Roads to Heaven, to Hell, And Back, Somewhat

A

1917 Dodge, About 1922
Photo courtesy of Edward Fenn (at right)

Recall from the site history, that Ed Fenn bought property along Mr. McKiernan's road astride Charlie Martin's road from Glenwood. This is that latter road as it passed in front of Ed's house (note the *Vinca major* on the bank behind the car). Typical road construction back then was with dynamite, shovels, and horse-drawn grading blades. Slopes receiving the fill were not cleaned or benched and the fills were not compacted. If it slid, they fixed it. What few culverts were installed were wood. In the winter, the surface was mud.

Wildergarten 5.4

This book was originally produced under the name *The Responsible Party* for which there were two revisions, 1.0 & 2.0. Major revisions are for complete rewrites. Decimal revisions are for revised chapters or navigational changes and are not archived. Back revs are viewable by the numbered links below.

Revision History 1.0 2.0 3.0 3.1 3.2 3.3 3.4 3.5 4.0 4.1 4.2 4.6 4.7 5.2 5.4

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Other writings by Mark Edward Vande Pol:

Natural Process: That Environmental Laws May Serve the Laws of Nature, ©Wildergarten Press, 2001, 454pp, ISBN: 0-9711793-0-1, LOC Control #2001092201.

Shemitta: For the Land is Mine: ©Wildergarten Press, 2009. Contains: 217pp text, 980pp overall, 14 picture books, 2 tables, 963 photographs, 9 maps, 2 drawings, 2 charts, 145 footnotes, 358 citations, and 216 other source references, not including external Internet links. ISBN 978-0-9711793-1-8

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This is a map of all the roads, trails, and drainages on this property. Each orange letter on this and the other aerial images in this chapter corresponds to where they were taken (some with an arrow indicating the direction). If you wish to keep track while reading, there is a separate file consisting of the aerial photos from this chapter which you can then keep open in another window as you read. My purpose in documenting them this carefully is to help locate future repeat photos, as vegetation change, and particularly forestry is elemental to many of these road and drainage management problems.

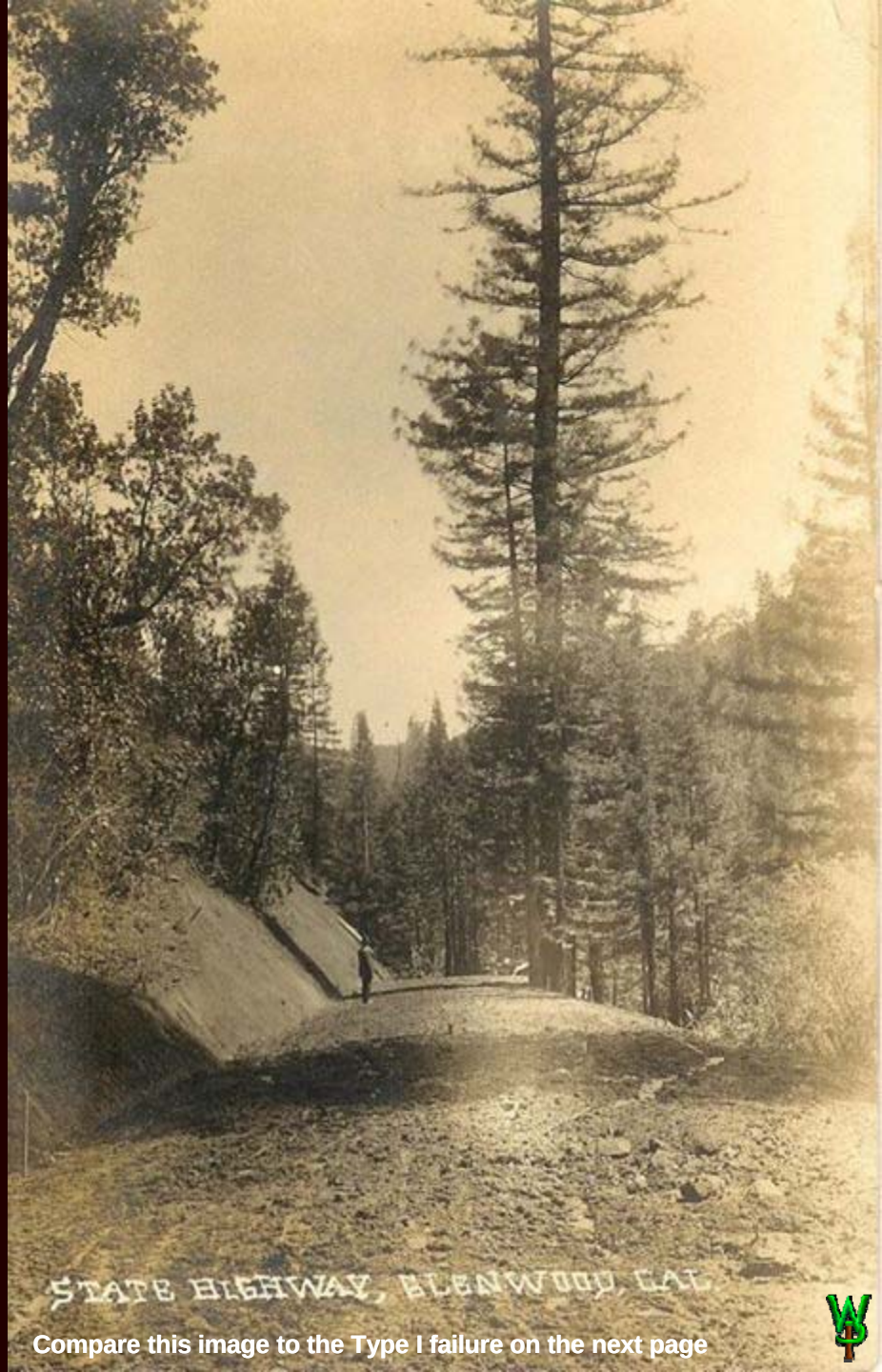
The first wagon roads in these mountains were built just after the 1849 California Gold Rush. The growth of the State's population was such that they were desperately needed. The State didn't have the money to do it. So the people's representatives passed a statute giving permission to private companies to build monopoly toll roads. They went in fast and cheap.

In the early 20th Century, automobiles paying fuel taxes funded the construction of State roads. Charlie Martin provided the State a free survey to persuade the government to build a highway to his town, such that he could get out from under paying Mr. McKiernan for the use of his skinny toll road and the cost of maintaining the access road adjoining our property. The resulting Glenwood Highway built with Federal funds was completed in 1915 (right).

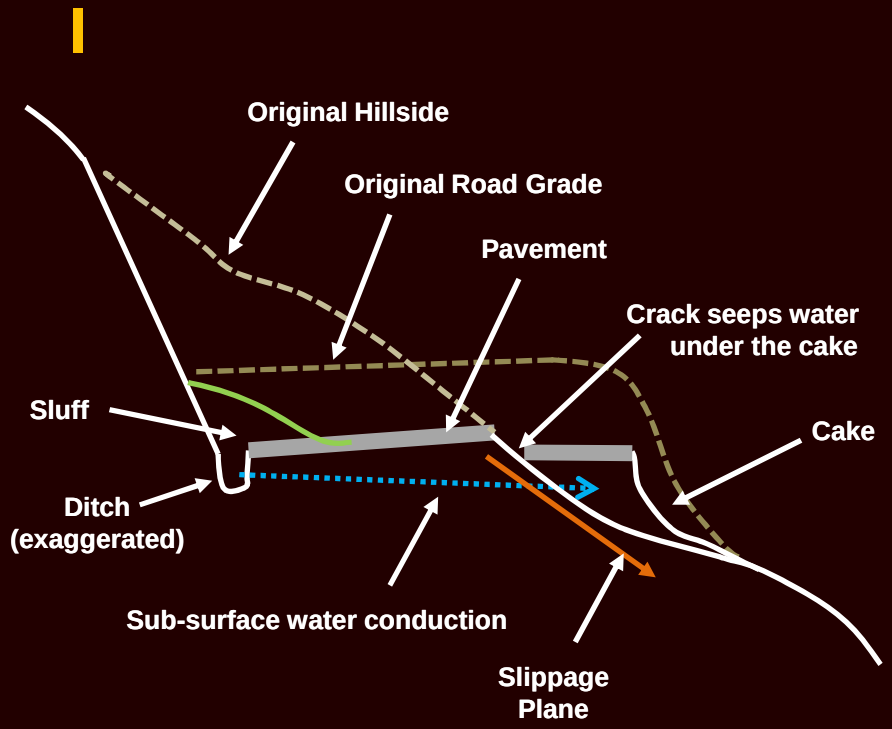
Grades for dirt roads sloped inward toward the hillside so that trucks with skinny tires would not slide off the mountain when they hit the brakes. That required a deep notch to drain water (right). The water then collected into a torrent. That does one or both of two things**:** It either cuts a ditch on the inside of the road destabilizing the slope above and collecting sediment, or, if it hits an obstruction such as a fallen log or a minor slide off the above embankment, it then kicks the flow over the outside edge of the road. In those days, the outside embankments were made of "unconsolidated" (not compacted) fill which did what loose fills do when torrents of water tear across them, cutting a ditch that grows as material falls in from the sides. The result was commonly called a "wash out."

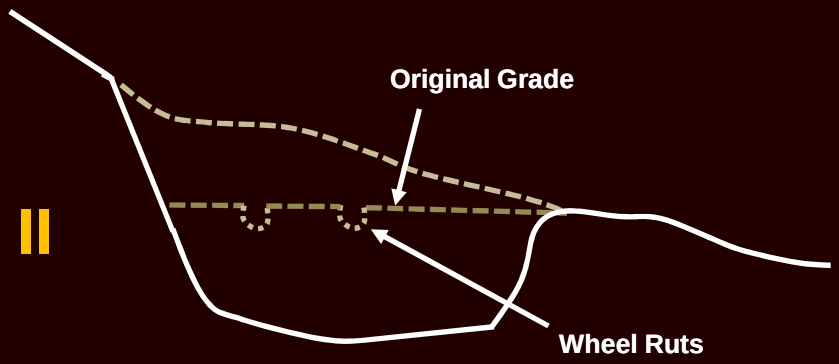
As you saw in the previous chapter on drainage, collected water has to go somewhere and usually that is an existing stream. The extra flow and mass of the abrasive slurry then rapidly cuts drainages deeper. The incision then destabilizes whole slopes that then fail in massive landslides. Fail they did, routinely, and on a scale so spectacular it is hard to recognize today.

Bad road design and construction cause big problems. The answer starts with vegetation management, improving rainfall infiltration in soil to reduce the peak flow of said torrent and retain sediment, and modify road design to dissipate the energy of those flows.



Compare this image to the Type I failure on the next page





So, roads interfere with drainage and erosion processes, they are conduits for weeds, and they change wildlife migration patterns. But, besides being economically necessary, where they go and how big they are affects the value of the surrounding real estate.

The original one-lane roads often traverse terrain not amenable to improvements. With mechanized earth-moving equipment, it became easier to build a wider road elsewhere with better paving and drainage than to fix the old ones. Yet better roads receive more and faster traffic that residents don't want. So it can end up working out that a tortuous single lane road lends a degree of exclusivity. Hence, we are left with these old legacy roads with occasional *very* expensive estates along them.

People with a lot to lose get desperate when a road is closed (especially real estate agents offering higher tax revenues with the sale). Rarely can one simply take a detour. It is difficult and expensive to do road work on rugged terrain. Which ones get fixed has everything to so with whether or not there is money available. The rest get fixed *when* they fail, repairs often waiting for Federal cash under the rubric of disaster relief. As a result, these old roads are usually badly maintained, have poor drainage, and sit on unstable substrates waiting to fail bigger.

Our road is on a ridge, so it has less of a landslide hazard from above. There are thus but two types of road failures around here. As to the first, you saw in the prior slide, the outside embankment was originally loose or poorly compacted fill on a "slip" of decaying organic matter in the surface soil of the original slope (above left). I call this soil mass a "cake." When (not if) the inside ditch fills in a storm, the water kicks outward and pours off outside edge of said fill. The result can take the cake. I call these impending disasters a "Type I" road failure (the most common around here).

Type II cases developed before there was pavement, where the road went on a long "cut" or traverse or with banks on both sides. The water then proceeded along the length of the road, cutting it ever deeper. Even on a relatively flat surface, simple wheel ruts could enlarge and turn the dirt road into a pending gully.

We will start with Type I road failures. When Charley McKiernan blasted out the rock and pushed it aside to make the road, the fill was neither benched nor compacted; the cake was loose fill sitting on a slip of rotting organic matter. But the loads were light and Charlie had plenty of dynamite to make more fill if he needed it. After all, this 25 mile road was built in two years without heavy equipment. The few houses here at that time were not much more than cabins. The road came first, or no houses. With big expensive houses above the slope today, the County cannot lay back the slope angle to reduce material sliding onto the road. So the County just keeps adding pavement to the cake and ditching out the sluff and either piling it on the other side or hauling it away. The only way to stabilize the hillside now is with proper vegetation management or outrageously expensive retaining walls.

As the cake settles down the hill and loose dirt falls down the cut bank, the in-sloped part of the road channeling drainage narrows. Worse, as the trees grow, they lean out from the unstable slope. When they fall *from above* the road, they block surface drainage with roots and soil, forcing water out and over the outside bank. When they fall *below* the road, They pull the cake down with them. The County responds to the subsidence by topping the cake with “cold patch,” hoping to retain the water and keep the cake from becoming saturated with runoff. They don’t touch the trees (it’s expensive and people would complain!). The power company *must* maintain line clearances which removes weight that leaves the trees unbalanced, increasing the leverage they exert against the hill.

80 inches of rain added significant weight and plasticity to the cake, inducing the trees to lean farther and the cake to slide 4-6 inches in but a few weeks. The County calls this a “Natural” disaster. I call it a road construction and maintenance disaster. Nobody argues that it would have been cheaper to fix the road before the storms. So, WHY are we systematically waiting? It’s about using the failure to justify State and Federal “disaster” money. We all know where that money comes ultimately from. But where does the water go?

This is the property below this mess. From the look of the tiers of retaining walls above his house-to-be, this owner clearly knew he has a lot to lose if that culvert plugs and the water brings the cake down on top of him. Contrast the engineering and vegetation management on these slopes with those above the road. The Planning Department forced this guy to build the walls to get a permit to build his house. Although what he grows is not ideal, it is far better than “doing nothing” as you saw above the road.

Whether the runoff on the road makes it through this culvert is doubtful. This culvert inlet will plug rapidly with “twigs” and leaves. If the culvert plugs, the ditch fills and the flow just heads down the road to the next culvert, gathering more water, more twigs, and soil to plug the next culvert, if it makes it that far. You’ll note the sluff has been cleaned from the culvert inlet. The landowner below the road who gets the water dumped down the slope above his house-to-be… he’s the guy who cleans it. The County should force the owners of the house *above* to clear the junk and pipe his runoff down to the culvert. Well, they didn’t. Watch what happens.

What happened? The rotted culvert (to the right of this image) had broken and just took the cake, dumping at least 100 cubic yards down the hill on that poor guy who built all those retaining walls and cleaned the culvert for years. He had finally satisfied the planners. He was just starting to build his house. He had the foundation and first floor built. Then the poor guy up and died. The people up the hill who've been dumping water down that trench with the tree in it remain, and the County has done NOTHING to hold them accountable for the failure of the slope above. Maybe they'd point to a rotten culvert as the cause in their defense?

Well, it gets worse. The County had cut the road maintenance budget severely, and watched while the runoff from above found a new path, thus creating a blob of unsupported “rock” above the slope. Said “new” path brought down about 20 yards of material, which obviously inhibited the performance of the culvert which, because the bottom of it had rusted out, was leaking water into the substrate and soaking and undermining the cake under the road with the obvious consequences. System failure is usually a team effort.

March 2017 – the white flowers with purple tips

Just down the road about 20 feet from the slide is a recently introduced invasive exotic species, “fumitory” *(Fumaria parviflora)*, a member of the poppy family. They make a LOT of seed. What do you bet the seed went down the hill with the slide? Gosh, just a small squirt of Roundup a couple of years ago would have prevented it too. And what do you know but the County banned roadside spraying pursuant to the demands of environmental activists! Did they pull the weeds instead? This is what you get with a democratized commons**:** lousy roads at higher cost with more environmental damage. So, why can’t the County fix a culvert?

This is another culvert just up the road, so rusted out that it is leaking out the bottom, just like the one that made the slide. In fact, there are three wash-outs along this road this year, all with this same cause with this one to come. The reason the County doesn't fix culverts in advance is simple**:** It takes YEARS to get a permit for a new culvert from the State Department of Fish and Wildlife. They get to "protect" coho salmon, an introduced fish fraudulently listed as endangered with County personnel as principal instigators, as documented in my book, *Natural Process*. This permitting process, supposedly to protect the fish from silt, is so slow and expensive that it defers maintenance to the point that roads fail, causing more silt in streams than without the State's bureaucrats and rules. It's their road now, but what the heck, negligence brings in more State and Federal "disaster" MONEY! The democratized commons is becoming a socialized commons**:** bureaucrats holding public assets hostage to increase cash flow, producing even lousier roads at higher cost with more environmental damage. Please do not tell me that this is unintentional. All the contractors know how this works.

The usual fix for small Type I failures is called a “crib,” basically digging out the cake, making a box with a flat floor on a “stable” substrate, and filling it with rock. Sometimes it is done with concrete “Lincoln logs” and large gravel like you see here.
Note: The pipe is the main water supply for nearly 70 homes, many without water storage adequate to fight a fire.

Between bad vegetation management, surface cracks, and poor drainage design, failures on this road can happen so fast the County can't prevent emergencies such as slides or slip-outs caused by failing trees. Unfortunately for the County, vegetation management is the responsibility of property owners in love with "Nature," believing that vegetation management is unnecessary.

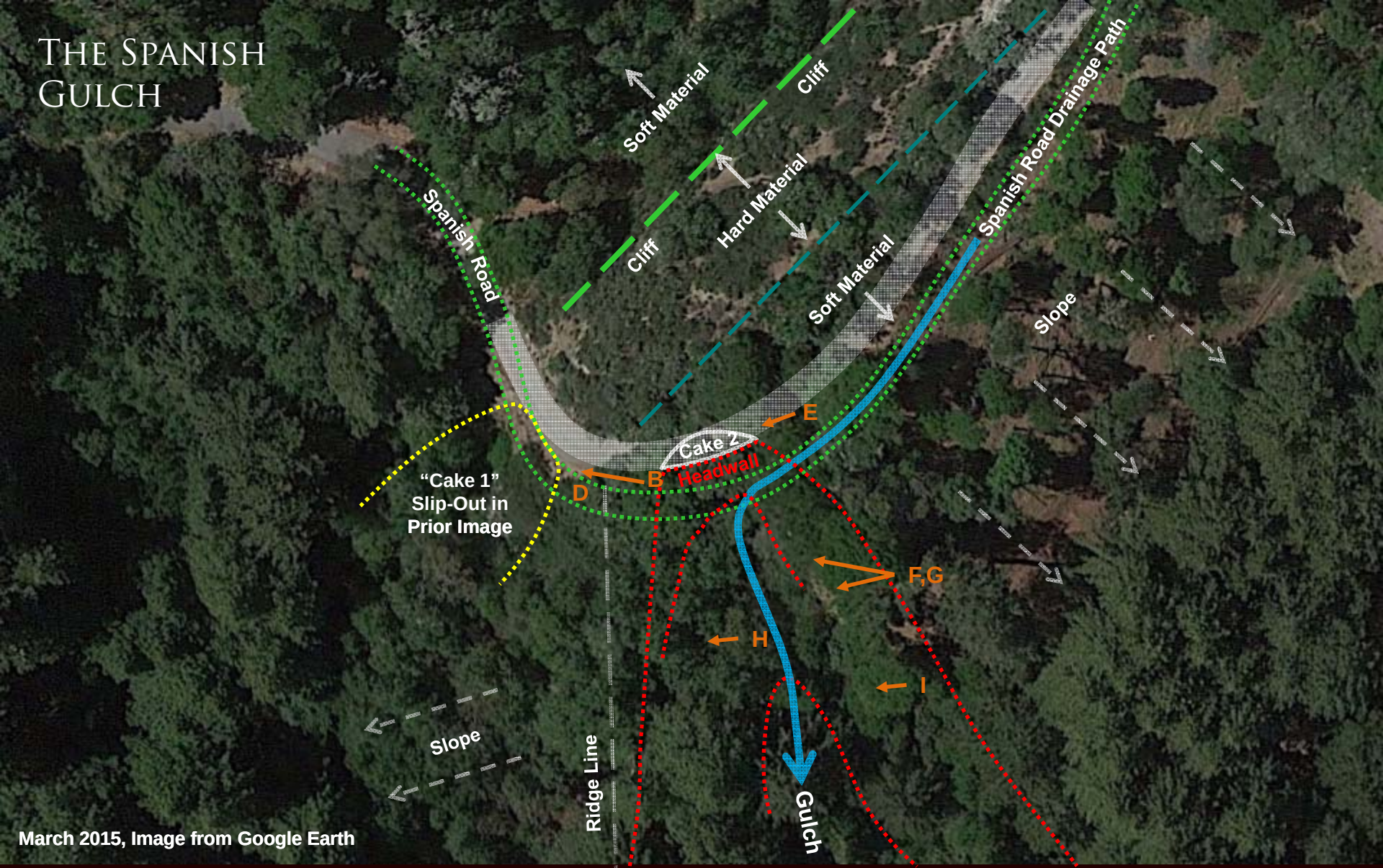
Today, when the road failure is too big to be addressed with a simple crib, the usual fix is for the Federal government to fund repairs with "disaster relief" money. The governing legislation specifies that the money is to be used only for repairs, and not improvements that prevent future repairs even if they are cheaper than the repairs (sigh). So they have to put the roads back where they were, usually with pricey feats of engineering like this one at right: a row of concrete pilings cast in holes drilled deep into the substrate.

When the pilings get too tall to hold the load or if the substrate is too soft, they are connected with "tie-backs" (steel rods either anchored to blobs of concrete "dead men" or fastened directly into the hill (right).

Type I road failures are a big deal in this area because the geology is so active. The "rock" is so erosive, unstable, and subject to landslides and earthquakes, that everything is moving. Maintaining fixed assets when everything is moving means eventual big failures. Yet when it comes to "big" you ain't seen nothin' yet.

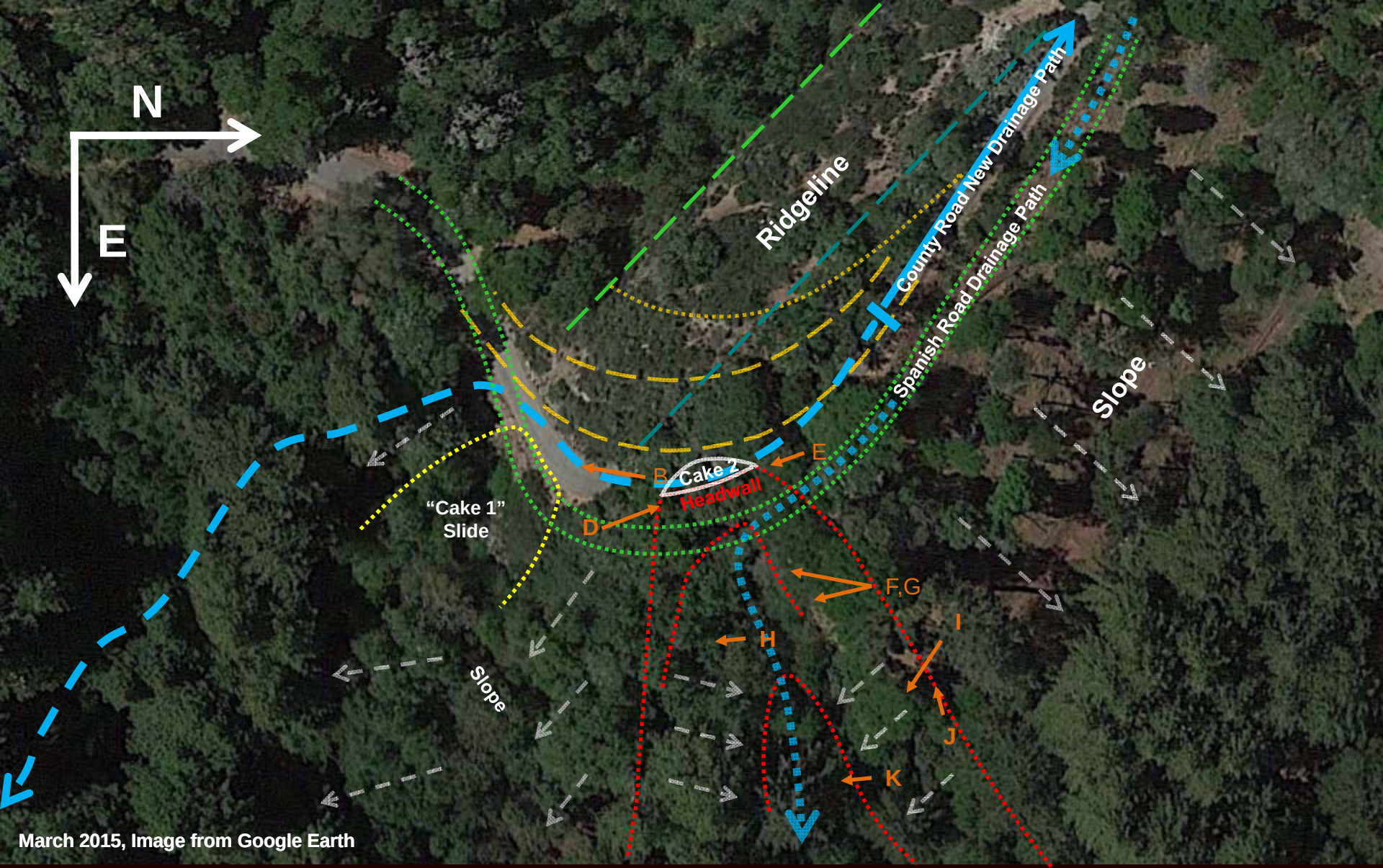
Just beyond the south end of our place, the road suffered a smallish Type I failure**:** The remaining cake at this blind one-lane turn had slumped far enough that the road surface sloped away from the ditch. The remaining in-sloped grade collected water that ran down the ditch to where it kicked out due to accumulated sediment. The flow then ran away from the ditch, across the road and, in 2011, just took the cake. This situation is less usual in that said “cake” was the same sluff as the parent material. This whole hillside is sluff.

The Spanish Gulch



The slip-out in the prior slide is in yellow. Geology is the ultimate "decision maker" here. Note the vegetation change along the green dashed line. That is a cliff of harder sandstone about 30-40 feet high. The three slopes around it are all of loose alluvium eroded off the hard ridge. The old Spanish road (which Charlie McKiernan followed (green dotted line)) was built on that soft sluff because all the Indians had for grading in 1791 was sticks, baskets, and *maybe* a few shovels. For at least 170 years thereafter, wheel ruts carried ALL of the water off that ridge to where it didn't make the outside corner (blue) and ran down the hill, thus cutting a gully (red headwall contours) in a manner *exactly* the same as the culvert outlet above. The resulting series of slides took the whole road.

This image is from the previous chapter on drainage with the gully headwall “100m that way” (upper right) along the County road (“Cake 2,” prior slide). From what I can tell, this drainage channel, representing about 30-50,000 cubic yards of lost material, was started when the Spanish channeled the water with their inside drainage ditch and dumped it off at the corner onto the colluvium.



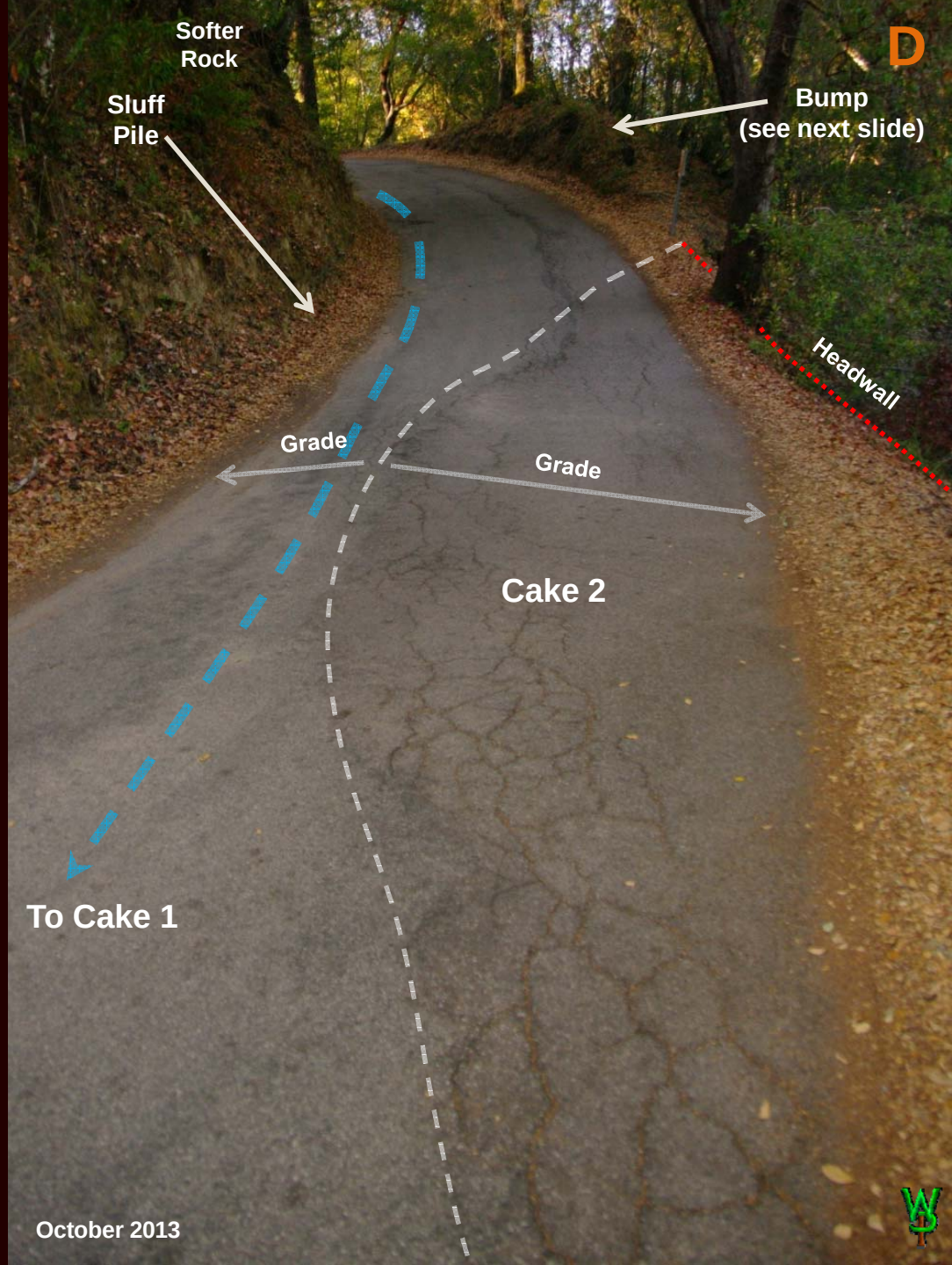
The County had no choice but to fix it. They cut into the ridge with a higher apex point and sloped a paved road the opposite way (solid blue line) to carry the water away from the gully. They still had to get down the road down to the next level to the south but at a steeper grade (for cars instead of horse-drawn wagons). It was a good idea, but not sufficient because the Cake II headwall is settling for reasons we will address in a bit. Some of the runoff still went around the corner (dashed blue)… except when it didn't, the result of which was Cake 1 Slide in 2011. Note that the ridge itself has almost no trees, but that they suddenly start just to the northeast of the ridgeline. That is softer material which falls onto the road, kicks the water off to the outside, and made Cake 1.

So it gets worse. Cake II is settling. With enough rain, the flow is sufficient to develop enough momentum around this corner to kick out on its own. It will obviously not take much sluff to kick out a flow and over the old headwall “the fix” (prior slide) was meant to avoid. Since the fix, trees in soft material have grown, are leaning out over the road, ready to fall to fill that drainage path. Unless the ditch is maintained perfectly, eventual failure becomes imminent. Thus Cake I.

Accordingly, this road can fail so fast that one cannot expect the County to prevent it by maintenance. What is needed is a larger fix of the type that worked for some 40-50 years**:** Reduce the rain collection area and reduce the flow before it gets here by sloping the road outward down the gentler slope at the top and then channel it inward around a wider corner cut into the harder rock. This would prevent a failure on the existing grade in all but the most extreme cases (with one proviso we will cover next). Nothing is perfect, but cutting the road into the harder rock is a LOT cheaper and less interruption than rebuilding the whole slope from below with a retaining wall drilled into that same soft material which, as you will see, would require pilings perhaps 70-100 feet long. It also produces a turnout at the top of a blind one-lane corner making it safer for opposing traffic.

Now, is all this just me begging for government protection against a *potential* problem? No. This road is the *only* emergency alternative to the State Highway for seven miles between Scotts Valley and Highway 39.

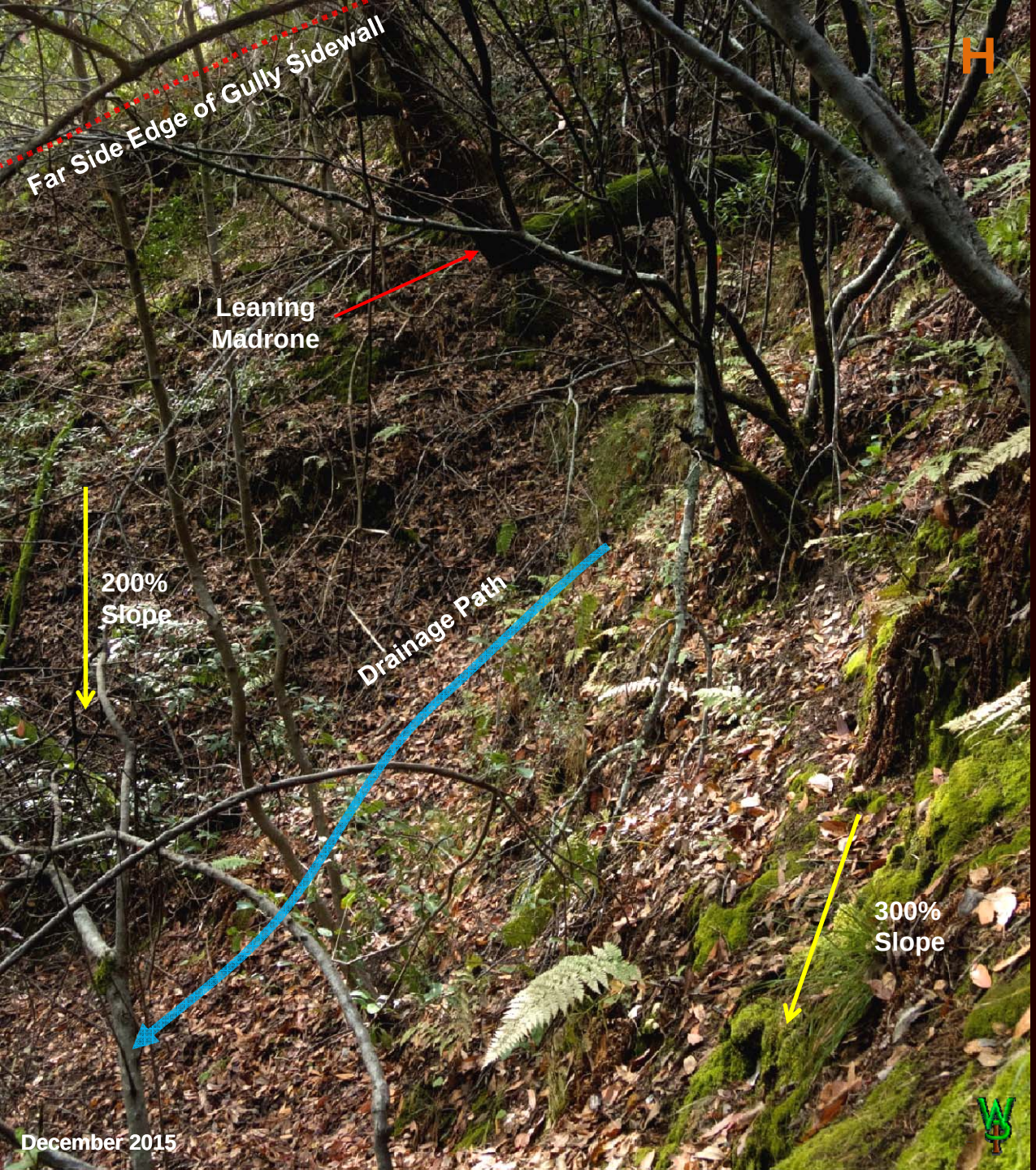
More importantly, realize that this “fix #2” is not enough. I too have a role in mitigating the risks to the road. “Vegetation management” can have almost as big a part in eventual road failure as drainage does. Somebody does that job from now on, or this headwall will fail sooner and repeatedly.



This is a look from the “bump” on the prior slide. With the trees growing in soft material leaning out over the road, it is only a matter of time until one falls, bringing a chunk of dirt with it. That will fill the rest of the drainage “ditch” and send the runoff over the edge and down the headwall. Needless to add, if the trees leaning from atop said headwall go down, they could close the road as well.

This is a side view of the headwall from below the “bump,” and this is just the beginning. Can’t see it? Note that what you do see on most of it is light, early successional brush such as this *Ceanothus cuneatis*, but there is stump from a fallen oak in the foreground indicating that the most recent slide on this side of the gully was only about 50 years ago. This is slower than the usual rate of succession in this area, but it is a north-facing slope of a material that does not usually support trees for very long.

Panning left, the next headwall down *is* filled with trees, and here is why I am going into so much detail on roads in a chapter under "Forestry"**:** Poor drainage and vegetation management come together to make this very expensive problem worse both for the land, wildlife, and for people who depend upon it. This gully stair-steps in successive slides forming an average 300% slope about 70 feet high, too tall to simply drill pilings for a retaining wall. It is now completely unstable …because of trees?



We are just to the left and down-slope from the second headwall looking along the right sidewall of the gully to the other side and uphill. Trees undermine this headwall. The slope stair-steps in successive slide headwalls, forming an average 300% slope about 70-100 feet tall below the road, too tall to drill pilings for a retaining wall into a material that will not hold much anyway. On the far side (north facing) wall are older trees, of which the madrone (red arrow) is typical**:** It grew out of the loose sluff seeking light, fell, and *then* it grew upward again, imparting considerable leverage against the slope to tear out the root wad. That soil material is so soft one can dig it with bare hands. Did I say this problem was big?

So, subsequent to bad road drainage we have bad vegetation management. Yet in this picture are clues as to what can be done to slow this down. At right is just below the south-facing top edge of the second slide, still populated with toyon but being invaded with young trees. Toyon is lighter than a tree, deep rooted, long lived, feeds birds, and regenerates vigorously after a fire, or being cut to the ground.

To simply “leave it alone” will guarantee that this slope and road fails, frequently, sending significant amounts of sediment down-stream each time. So, besides grading the County road into the hill, *somebody* should manage the vegetation to slow the rate at which this slope undermines the road.

Finally, I get to be “somebody”!

Some leaning trees get extreme. This fir grew on the slope that forms the near sidewall of the gully (facing southeast). It was 30”dbh and leaning out at a 40° angle from vertical. Taking trees like this down and cutting them up on a slope like this is hazardous. The wood is worthless (too much internal stress). Yet trees like this take out big holes from the side of the hill if allowed to fall on their own.

Like this. This hole from a fallen tree is about 30 feet across and twice as high. This type of erosion is called “pit and mound.” This is how trees undermine the slide headwall and cause entire slopes to fail as we saw in the section on redwood logging.

Below the headwall on the north-facing wall, half-way down toward the main drainage, we have 60-70 year-old redwoods with fir and redwood more recently invading the south east wall (foreground). There is a problem with redwood**:** Except for the lower slopes on the bottom of the gully, tall trees susceptible to windage on a weak substrate are hazardous. Over the intermediate term of 100 years or so, they will likely fall and tear out huge holes, destabilizing the slopes above. Redwood does fine in the bottom with thimbleberry snowberry and other low growing covers, but I may have to keep it smaller on top or grow something else. On the steeper south-facing side, I'll grow toyon and coffeeberry at the top because they are light, deep rooted, don't burn easily. Toyon regenerates rapidly from roots when coppiced or burned, as will madrone farther down. The fir and redwood on the south-facing side probably has to go because it will shade out such low-mass deep rooted trees and shrubs. Fir will not do well in the shade north of larger redwoods.

One last thing**:** A gully like this loaded with fir, madrone, bay, and Ceanothus makes for a dandy furnace. A fire blowing up this gully would make the road above a death trap precluding evacuation in said emergency. So my job is to get these fuels under control and reduce the loads on these steep slopes. That takes wielding a chainsaw while dangling on a rope. So the last thing in the world I want to hear about is some activist thinking he or she is saving “Nature” to bitch about it while I risk my neck. The way this situation originated was man-made. Left alone it will get worse for people and for wildlife. It **must** be managed. That’s just how things are.

Charlie Martin's Road

A

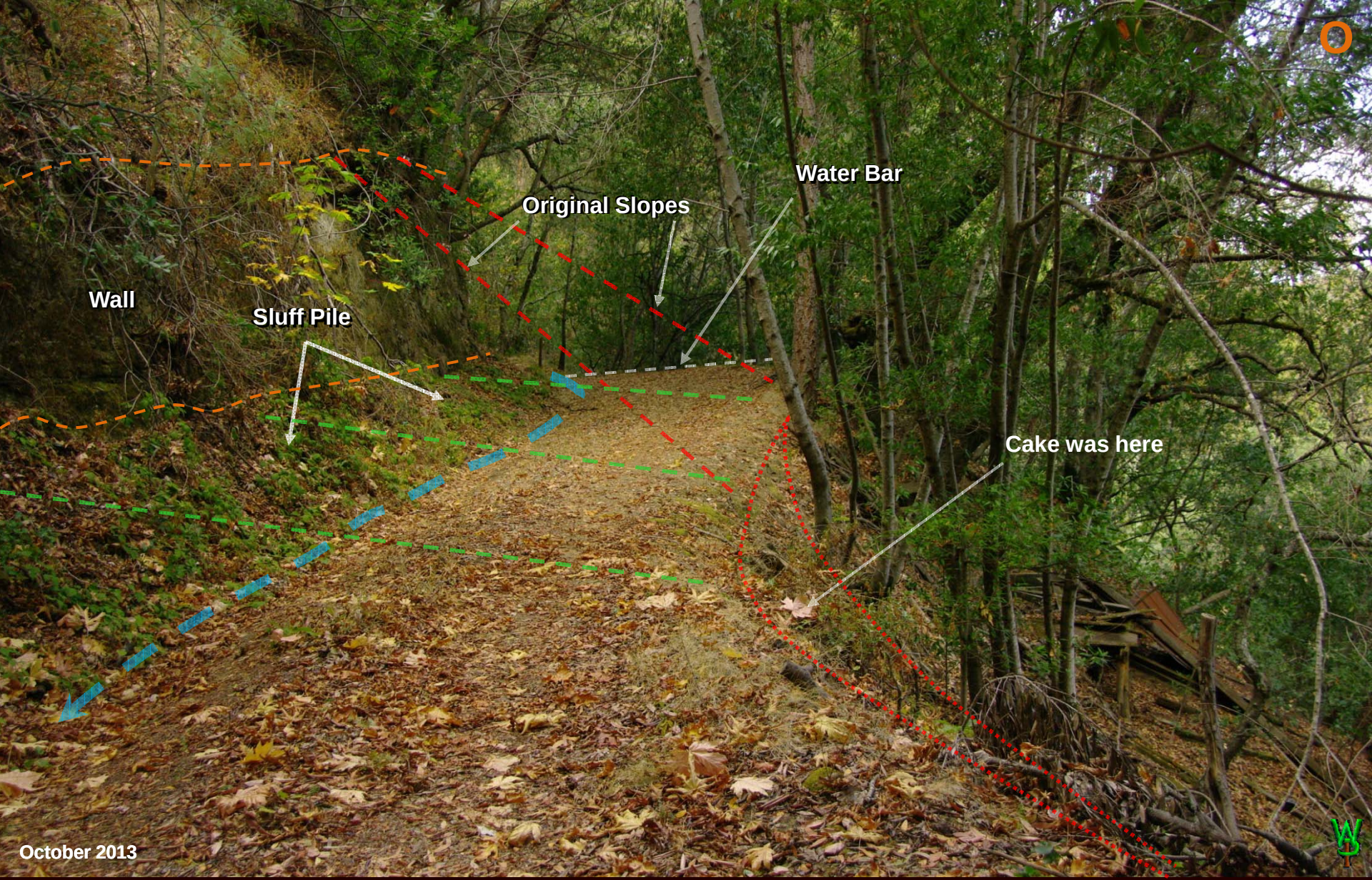
Ed Fenn's house, about 1922 - Photo courtesy of Edward Fenn

So, now we move on to the Type II case on Martin's Road (see site history) just north of our property. The watershed area behind Fenn's house was originally about 7 acres. After Charlie McKiernan's road was built, that drainage increased to over 15 acres, but the runoff did not come down this draw to the right behind the house as it originally had because Martin's road collected the runoff from above (behind the house), conducted it to the left, hit a switchback, and came back to the right in front of the house (the edge of the road is in the foreground). In the background are eucalyptus planted here possibly to stabilize the original channel. Today, those trees are 150' tall with 4' trunks, while the hilltop is a long abandoned Christmas tree farm, with pines over 100' tall.

To reduce erosion on the road I had to reduce the flow of water onto it at the entrance and then distribute the rest. The first step was to divert what was coming off the County road into the eucalyptus stand. This entailed a requirement for sufficient capacity to take all the water coming down the County road for nearly a quarter mile in the event that but a single County culvert plugs (it's happened). That collection area is now 15-16 acres because so many landowners along that stretch dump their water onto the County road… because it is a commons. It was already coming down this road entry so I simply made the best of things. I need to clean it out too.

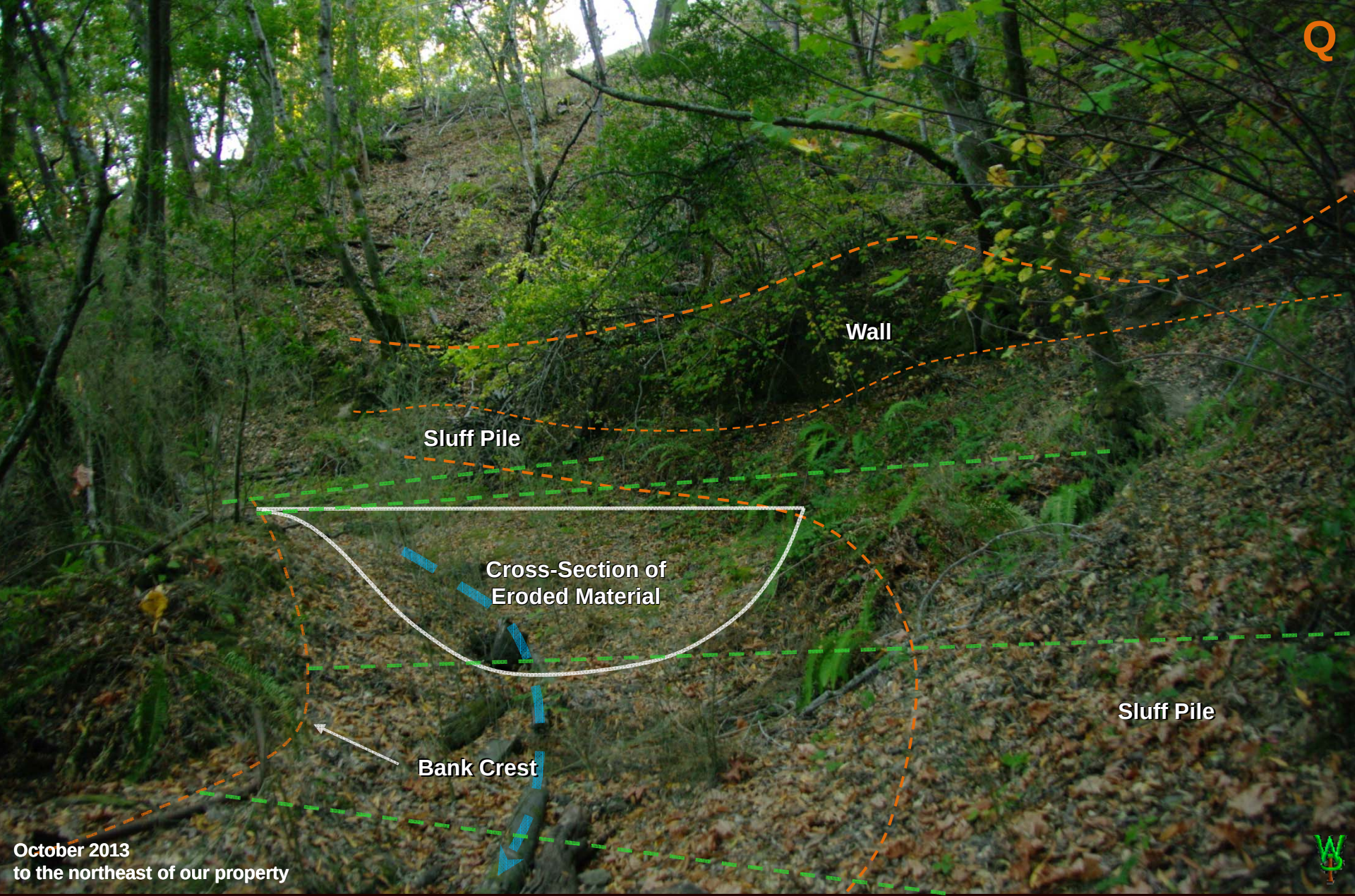
Then I filled in this long abandoned road segment (arrow) where the water originally entered Fenn's road. This was a Type II case turned into a useless gulley. So, I retired it in 2003 by having the County fill it with ditch cleanings and then I graded it out. This kind of thing takes a lot of fill, 6-8 dump trucks worth. The County lawyers ordered the Department of Public Works to stop doing this because somebody sued them for fill contaminated with wood (despite having signed a release agreement to take it as is). Public Works has to truck the fill some 20 miles to a landfill and I have a harder time getting fill with which to fix old problems.

Like this. Down the road, I installed and maintain 2 concrete culverts (plastic burns) with water-bars behind them in case they plug (the culvert at left is above the water bar). I also had other out-sloped water-bars made to shed the water at outside corners (right). These drainage improvements are separated by less than 100 feet. As long as the culverts are cleaned and we install a gate to keep joy-riders from tearing up the water bars in the winter, this is stable. If and when I come up with more material, I can then reinforce the water bars and build more of an out-sloped configuration which will reduce these concentrated flows (ideal grades in green).

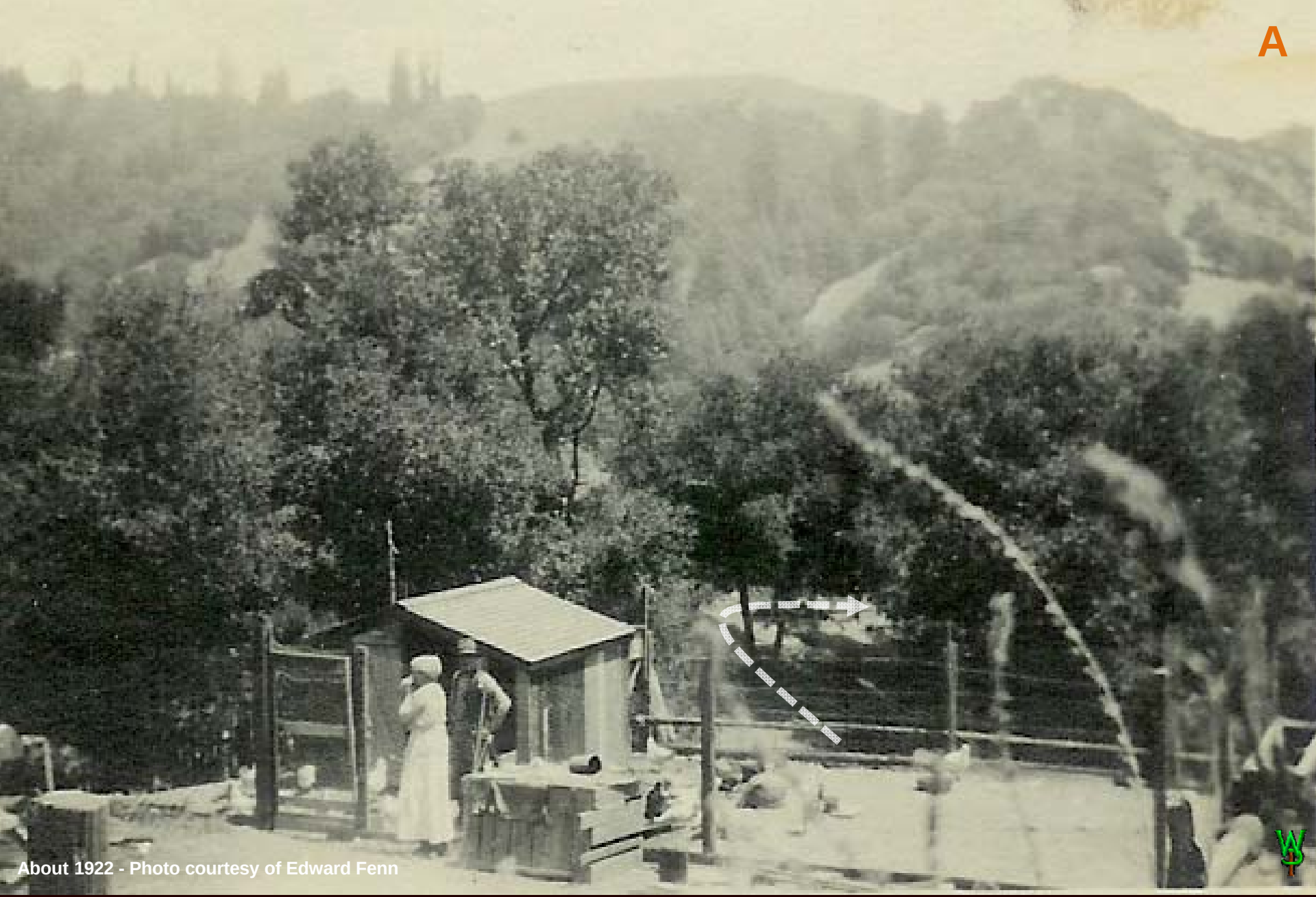


Before I put in the water bars, the flow came this way (blue). Here, this upper section of Martin's road suffered a minor Type I failure: Runoff from above added to the flow that came down the in-sloped road from the entry until the combined flow ran to the outside, and just took the cake. All that is left of the road is cut rock. Below the water bars, loose fill material with slowly accumulates as a sluff pile on the left. Over time, I will deposit that plus what fill I have available starting behind the water bars and work downward with the new grade. It will take hundreds of yards of fill to bring the slope to the ideal grade down to the next water bar.

Farther down Martin's Road adjacent to our property is this Type II channel. The cut extended over 100' without an outlet, so it became an incising bog in winter. Here, I've made a substantial and gradual water bar out of an overhang that I sloped off farther down, channeling the water through the embankment. In making that outlet, I exposed what may be the best accumulation of native soil I have yet found. It will definitely be analyzed, as such opportunities are rare. I've come to hate driving a backhoe over water bars!!! Years ago, I would have wanted to take out the entire outside bank just to have the road out-sloped and "fixed." Since then, I've realized that this is easily available material for future maintenance, simply removing it from the ends of the outside embankments.



This is farther down, off our property. In the old days, if the surface got rough or the shoulder washed away, they just cut the road deeper into the existing grade… and deeper, and deeper… Here, grading left an embankment on the left that channeled the water running down the middle of Martin's road below said switchback. It then suffered a Type II failure. This is no longer cutting because of how I did the diversion above. My estimate is that the loss of material from the original road grade is 3-4 feet deep here.



About 1922 - Photo courtesy of Edward Fenn

To the right of Ed Fenn's house in the last old photo was his chicken coop. Below it you can see the outside of his road to Glenwood (arrow). There was probably no outside shoulder; rutting probably started what you are soon to see. Note the young trees. What happened in this spot is representative of what we see elsewhere with old roads all over the American West.

This is a view of that same spot today from closer to the edge (because of vegetation) and without benefit of the height of the porch. Obviously, it would be easier to see what happened without all that broom. I'll see what I can do to get a better image after the property owner and I cut some trees. The channel to which I returned the water is indicated in blue.

About 1922 - Photo courtesy of Edward Fenn

Returning to the original photo, what developed in front of the house was a Type II failure. The road was graded level across from the slope above. It then rutted and eroded as the water channeled down the surface to the right. The former creek channel is to the right of the stairs in the right front foreground. Despite the diversion above, the collection area is still substantial. Please note the blackberry shrubs on the slope in the foreground, the eucalyptus behind, and the stairs to the right front.

Yes, there is no doubt that this is the same spot. I found the old root cellar dug into the hill that Ed Fenn told me would be behind where the house had once been. The redwood “sleepers” that once formed the house foundation are still there.

About 1922 - Photo courtesy of Edward Fenn

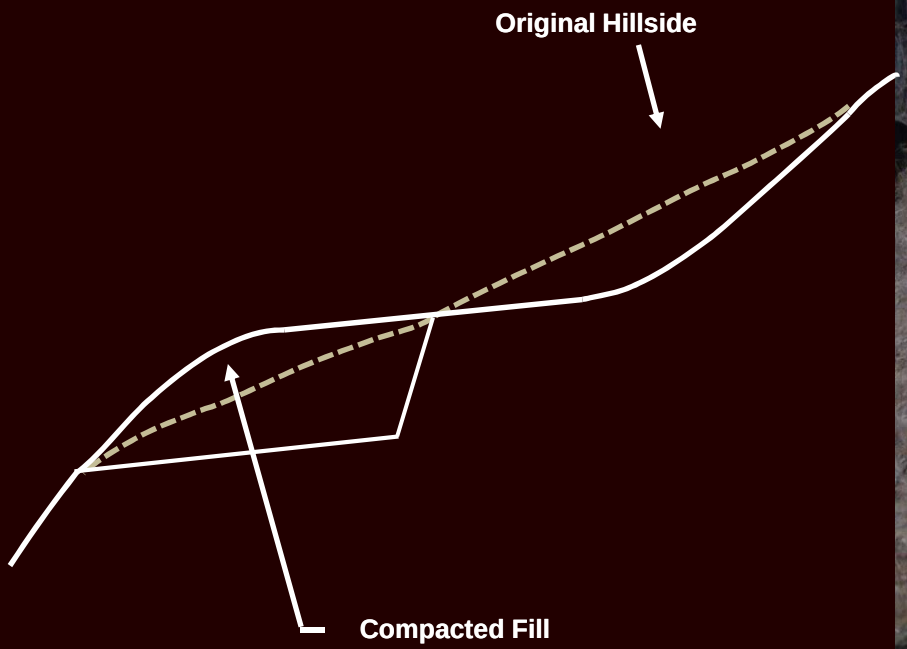
They unloaded the car here in front of the house....

About 1922 - Photo courtesy of Edward Fenn

After assisting the lady, Ed parked The Dodge under the tree on the right.
Note the stairs on the left under the horse's chest. This is the same spot.

Here is the repeat cross-section photo (I would need a ladder for the original perspective). Altogether, I estimate that over 2,000 cubic yards of material have been lost from in front of this old house site. So, where do we get the material to fix it? The rock nose above the road that the County needs to cut back would do the job nicely and would save the County from having to truck it out of the area. It would also enable firefighting equipment to get up the hill from the valley below or provide an emergency evacuation route.

Various Roads On our Property



As to what I am doing here, I reshaped this old Type I road to an out-slope in 2006. This is typical of the design for timber haul roads today. It is virtually maintenance free and particularly resistant to gopher damage, because there is not enough water at any one point to enter a hole and turn it into a trench. So, why don't I do it elsewhere? I don't have the fill material I need.

This old road was re-graded to get equipment in and material out for both forest thinning and brush control. To that end, I changed the grade from an in-sloped to an out- sloped drainage configuration, thus eliminating the need for culverts. It has worked beautifully to reduce the flow in the channel below, and has required no maintenance at all other than weeding. The two fir trees on the right are there for a windbreak and for high-lead yarding redwood logs out of the stand on the left. The redwoods to the right are now gone.

This road is the backup drainage for a flat that occasionally spills off one end. The narrow ridge has impossibly steep sidewalls; so there is really no good place to drop the water off to the sides. So what I did is run the water down the spine of the ridge while slowing and retaining it with strategically placed branches, losing altitude until the grade into the channel was much more gradual. The presumption is that the ridges are of harder material than the gullies (that may not be true). Still, the propensity for a convex surface is to break up the flow into smaller and more chaotic flows, thus reducing surface wear. The branches last about 15 years.

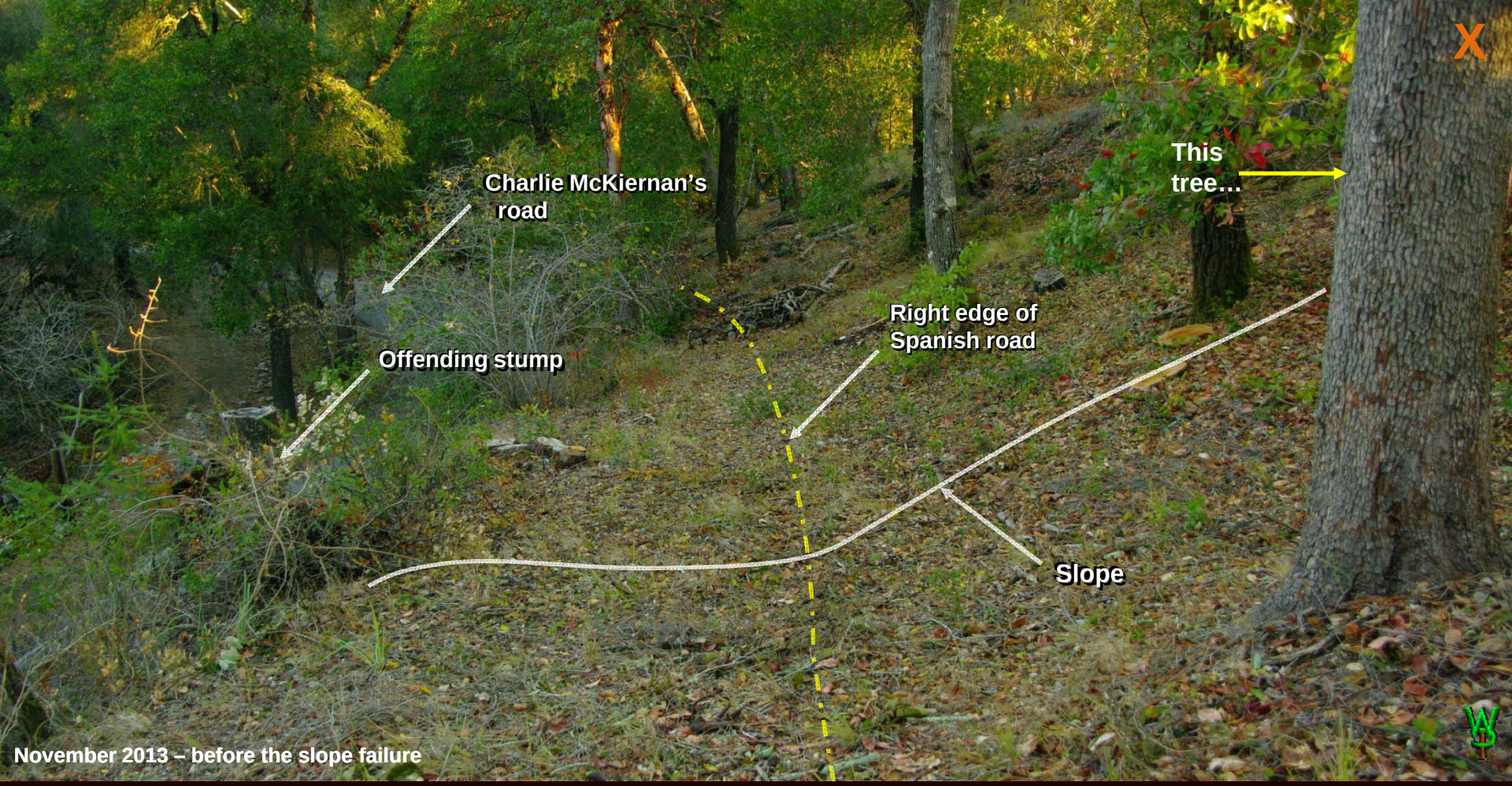
A word here about trails. Trails are basically small roads. They have similar drainage and stability issues but lower loads and surface wear (although raindrop impingement is an issue). The first time I thought about this was at the suggestion of a visiting docent from Jasper Ridge. At first I was taken aback, but had I known how affordable and useful trails are I would have done this many years ago. Picking trail routes is one of the more satisfying art projects I’ve undertaken in a very long time. Animals love them.

Making trails is a lot of work. An excavator capable of digging one cannot make an out-sloped surface (too dangerous to the operator when he catches a root). The out-slope gets built by pulling material back up to the uphill side of the path with a rake, or in buckets and chipping off the top edge of the cut from above with a pick. Clods get broken with a vibratory plate. Then a hand-rake shapes the surface. Water and pack it with the vibe plate. Then “pave” it with leafy duff to protect it from raindrop impingement.

Stairs help keep the grade more manageable. Making the stair frame is one thing, bringing in the fill is another. By the time this spot was compacted, it required almost six yards, which may not be a lot of fill to move with a tractor, but it's a lot to load into a wheelbarrow by hand and creep down a steep grade for a couple hundred yards. So it's wise to plan the route such that moving dirt is minimized but then, it's also wise to keep the grade of the trail low to minimize surface erosion. It's about tradeoffs.

But are all my roads perfect? No! There are some that could be better, particularly in how they collect water. The problem with this culvert is that the east facing slope on the northern half of this place (down to the left) is so steep, there is no good place to run the water down it. Sometimes you have to make one, as we did in the case of the rock drainages you have seen. That just takes time and money to get done. I've done one channel every several years with two left to do. Hopefully I will have the situation corrected within my working lifetime. In any case, this one gets its ditch cleaned and a bigger water-bar as soon as I get done with…

…this. This is a different type of problem that, although inevitable, has since been made more urgent and more complicated by environmentalists and lawyers. The original problem was our stump. Although I had removed the weight of the tree, it was doomed to slide. However, it slid a LOT sooner because the County cleaned the ditches two feet from the pavement to keep the water off the pavement. The County lawyers had spoken: 'There shall be no water on pavement,' because they didn't want to be sued. The problem with that "logic" is that anybody driving fast enough to hydroplane on single-lane, treacherous, windy roads like this deserves what they will get. Within months, about 40 cubic yards of soil slid four feet onto a road surface only 11 feet wide, forcing heavy trucks to run with their wheels supported by the edge of a cliff to the left. As the stump sagged, its roots tangled with others, started to pull off the whole slope. The customary landowner practice is to wait for a storm, allow their trees to fall, block the road, and then complain to the County. Then the County comes along (after dealing with bigger problems elsewhere) and cleans up the mess for free, leaving the unstable slope in place to fail again. Eventually, they may hydro-seed the slope with exotic grasses per environmental specifications to "protect" the streams a half mile away from sediment. I can't let that happen. So the Department of Public Works gave me a permit (free) to deal with it. More importantly, when I couldn't find a contractor, they let me do my thing. Thank you.



Yet there was a minor complication to beginning the job to which you are now a witness, one that required a bit of extra documentation for posterity because of the site history you have already read. Note that the slope to the right of the dashed yellow line becomes almost flat to the left of the line. Note also how this flat section follows roughly the same course as the county road below. Even without Mr. McKiernan's road below, the original slope would never have been level across it as it is here. It is almost as if this was an older road, one made long ago, except that the only older "old road" made before Charley McKiernan built his in the 1850s was the path made for the Spanish by Indians of Mission Santa Clara equipped with sticks and baskets in the summer of 1791. Accordingly, it seems that this may indeed be that old Spanish track. Unfortunately, the repair to reslope that overhanging embankment will remove just about all of the old road. What to do? Get the permit, document it for the archaeological record, check it with a metal detector, scrape off the surface to stockpile native grasses, save the topsoil for the revegetation job, and fix it. It is saddening to take out this likely vestige of the mission era, and it does cause one to ponder what the Indians had to do to build it or how the land might have looked to the Spanish when they passed by this very spot 225 years ago, but it's just how things have to be.

Getting rid of the mess is of course not at all free for us. This Case backhoe rents for $2,000 a week (of which almost $500 is taxes). Between the backhoe, skip loader, and various sundries for this project, we put in about $10,000 and got 90 yards of fill dirt. So, what did that $3,000 in taxes get you? Carbon credits for big corporations.

October 2016 – Ready for revegetation
Unlike the oak, a madrone stump can take 20 years to rot, so it will help hold the slope until fresh roots can take over.

I sloped the hill and shuttled out the fill using it to improve drainage on dirt roads elsewhere. Dug out the ditch by hand to provide support from the pavement surface for a 10”X24” berm in the ditch of 1-1/2” drain-rock to resist impact from car tires (you can see the tracks already). Moistened the fill, mixed it, backfilled the ditch, and compacted it in 3 lifts. Added more above the first course and packed it. Had contractors round off the top edge with an excavator and grind the remaining stumps. After $10,000 of our money and three months of arduous labor, it’s ready for topsoil. Had the County done this, it would have probably cost you $50,000 more.

October 2016 – Cast of character… (note the tractors on the tape)
Thank you Beacon Veterinary Hospital

In the process there was $7,000 in incidental damage to my beloved companion and protector. At the end of each day, Dax **loved** riding in the loader bucket of the tractor; for four weeks she was queen of the road. Then, when I shifted from a backhoe to a skip loader, in came a John Deere instead of the Case machines to which I was used. When I parked the Deere and depressurized the hydraulic system, unknown to me, the “four-in-one” bucket would open overnight, unlike the Case (couldn’t see it from the cab and should have checked). The next morning, she jumps in the bucket as usual. I start the tractor and raise the bucket… with one of her feet on the ground in the gap between the two halves of the clam-shell. The jaws closed by gravity and mashed her shin bones. Dax surely didn’t deserve it, but until this, at 12 years old she was having the time of her life. This was four weeks of heaven, and six of pure hell being stuck in the house, followed by another 12 weeks of rehab purgatory. She’s my buddy, my guard dog, and my responsibility with only a couple of years left, hopefully to help train her heiress. With a puppy, it’ll be heaven and hell for her, mixed together all over again.

November 2016 – “Revegetation,” this slope got temporary tarps whenever it rained (above)

Revegetation started with a topsoil slurry from the top. It was spread by hand, but it could be done with a hopper mixer feeding an articulated conveyor. The bottom third was tossed with a shovel. Water that down so that it forms a film. Plop in some irises, sedges, buckeye seeds, toyon seedlings, elderberry started from cuttings, Ceanothus, and other such. Keep watering until the rains come for regeneration from remnant roots of wild peas and our awesome grasses for steep slopes, *Calamagrostis rubescens,* and *Agrostis halii*.

When the heavy rains came it got cold, with a plastic cover with the edges wrapped in battens screwed to 3X6 timbers. Effectively, this is similar to the “mini-greenhouse” technology used in the grassland restoration chapter. Note the date. Unfortunately, I was too late.

September 2017 – Just up the road from the prior image

I was too late finishing the project and it got too cold for the roots to sprout, partly because this part of the project was in shade almost all day when the winter sun was at a low angle. Then we got that infamous 87 inches of rain. Some of the plants I put in did take (especially the shrubs), but I am sure by now the bulk of those root nodes I spread on the surface are dead. So this part may get a classic seed and mulch treatment before being again covered with timbers, tops and plastic as before.

This project got rain in the early fall, and then was covered by mid-October. That provided enough warmth for good root development. I removed the plastic to weed it in the spring. To me, this is a perfectly acceptable outcome because I have sufficient number deep-rooted individuals of species that spread by rhizomes well enough distributed to establish a full cover. To the County, this is not yet enough cover for an erosion control project, principally because they usually seed with annuals that cover every inch with shallow rooted grasses. Yet this is September, and these bunch grasses are green. Had I watered it over the summer, these grasses would have met that full cover expectation with more soil-holding power than do the annuals the County uses. We have only to wait.

The point of all this ranting about failing roads is that YOU, "General Public," have been in command of this situation all along. Your agents at the State asked investors to build toll roads because General Public wouldn't pay the State or County enough to do it. Your agents gave a monopoly to Mr. McKiernan, forcing Charlie Martin to snake his road up here. General Public, didn't ask how the builders would manage the risks or specify those construction methods. Then your State agents helped the railroads gain rights of way that put the toll roads out of business. So then you "bought" those toll roads for $0.10 on the dollar. Then your agents built another highway and ignored that old County road. Then they "improved" it with a cheap skin of oil and screens they wouldn't let anybody else get away with to increase tax revenue on new houses. Today your agents whine about the mess and lack of "funding" to fix it while specifying road standards that are impossible for anyone to afford. Some of these old problems (like Martin's road) are on private property. I am not asking you to fix those. I ***am*** asking you to leave those of us who *want* to fix those old problems for free, FREE to do that work without your permission or supervision. None of that can happen as long as your government agents cling to the power to extort a series of ridiculous payoffs to supposedly supervise and protect an often flimsy claim to protect public health and safety without *real* responsibility for the outcome. That bureaucratic claim to manage all risk, supposedly on your behalf, is what makes these technical issues essentially political, even on private land. It's not working for the roads, the land, or its users, human or otherwise.

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