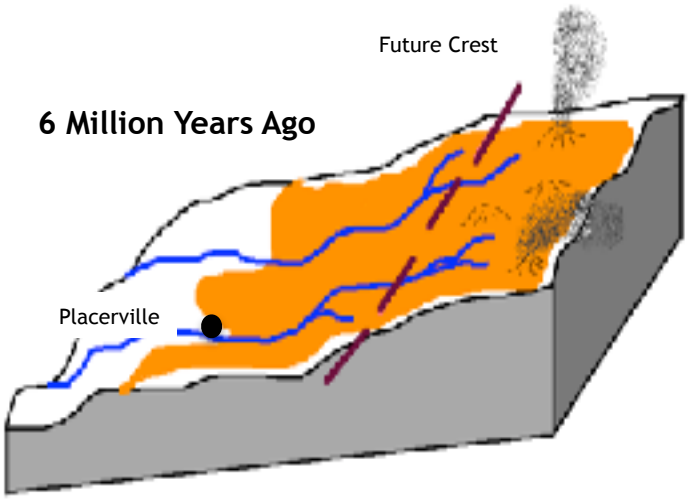
## A Tale of Five Rivers

When we look at the rivers in the Eldorado National Forest, we see how they change across the seasons; When they are frozen and sheathed in a blanket of white snow, when the riparian vegetation turns green and the rivers spill their banks, in the Summer as the flows decrease and the water invites us in, and in the Fall when the leaves turn to yellow, red, gold and brown. But we think of them as being permanent features of the landscape – How much could they have changed over time?

Our tale is about the five rivers, and some of the tributaries that flow through the Eldorado National Forest. The Mokelumne River marks the southern boundary of the Edorado Forest. Moving north, the next river is the Cosumnes River, the only river in the Sierra Nevada that is undammed. The South Fork of the American River splits the Eldorado Forest. The Middle Fork of the American River forms the

northern boundary of the Eldorado Forest, while the Rubicon River is a tributary of the Middle Fork and extends into Desolation Wilderness.

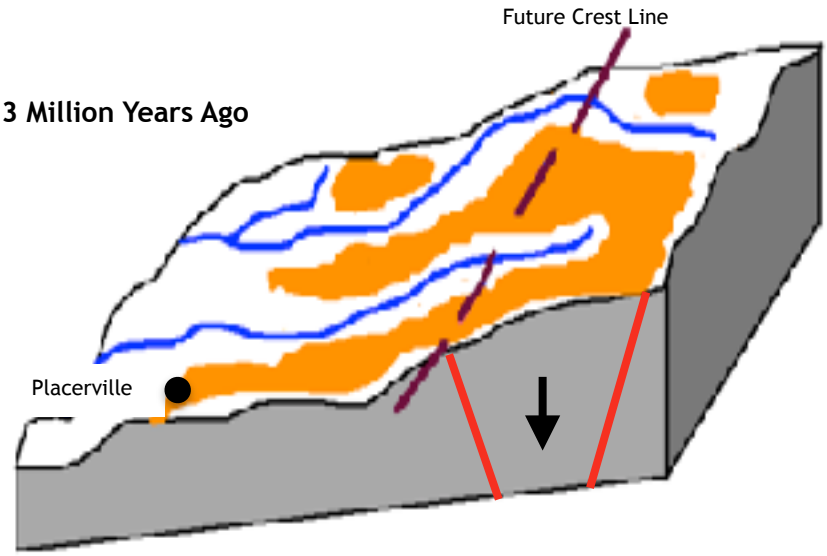


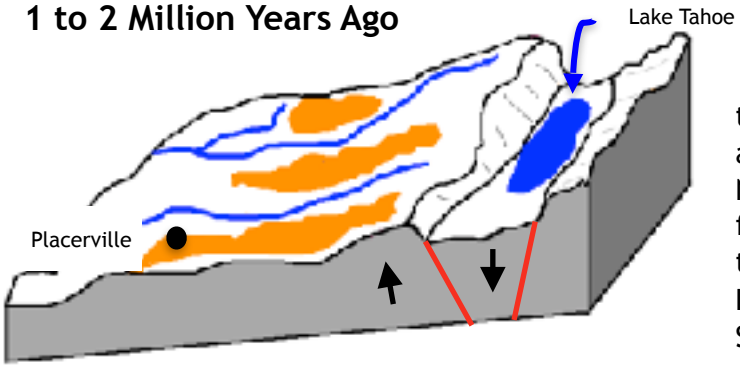

But actually it wasn't that long ago that these rivers did not even exist, at least in their present locations. So let's jump back about 6 million years ago. This is a time well after the age of dinosaurs and just a few million years before the Great Ice Age. There were rivers draining to the west (we refer to them as the "ancestral rivers"), but you wouldn't think to call the river that flowed under ridgeline at the Placerville Airport the American River, nor the river that flowed beneath the volcanic rocks at Carson Pass as the Mokelumne River. The Sierra Nevada mountains were a very different feature then. The crest of the Sierra Nevada did not yet exist, but rather the mountain range continued to the east.

And the landscape of the Eldorado NF was buried under volcanic rocks – debris flows, andesite flows, ash deposits and sediments derived from volcanics (the orange area in the diagram above). The volcanoes that were the source of the volcanic rocks were east of the modern crest; Round Top being the throat of one of these volcanoes. You can see these volcanic rocks still at Carson Spur along Highway 88, as you drive Hwy 50 near Camino and along the Ice House Road near Peavine Ridge.

During this time, the area of the Eldorado Forest is a broad, gently rolling landscape continuing to rise to the east. Imagine as you look southward along Hwy 50 near Pollock Pines or driving along Hwy 88, what the landscape looked like if you fill in all of the valleys and have just a broad expanse of volcanic debris. Further to the east in Nevada the land has been extending, and the series of narrow mountain ranges and broad basins that make up the Basin and Range were forming.

But then between about 6 and 3 million years ago, these volcanoes went dormant, and the eruptions stopped. With the cessation of new volcanic deposits filling the streams, the modern rivers finally found their present position. But these channels were several thousand feet higher than their current courses. And, even more striking, their headwaters were well east of their current locations. Lake Tahoe did not yet exist, and the major rivers were draining areas probably well into modern Nevada.

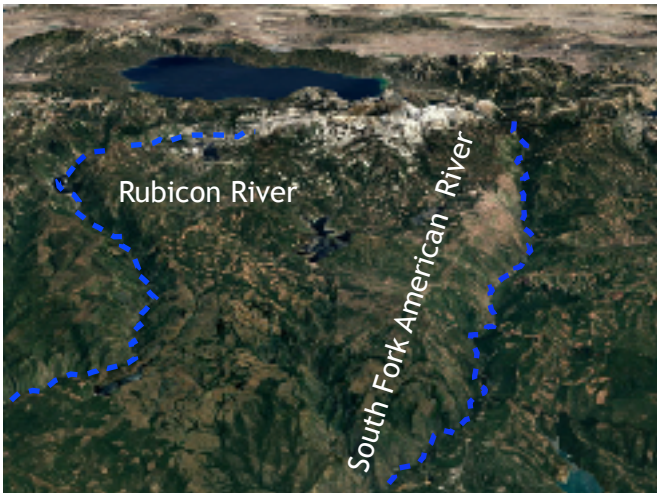



Now jump forward again to about 1 to 2 million years ago. A series of faults along the east and west sides of Lake Tahoe have allowed the land between them to drop down and so the modern crest of the Sierra Nevada in this region is starting to form. Essentially, the western edge of the Basin and Range has shifted to the Lake Tahoe Basin. And in addition, the Sierra Nevada mountain range is rising, although the land was already fairly high even before this time.

As the mountains rise, and as ice covers the crest and then melts, the rivers begin to downcut more swiftly, creating incised gorges.

You can see the deep gorge of the Rubicon and South Fork American Rivers in this photo from Google Earth. for those that have driven the 11 Pines Road out to Nevada Point Ridge and Hell Hole Reservoir, you are certainly familiar with how deep the Rubicon River has cut into the landscape. For those that have driven



the Ice House Rd, think how steep the canyon appears as you drive north, but then how rolling the topography becomes once you reach Peavine Ridge and the Granite Springs Road. In the center of the photo is Union Valley Reservoir in the middle of this large gently rolling landscape. This is the landscape of 3 to 6 million years ago, only slightly disturbed here and there by the downcutting streams.

And the Mokelumne, Cosumnes and Middle Fork American Rivers have downcut as well.

The faulting that helped to create Lake Tahoe also cut off the eastern parts of the drainages of the South Fork American River and Rubicon River. We refer to these as "beheaded streams". In this image from Google Earth, we are looking west towards Echo Summit and down the South Fork American River canyon. You can see the clear shape of the canyon and how it just stops at the summit. The headwaters of normal streams do not stop at a broad valley like this.

The Rubicon River has some similar features, although not nearly so obvious. Carson Pass is another beheaded stream.

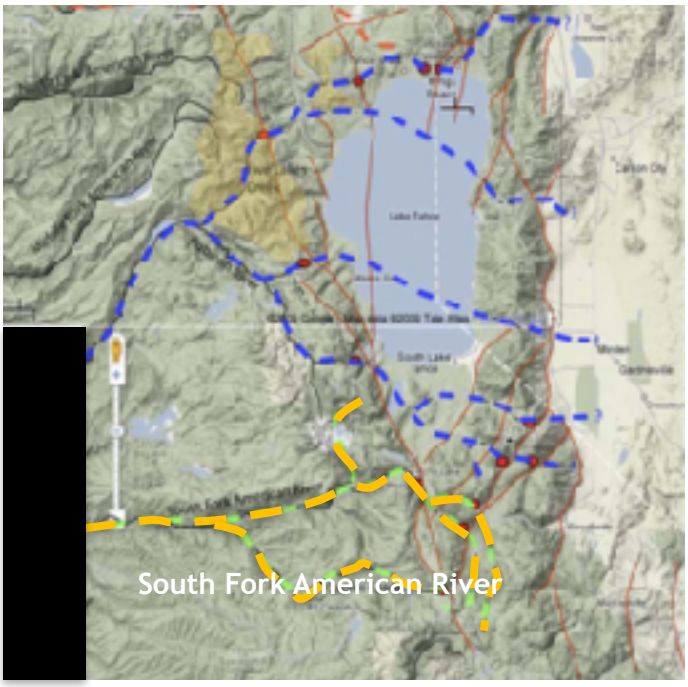
But when we look at the Mokelumne River, such as in the map at the beginning of this article, we see that the Mokelumne extends much further to the east and is not beheaded – the faulting has shifted further to the east here and so didn't create the same features. And the Middle Fork of the American River and Cosumnes River both have their headwaters west of the crest of the Sierra Nevada, and so are also not "beheaded".

Researchers that have tried to piece together the story of these beheaded streams found remnants of the old channels of the South Fork American River and the Rubicon River in the Carson Range. Luther Pass and the valley of Grass Lake is one such feature. The photo to the right is a view of

Luther Pass from near the intersection of Highways 88 and 89 near Hope Valley. Can you see the borad valley? This valley was formed by the eastern extension of the South Fork American River some 2 to 3 million years or so ago.

And the valley that formsy Spooner Summit was one of the forks of the Rubicon River at about this same time. Notice how much larger the Rubicon drainage was than the South Fork American River.  It looks like the Rubicon River and its tributaries drained the area east of North and Middle Forks of the American River, keeping their headwaters to the west and so avoiding their becoming “beheaded”.

Hopefully when you next stand on the banks of the beautiful rivers within the Eldorado Forest you will ponder how much the landscape can change over the millennia. and appreciate the continuity of change.

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