

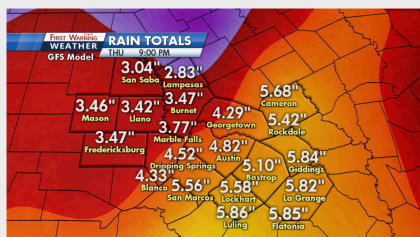
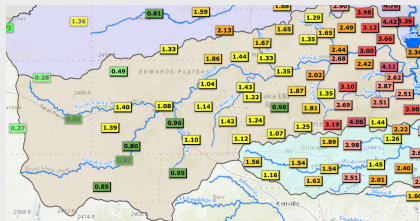
WATERSHED WEEK IN REVIEW



Another Weekend. Another Eye on the Weather

Weather forecast models for the area are showing the potential for 4-5 inches of rain over the next six days.

As the lower portion of the watershed has experienced 2-4 inches already this week, the potential for runoff and flash flooding could be high.



Potential rain totals from the GIS model over the next week. The National Weather Service projections are as much as 7 inches.

Gradient Boundary



Photo : Robert Stubblefield

The gradient boundary is the line which separates private ownership of the uplands from public ownership of the stream bed. In other words, the public has a right to use a navigable waterway (see last week's newsletter) up to the gradient boundary.

How is it defined?

The gradient boundary is located midway between the lower level of the flowing water that just reaches the cut bank and the higher level of the flowing water that just does not overtop the cut bank.

Simple enough? Not really. Read on...

Gradient Boundary

The gradient boundary is probably the most complicated and confusing aspect of Texas water law, and with good reason, one of the most confrontational. We will try to shed some light on it in this week's newsletter.

But before we get started...

...please note that the information provided here does not, and is not intended to, constitute legal advice. Readers should contact an attorney for advice with respect to any particular legal matter.

Much of the information obtained for this article comes from a 1952 article by Colonel Arthur A. Stiles, born in Travis County and known as the “Father of the Gradient Boundary Method”. While the article is considered the bible for surveyors of the gradient boundary, for the layperson, it is drier than the 2011 drought and woefully lacking in graphics.

How did the Gradient Boundary come to be?

It all starts with the southern bank of the Red River (right), which was a border between Spanish and French territories (think Louisiana Purchase) before it was the Texas-Oklahoma border. Determining where that bank actually lay was always a question along the ever-shifting Red, and became of greater importance when oil was discovered in the 1910s. After



Photo from Pinterest

years of litigation between the two states re who owned the land and the oil, the Supreme Court of the United States ruled in 1923.

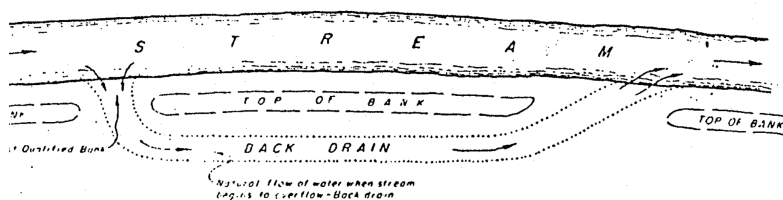
...we hold that the bank...is the water washed and relatively permanent elevation at the outer line of the river bed which separates the bed from the adjacent land... and serves to confine the waters within the bed and to preserve the course of the river, and that the boundary intended is on and along the bank at the average or mean level attained by the waters in the periods when they reach and wash the bank without overflowing it. When we speak of the bed we include all of the area which is kept practically bare of vegetation by the wash of the waters of the river from year to year in their onward course, although parts of it are left dry for months at time...

Here is where surveyors Colonel Arthur Stiles and Arthur Kidder enter the story. With the Court's words in hand, they set out along the banks of the Red to fit the opinion of the court to the river. As Colonel Stiles recalls in his article, "*It is clearly indicated that a **gradient of the flowing water** in the river was the only possible datum for locating this boundary upon the ground...In this way, the gradient boundary was laboriously worked out on foot, bank by bank, on the Red River.*"

As Stiles notes, the height and position of the gradient boundary are fixed by the bank of the river, not by the water in the river. Examining gage-height records of the river for the height of the boundary is a misconception and a waste of time.

For each bank, the surveyors first had to determine a qualified bank. A

qualified bank is that point on the bank where water first overflows through a cut in the bank, leaving the

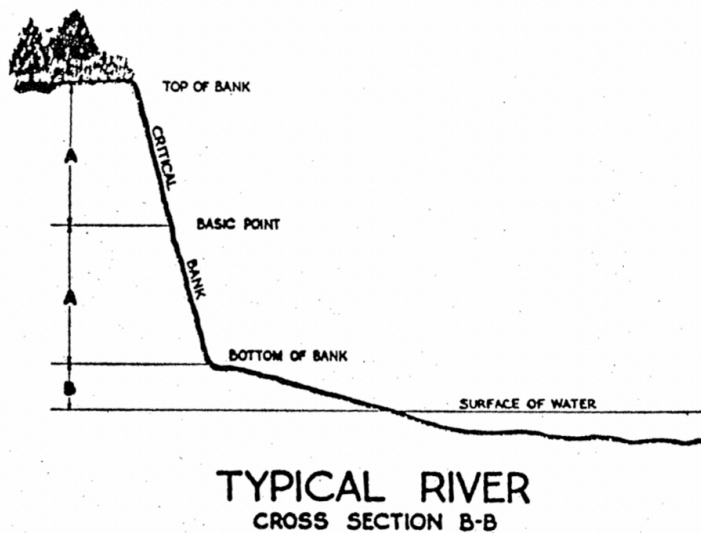


From R.K. Paxson - The Gradient Boundary

channel via a back-drain to later reenter the channel downstream (see Paxon above). A qualified bank represents the gradient of the stream along a certain reach. If the gradient of stream changes due to a change of geology for example, a new qualified bank should be calculated.

The use of the term 'cut-bank' in the definition of gradient boundary often creates confusion. In river studies, "cut bank" references the bank on the outside of a meander, where the river is cutting into the bank. In the gradient boundary case however, it refers to a cut in a bank where water just leaves the channel. In fact, the cut-bank used for determining the gradient boundary is usually found on the accretion bank, on the other side of the river from the traditional cut bank.

Stiles warns, *finding the one correct bank in the vicinity that locates the gradient boundary upon the ground is no casual undertaking. If this bank is wrong, the whole boundary is wrong on both sides of the river... The bank intended is water-washed and relatively permanent. It is at the outer line of the river bed, separates the bed from the adjacent upland, and serves to confine the waters within the bed and to preserve the course of the river... **The bank can be found only by close study in walking along the banks, not by inspection from a distance, from the air, from across the river, or from a few isolated places most easily reached in an automobile... Finding this bank means hard work on foot on the river.***



Next, the surveyors had to determine the bottom of the cut-bank. To this author, this seems as difficult as finding the cut-bank. Depending on the water level, the bottom of the cut-

bank (or toe) can be above or below the water line.) See Typical River, from Will A. Rounds, The Gradient Boundary.)

The basic point, or gradient boundary is then that point halfway between the top and bottom of the bank (see photo below). The elevation of that point is then measured against the surface of the water to define the gradient boundary for that section of the river represented by the qualified bank. Stiles notes that the gradient boundary of the Colorado River below Austin was found to be about 1.5 feet above the surface of the water. Remember, the gradient boundary determined by the lowest cut bank applies to both banks of the river.



Picture 5—Shows the top of the bank, the basic point, and the bottom of the bank, marked T, BP and B respectively.

From Rounds

Sound impossible to determine the gradient boundary? Without a surveyor specifically licensed to determine the gradient boundary, yes.

But perhaps there is another way to approach the issue. Stiles defines the bed of the river as *all of the area kept practically bare of vegetation by the wash of the waters of the river and is composed of light, loose sand.*

He goes on to qualify that statement :

In many places the surface of the river sand bed is far from smooth. It is broken by... banks and bars of bare sand or other material left by the high water, and by sand dunes formed by the wind. These contrary heights should be excluded, otherwise, the sand bed is made too high. Similarly, sloughs, by-passes, and secondary channels of the river should be excluded or the boundary bank is made too low.

A general rule-of-thumb amongst the boater community is to stay below the vegetation line. If you notice in the above picture above, the man in the middle holding the Basic Point sign, is standing very close to the line where the sand is not bare of vegetation. And while this is not official state policy or legal advice, it does provide a guideline that might be used in the field to help avoid conflicts. Another sure way to avoid conflicts is to utilize the islands often found in the middle of the channel. These islands are, for the most part, considered public. The

island at James River Crossing is a good example. But more on that next week.



James River Crossing - *from* Google Earth

Special thanks to Joe Riddell,
Texas Attorney General's
Office-Retired for providing
some of the hard-to-find
documents used for this article.