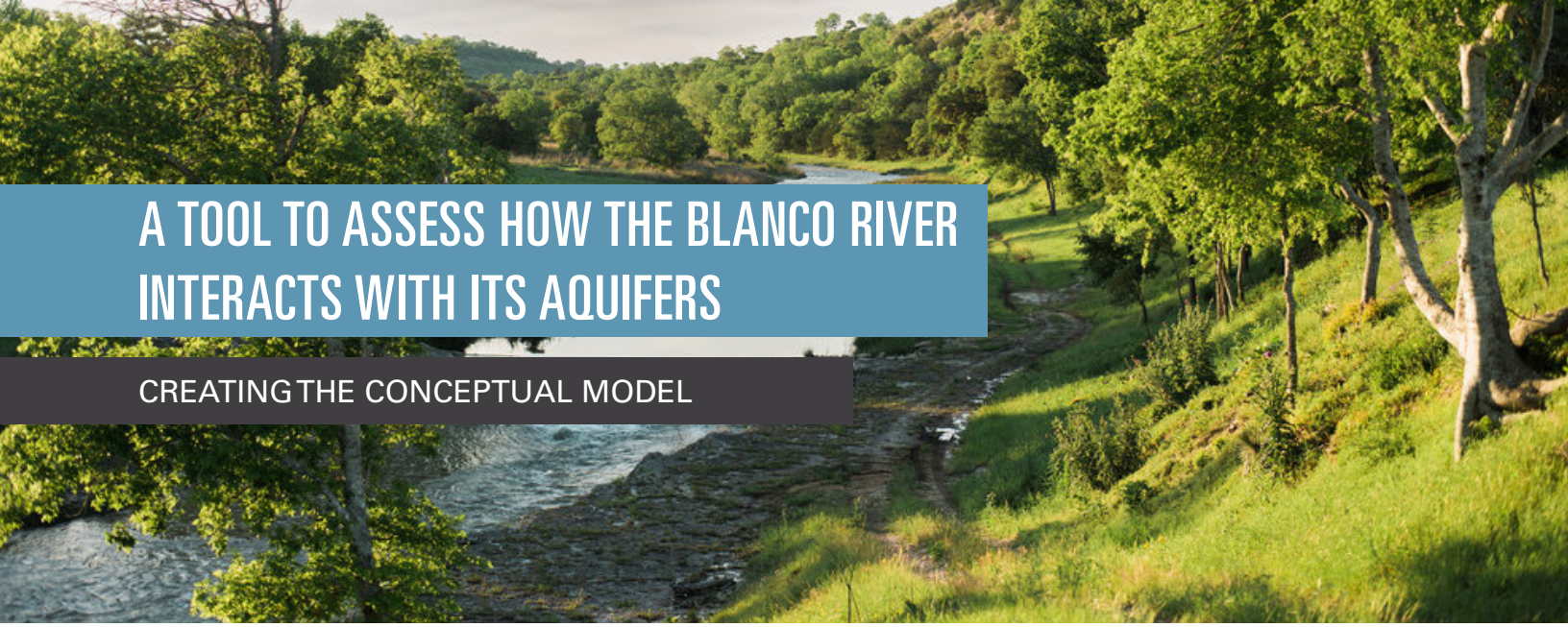

A TOOL TO ASSESS HOW THE BLANCO RIVER INTERACTS WITH ITS AQUIFERS

CREATING THE CONCEPTUAL MODEL

WHAT?

Collect and process hydrogeological data and information to create a conceptual model describing how the Blanco River interacts with its aquifers as the first step in constructing a numerical model that will simulate how the Blanco River interacts with its aquifers.

WHERE?

The Blanco River watershed from its headwaters to its confluence with the San Marcos River.

WHY?

The Blanco River basin includes some of the nation's fastest-growing counties. With increased growth comes increased aquifer pumping, and with increased aquifer pumping comes decreased flows to the Blanco River. A localized numerical model currently does not exist for this area and will be a vital tool for landowners, communities, and groundwater conservation agencies to better understand and manage groundwater and surface resources in the Blanco River Basin.

WHO?

Dr. Robert E. Mace of The Meadows Center for Water and the Environment is the management and communication lead on the study while Dr. Ron Green of Southwest Research Institute is the technical lead. Local groundwater conservation agencies will be the primary stakeholders.

HOW MUCH?

This first phase of the project (creating the conceptual model) will cost $65,000.

HOW CAN YOU HELP?

If you would like to make a gift to support this project, please visit https://donate.txstate.edu/meadows and note in the comments "Blanco Model." If you have any questions, you can contact Dr. Robert Mace at (512) 245-6021 or rem142@txstate.edu.

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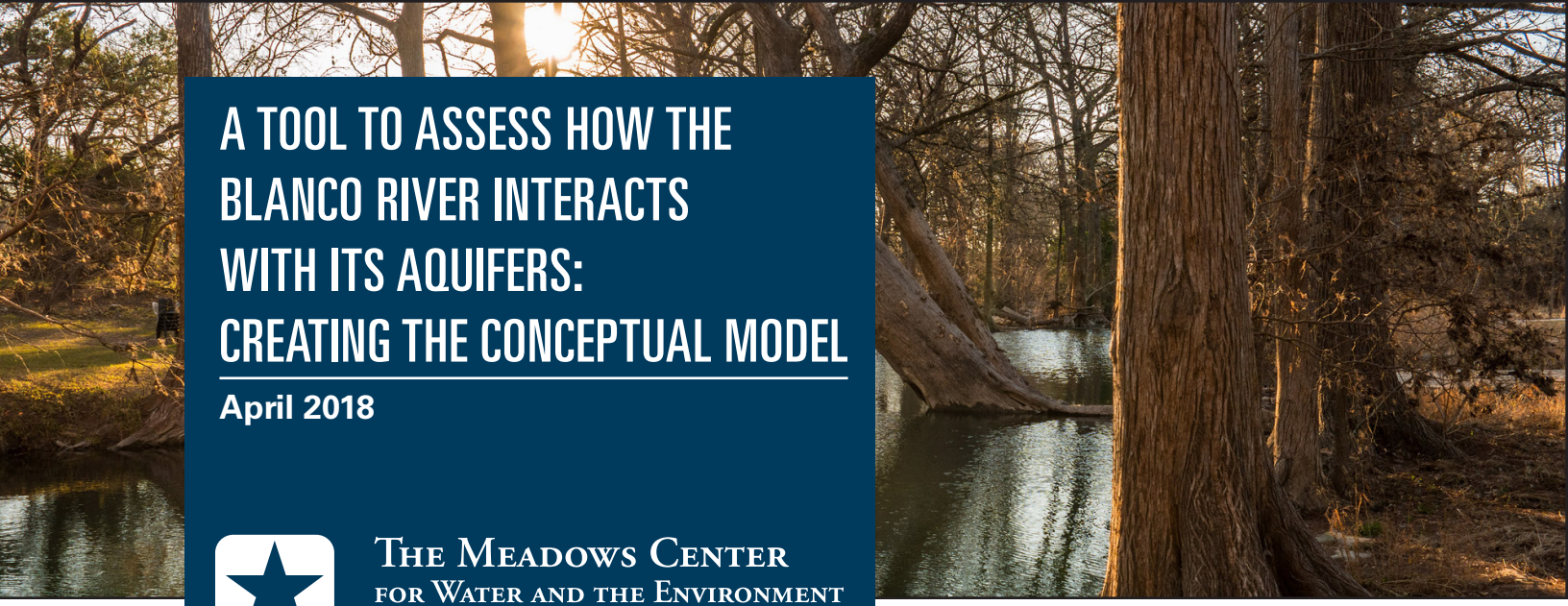

A TOOL TO ASSESS HOW THE BLANCO RIVER INTERACTS WITH ITS AQUIFERS: CREATING THE CONCEPTUAL MODEL

April 2018

The Meadows Center for Water and the Environment
Texas State University
MEMBER THE TEXAS STATE UNIVERSITY SYSTEM

Statement of Problem

There is and continues to be a very high level of economic development and growth along the I-35 corridor between Austin and San Antonio as well as west of I-35 in ecologically sensitive areas of the Hill Country. A significant by-product of this growth is the stress and demand placed on natural resources, foremost of which are water resources in the Blanco River watershed (see figure). Increased demand for water leads to more wells and more pumping which in turn affect springs and baseflow to rivers and streams. For example, water levels in the Middle Trinity Aquifer declined between 3 and 54 feet between 1980 and 1997 (Jones and others 2011). A historical observational well near Wimberley shows a decrease in water levels of more than 100 feet since the mid-1980s (TWDB 2018a). Water wells near the river also show substantial water-level declines during drought when pumping is typically higher. For example, a well in Blanco near the river showed more than 80 feet of water-level decline during drought periods (TWDB 2018b). Water-level declines decrease spring and baseflow which in turn affect iconic springs; flows in the river for the environment, recreation, and water supplies; and recharge to the Edwards Aquifer (which affects other iconic springs).

The Texas Water Development Board (TWDB) has developed a model of the Trinity Aquifer in the Hill Country; however, this model is regional in scope with the primary purpose of estimating aquifer-wide modeled available groundwater values. TWDB's model does not include the detail that local groundwater conservation agencies and communities need to effectively address local management issues such as the impact groundwater pumping has on springflow and baseflows in the Blanco River and tributary creeks.

As a result, we recommend that a new groundwater model—specific to the aquifers in the Blanco River watershed—be developed to create the tool needed by local landowners, communities, and groundwater conservation agencies to better understand and manage groundwater resources in the Hill Country. This new, more local model would not replace TWDB's groundwater availability model; instead, it would supplement the TWDB model with more detailed data that local groundwater conservation agencies can use to not only inform local management decisions but to inform decisions on desired future conditions and to improve subsequent updates of the regional model.

Developing a predictive numerical groundwater model to assess the potential impacts of pumping on water levels, springs, and baseflows is a lengthy effort. Therefore, we have divided the effort into two phases: Phase 1 to create the conceptual model and Phase 2 to develop the numerical groundwater flow model (what we are

calling the Blanco River-Aquifers Tool for Water and Understanding Resiliency and Sustainability Trends). Additionally, there could be subsequent phases of work where the model is used to investigate the impacts of future pumping on the aquifer and the river.

Background

The Blanco River and its watershed play critical roles in the conveyance of surface water and groundwater in the Trinity and Edwards aquifers in central Texas. As a subset of this role, the Blanco River and its watershed provide recharge to essential points of discharge in central Texas – Barton Springs, San Marcos Springs, Pleasant Valley Springs, and Jacobs Well. Currently, we lack an adequate understanding of the hydraulic relationships among the Blanco River watershed, the springs, and neighboring hydrogeologic systems, such as the San Antonio Segment of the Edwards Aquifer, to effectively manage these resources over the long-term. Although considerable data and information regarding the hydrogeology of the Blanco River are available, the system is sufficiently complicated that a coherent conceptual model is not yet available.

The project will be a collaborative effort involving numerous stakeholders and experts. These will include, but are not limited to, Southwest Research Institute©, The Meadows Center for Water and the Environment, Barton Springs Edwards Aquifer Conservation District, Blanco-Pedernales Groundwater Conservation District, Cow Creek Groundwater Conservation District, Hays Trinity Groundwater Conservation District, and Edwards Aquifer Authority.

Scope of Work

The scope of work for Phase I includes compiling and analyzing existing data and information to develop a conceptual model of the hydrogeology of the Blanco River watershed. We will also identify gaps in data or additional information needed to develop a credible conceptual model during this phase. Tasks associated with Phase I include:

1. Refine objectives of the investigation/study with technical stakeholders.
2. Delineate candidate watershed boundaries and define study domain.
3. Compile existing documentation on watershed geology and hydrology.
4. Compile water elevations at wells and springs.
5. Compile a database of surface-water occurrence, flow rates, and gain/loss measurements.
6. Compile spring discharge, stream flow, and pumping data.
7. Compile spring and well water-chemistry data.
8. Develop an ArcGIS project of watershed.
9. Compile precipitation data.
10. Evaluate and identify recharge mechanisms.
11. Assemble a preliminary hydrostratigraphic-framework model.
12. Assign boundary conditions to the model domain.
13. Calculate a first-order water budget.

Project Outcomes

Phase I of this project is the development of a conceptual model of the Blanco River watershed. A conceptual model is the first significant step in designing a comprehensive surface-water/groundwater numerical model. A numerical model will allow for analysis of the impacts groundwater pumping has on springflow and baseflows, which local groundwater conservation agencies can use to manage groundwater resources more effectively and which landowners can use to better understand their groundwater resources.

The development of a conceptual model has many benefits on its own, which is why Phase I is essential. For years, scientists throughout the Blanco River watershed have collected data and conducted studies related to the hydrogeology of the Blanco River and its aquifers, but none of this data and findings has been compiled and harmonized with the end goal of describing how the whole system works. To develop a conceptual model, we will assemble and analyze existing data and studies, providing us with a much more thorough understanding of how existing studies relate and of how the Blanco River interacts with its aquifers. Additionally, through this effort, we will identify data and information gaps that need to be filled before we can develop a comprehensive surface-water/groundwater numerical model that will support water-resource management decisions.

For Phase I, the stakeholders in this project will provide data sets and technical expertise that will support a report describing our current understanding of how the Blanco River and its Aquifers interact. This report will—for the first time—describe our current understanding of how the Trinity Aquifer and the Blanco River interact and, in turn, how the Blanco River and Edwards Aquifer interact. The report will be publicly available and, in addition to being the foundation for the more numerical model, can be used by the public as a resource to more fully understand how the Blanco River interacts with its aquifers.

Project Management

Dr. Robert E. Mace of The Meadows Center for Water and the Environment has agreed to be the management and communication lead on the study. Dr. Ron Green of Southwest Research Institute will serve as the technical lead for the study.

Schedule and Cost

The duration of Phase I of the project will be six months. Total costs for Phase I of the project will be $65,000.

References

Ferguson, W., 2017, *The Blanco River:* Texas A&M University Press, College Station, Texas, 170 p.

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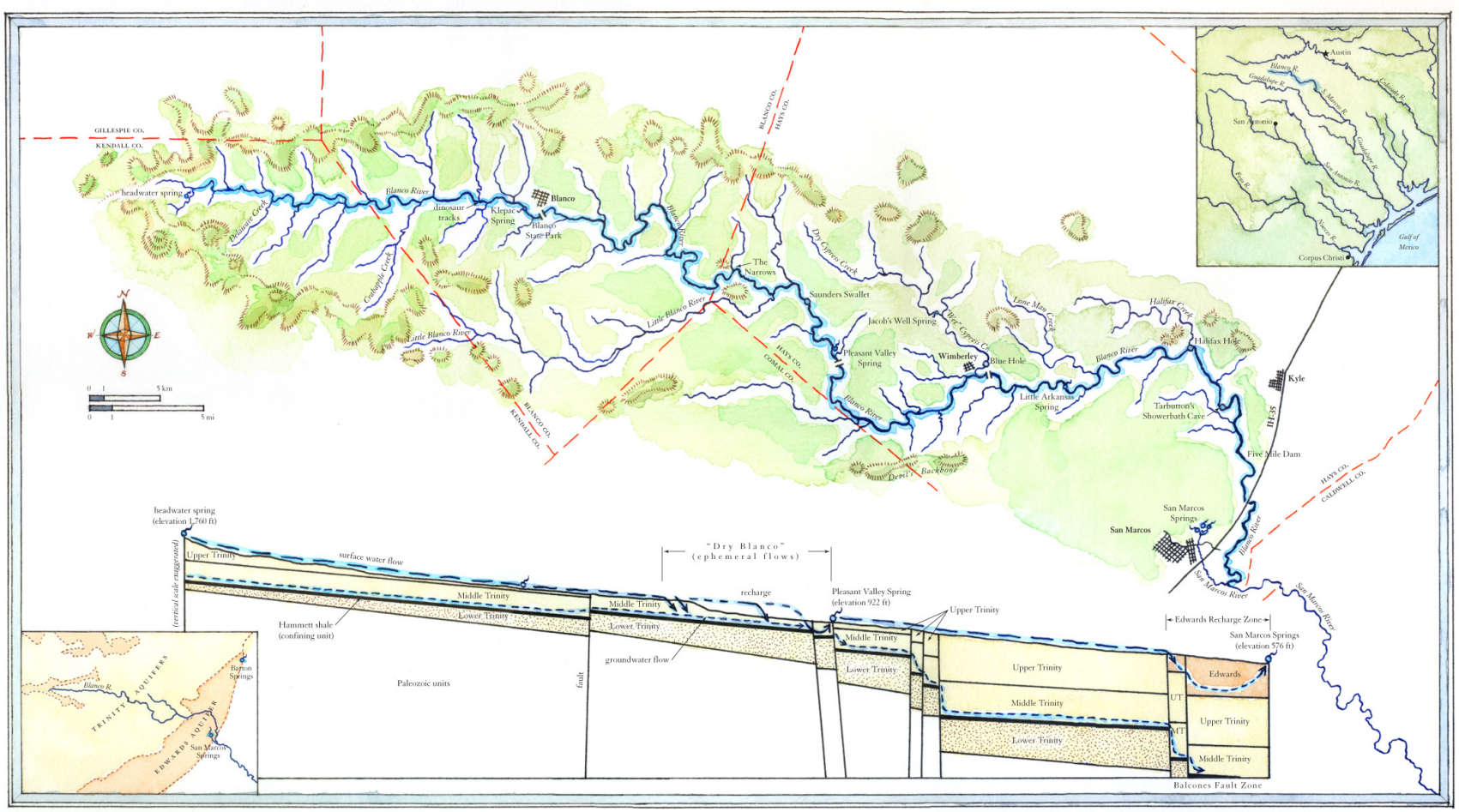

The Blanco River watershed with a generalized vertical geologic cross section (drawing by Molly O'Halloran; original is in Ferguson [2017]).