Northern Segment of the Edwards (Balcones Fault Zone) Aquifer GAM Stakeholder Advisory Forum Number 1

Belton, Texas

March 5, 2018

Ian C. Jones, Ph.D., P.G.

*Unless specifically noted, this presentation does not necessarily reflect official Board positions or decisions.

Texas Water Development Board

Outline

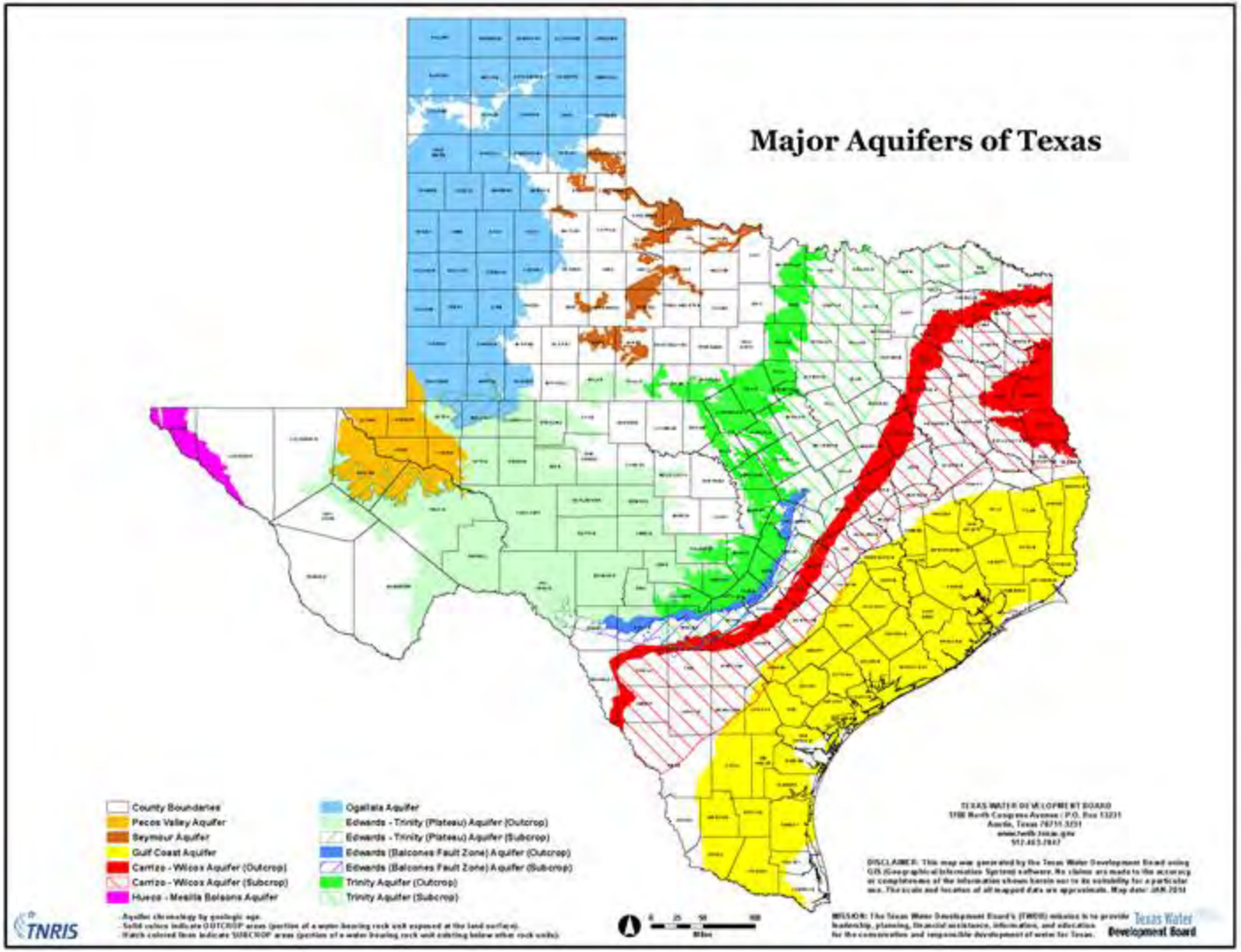
- Introduction
- Regional overview
- Basics of groundwater flow
- Overview of Northern Segment of the Edwards (Balcones Fault Zone) Aquifer
- Groundwater modeling
- Data collection
- Project schedule


INTRODUCTION

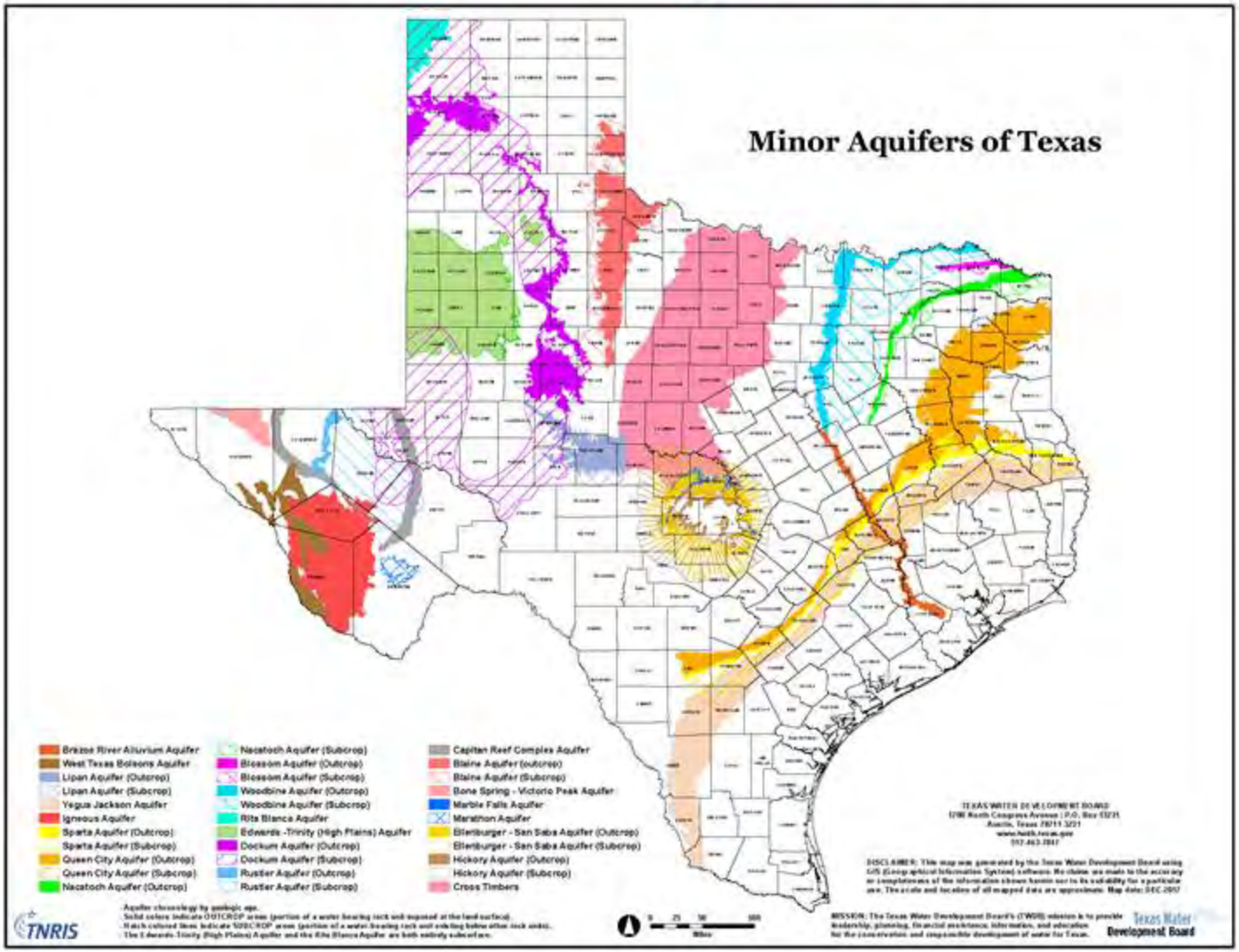
Groundwater Availability Modeling Program

- **Aim**: Develop groundwater flow models for the major and minor aquifer of Texas.
- **Purpose**: Tools that can be used to aid in groundwater resources management by stakeholders.
- **Public process**: Stakeholder involvement during model development process.
- **Models**: Freely available, standardized, thoroughly documented. Reports available over the internet.
- **Living tools**: Periodically updated.

Major Aquifers



Minor Aquifers



How we use Groundwater Availability Models

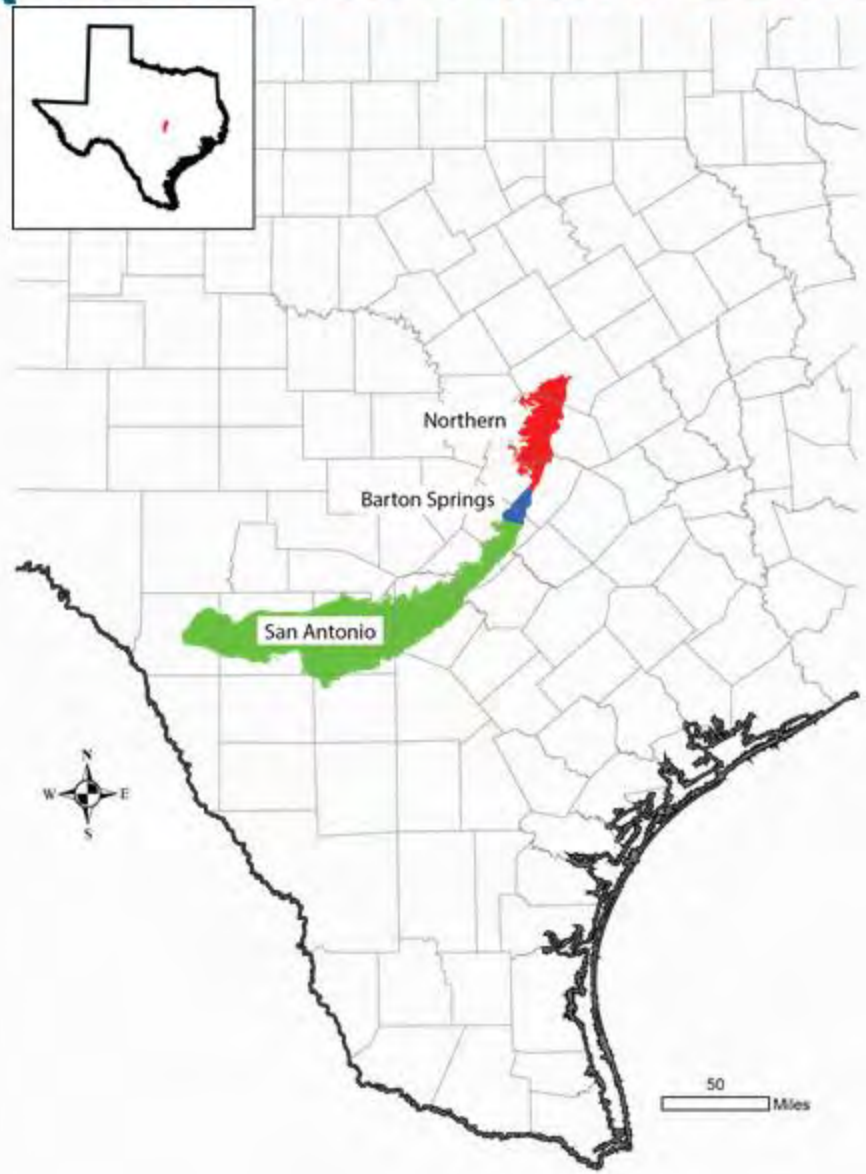
- Uses required by statute
  - Provide groundwater conservation districts with water budget data for their management plans.
  - Calculating Modeled Available Groundwater.
  - Calculating Total Estimated Recoverable Storage
  - HB 1232 Texas aquifer study
  - HB 30 potential brackish groundwater production area determination
- Other uses
  - Assisting groundwater management areas in determining desired future conditions.

Stakeholder Advisory Forums

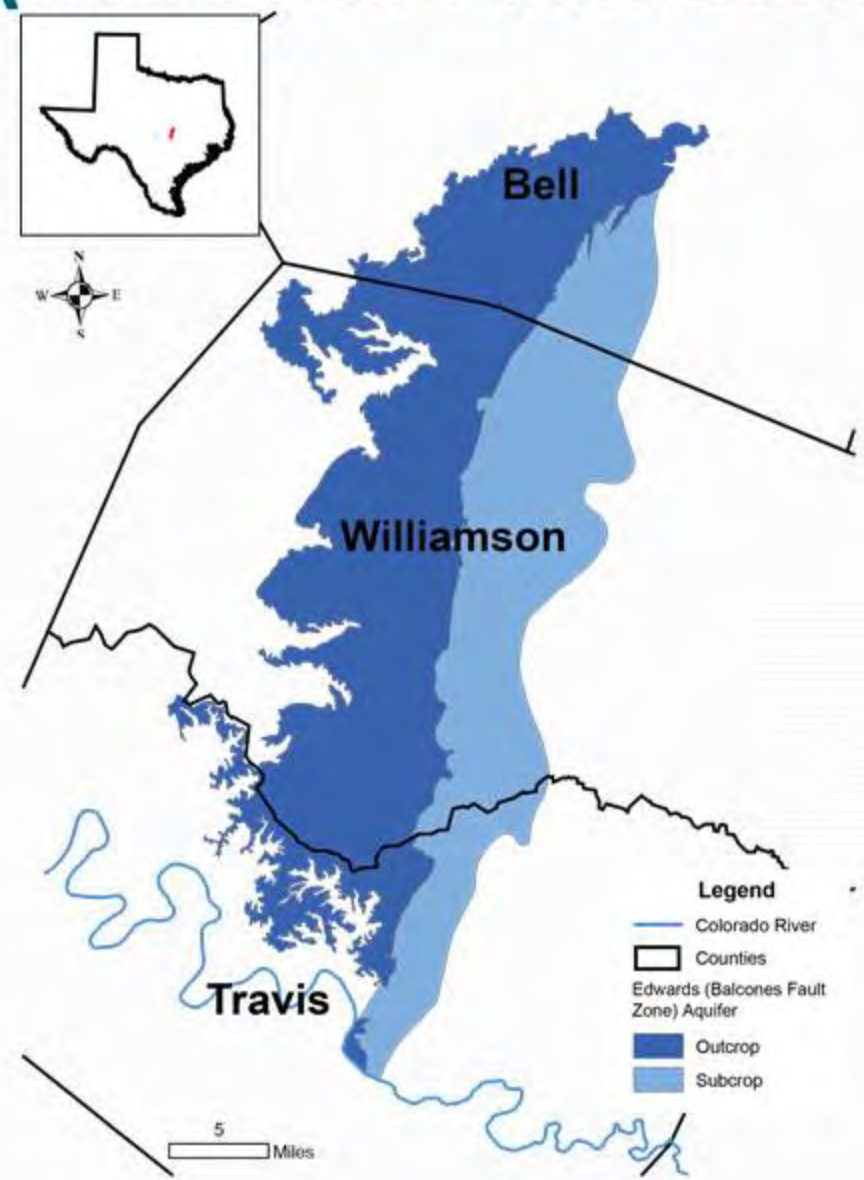
- Keep stakeholders updated about progress of the model
- Inform how the groundwater model can, should, and should not be used
- Provide stakeholders with the opportunity to provide input and data to assist with model development


REGIONAL OVERVIEW

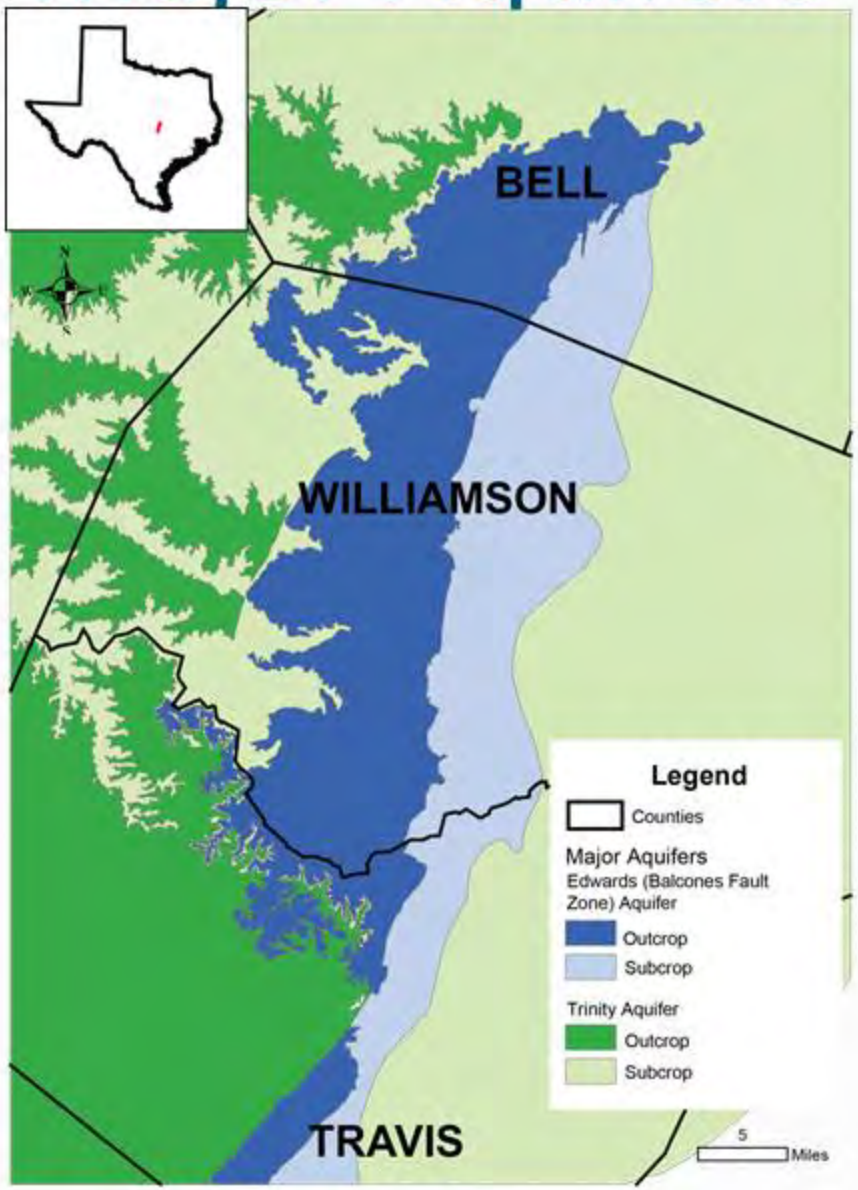
Edwards (Balcones Fault Zone) Aquifer



Edwards (Balcones Fault Zone) Aquifer

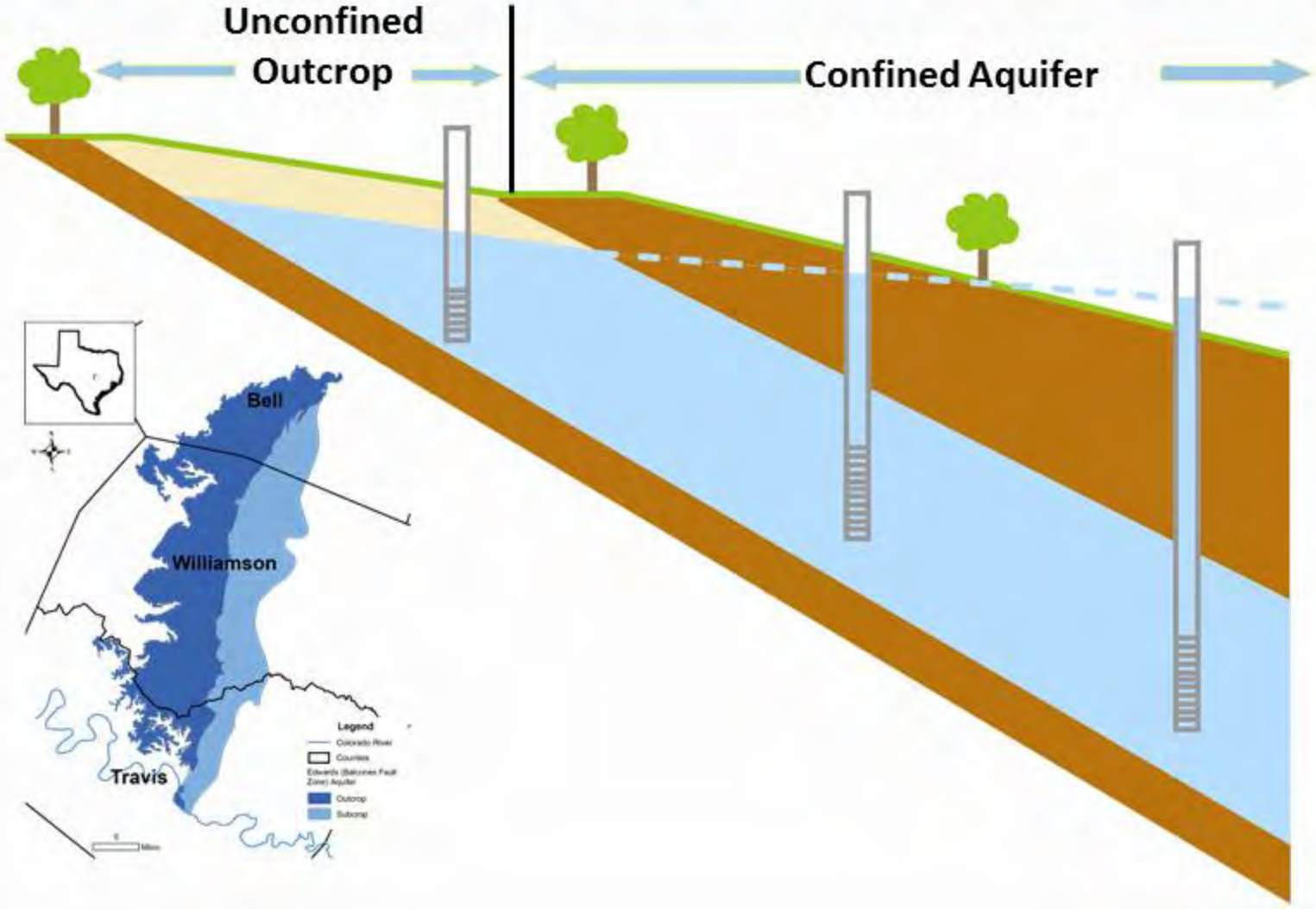


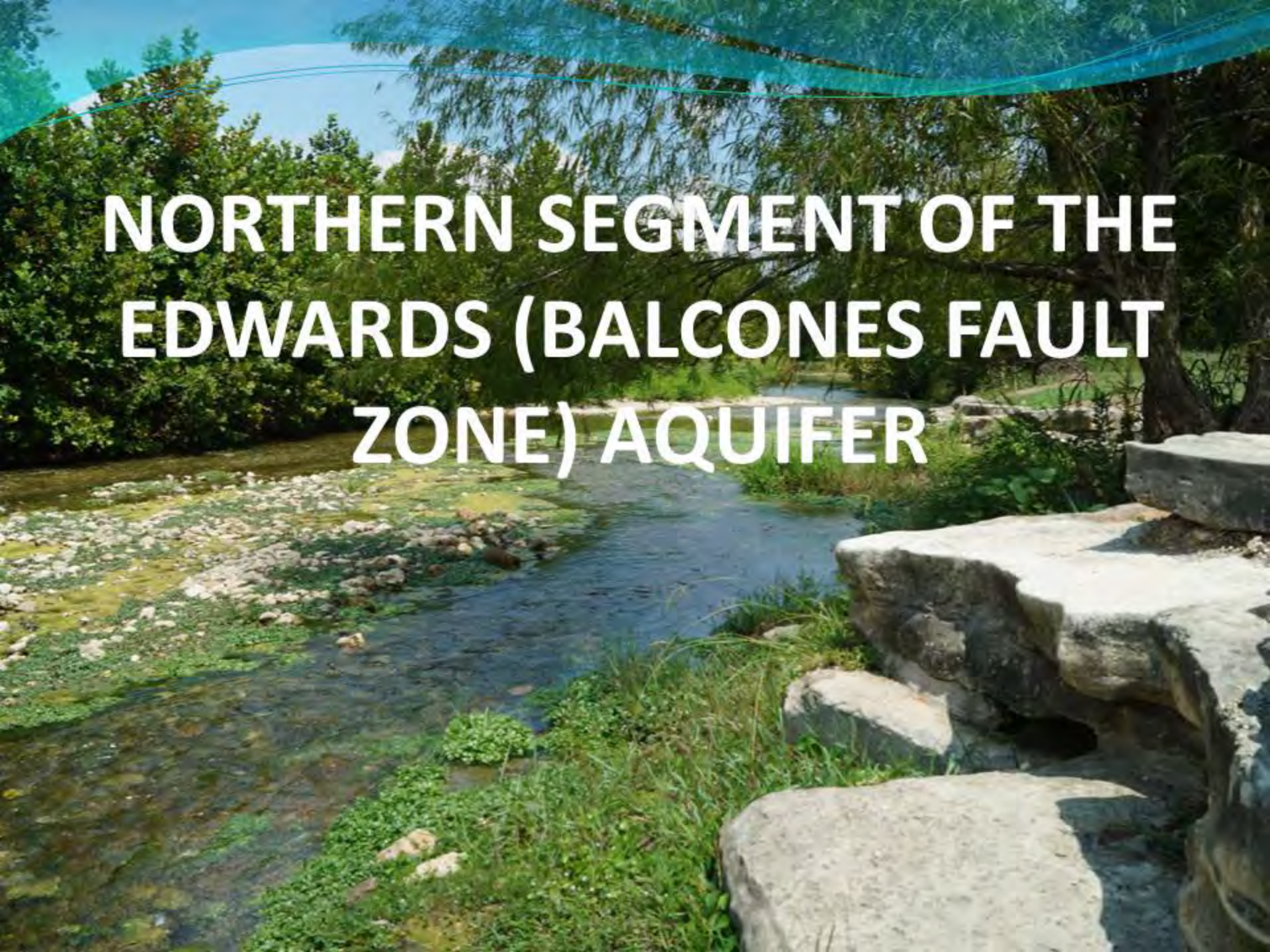
Major Aquifers



BASICS OF GROUNDWATER FLOW

Confined/Unconfined Aquifer




NORTHERN SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER

Northern segment of the ×

www.twdb.texas.gov/groundwater/models/gam/ebfz_n/ebfz_n.asp

Apps IWEB TWDB Home TxWISE

Home Board SWIFT Financial Assistance Water Planning Groundwater Surface Water Flood Conservation Innovative Water

Northern segment of the Edwards (Balcones Fault Zone) Aquifer

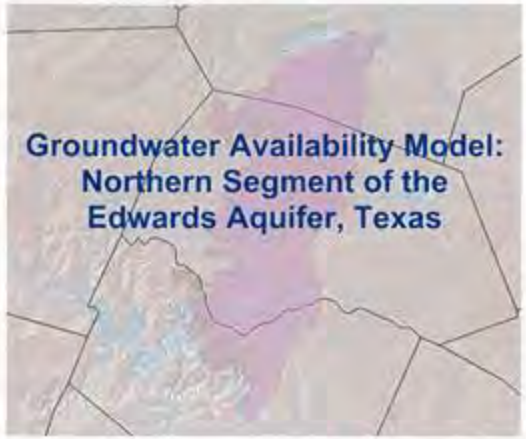
Groundwater Availability Model (GAM)

The Texas Water Development Board is currently updating the 2003 groundwater availability model for the northern segment of the Edwards (Balcones Fault Zone) Aquifer.

Model update for the northern segment of the Edwards (Balcones Fault Zone) Aquifer GAM

Northern segment of the Edwards (Balcones Fault Zone) Aquifer GAM

Aquifers



Report 358

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December 2003

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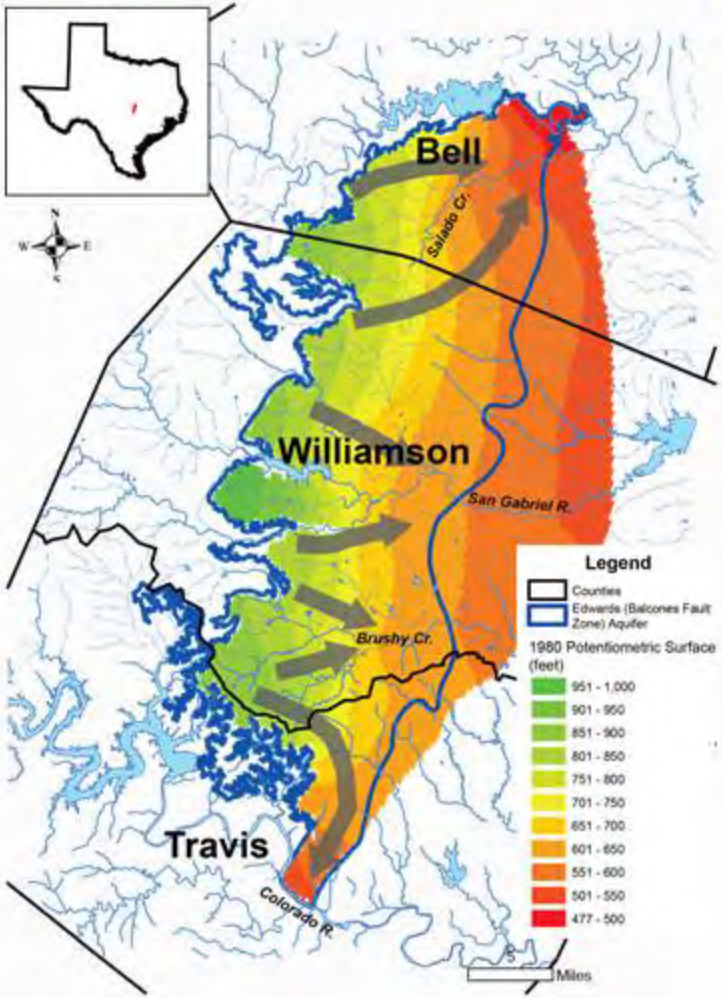
AM
2018

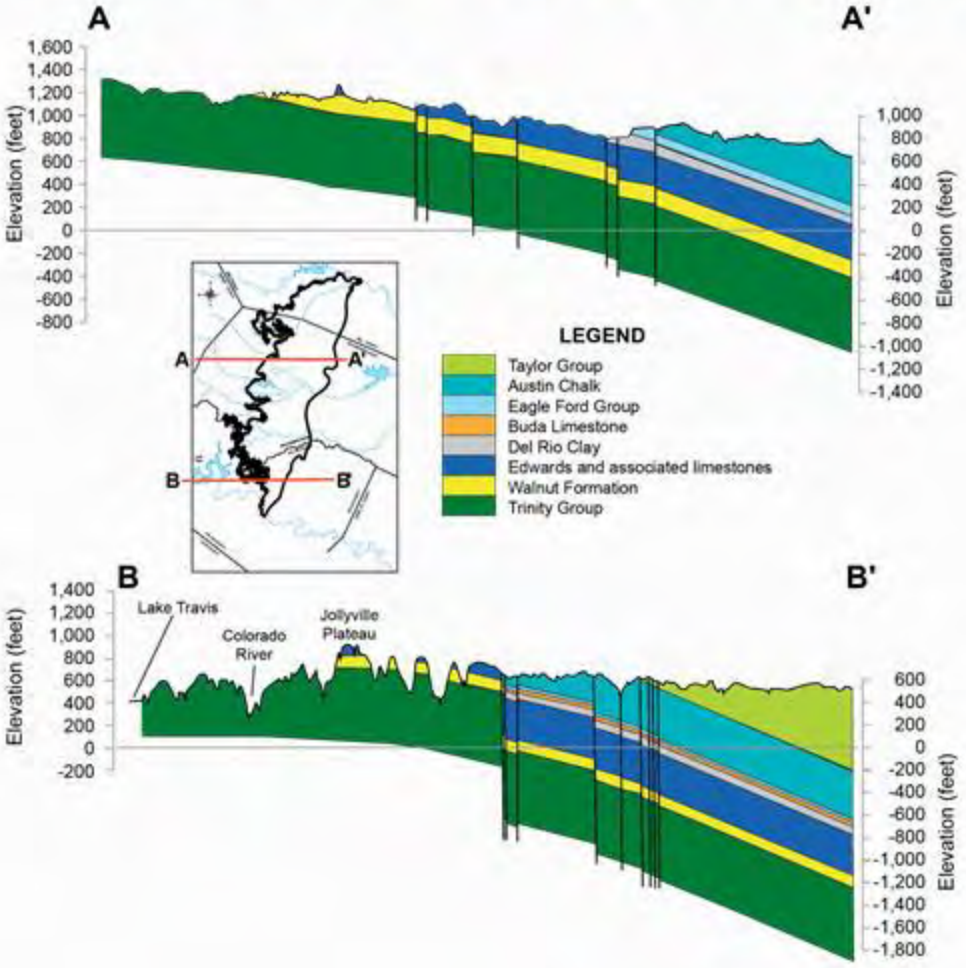
Generalized Stratigraphy

Series	Group	Stratigraphic Unit		Hydrologic Unit	Maximum Thickness (feet)
Gulf	Navarro			Navarro and Taylor Group	850
	Taylor				
	Austin			Austin Chalk	450
Comanche	Eagle Ford				50
	Washita	Buda Limestone			50
		Del Rio Clay			60
	Fredericksburg	Georgetown Formation		Edwards (Balcones Fault Zone) Aquifer	100
		Edwards Limestone			200
		Comanche Peak Limestone			50
		Walnut Formation			150
	Trinity	Paluxy Formation		Upper Trinity Aquifer	10
		Glen Rose	Upper Member		450
			Lower Member	Middle Trinity Aquifer	450
		Travis Peak	Hensell Sand Member		100
			Cow Cr. Limestone Member		100
			Hammett Shale Member		50
			Sligo Member	Lower Trinity Aquifer	150
			Hosston Member		850

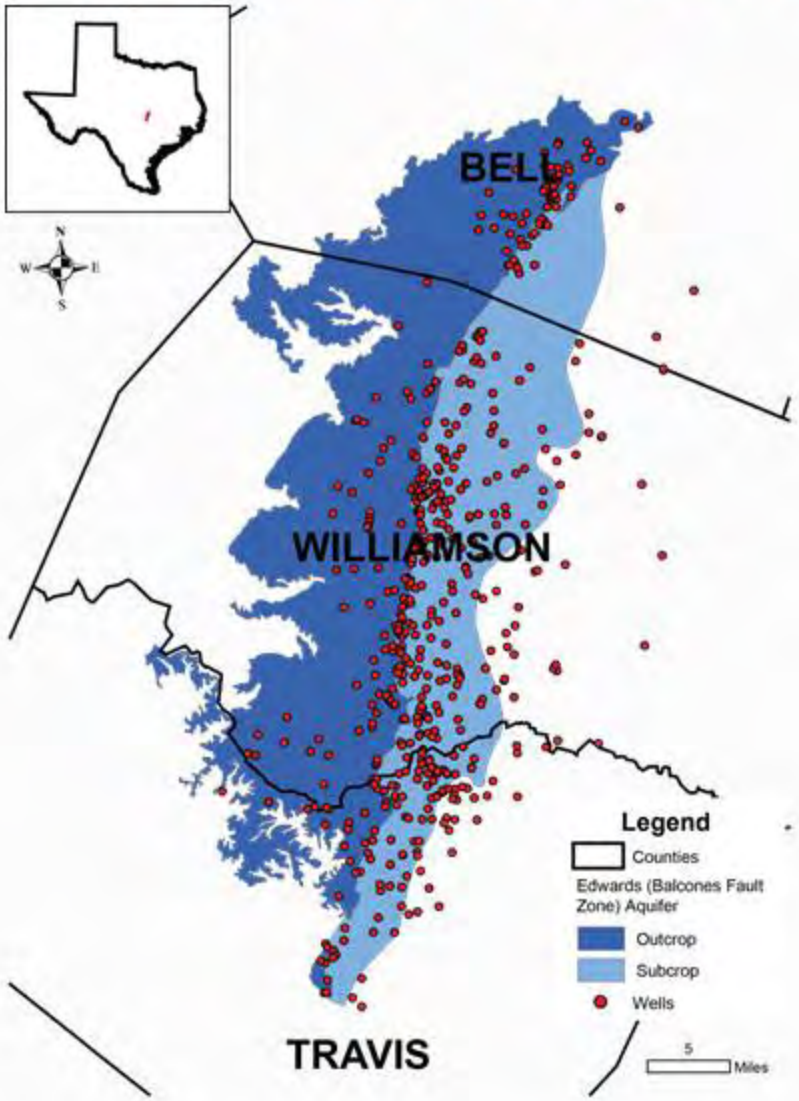
Conceptual Flow System



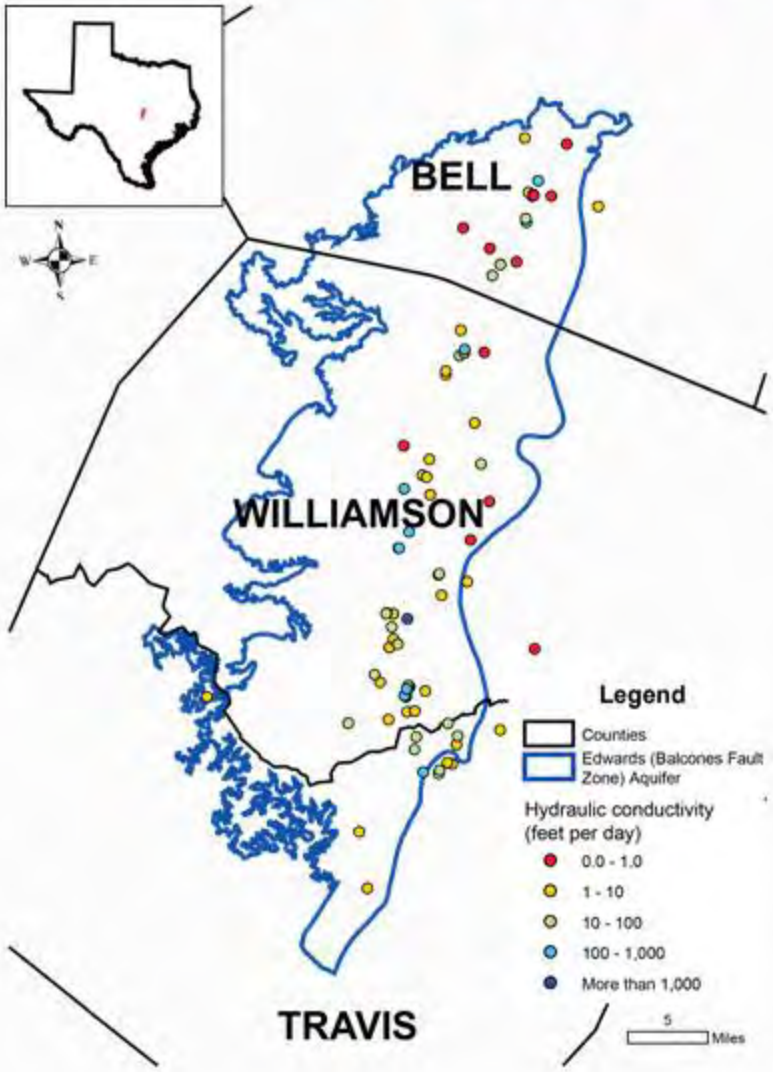
Generalized Cross-Section

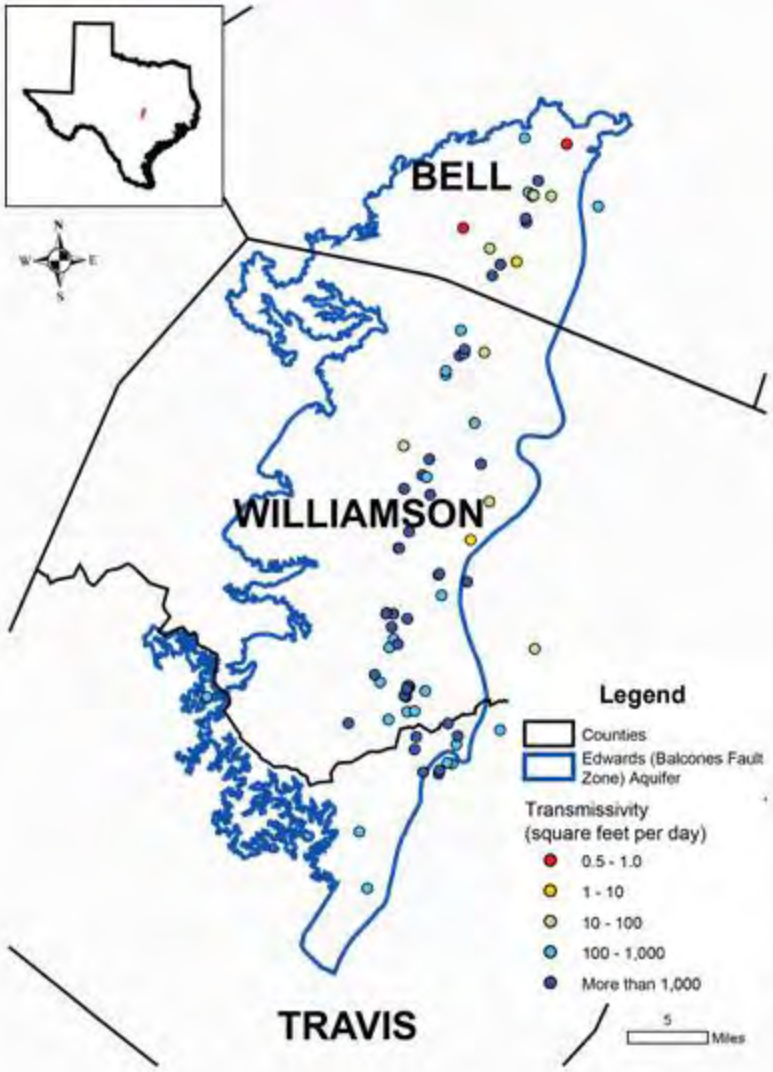


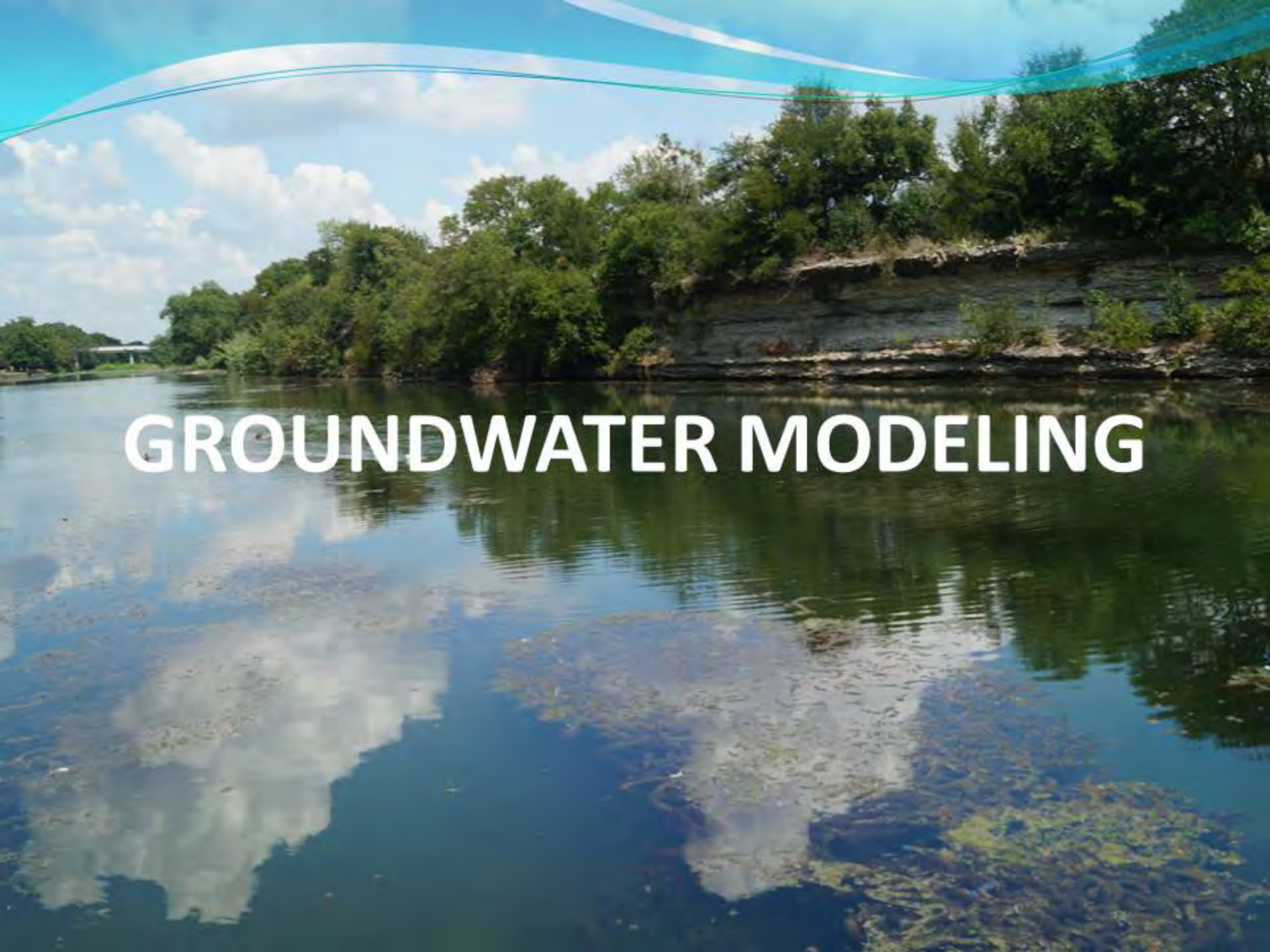
Water-Level Data



Hydraulic Properties



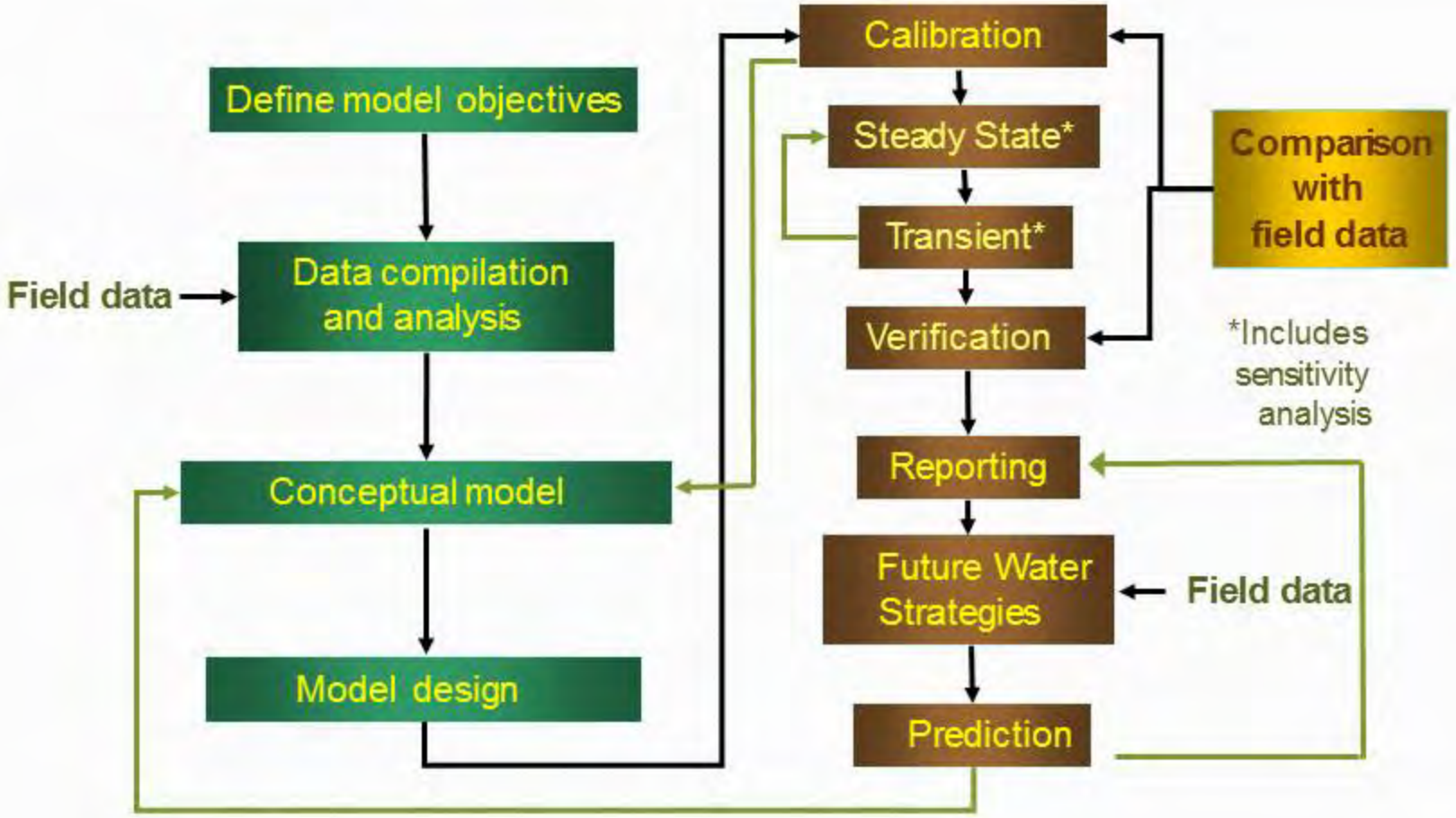



GROUNDWATER MODELING

Definition

- A mathematical device that represents an approximation of an aquifer *(The Compendium of Hydrogeology)*
- Simulation of groundwater flow by means of a governing equation used to represent the physical processes that occur in the aquifer, together with equations that describe heads or flows along the boundaries of the model *(Anderson and Woessner, 2002)*

Modeling Process




DATA COLLECTION

Data Collection

- Heads, discharge, hydraulic properties, water quality data
  - County Reports (predevelopment)
    - Evidence of artesian wells
    - Evidence of flowing springs
  - TWDB groundwater database
  - Railroad Commission Surface Casing Database
  - GCDs
  - Thesis work
  - Other literature
  - Stakeholders


PROJECT SCHEDULE

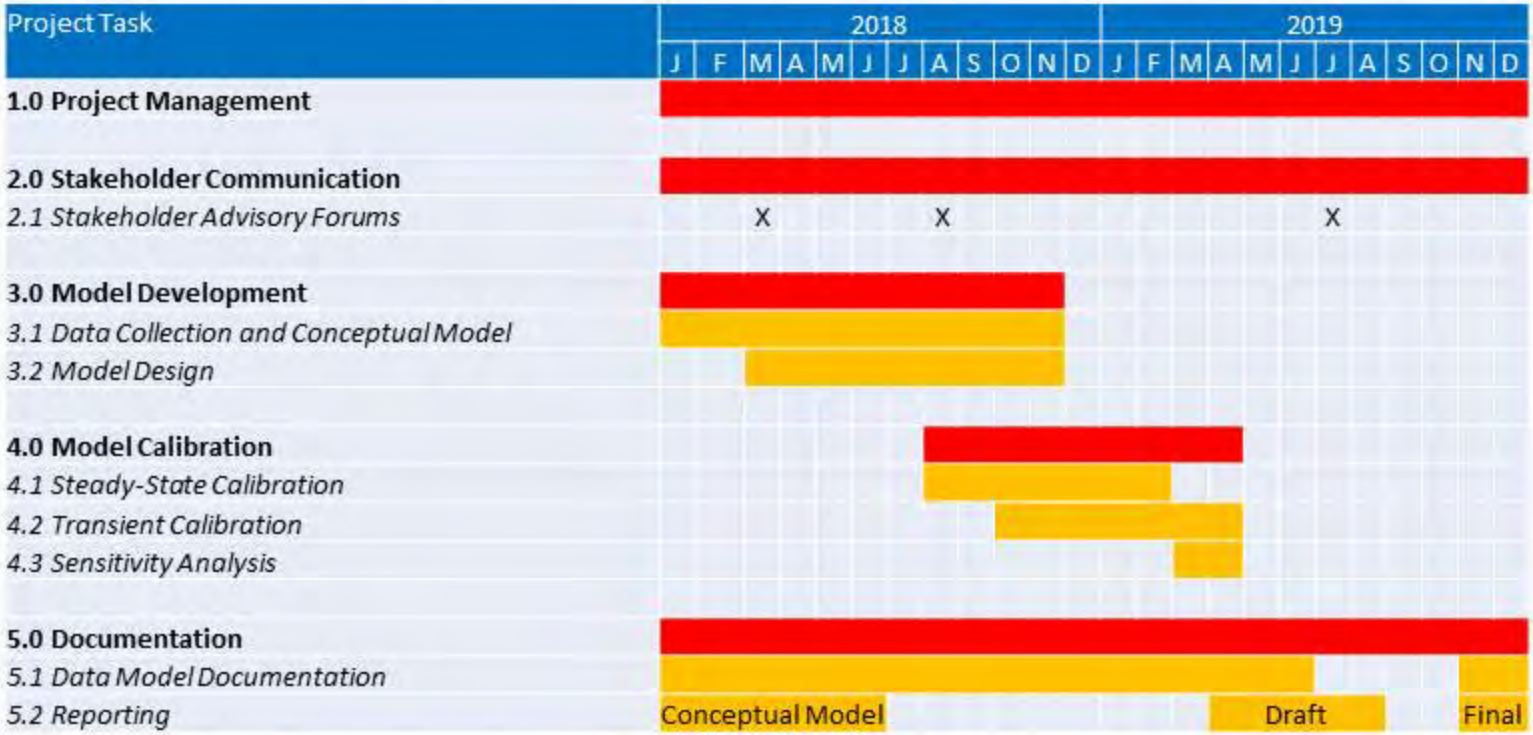
Model Update Process

- Revise conceptual model
  - Interaction with the Trinity Aquifer
- Review input data
  - Review other aquifer-related studies
  - Fill data gaps, where possible
  - Pumping volumes per well, where feasible
- Extend calibration period
- Current version of MODFLOW

Data Request

- Request:
  - Unpublished data to support the model
    - Water levels
    - Pump test results
- Deadline:
  - August 2018

Project Tasks and Proposed Schedule



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www.twdb.texas.gov/groundwater/models/gam/ebfz_n/ebfz_n.asp

MEETING MINUTES FOR THE FIRST NORTHERN SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER GROUNDWATER AVAILABILITY MODEL STAKEHOLDER ADVISORY FORUM

March 5, 2018

Offices of the Clearwater Underground Water Conservation District, Belton, Texas

Q: Do you require data up through 2016?
A: Yes through 2016, but we need pump test data of any vintage.

Q: If 2016 water levels data are not available, will you take 2018 measurements?
A: We have a fair amount of data in Williamson County and a few instrumented wells. There may be enough, just that more is better.

Q:Will you be needing pump test data in the Trinity *[Aquifer]* under the Edwards *[(Balcones Fault Zone) Aquifer]*?
A: Yes, definitely.

Q: How will you calibrate the steady state, since the aquifer is no longer at steady state?
A: People define steady state in different ways. For some means "predevelopment", others define it as "not changing with time". Typically, in the model it means the first stress period, a snapshot in time.

Q: Are you going to use annual pumping data?
A: We will probably use monthly data, that's how the original model was run.

Q: So from us you'd require monthly production data over time?
A: Yes. Otherwise, we may have to artificially split it up over the year.

Q: What prompted the decision to update the model? Statutory requirement?
A: There is no statutory requirement to update, but over time we run into problems with these models, such as some assumptions made in the old model, may need revisions, also some of the GAMs predate the DFC process. In our case, having a model for the Edwards alone will not be helpful in answering questions regarding interactions with the Trinity.

Q: Will you calibrate the model using pumping in the Trinity to see how it affects the Edwards *[(Balcones Fault Zone Aquifer]*?
A: Yes.

Q: Will you be changing the 1,000 mg/l line *[the down-dip boundary of the Edwards (Balcones Fault Zone Aquifer]* if new data TDS warrants it?
A: There is a possibility of small changes to that boundary.

Q: Are you going to take a look at the recharge distribution, and how recharge changes with time? There are many new quarries in the area that can serve as potential sites of focused recharge.
A: The quarries are probably too small to make a difference in the model. Something to think about.

Q: How are you going to get a recharge number?
A: Through the calibration process. Will back into it.

Q: Have you looked at the USGS soil water balance code for estimating distributed recharge?
A: Not at the moment.

Q: What about the conceptual report?
A: The conceptual report is more general description of the aquifer, and can include things that don't actually go into the model. The model report is more likely to change than the conceptual model report.

Q: The fear I have is that the bad water lines moves further to the west…
A: The connection between Trinity Aquifer and the Edwards (Balcones Fault Zone) Aquifer could be through fractures. There are points of higher salinity in areas of fresh water. That could be attributed to flow from the underlying Trinity Aquifer.

Q: MODFLOW assumes porous media, *[is there]* any intention of adding fracture flow components to the model?
A: In the original model, we looked at the big picture, where individual fractures don't play much of a role. In the updated model, we may adjust anisotropy *[if necessary]* to cause potentiometric heads to match observed flow paths.

Q: What size grid will you be using?
A: Quarter-mile, same size grid as in the original model; and at least one additional layer.

Name	Affiliation
Amy Muttoni	Brazos River Authority
Brant Konetchy	WSP
Corry Dawson	Clearwater UWCD
Dirk Aaron	Clearwater UWCD
Glenn Dishong	City of Georgetown
Ian Jones	TWDB
Jim Briggs	City of Georgetown
Joe Yelderman	Baylor University
Michael Keester	LRE Water
Radu Boghici	TWDB
Stephanie Wong	Baylor University