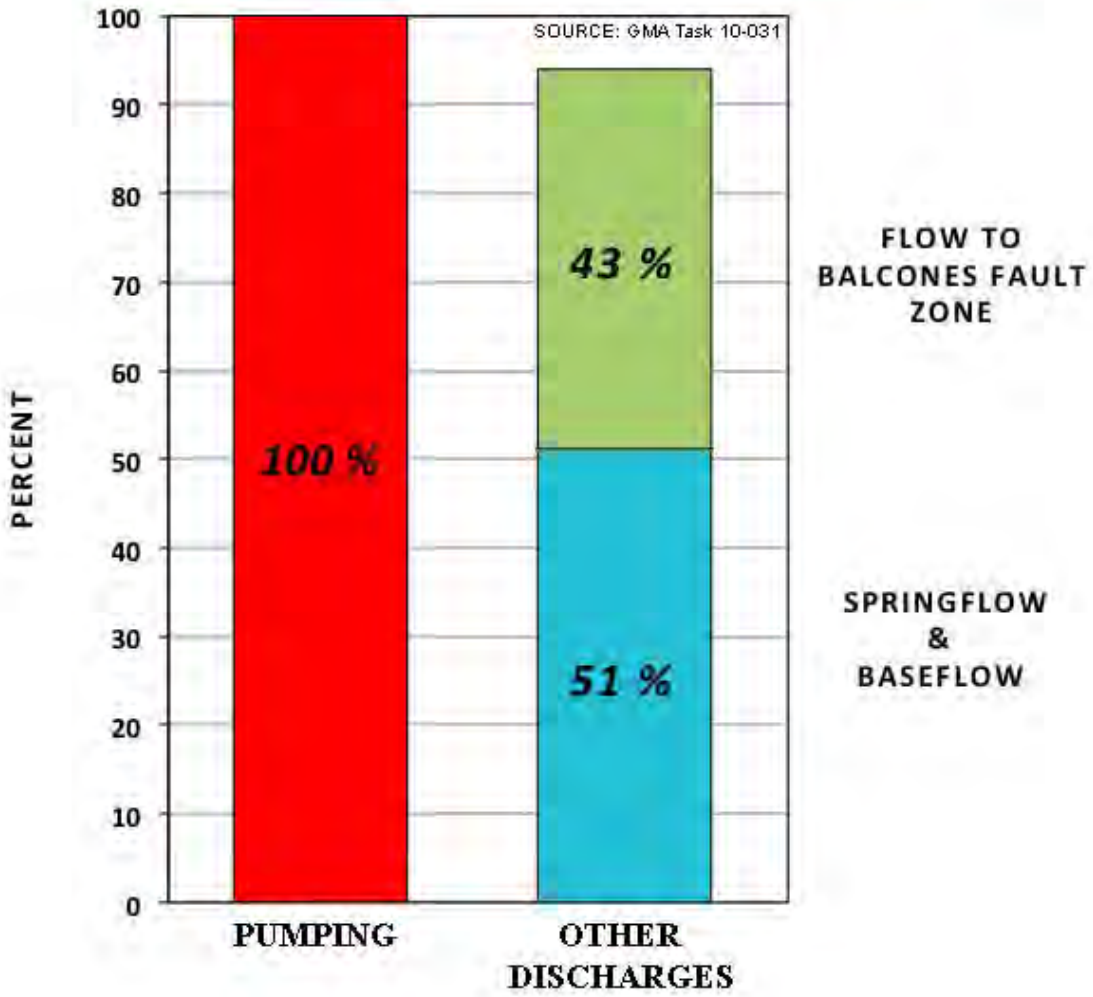


Change in Key Discharges from Hays County's Trinity Aquifer Resulting from 30-Foot DFC
2008 - 2060

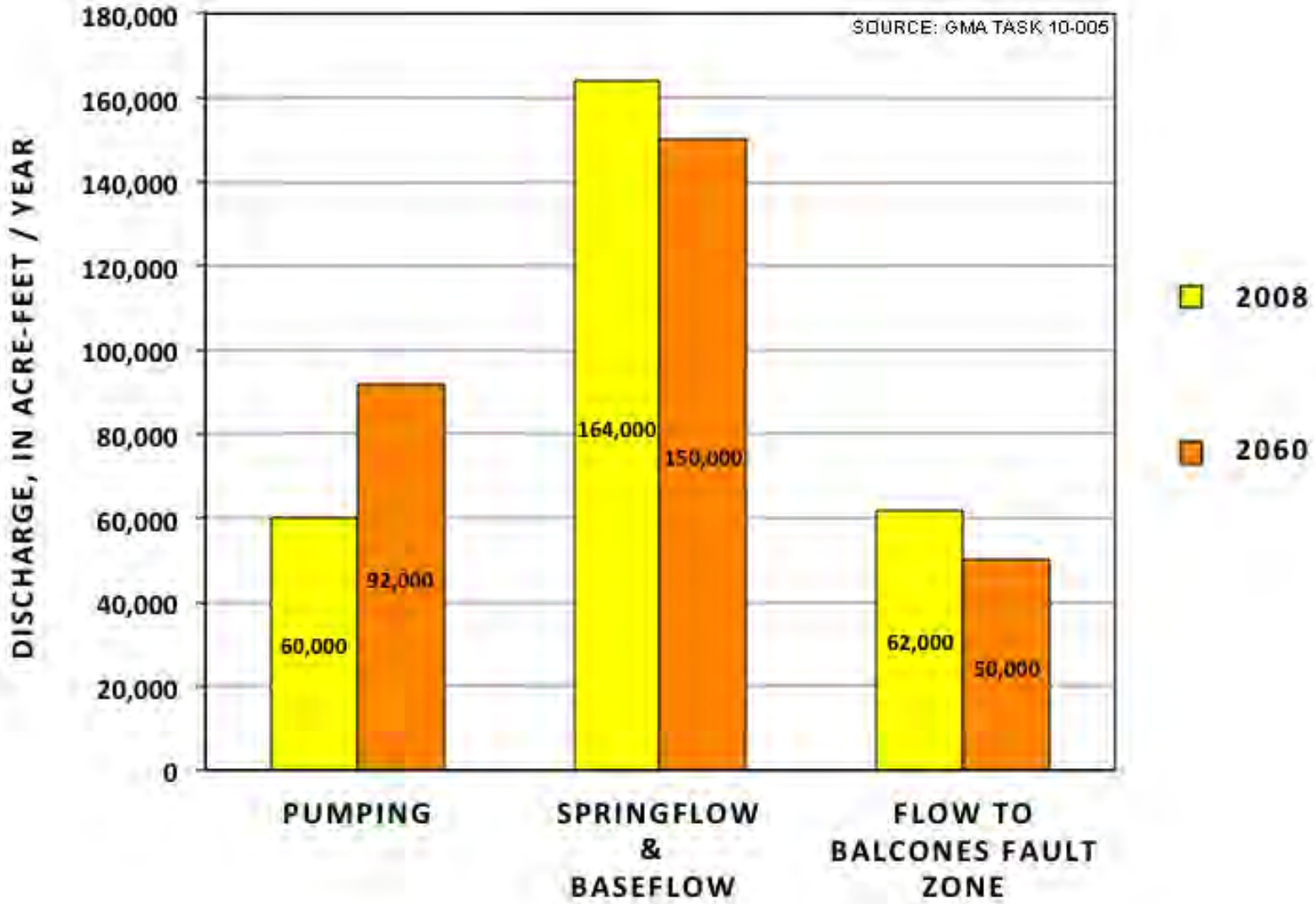


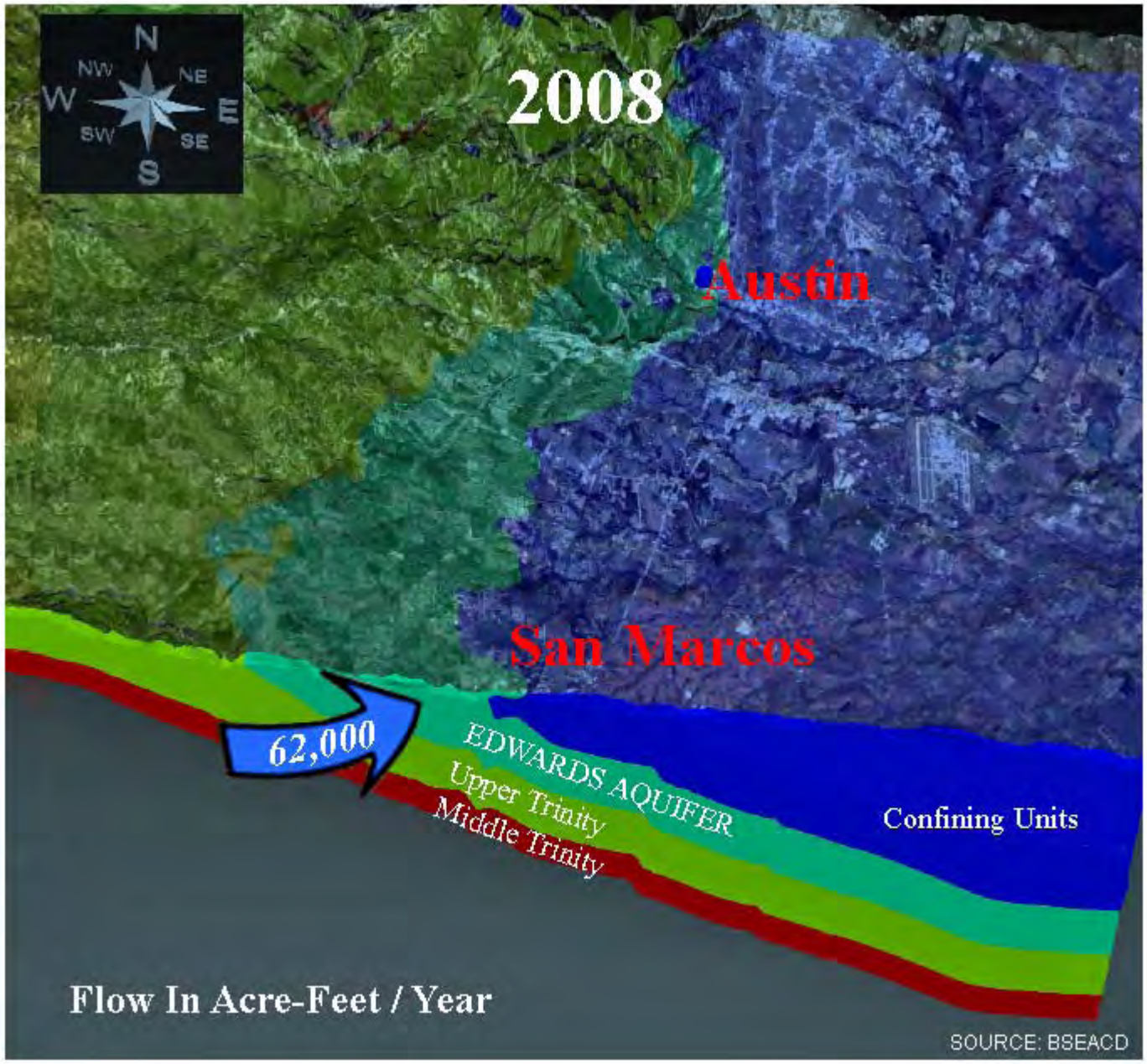
Sources of Water Supplying Increased Pumpage from Hays County's Trinity Aquifer (2008 - 2060) Resulting from 30-Foot DFC

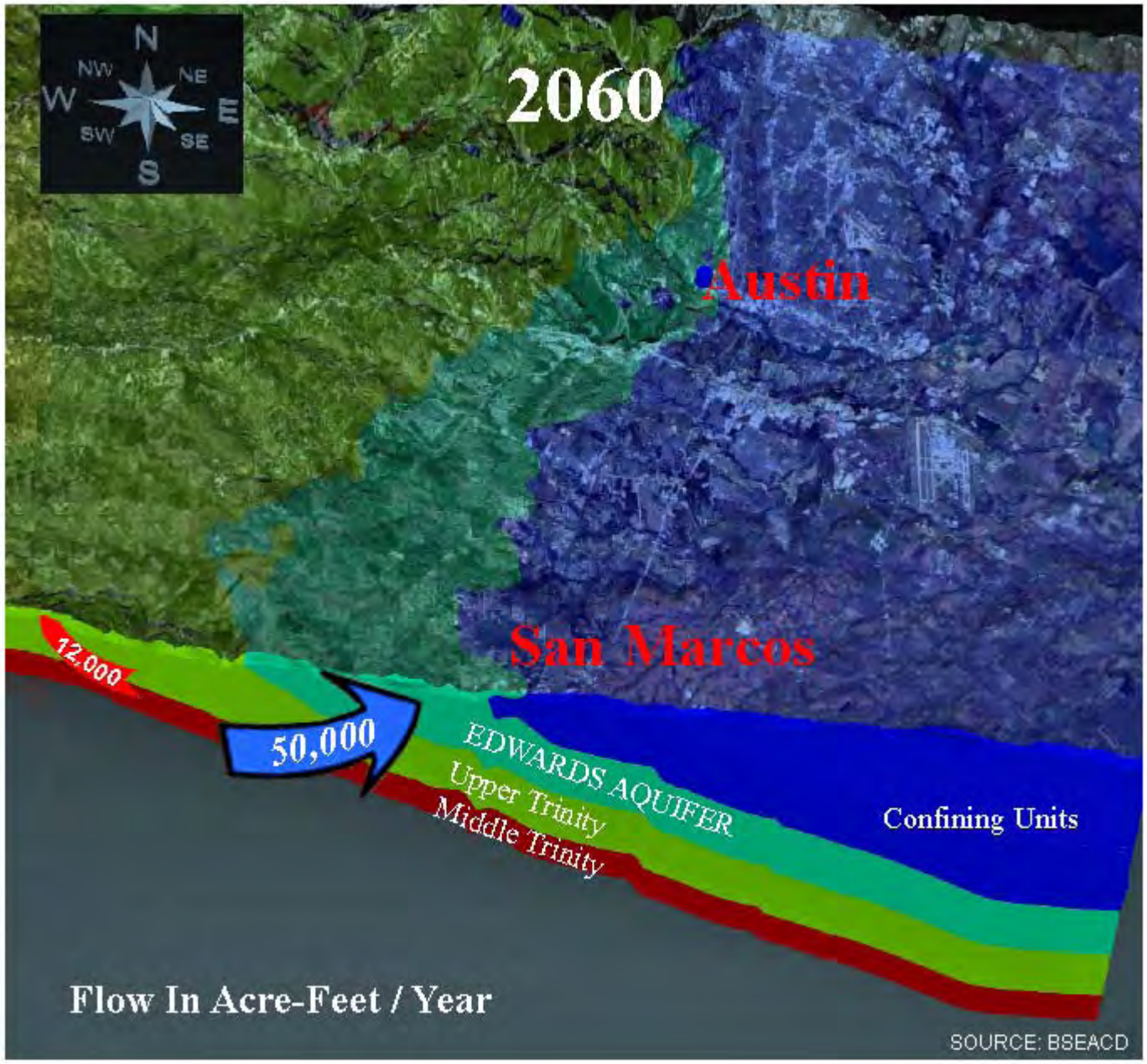
Shown As Percent of Pumping Increase



Changes in Key Aspects of Simulated Water Budget for GMA-9 Resulting from 30-Foot DFC
2008 - 2060




N
NW
NE
W
E
SW
SE
S
2008
Austin
San Marcos
62,000
EDWARDS AQUIFER
Upper Trinity
Middle Trinity
Confining Units
Flow In Acre-Feet / Year
SOURCE: BSEACD


N
NW
NE
W
E
SW
SE
S
2060
Austin
San Marcos
12,000
50,000
EDWARDS AQUIFER
Upper Trinity
Middle Trinity
Confining Units
Flow In Acre-Feet / Year
SOURCE: BSEACD

Edwards Aquifer Recovery Implementation Program

Habitat Conservation Plan

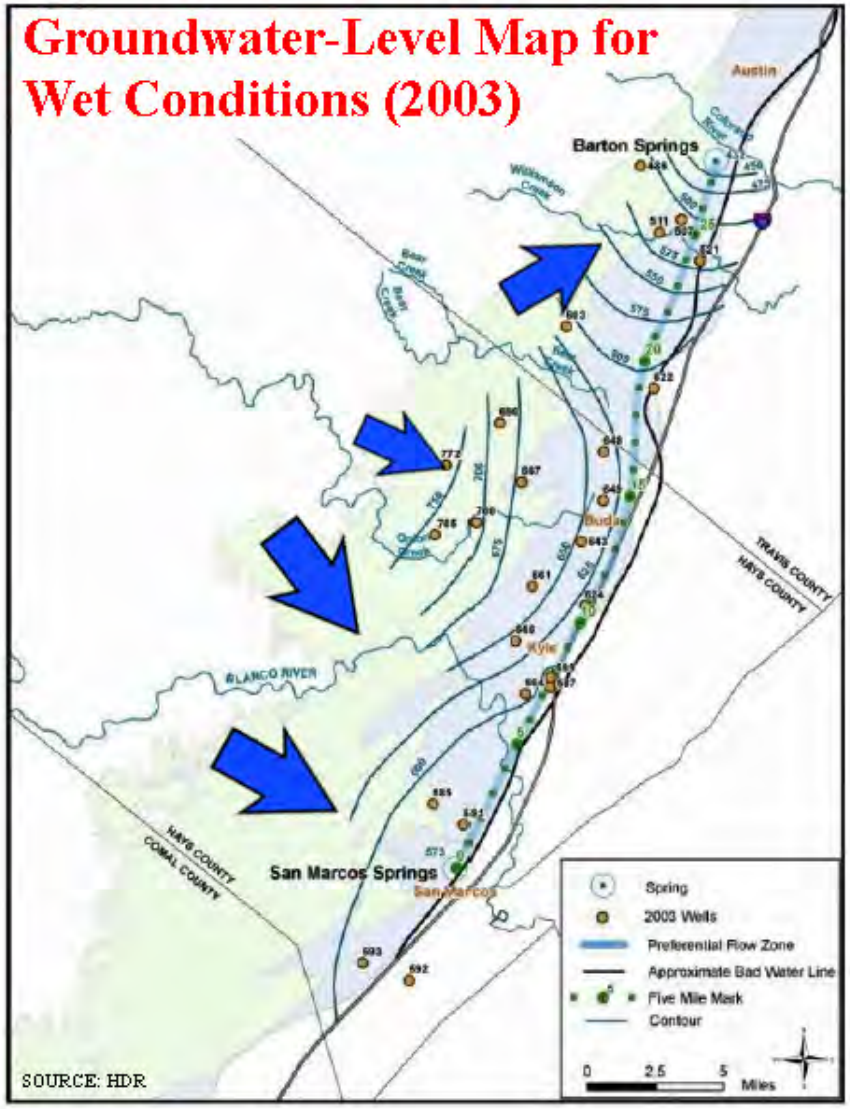
Final Working Draft
October 2011

Prepared For

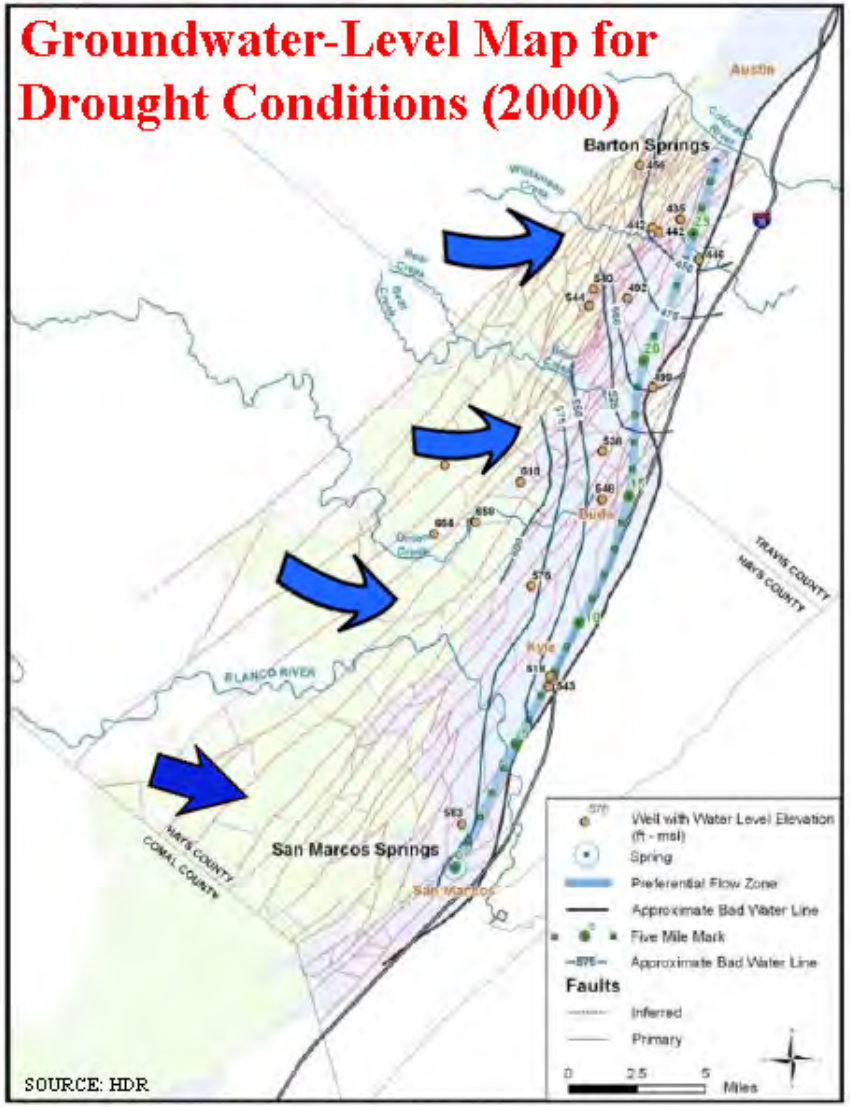
Dr. Robert L. Gulley
Program Manager
Edwards Aquifer Recovery Implementation Program

Prepared By
RECON Environmental, Inc.
Hicks & Company
Zara Environmental LLC
BIO-WEST

Groundwater-Level Map for Wet Conditions (2003)



Groundwater-Level Map for Drought Conditions (2000)



SOURCE: HDR

From TWDB Report 377 (Jones et al., 2011)

①*"This model is most accurate in assessing regional-scale groundwater issues, such as predicting aquifer-wide water level changes and trends in the groundwater budget … on an annual timescale.*

②*Accuracy and applicability of the model decrease when moving from addressing regional- to local-scale issues because of limitations of the information used in model construction and the model cell size that determines spatial resolution of the model.*

③*Consequently, this model is not likely to accurately predict water level declines associated with a single well or spring because (1) these water level declines depend on site specific hydrologic properties not included in detail in regional-scale models and (2) the cell size used in the model is too large to resolve changes in water levels that occur over relatively short distances."*

CONCLUSION

Given the average annual rates of data input, together with the inherent assumptions and simplifications, plus the regional "scale of application" associated with the Trinity Aquifer GAM, it is prudent to use this model's output judiciously and in combination with *ALL* relevant information.

Such a conservative approach is especially appropriate when and where it affects, not only regional and long-term conditions, but the future of local and short-term rates of groundwater discharge from wells and to springs and streams—*ALL* of which should be considered Desired Future Conditions necessary to sustain the economic and environmental health of Hays County.

rB (11-14-2011)

PRAY
for
RAIN
the
end...

Blue Hole

Photo courtesy of Cypress Creek Project

Courtesy of Austin-American Statesman

Photo courtesy of David Baker

Photo courtesy of David Baker

In summary, a 30 ft. average drawn-down of the Trinity Aquifer in GMA-9 would lead to a major degradation of economic, ecological and quality of life conditions for the Wimberley Valley.

Photo courtesy of Hill Country Alliance

Photo courtesy of David Baker

Summary & Conclusions

- We must find a way to accommodate growth while maintaining baseflows to springs and rivers.
- Recommend we begin a collaborative process that will
  - Define a special management area for Jacob's Well and Cypress Creek
  - Bring together affected parties to adopt a DFC for this area that addresses economic and environmental importance of springs and rivers
- Create a new DFC that specifically addresses:
  - Local impacts to existing well owners
  - Drought conditions
  - Springs and baseflows
- Develop the strategies needed for alternative water supply (rainwater, conservation, Lower Trinity, surface water, etc.) so the new DFC will be achievable
- Ensure GCD's have the necessary tools to manage the aquifer for sustained yield

Summary of Petition to TWDB

- ***Aquifer mining is inherently unsustainable*** and goes against groundwater districts' stated management goals
- ***Aquifer mining is already occurring*** with current pumping
- The adopted DFC ***will have economic, property rights, and public health impacts*** for well owners, local economies and recreational users
- The adopted DFC ***will have environmental impacts*** on springs and baseflows

Summary of Petition to TWDB

- The GAM model can only show regional trends and ***is unable to accurately predict local impacts*** on individual springs and wells
- ***No systematic process exists for monitoring and applying*** a regional and multi-year average DFC that ***combines three very different aquifer systems*** into one average drawdown value
- ***Exempt users have been and will continue to be impacted*** by additional permitted pumping allowed by the adopted DFC

POSSIBLE ACTIONS

- Revise the 30' DFC to more reasonable and conservative level
- Set up groundwater management zones in critical areas of depletion
- Account for DOR in the GAM model and conduct joint drought planning
-
- Establish functional GCD's across all of GMA-9
- Focus on incentives for landowners to encourage stewardship of aquifers & springs that feed our Creeks and Rivers