

Site Suitability Analysis for Potential Reservoir Sites in the Texas Hill Country

By

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Introduction:

In this project, I aimed to find the areas suitable for the potential construction of a reservoir in the Texas Hill Country. Reservoirs are sometimes essential to environments where water is not evenly distributed throughout the entire region. I picked the Texas Hill Country because it experiences little rainfall and has had several droughts in the past decade. The effects of drought, population growth, and land-use have led to a significant decrease in water availability and the drying of riverbeds throughout the region.

In general, reservoirs offer several benefits to the surrounding community and environment. A reservoir in the Hill Country would provide an excellent opportunity for a new source of drinking water for the increasing population that resides in these regions. This stored water could also be used for irrigation purposes as well and even used to produce electricity if a dam were to be built on this system. Reservoirs are also very effective when controlling unexpected floods.

Reasoning Behind Criteria and Parameters:

My first criteria for the potential sites of a reservoir in the Texas Hill County were that it be within 2 miles of an existing stream or river. To do this, I made a 2-mile buffer around significant streams in this area. Ideally, the reservoir would connect to a stream system and have a constant input of water flow. Since reservoirs are usually fed by precipitation or rainwater run-off, it would be important for the reservoir to receive its water from an alternate source such as a river since precipitation is not always abundant in this region.

My second criteria was that the reservoir should not be within 10 miles of another lake or reservoir. To do this, I created a buffer of 10 miles around all lakes. I then erased this buffer layer from the entire region resulting in a map that only displayed areas 10 miles from other lakes. This allows for a greater distance between lakes and would prevent the construction of a reservoir in an area that already has plenty of water and lakes available.

Data Used:

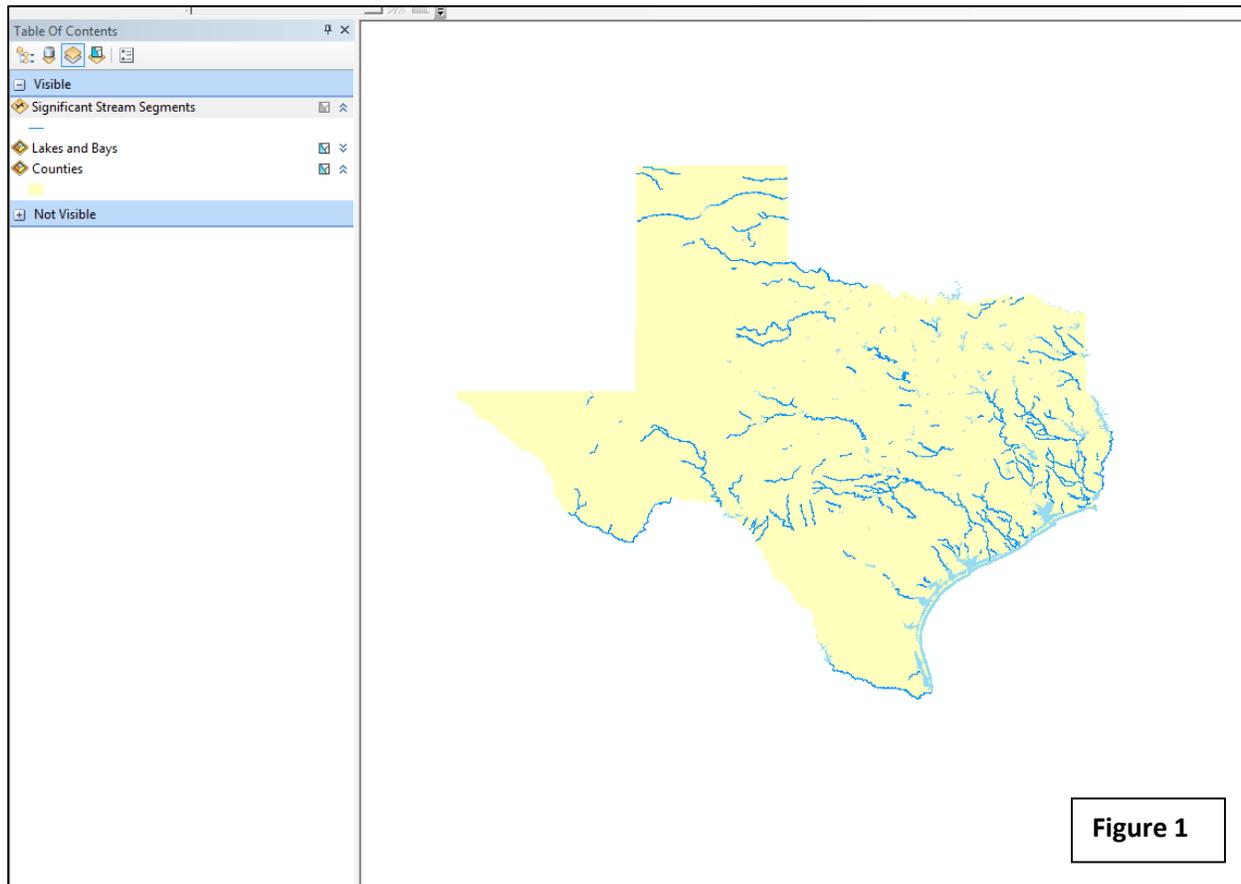
Significant stream segments - <https://tnris.org/data-catalog/entry/tpwd-significant-streams-segments/>

Lakes and bays - <https://tnris.org/data-catalog/entry/tpwd-lakes-bays/>

Texas Counties - <http://tpwd.texas.gov/gis/data>

Steps:

I first added three shapefiles called “Counties”, “Significant Stream Segments” and “LakesBays” from the Texas National Resources Information System website and Texas Parks and Wildlife (Figure 1). These files’ coordinate systems were all NAD 1983 so projections were not necessary.



Since I want to focus on just the Texas Hill Country, I used the “select by attribute” tool to select the counties in the Texas Hill Country and exported this data to a new layer (Figures 2 through 4).

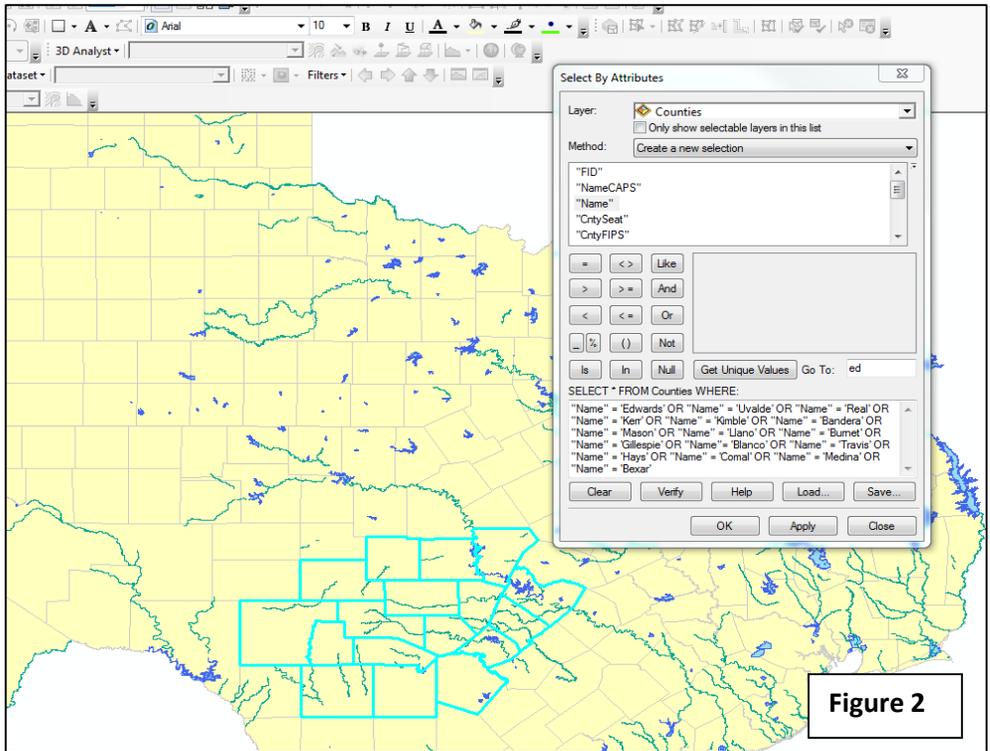


Figure 2

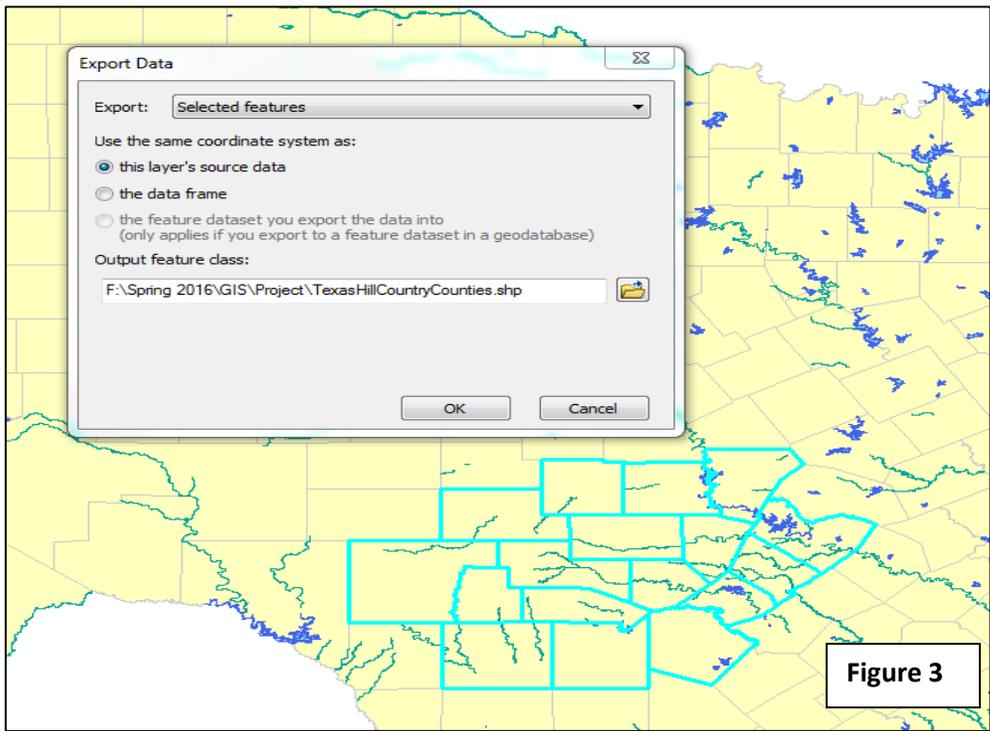
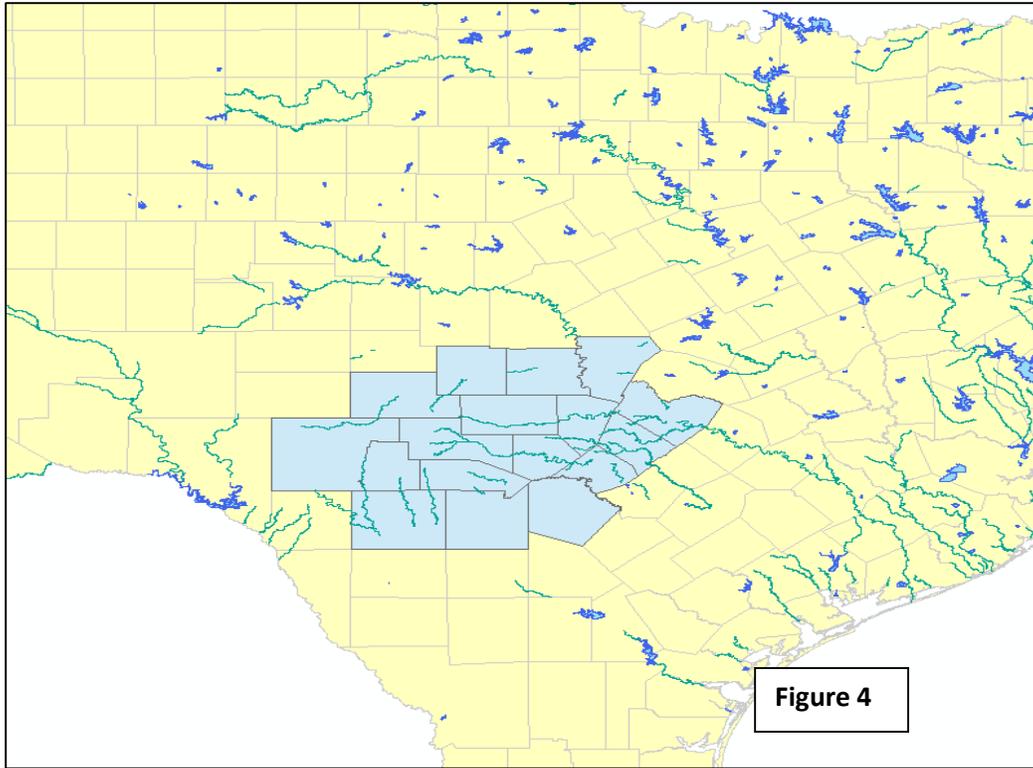
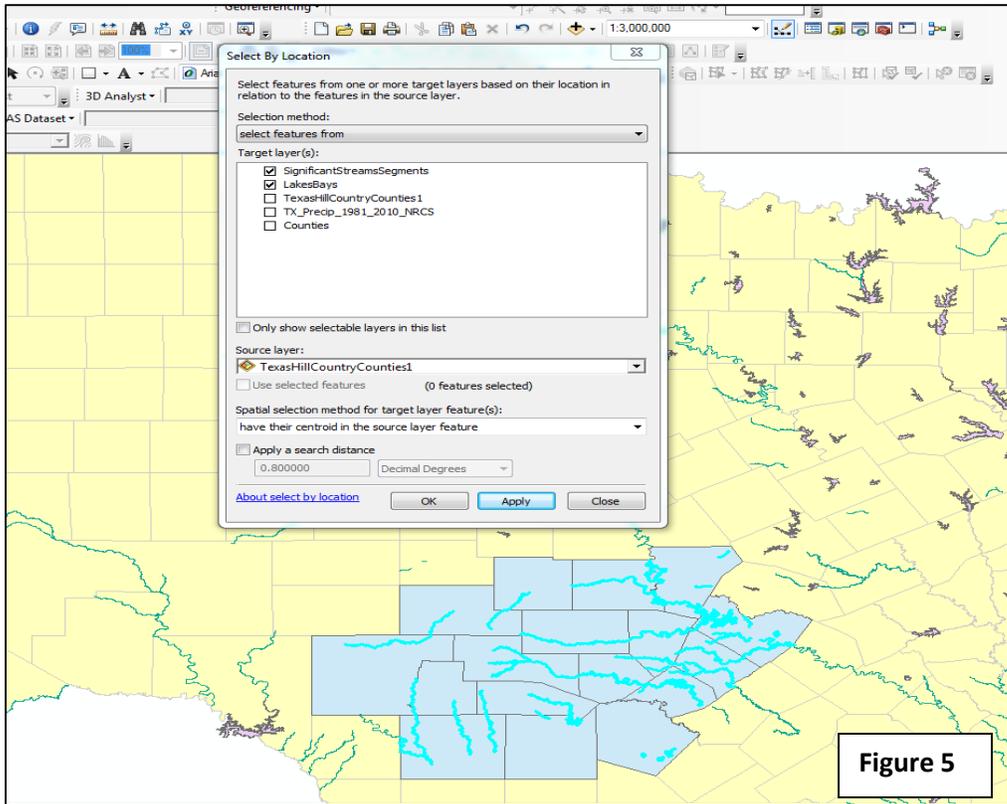


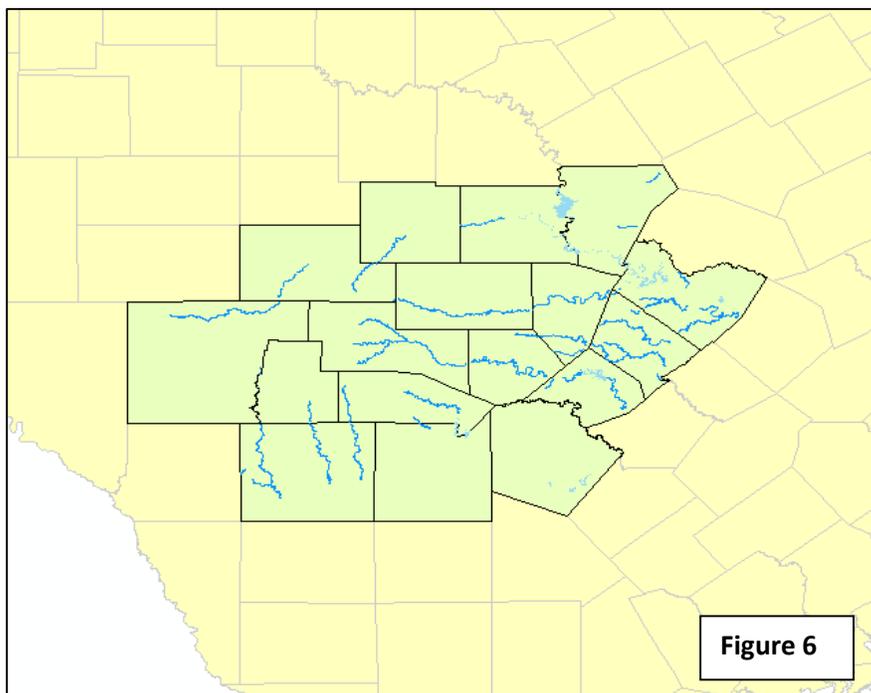
Figure 3



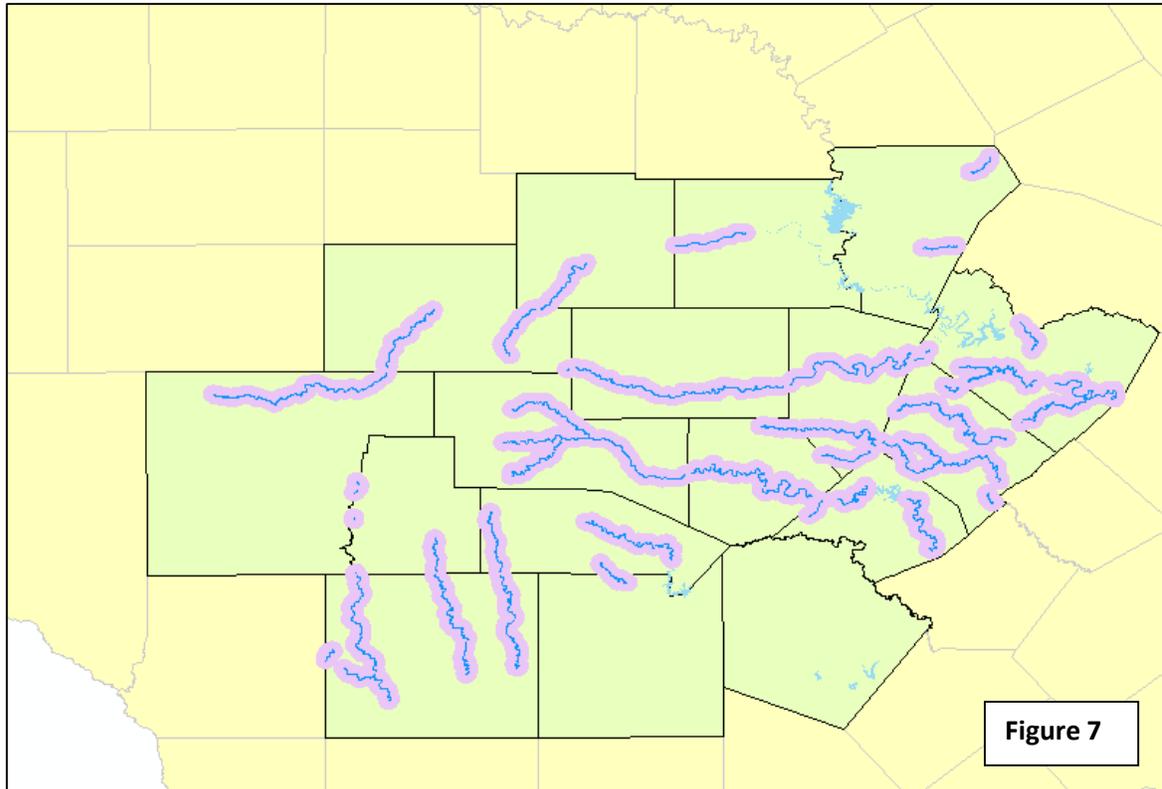
I then used “select by location” to show only lakes and significant stream segments within the new Texas Hill County Counties layer (Figure 5).



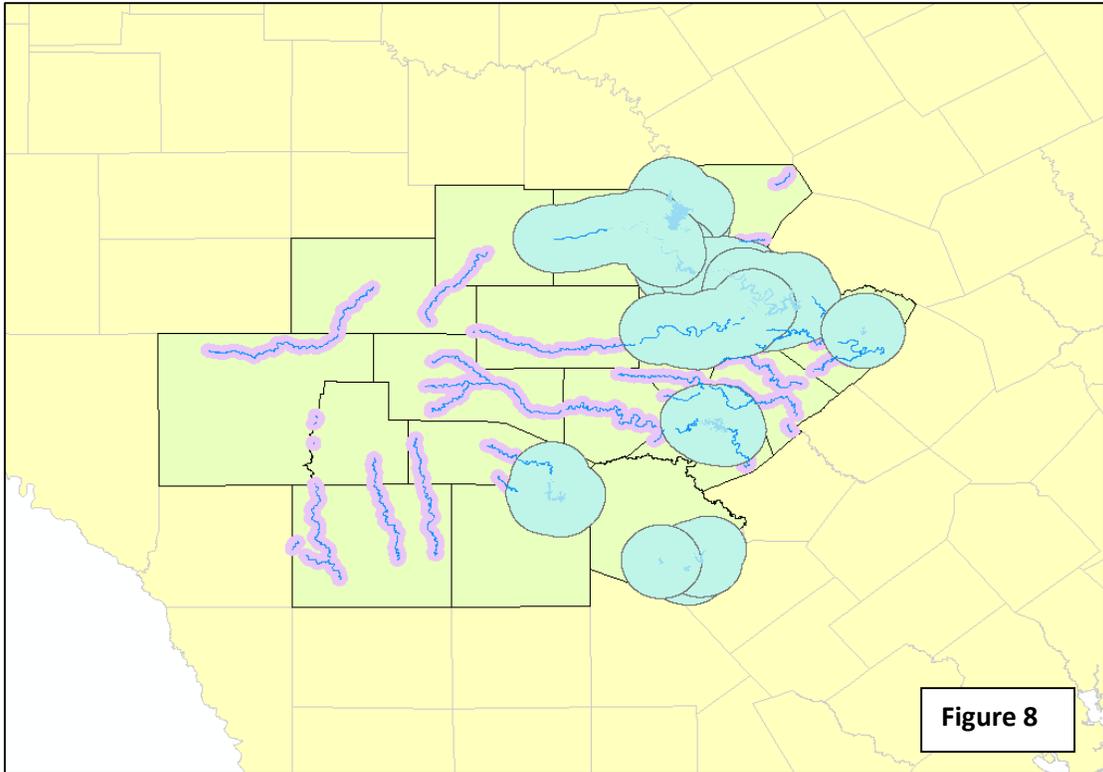
This produced a new layer showing lakes and stream segments within Texas Hill Country counties (Figure 6).



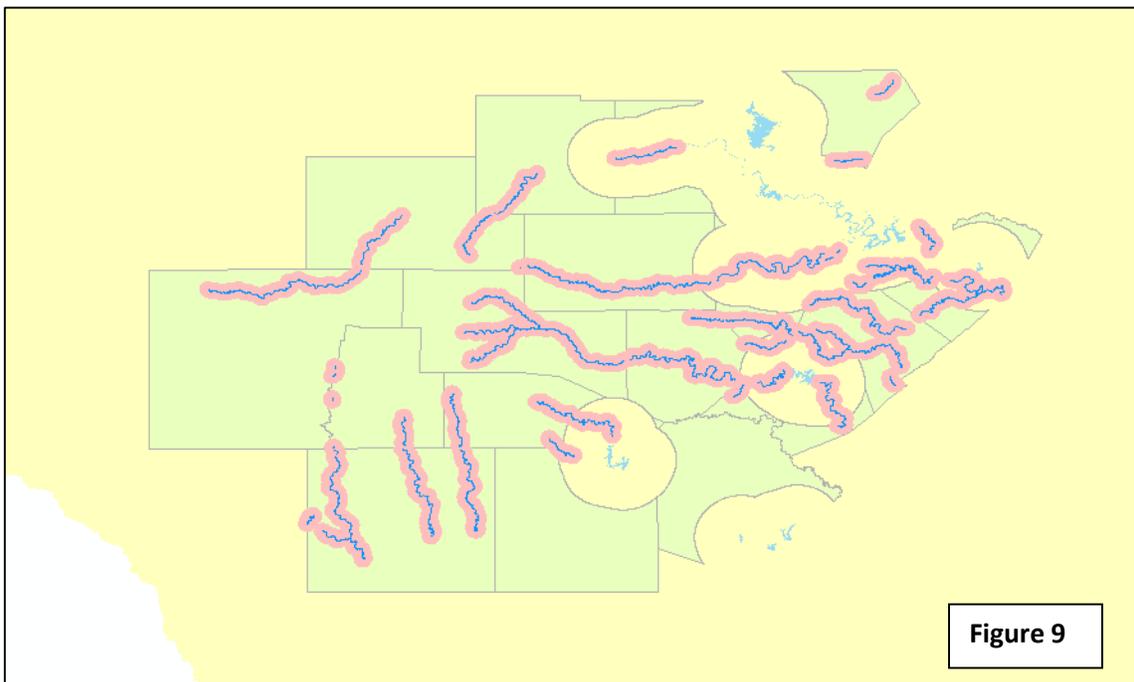
My first criteria for the potential sites of a reservoir in the Texas Hill Country were that it be within 2 miles of an existing stream or river. To do this, I made a 2-mile buffer around significant streams in this area (Figure 7).



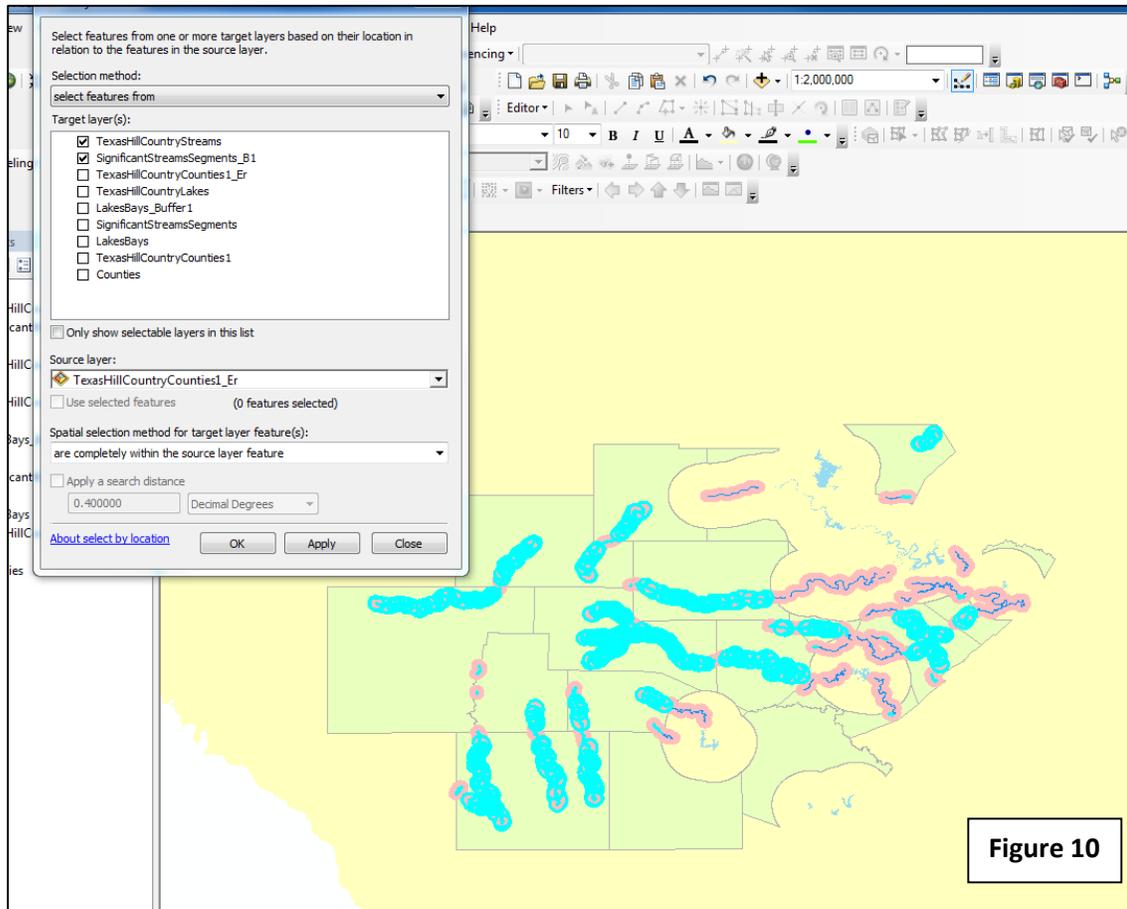
My second criteria was that the reservoir should not be within 10 miles of another lake or reservoir. To do this, I created a buffer of 10 miles around all lakes (Figure 8).



I then erased this buffer layer from the entire region resulting in a map that only displayed areas 10 miles from other lakes. This allows for a greater distance between lakes and would prevent the construction of a reservoir in an area that already has plenty of water and lakes available (Figure 9).



After erasing areas that were within ten miles from an existing lake or reservoir, I used “select by location” to select only the streams and their two mile buffers that were within the green region above and then created a new layer showing these selected areas (Figure 10 and Figure 11).



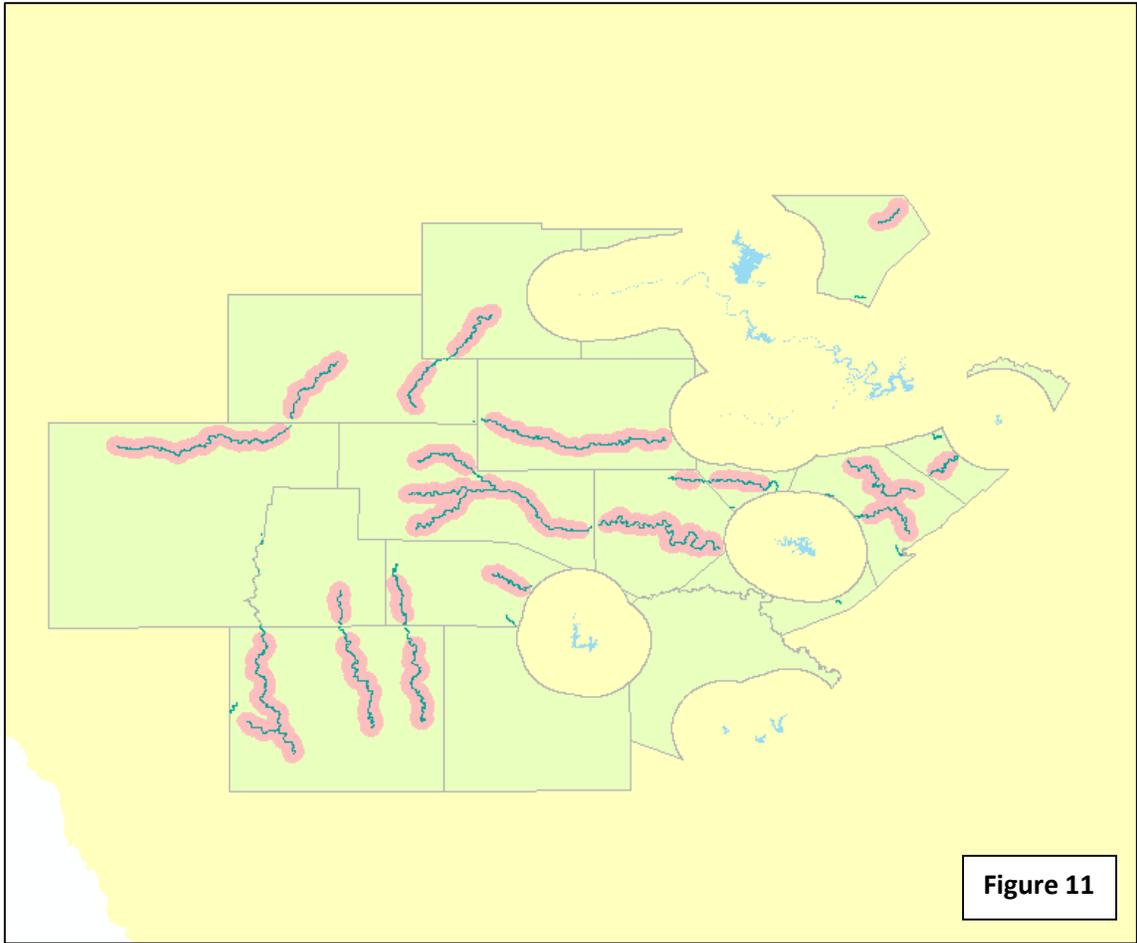
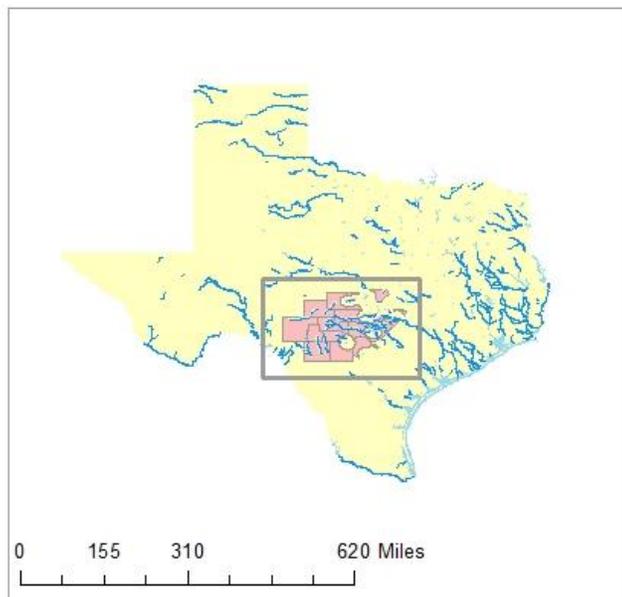
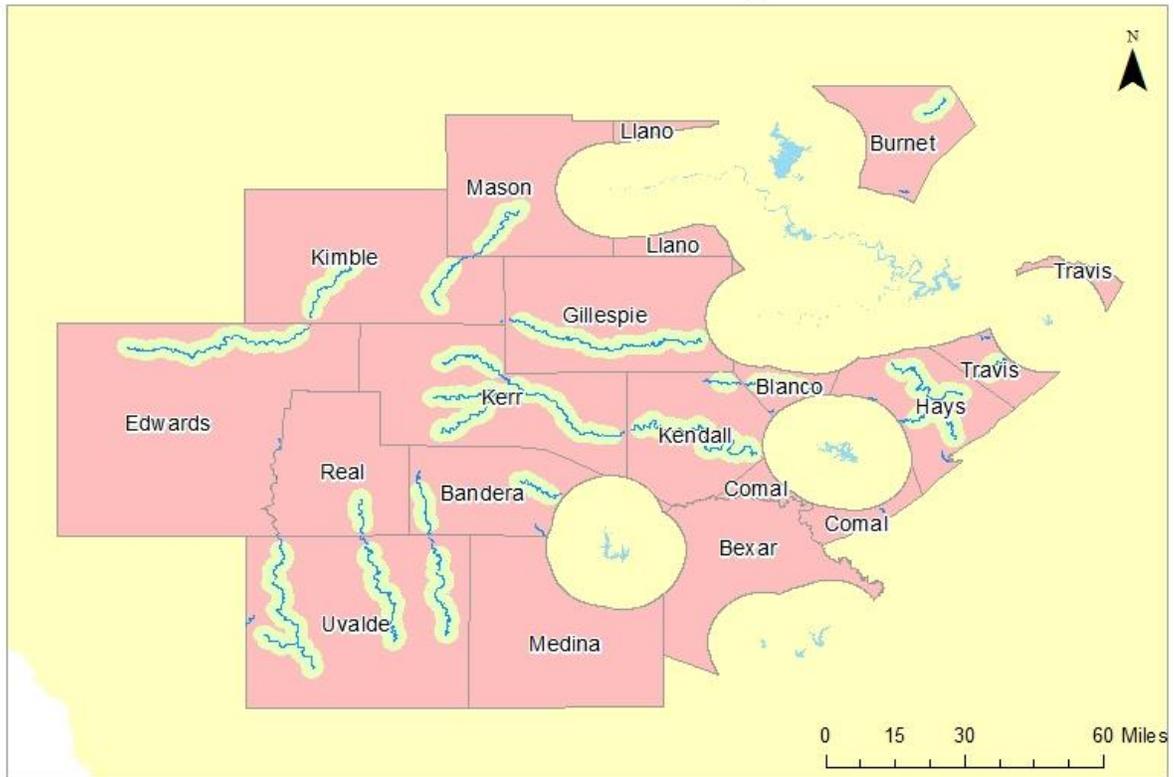


Figure 11

Map Showing Final Results:

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Site Suitability Analysis for Potential Reservoirs in the Texas Hill Country



Map Features

- Areas that are at least 10 miles from nearest lake
- Most Suitable Sites for Potential Reservoir
- Lakes and Bays
- Significant Stream Segments

Coordinate System: GCS North American 1983
Datum: North American 1983
Units: Degree

Discussion of Results:

My results show that the most suitable sites were most present in the western side of the Hill Country. This is because the eastern half of the region has several lakes which eliminates the potential for a reservoir since one of my criteria was that the reservoir needed to be at least 10 miles from any lake.