

Environmental Development of River Road Ranch

New Braunfels, Texas



Alix Scarborough

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Introduction

The 2,400-acre Word-Borcher ranch has been owned by the Word family since 1941. Located along the Guadalupe River in the Texas Hill Country, the land is both beautiful and environmentally sensitive, as it is also in the recharge zone of the Edward's Aquifer. On the other hand, with the rapid growth of the Central Texas Region in recent years, development pressures have been increasing for this large piece of land near the City of New Braunfels, TX, in Comal County.

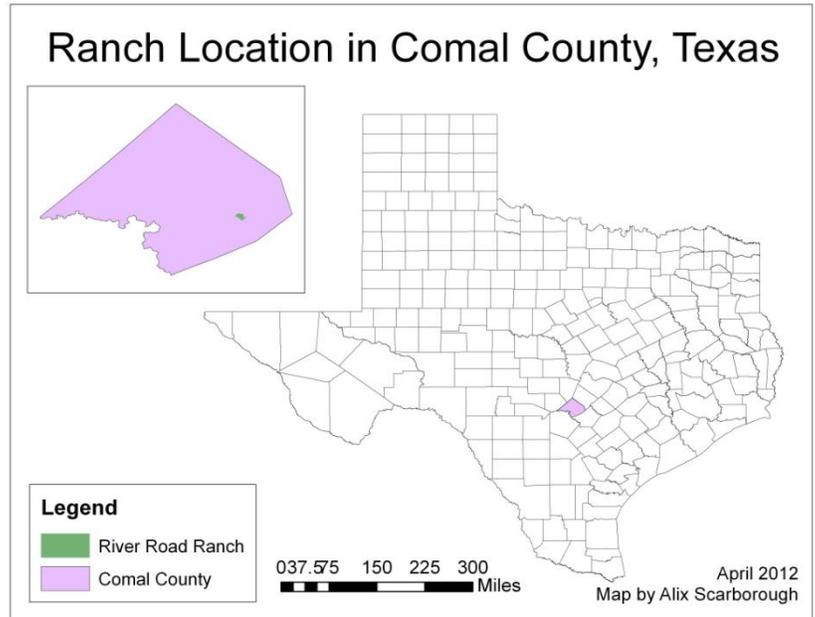


Figure 1

(See locator map, Figure 1.) Only 300 acres of the property are currently within the city limits, but the municipal government has been threatening to annex the rest of the area as demand for housing grows around the city. Though most of the land is still in its natural state and the family would like to keep it that way, they have recently realized that, realistically, the valuable property will need to be developed sooner rather than later. In order to maintain some control over the land's development, the property owners are working with a development company to create a mutually-agreeable master plan. As it currently stands, this plan includes a mix of residential and commercial, as well as a technical college. The portion consisting of the northeastern 662 acres along the Guadalupe River, separated from the rest of the property by River Road, is designated as a tourism area. This section is referred to as River Road Ranch. (See Figure 2.)

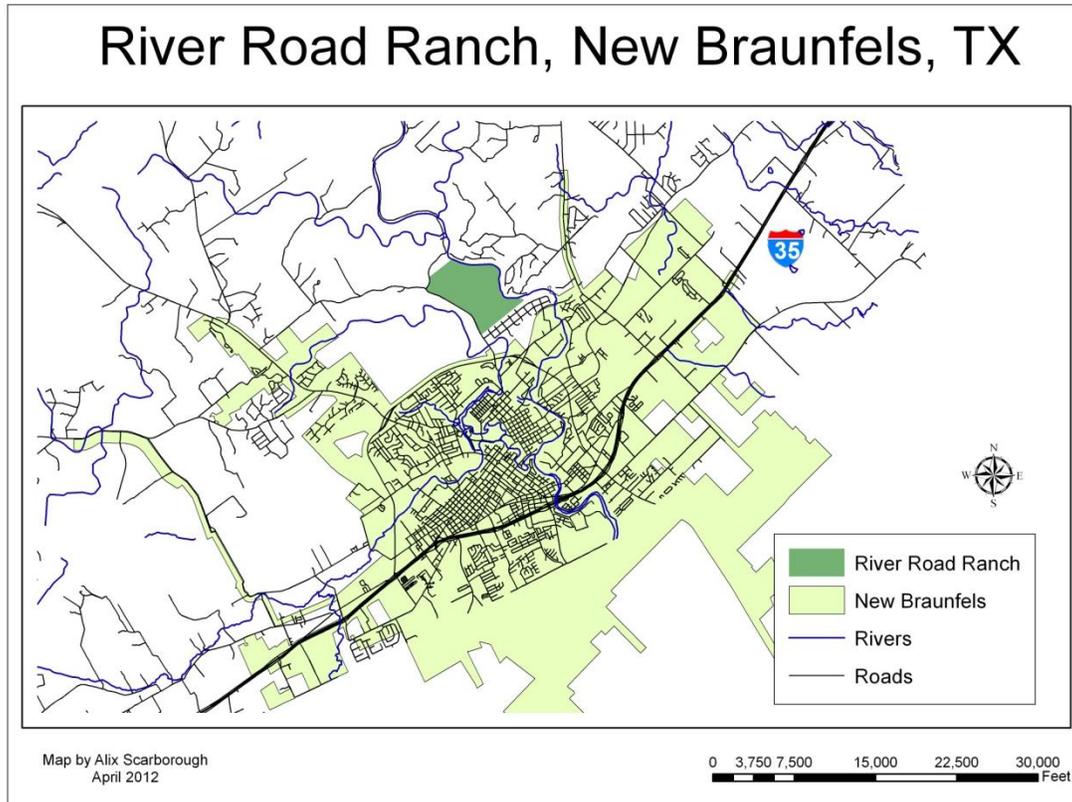


Figure 2

The current plan for River Road Ranch is anchored by a large, upscale resort along the bank of the Guadalupe River. The choice to promote tourism in the area is an obvious one; Tourism is one of the biggest economic drivers in New Braunfels, due in part to the river and the city's location between Austin and San Antonio. However, a large building next to a flood-prone body of water is environmentally irresponsible. An expensive conference center and resort will not be affordable to many people, including the lower-income residents of nearby small towns. It will do nothing to protect potential habitat for the many engendered species in Central Texas, including black-capped vireo, golden-cheeked warbler, and whooping crane. Perhaps most significant to the developer, this land use may not be the most profitable option.

My proposal is to develop River Road Ranch less intensely while positioning it as a regional tourism destination. Figure 3 illustrates the unique amenities this plan can provide by

utilizing the available natural resources. Crucial to this type of development is building in a sustainable way, which includes situating elements appropriately on the land. The focus of this project is finding the best locations at River Road Ranch for three amenities: cabins, campsites, and trails.

River Road Ranch Amenities	
Four price tiers of lodging options	Birding and stargazing pavilion
Botanical gardens	Horse stables
Sustainable small-scale agriculture	Indoor/outdoor event pavilion
Wildlife preserve	Guest lodge with bar
Interactive educational opportunities	Upscale restaurant
Hike and bike trails	Casual café
Accessible walking trails	Partnerships with local businesses

Figure 3

Geographic Concepts

Locating these amenities involved a careful consideration of the site’s resources and natural attributes, as well as existing man-made features and the needs of the future visitors. Drainage is the direction water flows downhill during a precipitation event, which is especially relevant because the Guadalupe River borders the eastern edge of this property. Due to topography, some regions of the property drain directly into the river instead of stopping off at local ponds, creating a drainage buffer along the river. This flood-prone and environmentally sensitive area is not appropriate for buildings (such as cabins), but temporary structures such as tents can take advantage of the river’s edge.

As well as affecting drainage patterns, slope is a barrier for certain types of development. Campsites will be restricted to areas of very gentle slope, so that tents can comfortably be set up. Cabins sites can be slightly more sloped, as small areas can be leveled as the cabins are built.

There are four main types of habitat within the River Road Ranch property: shrubland, pasture with scattered trees, oak-juniper woodlands, and riparian. These are determined primarily by the type and density of plants. Oak-juniper woodlands are ideal for cabins, as the denser trees provide shade. Campsites are more flexible with placement; either oak-juniper woodlands or pastureland with scattered trees is appropriate.

For unloading heavy camping equipment, campsites should be near the property's main interior road. For privacy, on the other hand, all lodging should have a further proximity from public roads surrounding the property, especially the housing development along the southeast border of River Road Ranch.

Data and Methodology

Data Sources

Several pdf and jpeg documents were originally compiled by consultants and obtained from Jennifer Word on behalf of the Word family. Maps of drainage patterns and habitat types were spatially referenced and digitized into polygons, as was the property boundary. The main interior road and smaller cow paths were estimated from aerial imagery. The rest of the data were downloaded from the Texas Tech University Center for Geospatial Technology. Comal County roads and rivers are Census TIGER files, and the Comal County DEM was created as part of the National Mapping Program. In addition, county boundaries were downloaded from the Texas Natural Resources Information System web site. All datasets were in North American Geographic Coordinate System, datum 1983.

Cabin Location

The criteria for locating the cabins are summarized in figure 5. The purpose of these criteria was to narrow down the potential area in which to build cabins on the River Road Ranch property. The overall strategy was to create a raster layer with a value of one for each of the four criteria, then multiply them together. After digitizing the drainage areas map, I selected and created a new layer from the direct Guadalupe River drainage area. This polygon along the river was then erased from the River Road Ranch polygon, in order to show areas that do not fall within the drainage region, and the resulting polygon converted to raster data. Next, I selected by attributes all sections labeled habitat three (oak-juniper woodlands) from the digitized habitat map, then converted this total habitat three area to raster.

Cabin Area Location Criteria
Outside direct Guadalupe River drainage area
Oak-juniper woodlands habitat
Slope less than 10 degrees
At least 1,000 feet from adjacent public roads

Figure 5

To determine sufficiently flat areas, a slope layer was created from the Comal County DEM (clipped to the property boundaries). The slope layer was reclassified such that slopes of less than ten degrees were labeled “one” and slopes of greater than ten were labeled “zero.” Finally, roads adjacent to or near the property were selected from Comal County roads. These included River Road to the north and west, and Edwards Blvd and its various cul-de-sacs to the southeast. Roads across the river were disregarded. I created a 1,000 foot buffer from these selected roads, erased the buffer from the property boundary polygon, and converted the resulting area to a raster dataset with a value of one. These four raster layers were multiplied together, two by two, using raster calculator. The few areas that resulted in a value of zero were reclassified to “no data” since they were not part of the final location area. The ultimate output was a raster layer showing two regions that meet all four criteria identified earlier as ideal for

building cabins. The model I built, containing almost all operations described above, is shown in Figure 6 below.

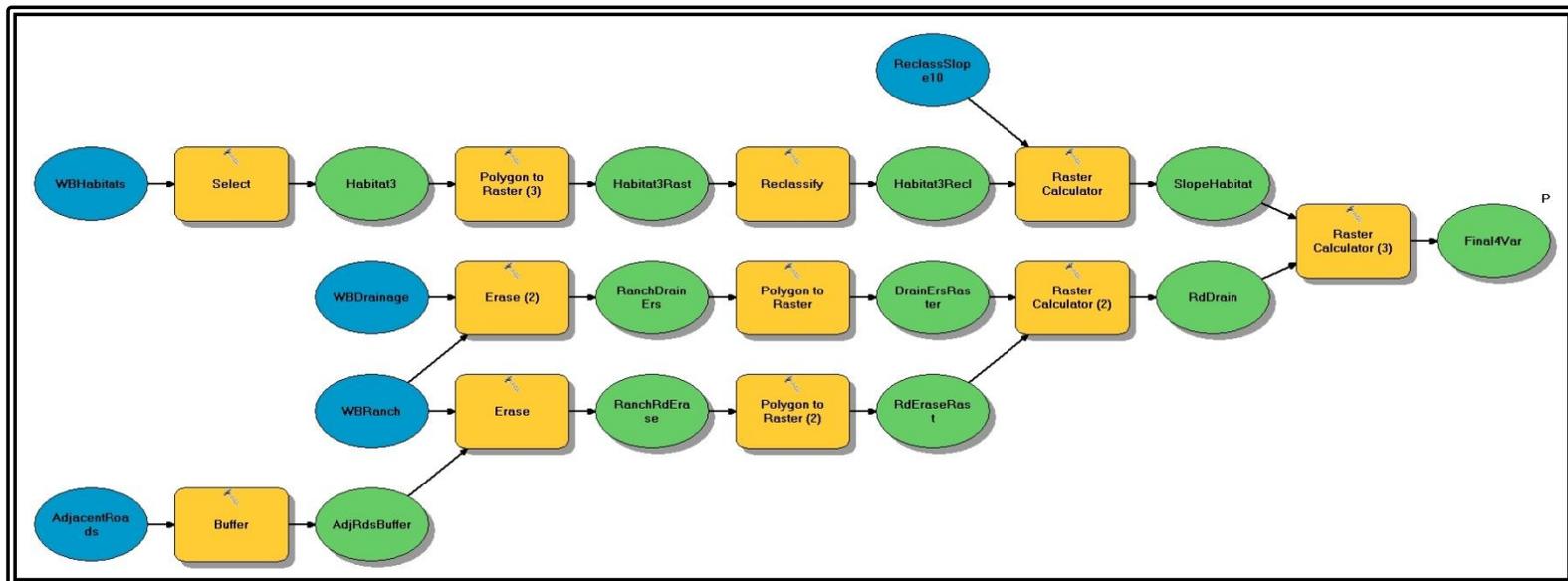


Figure 6

Campsite Location

The criteria for locating the campsites are summarized in Figure 7. A process very similar to the one described in “Cabin Location” was used to find ideal areas for placing campsites. First, a 600 foot buffer was created around the section of the Guadalupe River that bordered the property. This buffer was converted to raster data with a value of one, for the purposes of later multiplying it with other criteria layers. Next, habitat types two and three (pastureland with scattered trees or oak-juniper woodlands) were selected from the habitats layer using SQL. These habitat areas were then converted to a single raster dataset.

Campsite Area Location Criteria
Less than 600 feet from Guadalupe River
Pastureland with scattered trees or oak-juniper woodlands habitat
Slope less than 5 degrees
Less than 200 feet from interior main road

Figure 7

The slope layer created to identify cabin areas was reused, this time reclassified such that a slope of less than 5 degrees had a value of one and a slope of greater than 5 degrees had a value of zero. For the final criteria, a buffer of 200 feet was created from the main interior road on the property. This was converted to raster, and multiplied with the other three criteria layers (and reclassified to show only the acceptable areas) to identify a final region where campsites should be located. The model for this section of the project is shown in Figure 8.

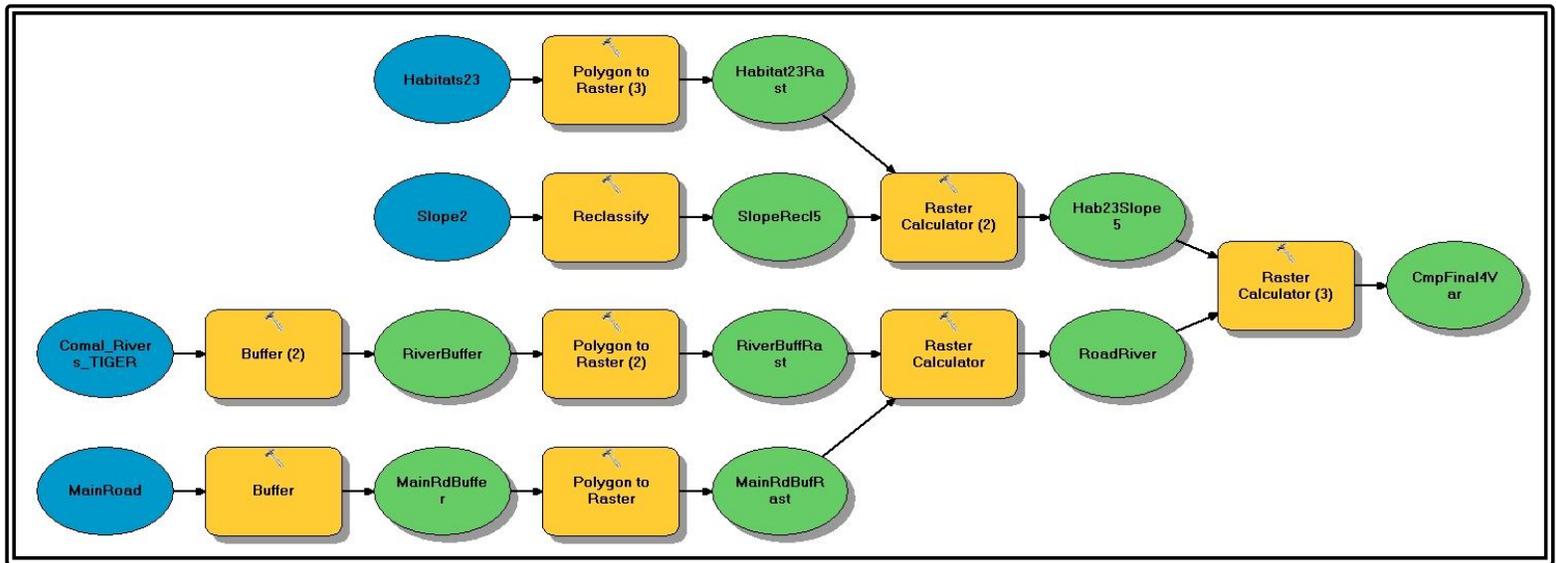


Figure 8

Trail Location

For trail location, instead of conducting a location analysis similar to the previous two, I chose to use only an aerial image. This is because the most efficient way of locating trails on this property was to utilize existing roads and cow paths, which can be seen as lighter lines indicating cleared linear areas. There are currently no paved roads on the property, but many years of wandering cattle and trucks —creatures of habit both—have worn paths through the underbrush and trees. These span most of the property, and go through a variety of habitats while generally taking the path of least resistance. (Cows and trucks prefer not to climb steep hills if it can be

avoided.) These existing paths are therefore ideal for humans to walk or bike, and are less costly to implement as only minimal maintenance will be needed to make them usable.

To create these polylines, I simply digitized from the aerial image, occasionally overlaying the DEM and habitat layers to ensure cleared areas were in fact paths, and not come other confounding variable.

Analysis and Conclusions

For my cabin location, my final output showed two areas on the property that would be ideal for building cabins according to the specified criteria. The total area for these suitable regions is 5,930,000 square feet. Since this area is so large, adding another variable to the location analysis could help narrow the area down for a future project. This variable could be determined by conducting a more thorough site visit and identifying additional barriers to development. The campsite output was also in two regions. They more closely reflected my expectation for ideal campsite placement. Figure 9 shows both the potential cabin area and the potential campsite area.

My trail creation yielded several miles of multi-use trails on the property. They are all loops and most connect to other trails to facilitate the flow and ease of navigation. Trails go through each type of habitat, giving visitors a complete overview of the land's unique characteristics. (See Figure 10.)

The next steps for this project, should the Word family decide to take this plan into consideration, would be to locate the larger buildings, such as the lodge and café. An environmental impact assessment would also be important, given the property's location in the Edward's Aquifer Recharge Zone.

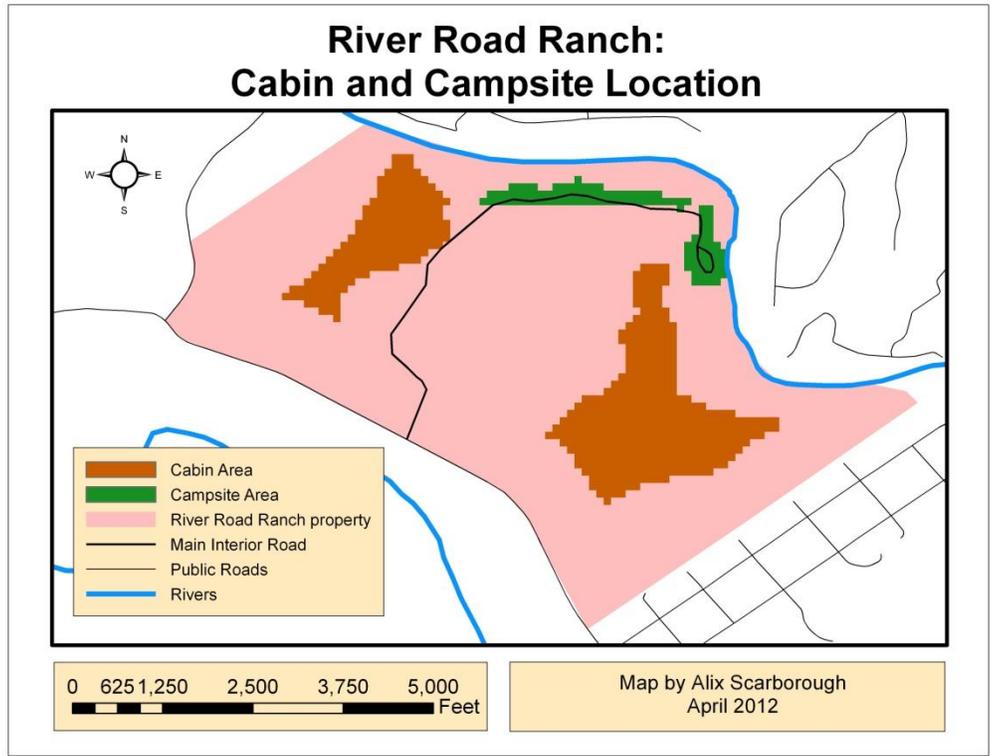


Figure 9

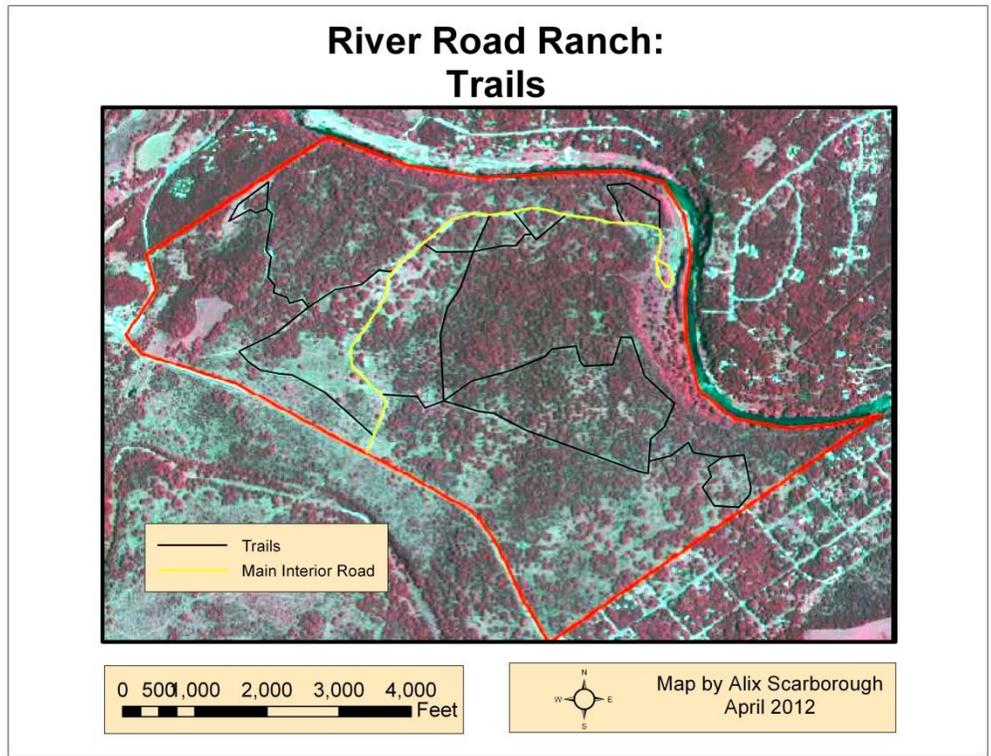


Figure 10