How the White River Works and Why It Threatens SR 410

The White River has show it can jump its banks when water levels are high. This photo was taken in Nov. 2006 when the river spilled over onto SR 410 in the Federation Forest State Park.

The characteristics of the glacier-fed White River help explain how it threatens nearby SR 410. Nearly a century ago, the highway was built within the White River floodplain on a former riverbed. At that time engineers did not fully understand the dynamics of river movement and how it could eventually threaten the highway.

Wandering within its floodplain

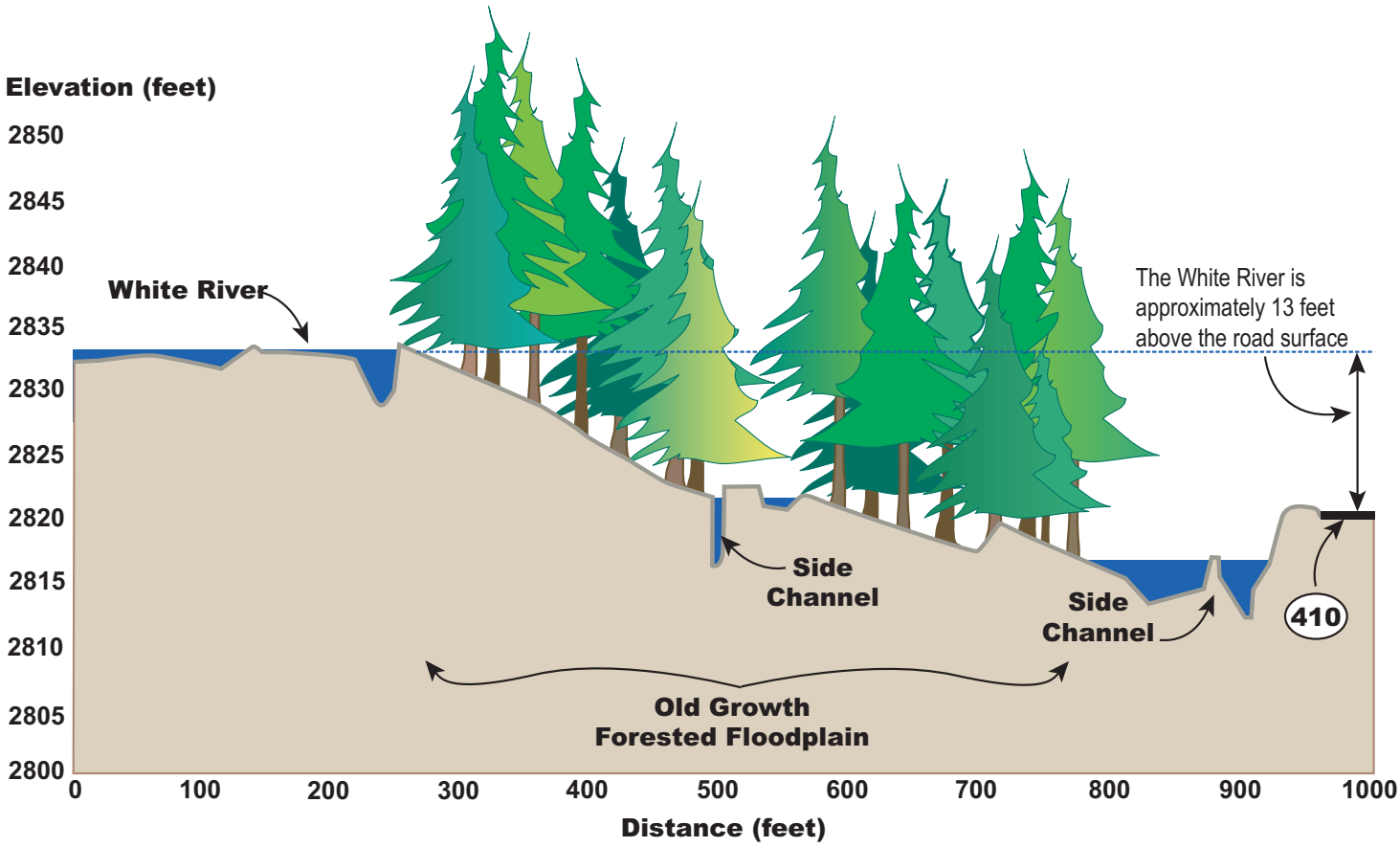
Like many glacier-fed rivers, the White River is a braided river. Braided rivers are wide, shallow and comprised of a series of channels that split off and rejoin each other as they run down the mountain into the valley. These channels frequently change route as they flow along the riverbed. When water levels are high, river channels can overwhelm their banks, move to lower ground and establish a new riverbed within the floodplain.

Forest helps stabilize the riverbanks

The old growth forests that flank the White River Valley separate the river from the road and generally help to restrain the river within its customary area. The trees and plants help stabilize soil and riverbanks. When water levels are high the river can erode its banks, undermine trees and plants and pull them into its flow. Larger trees and plants lodge themselves into the river and the river bank, trapping rock and sediment. These naturally occurring logjams help moderate river flow and create eddies and pools that are hospitable to fish and wildlife. In some places this forested barrier is now gone and the river abuts the highway.

In 2003 and 2006, the river dove into the forested floodplain, carving new side channels into the old-growth forest and eventually winding down onto SR 410. WSDOT maintenance crews constructed temporary gravel dikes at these problem sites inside and outside the park boundary. They also placed woody debris between the river and the forested floodplain to redirect the water away from the road. For now these fixes are protecting the highway.

Cross-section of the White River and SR 410 (milepost 58.45 near Mount Rainier)



Building and eroding its riverbanks

Each spring and fall, glacial melt increases the volume of water in the river. The fast moving water drags rocks downstream, scraping riverbanks and collecting debris. As the river rushes through the valley, the water is faster and deeper on the outside of curves. The force of this water erodes the riverbanks, picking up rock, dirt, plants and trees. The water is slower on the inside of curves, so rock and dirt are deposited in these locations. This builds the riverbanks and redirects the river.

Higher riverbed

When the river flow slows during winter and summer, it can no longer force the sediment it carries to its outside curves. Instead, the sediment is deposited in the bottom of the riverbed. The river then flows on top of the accumulated sediment. This gradual process has made the riverbed higher than SR 410 in several locations. The bottom of the river valley is built on terraces constructed of ancient logs torn down overtime by the river.

Rising water levels overwhelm riverbanks

The White River originates at the Emmons and Frying Pan glaciers on Mount Rainier. These glaciers, rain and runoff feed the river. In recent years more snow and ice have melted off the glaciers and the melt-off occurred rapidly. This increased the volume and force of water in the White River, which increased its ability to erode its banks, take down trees, and carry debris, in its search for lower ground.

Historically, White River channels wandered between the two canyon walls of the river valley. SR 410 lies at the foot of the right valley wall near the current river channels. As floods in 2003 and 2005 indicate, high water in the river from increased glacier melt, can help the river overcome its banks and move to lower ground. Unless we intervene, it is only a matter of time before the highway becomes the riverbed.

Washington State Department of Transportation