Roads to Hell and Back, Somewhat

November 2017 – I graded a road down the ridge at left to run the water from a ¼ acre flat above, down the ridge, and around these fir trees to a cross-ditch where it turns off onto a 10% slope into the channel at right. Dropping it off above would have eroded a longer and steeper slope.

Roads before drainage or drainage before roads? I didn't want this revision to be a 200-page chapter, so it couldn't be both. Roads are absolutely necessary to do forestry. Bad drainage will ruin a road, whether softening the substrate or inducing "slip-outs" from underneath. On the down side, roads steepen slopes, collecting and concentrating flows into streams long before the land would have done so without them. Those streams then incise channels that then destabilize the slopes above them, making the entire landscape steeper than it otherwise would have been. Steeper is less stable and increases water energy, thus abetting erosion but roads can also channel water away from historic drainage problems offering a gentler path for the water to get down the hill (above). Our property has a County road above 2/3 its length, and another around 1/3 of its perimeter. It has another half-mile within the boundaries for forestry. Hence, much of the forestry I do is because I have roads and much of the road work I do is because of drainage. Roads first.

Wildergarten 6.2

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 5.8 6.2

Vande Pol, Mark Edward, 1954 –

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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Revision Date: March, 2022

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 this image 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 the situation changes, as forestry is elemental to many of these road and drainage management problems.

The first road through these mountains adjoins our property, a trail built by 500 Indians conscripted from Mission Santa Clara under the direction of Spanish soldiers. What may be remnants of that original trail are still visible here. It was opened in August of 1791 and remained as the sole direct pathway from Santa Cruz to Santa Clara for over 60 years until Americans improved it for use by wagons. Until then, exactly to what degree it was passable for vehicles is unknown, but one must assume it could accommodate an ox cart, as Mission Santa Cruz was isolated from the port and capital at Monterey in winter because of the bogginess of the wetlands of the Pajaro River, so this road was a difficult lifeline for supplies in the early 19th Century.

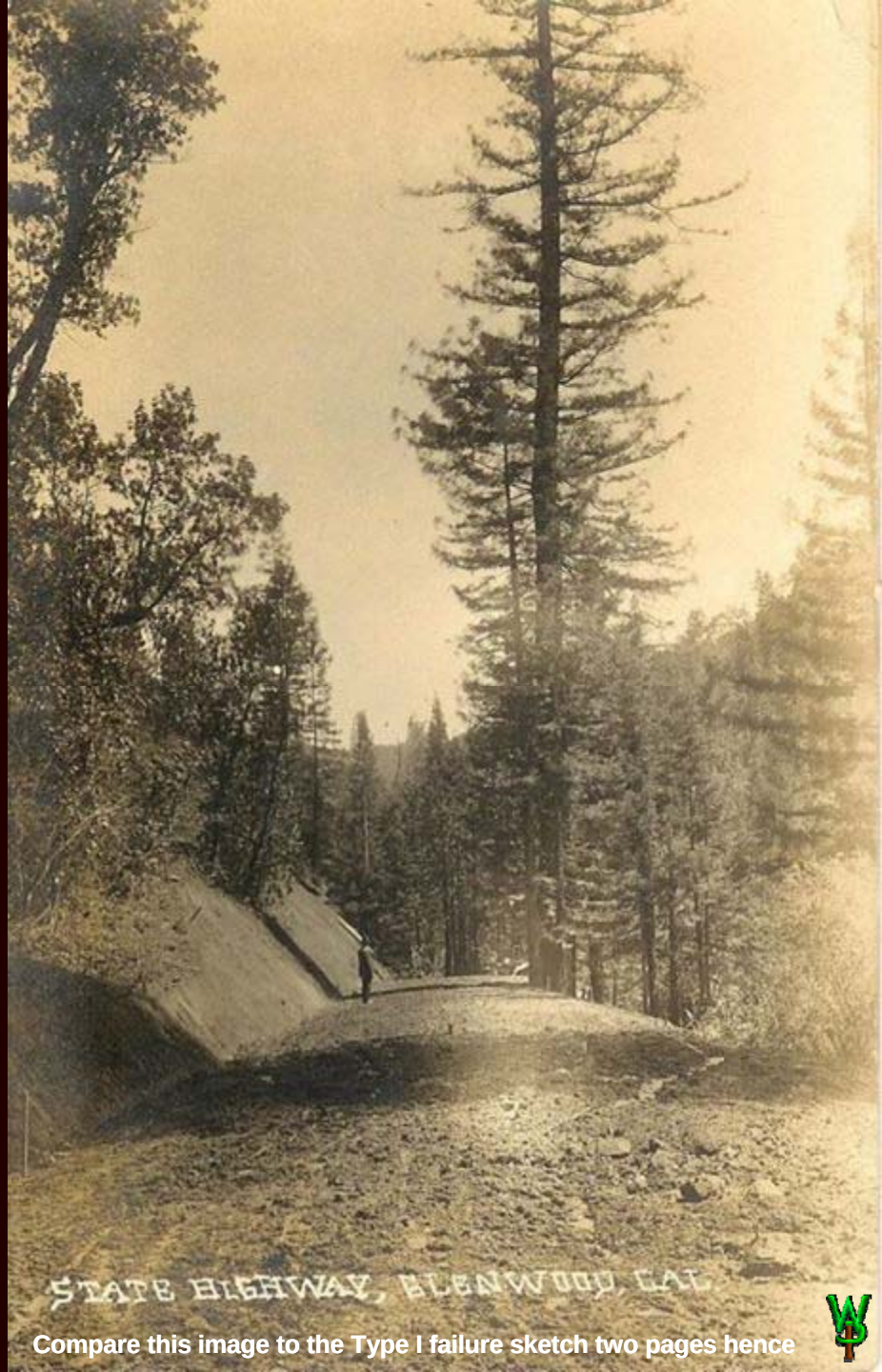
The first wagon roads in these mountains were started just after the 1849 California Gold Rush. The growth of the State's population was such that all forms of infrastructure were desperately needed. The State didn't have the money to do it, so the legislature passed a statute giving permission to private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

In the early 20th Century, Charlie Martin provided the State a free survey to persuade the government to build a concrete highway to his town, so 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 was completed in 1915 (right) with Federal funds from the Department of War, supposedly to haul cannons to the coast.

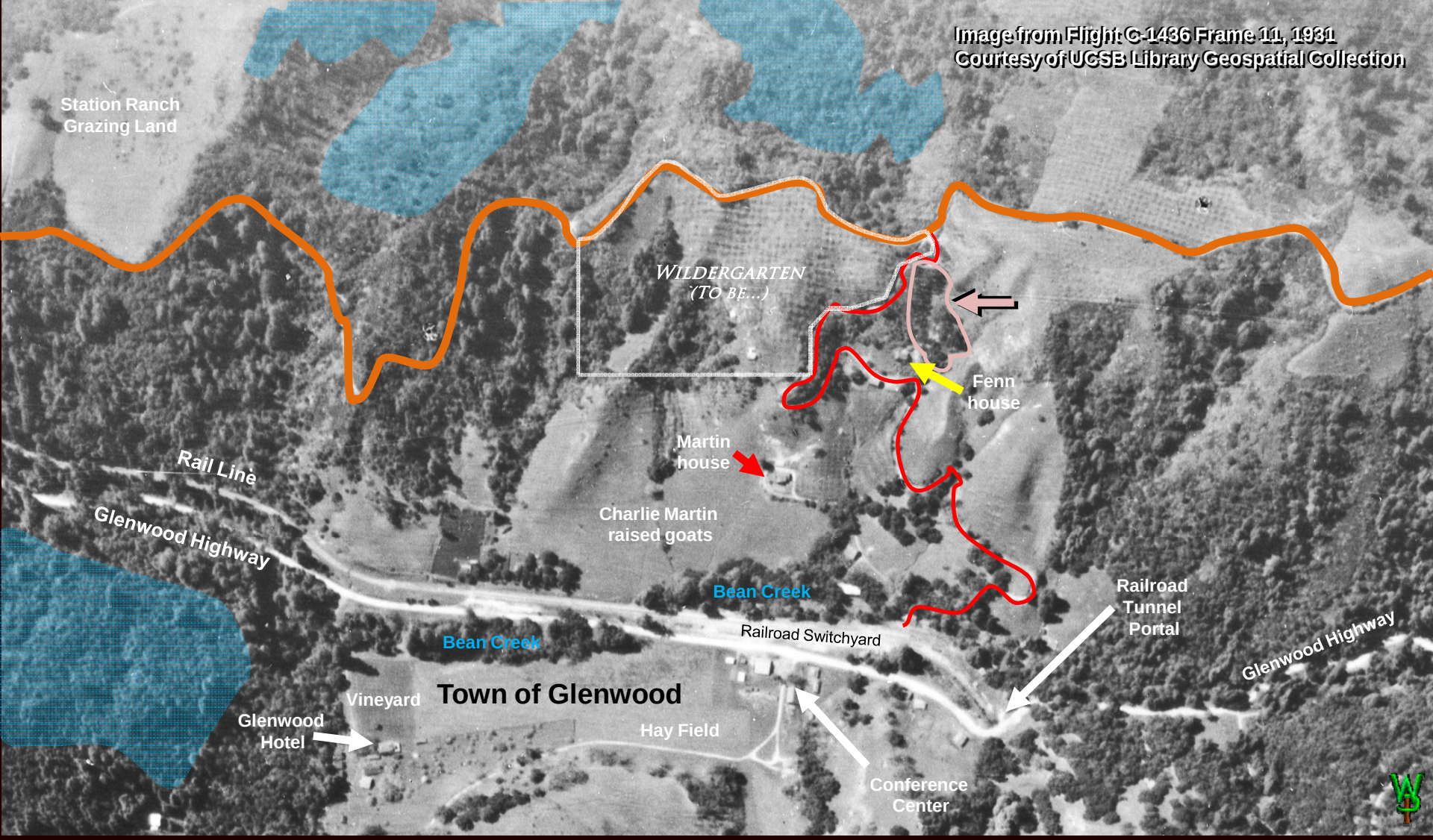
Grades for dirt roads sloped inward toward the hillside so that wagons and trucks with skinny tires would not slide off the mountain when they hit the brakes in winter. That required a deep notch to drain water (right). The water then collected into a torrent that does one (or both) of two things**:** It cuts a ditch on the inside of the road destabilizing the slope above, and/or, if it hits an obstruction such as a fallen log or a minor slide off the above embankment, it collects sediment which kicks the flow out and over the outside edge of the road. In those days, the outside embankments were made of uncompacted 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 will see in the next 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 eventually fail in massive landslides. And fail they did, routinely, on a scale so spectacular it is hard to recognize today.

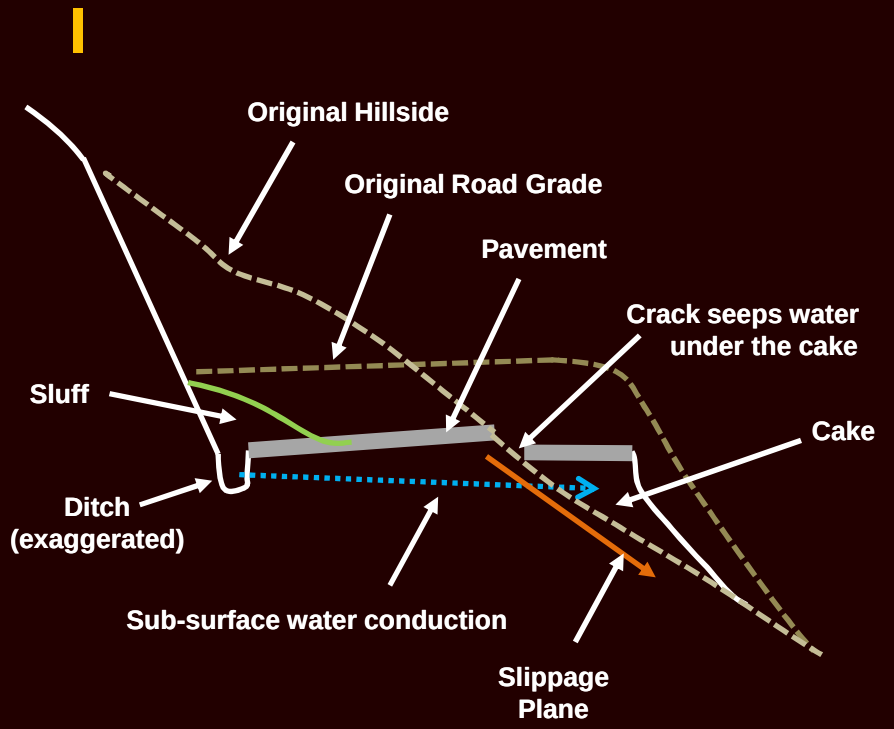
Bad road design and construction cause big problems. The answers start with vegetation management (improving rainfall infiltration in soil to reduce peak flows of said torrents) and extend to modified road construction to dissipate the energy of those flows.

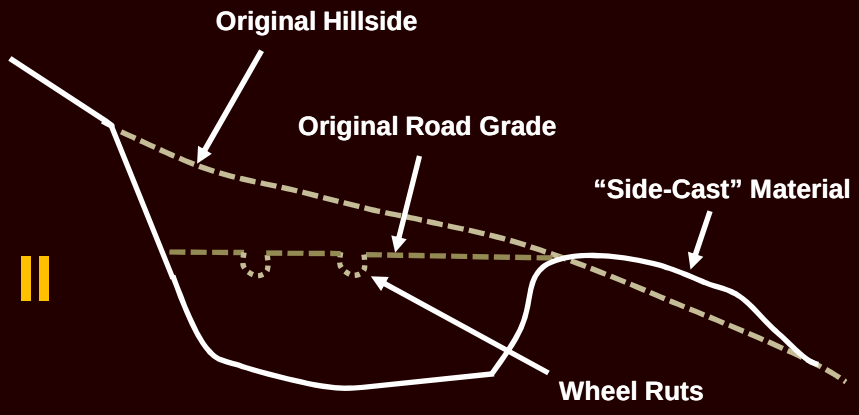


Compare this image to the Type I failure sketch two pages hence



Charley McKiernan's toll road followed the Spanish road from Santa Clara to Santa Cruz. It was still the only way to get from the Santa Clara Valley to Santa Cruz. Charlie Martin added his access road to his Glenwood resort town a few years later. Orchards soon dotted the area to take advantage of the road and extra rainfall compared to inland. The railroad came in 1890 with a station at Glenwood serving its hotels and vacation cabins also lowering transportation costs for apples from Pajaro Valley, putting some orchards up here out of business. Hence, Charlie Martin's road fell somewhat into disuse until he could find a tenant for what became our place. Ed Fenn moved in to grow apples just above the train station shipping via Martin's road, also agreeing to to do the road maintenance. Martin swung the US War Department to build the concrete Glenwood Highway in 1915. As part of that project, Eucalyptus, was planted to reduce erosion due to the additional rainfall collection area resulting from construction of McKeirnan's road.





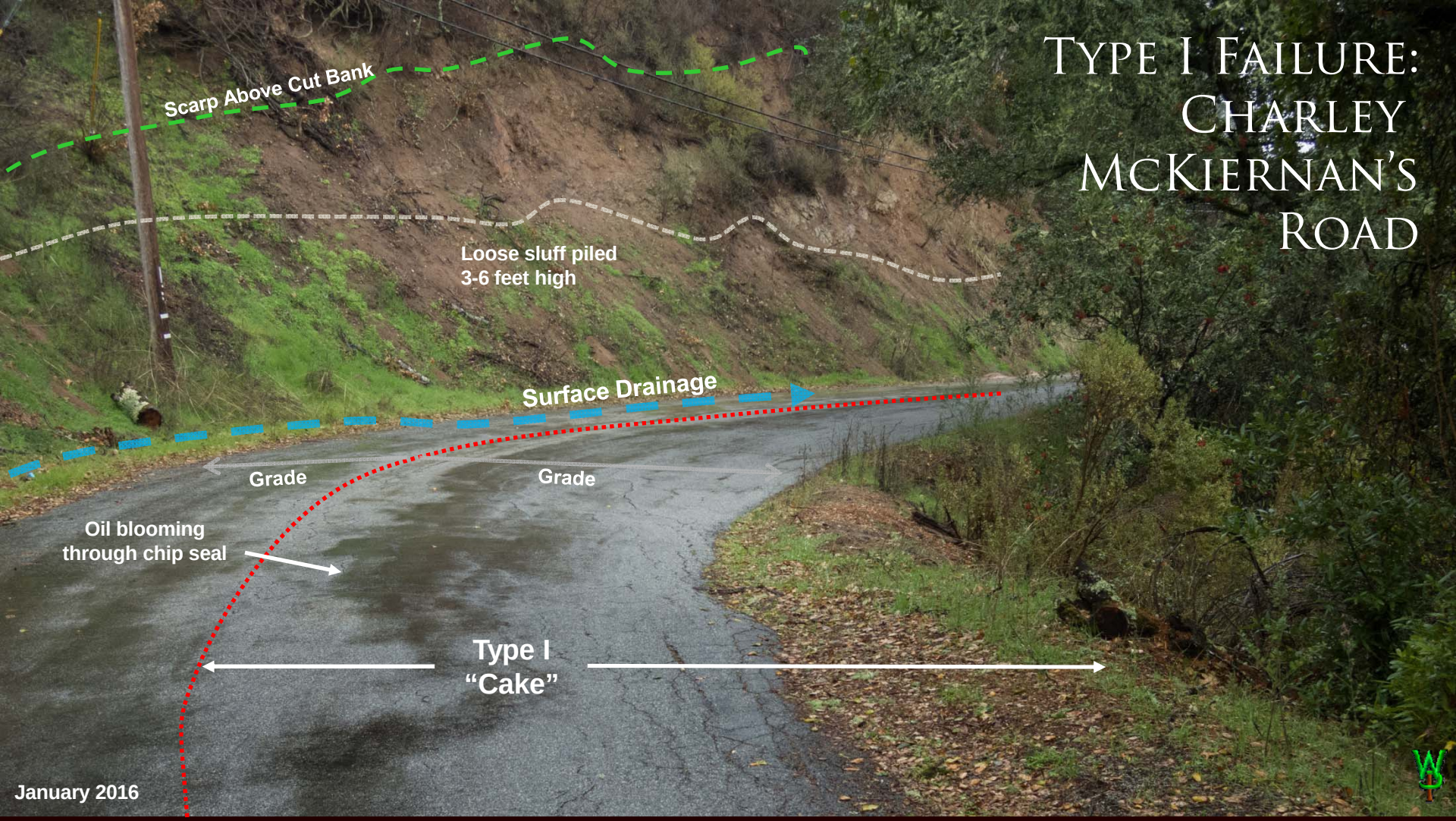
Until paving with oil became prevalent, dirt road maintenance was cutting it deeper, with the result that entire hillsides both above and below them became steeper. Roads undoubtedly interfere with drainage and erosion processes, are conduits for weeds, and change wildlife migration patterns. But, besides being economically necessary, where roads 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 anything larger. 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 residents don't want. So it can end up working out that tortuous and decrepit single lane roads lend a degree of exclusivity. Hence, we are left with these crumbling "legacy roads" with occasional *very* expensive estates along them.

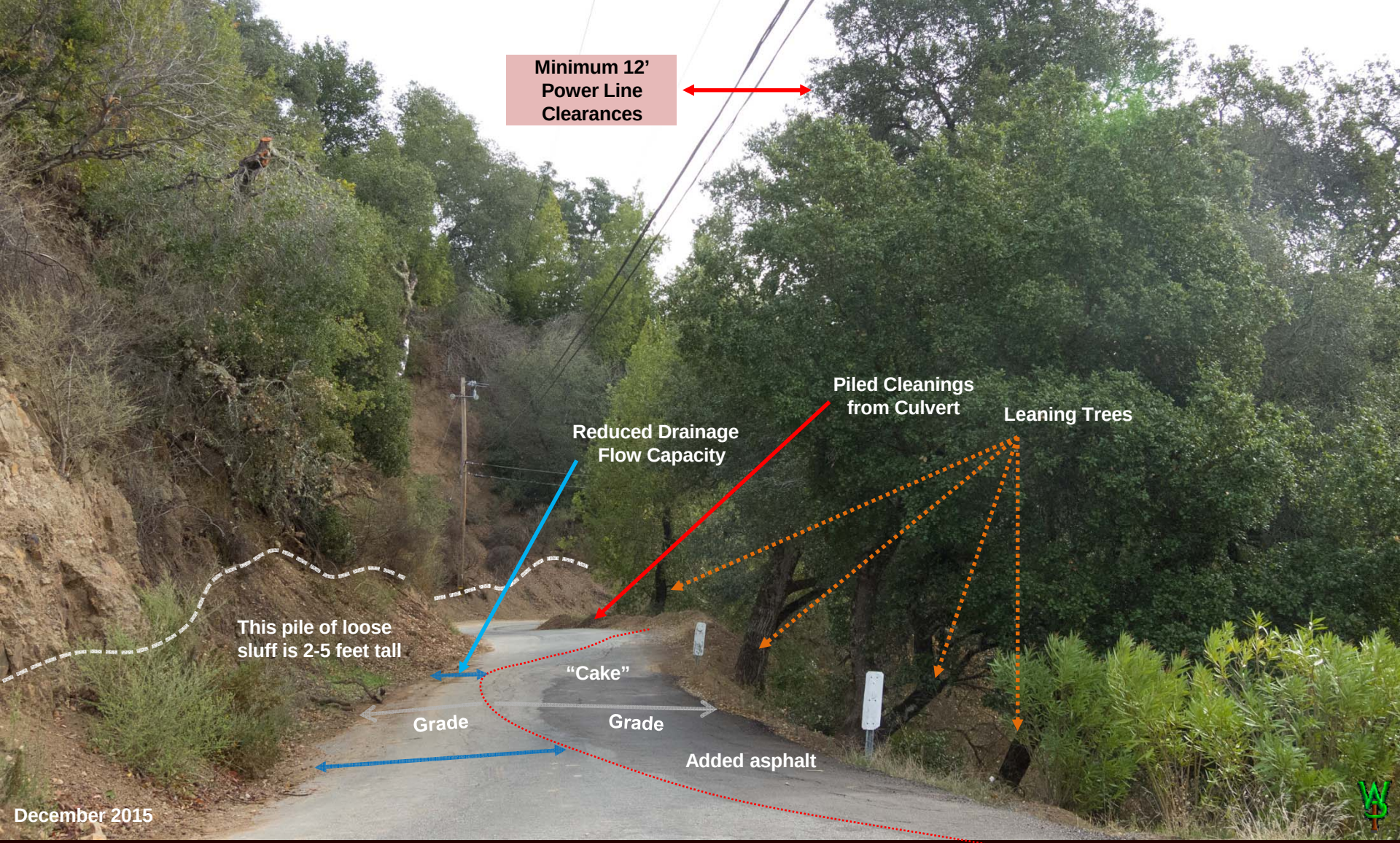
Still, people with a lot to lose get desperate when such a road fails. Rarely can one simply take a detour. It is difficult and expensive to do road work on rugged terrain. Roads populated with owners with political leverage get the maintenance. The rest get fixed *when* they fail, repairs often waiting 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 big enough to warrant expensive repairs.

There are thus but two types of road failures here. A "Type I" road failure (the most common around here) starts with what you saw in the earlier 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 (top sketch). I call this soil mass a "cake." When (not if) the inside ditch fills in a storm, the water kicks outward and can either pour off outside edge of said fill or saturate the support for the cake. Type II cases usually developed before there was pavement, where the road went through a "cut" with banks on both sides. The water then proceeded along the length of the road, cutting it ever deeper.

Type I Failure: Charley McKiernan's Road



We will start with Type I road failures. This 25 mile road was originally built by the Santa Cruz Turnpike Company for $6,000 in only two years ("heavy equipment" consisted of more than one horse). When Charley McKiernan blasted out the rock and pushed it aside to make the road; the "cake" was the now typical loose fill sitting atop a slip of rotting organic matter. But loads were light and Charley had plenty of dynamite to make more fill if he needed it. Nor did it matter if the road was graded ever lower as necessary, even though that notch in the hillside grew until it destabilized the slopes above. The few houses here back then were not much more than cabins easily replaced. With big expensive houses above the road today, the County cannot lay back the slope angle to reduce material sliding onto the road, nor can they cut downhill now that it is paved, making the need for regular grading unnecessary. So the County just keeps adding pavement to the cake and ditching out the sluff, usually piling it on the other side carrying weeds down the hill. The only way to stabilize the hillside now is with proper vegetation management and/or outrageously expensive retaining walls.



As loose dirt falls down the cut bank, the in-sloped part of the road channeling drainage narrows, also forcing heavy trucks to the outside, increasing the load on the cake. Worse, a cake rebuilt with ditch cleanings is a perfect germination bed for trees. Trees growing from an unstable slope invariably lean outward. When they fall from *above* the road, they block surface drainage with wood and soil, forcing water out and over the outside bank. When they fall *below* the road, they pull some cake down with them. Meanwhile, PG&E *must* maintain line clearances which leaves the downhill-side trees unbalanced and increases the leverage they exert against the hill. 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. Beyond line clearances ,they don’t touch the trees (it’s expensive and people would complain).

Two years later, 80 inches of rain added significant weight and plasticity to the cake, cracking the surface, permitting entry of water, inducing the cake to slide 4-6 inches in but a few weeks. If it fails, the County will call it a “Natural” disaster. I call it bad road construction and maintenance. 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 “disaster” to justify State and Federal money that ultimately comes from taxpayers anyway. Yet the amount of water on this road is not entirely the County’s fault.

Culvert Operations

Private residences above the road have roofs, roads, patios, and other such that exert a major effect on how much rainfall soaks in instead of running downhill. Where they direct that runoff is usually a matter of convenience. In this case, the process progressed until it took down a tree plugging this culvert 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 more soil to plug the next culvert, if it makes it that far, in which case it dumps off the side down the hill. 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 out of the drainage or (better) pipe their runoff down to the culvert. Well, they don’t.

This is the property below that mess. From the tiers of retaining walls above his house-to-be, this owner clearly knew he had a lot to lose if that culvert plugs and the water brings a 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. Watch what happens.

The runoff from above found a new path, thus creating a blob of unsupported “rock” above the slope. Said “new” path brought down another 20 yards of soil, which obviously inhibited the performance of the culvert. Eventually the bottom of the pipe rusted out, leaking water into the substrate, soaking the cake, and allowing it to creep on that organic slip. One stick catching on a corroded surface inside the pipe could then capture sediment until the rotting pipe supporting the weight collapsed . The County had cut the road maintenance budget severely. All they could do was put up a sandwich sign telling people not to drive off a cliff.

The rotted culvert (to the right of this image) broke and just took the cake, dumping at least 100 cubic yards down the hill to that guy who had 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 that poor guy just 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 below them. Maybe the defense would point to a rotten culvert as THE cause? System failure is usually a team effort.

This is another culvert just up the road, so eroded that it is leaking out the bottom along its entire length, just like the one that made the slide. In fact, there were three wash-outs along this road in 2017, all with this same cause and with this one still yet to come! One reason the County doesn't fix culverts in advance is simple**:** It takes YEARS for the County to get a permit for a new culvert from the State Department of Fish and Wildlife. They are "protecting" coho salmon, an introduced fish fraudulently listed as endangered with County personnel as instigators (see my book, *Natural Process*). This permitting process, supposedly to protect the fish from silt in streams, is so slow and expensive that it causes more culverts to fail, resulting in **more** silt in streams than without the State's bureaucrats and rules! Besides, 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. All the contractors know how this works.

Worse yet, DFW specifies use of plastic pipe for culverts, which WILL burn out in a fire. The correct alternative to plastic culverts is to insert a plastic liner into the old galvanized steel pipe as a protective sleeve. Above is Snap-Tite®. It requires no excavation or paving. Simply slide the plastic liner into the rotted steel culvert and seal the inlet with grout (extensions snap together as shown above). If needed, the cavity under the old pipe can be filled with a sand slurry or grout. If desired, a new protective steel outlet sleeve can be installed, hopefully with energy dissipation to slow the water coming out and impacting soil. With a coating of a light-weight gunnite or stucco , the plastic liner pipe is protected until the fire has passed. It beats digging out the old pipe and installing one that will burn.

Piling On

January 2016

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 “gabion rock” like you see here.
Note: The 2” pipe is the water supply for nearly 70 of said “expensive homes,” many lacking sufficient water storage 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 failing trees causing slides or slip-outs. Unfortunately for the County, vegetation management is the responsibility of property owners so in love with "Nature," they believe vegetation management is unnecessary.

Today, once Federal "disaster relief" money is involved, the governing legislation specifies the money is to be used only for repairs, and not improvements; i.e., they will not fund improvements that prevent future repairs even if they are cheaper than the repairs to pre-existing conditions (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 to hold the pilings under load, they are connected with "tie-backs" (steel rods either anchored into blobs of concrete "dead men" or screwed directly into the hill (right).

Note the guard rail. The State specifies that guard rails must be fastened to wood posts that break upon high impact to allow the rail to give. That installation wastes a couple of feet that could be a wider road compared to fastening the rail directly to post extensions. NOBODY is going to drive so fast with so much weight that such a capability is needed here, but that is the nature of "one size fits all" State specifications.

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. Here we see a culvert outlet with no splash blocks. The water impacting the soil dug a ditch 20 feet wide and10 feet deep (until the pipe broke). Note the power pole next to it, now lacking support. If the pole falls in the dry season the result could be a rather expensive holocaust. Wouldn’t be cheaper to pipe the water to the bottom of the hill? If plastic pipes on top of the surface burn, they are not expensive to replace. Maintaining fixed assets when everything is moving means eventual big failures. Yet when it comes to “big” you ain’t seen nothin’ yet. Compared to the Spanish, these moderns are saints.

The Spanish Gulch

B

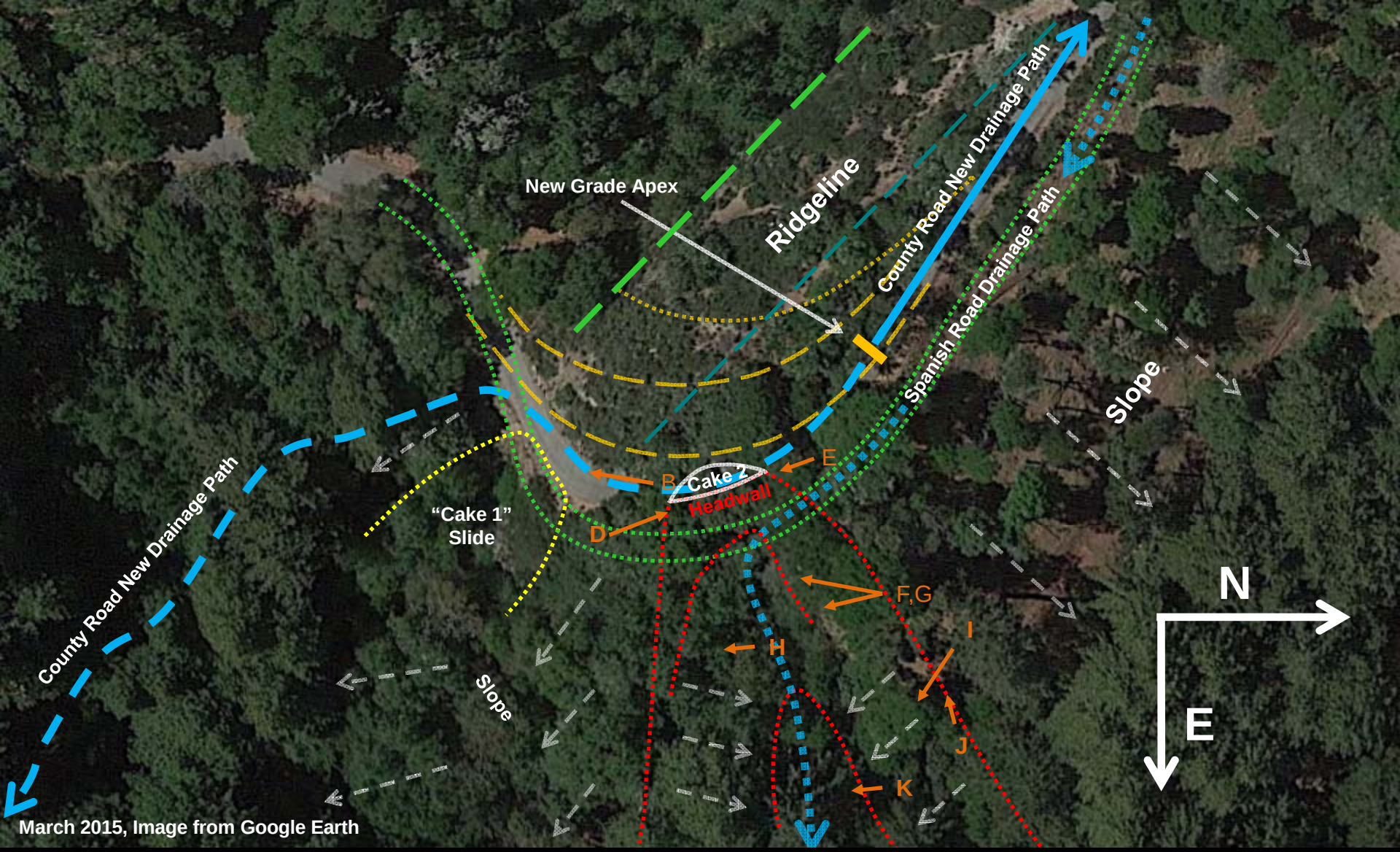
October 2013

I discovered what caused what I then named “Spanish Gulch” in the process of witnessing this smallish Type I failure in 2011, just beyond the south end of our place. It caught me by surprise because the pavement was so good there and the collection area for rainfall was so small. The cake at this turn had slumped far enough that most of the road surface sloped away from the ditch but the substrate was hard and surface smooth. The remaining in-sloped grade collected accumulated sediment. In 2011, a short cloudburst fed the water running around the corner with sufficient momentum to hit the sediment, run across the road, and… it took a bite of cake.

October 2013 – The County had seeded the slide area with grass

Now, this particular failure is particularly interesting, not because of how it happened, but because of its history. This situation is less usual in that said “cake” was fully compacted. Before the slide, the pavement lacked the usual cracking and subsidence. Why? Well, this sluffed parent material has had LOTS of time to consolidate. This fill was old, VERY old. The whole hillside is composed of eroded sandstone from the “rock nose” forming the end of the ridge above, slowly accumulating that alluvium for thousands of years.

Geology is the ultimate "decision maker" here. Note the vegetation change from brush to trees above the green dashed line. That line is a cliff of harder sandstone about 30-40 feet high forming a ridge that just ends where the road wraps around it (what I call a "nose"). The slopes around it are loose alluvium eroded off the harder ridge. The old Spanish road (green dotted lines) was built on that softer sluff because all the Indians had for grading in 1791 was sticks, baskets, and *maybe* a few shovels. For at least 100 years thereafter, wheel ruts collected and carried all of the water off that ridge to where it didn't make around the outside corner and ran down the hill (blue), thus cutting a gully (red headwall contours) into the alluvium in a manner very much the same as the failed culvert outlet discussed earlier. The resulting series of slides eventually took the whole road.



The County had no choice but to fix it, but back then they were not so hog-tied by State and Federal regulations (or their own bureaucracies). They simply cut into the nose with an excavator, graded the corner with a higher apex point and then sloped a paved road the opposite way (solid blue line) to channel the water away from Spanish Gulch. They still had to get the road down to the next level to the south but cars could easily handle the steeper grade compared to horse-drawn wagons. It was a good idea, but not sufficient because the Cake II headwall is collapsing for reasons to be discussed. Some of the runoff still went around the corner (dashed blue)… except when it didn't, the result of which was the Cake 1 slide in 2011. That is softer material including some of the loose fill made when they cut the new path and made Cake 1. Today we can pack that fill with a hydraulic rammer on an excavator.

This is looking down Spanish Gulch from midway up. It is hard to visualize the loss of the 30,000 cubic yards that made this channel (channel bottom in red). There has been no stream here since the road grade was changed when the County fixed it, but once something like this starts, it will keep getting bigger even without the water. It is history that teaches what we are seeing. That story will be completed in the forestry chapter on drainage to come next. Without scrambling over every inch of ground equipped with that history, it is very hard to see what to do about it and the tendency will be to fall back upon whatever is familiar.

It's big. The gully headwall is "400 feet that way" (upper right) along the County road ("Cake 2," 4 slides prior). 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 and dumped it off at the corner onto the colluvium, but there was more to it as the process didn't stop there.

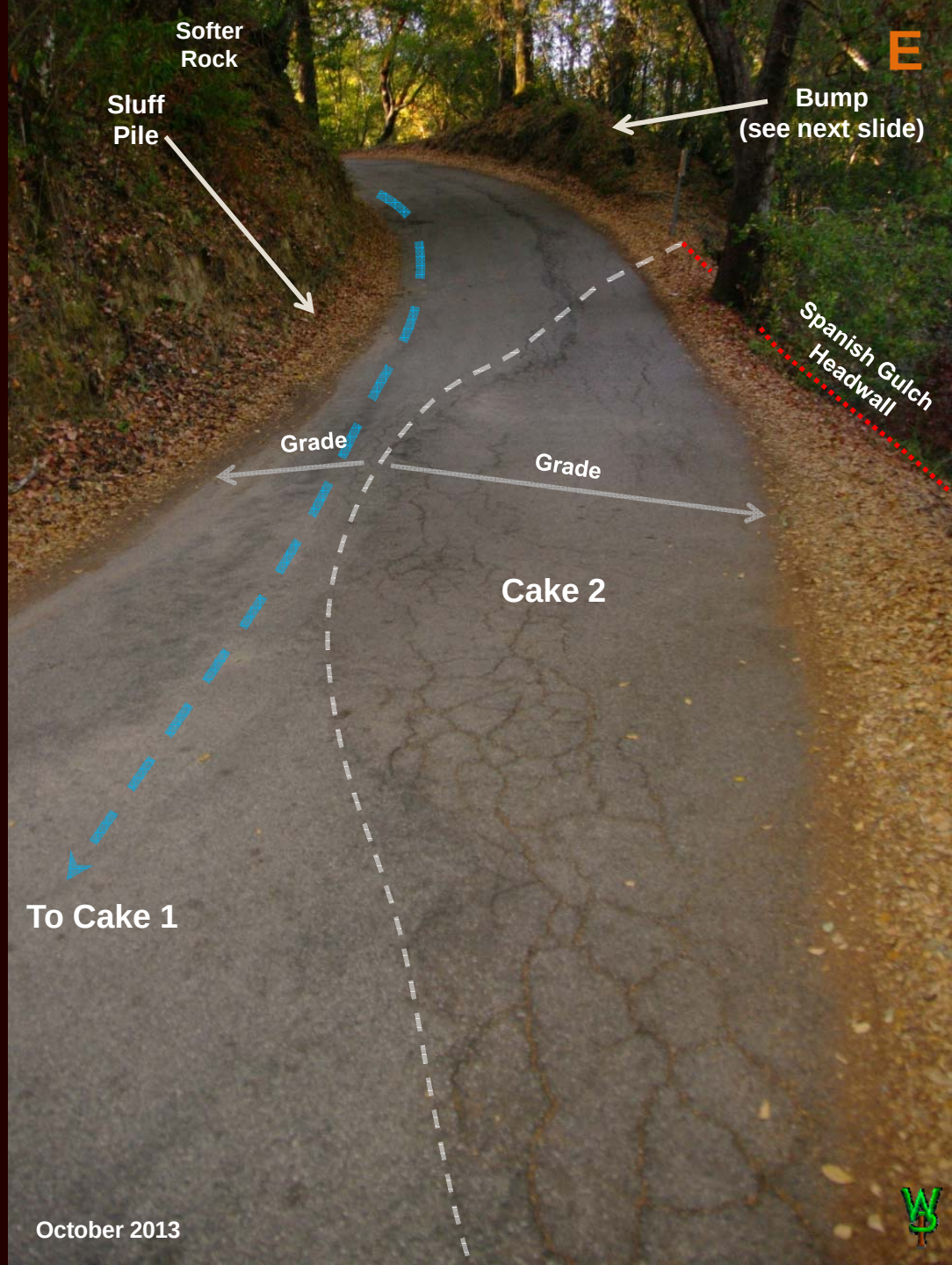
It took the County 11 years to fix this minor slip-out despite having an insurance settlement in hand to cover the cost. These pilings will be 6-10 feet tall above where they leave the ground and will have tiebacks. Getting that excavator up the road past a hairpin turn around another rock “nose” about a quarter mile down was a major challenge to get around the corner. According to the guy who did it, he was taking his life into his hands as the outside tires almost slipped off.

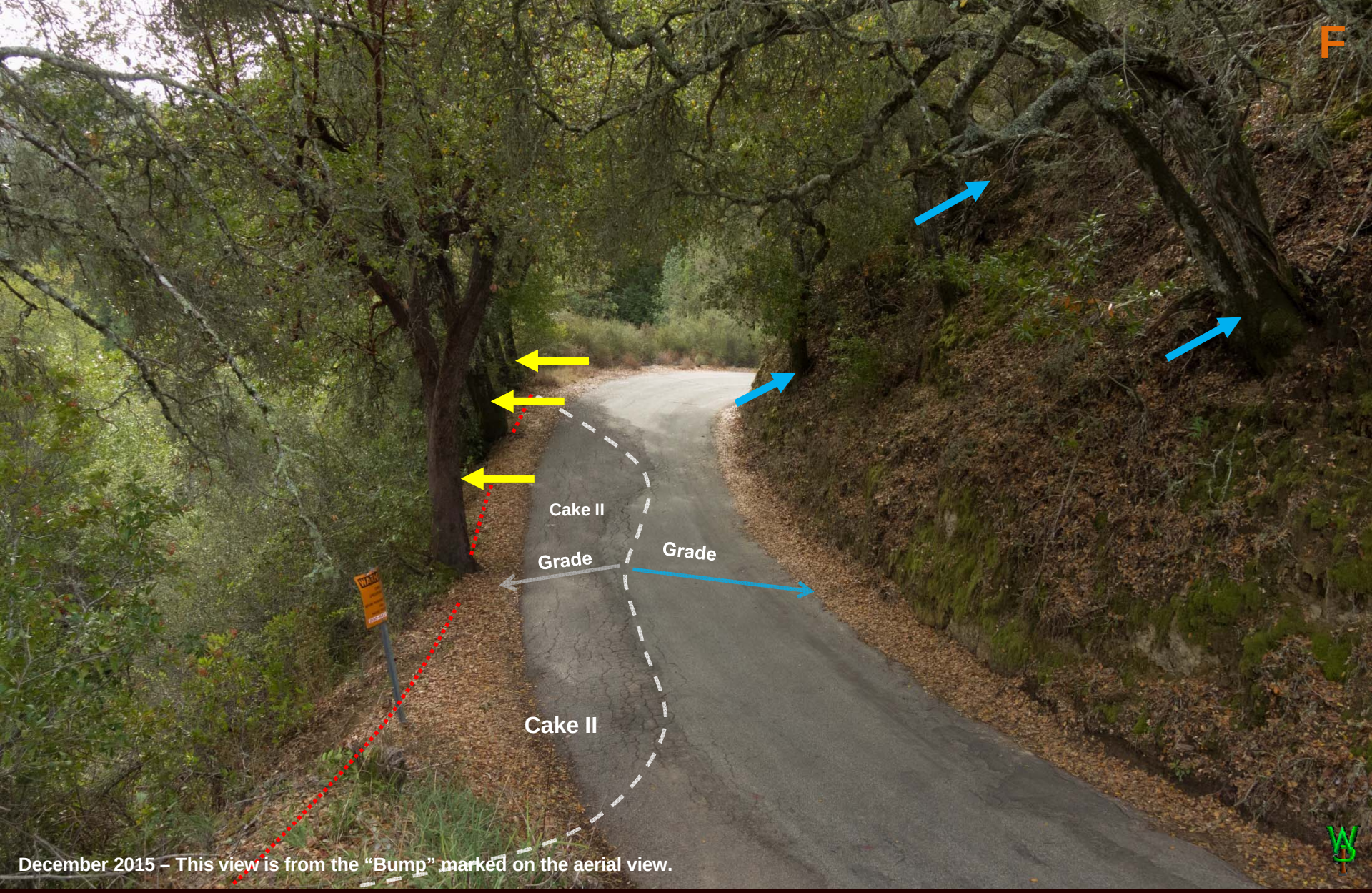
So it gets worse, again. Cake 2 atop Spanish Gulch is settling. It will not take much sluff to kick out a flow over the old headwall "the fix" was meant to avoid. With enough rain, the flow could be sufficient to develop enough momentum to go down the headwall. Since the fix, trees in soft material have 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 and soon Cake 2.

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 rock nose (called a "retreat"). 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. For seven miles of Highway 17, between Scotts Valley and Summit Road, this road is the *only* emergency alternative. Close 17, and this one-lane road becomes an impassible traffic jam.

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.



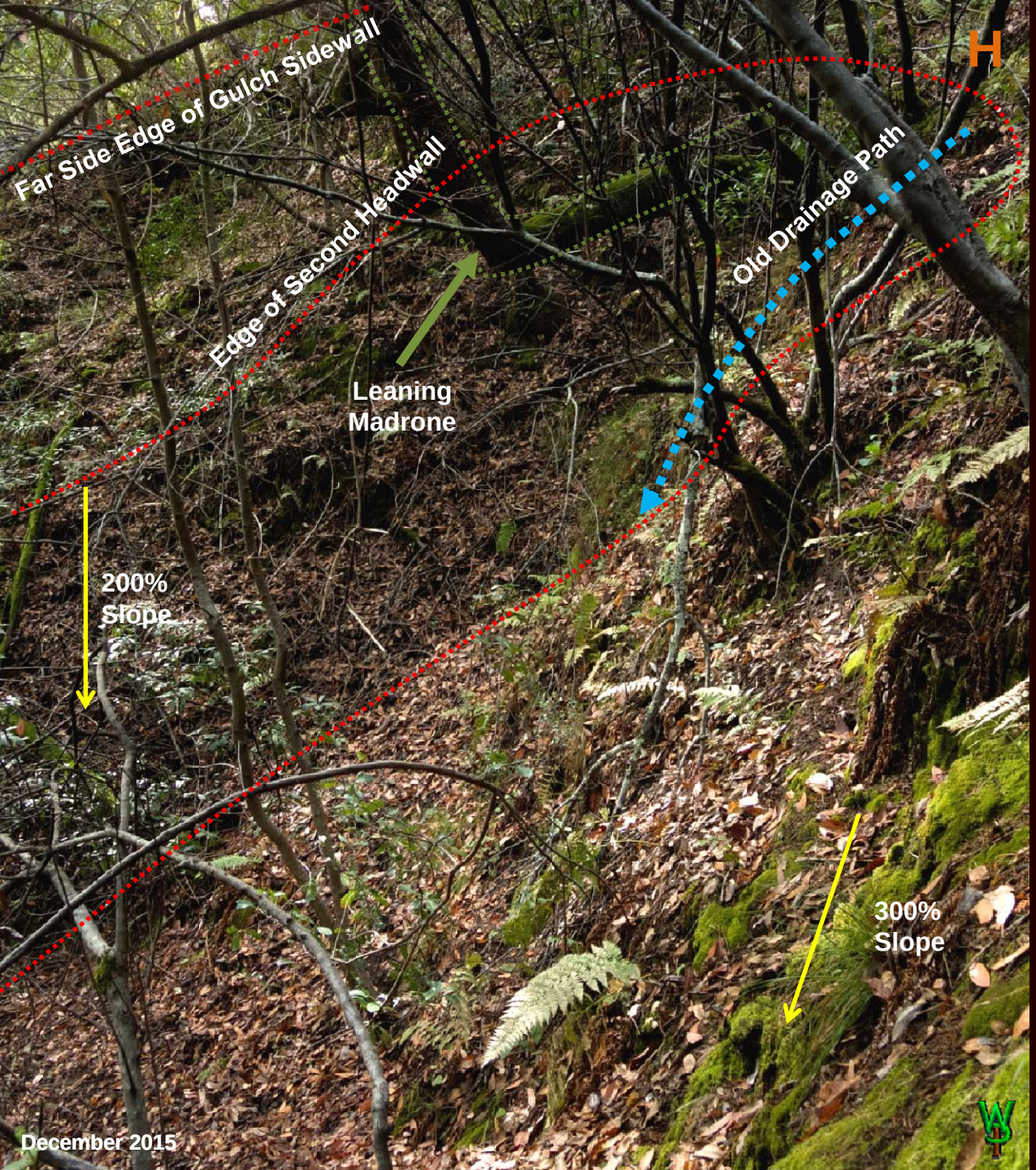


December 2015 – This view is from the "Bump" marked on the aerial view.

As to how the new headwall came right up to the edge of the road even without a substantial flow of water, the likely reasons are similar to what you see here. When this road section was cut, the Gulch would have taken a huge fill to support the road, so they cut as little as they could get away with. Trees leaning out from said headwall growing in soft material eventually go down, eventually taking some headwall with them. Repeat as eventually. Similarly, trees leaning out over the road eventually do the same, taking a chunk of dirt, filling the drainage, and sending the runoff over the edge and down the headwall. Probably both.

This is an oblique view of the headwall below “Cake 2,” and this is just the beginning. Note that what you do see on most of it is light, early successional brush such as this *Ceanothus cuneatis*, and a madrone stump indicating that the most recent slide on this side of the gully was only about 50 years ago. One would think that in a place that can grow trees very rapidly, there would be more here. The reason there aren’t is that they lean into the Gulch for sunlight, hanging onto material so soft they fall down, frequently.

Panning left, below the next headwall is the original Spanish Gulch filled with trees, and here is why I am going into so much detail on roads in a chapter under “Forestry”**:** Poor drainage and lack of vegetation management came together to make this very expensive erosion problem even worse for the land, for wildlife, and for people. This gully stair-steps in successive slides with headwalls having a 300% slope, one 50 feet high (too tall to simply drill pilings for a retaining wall). It got this way…*because* of trees?



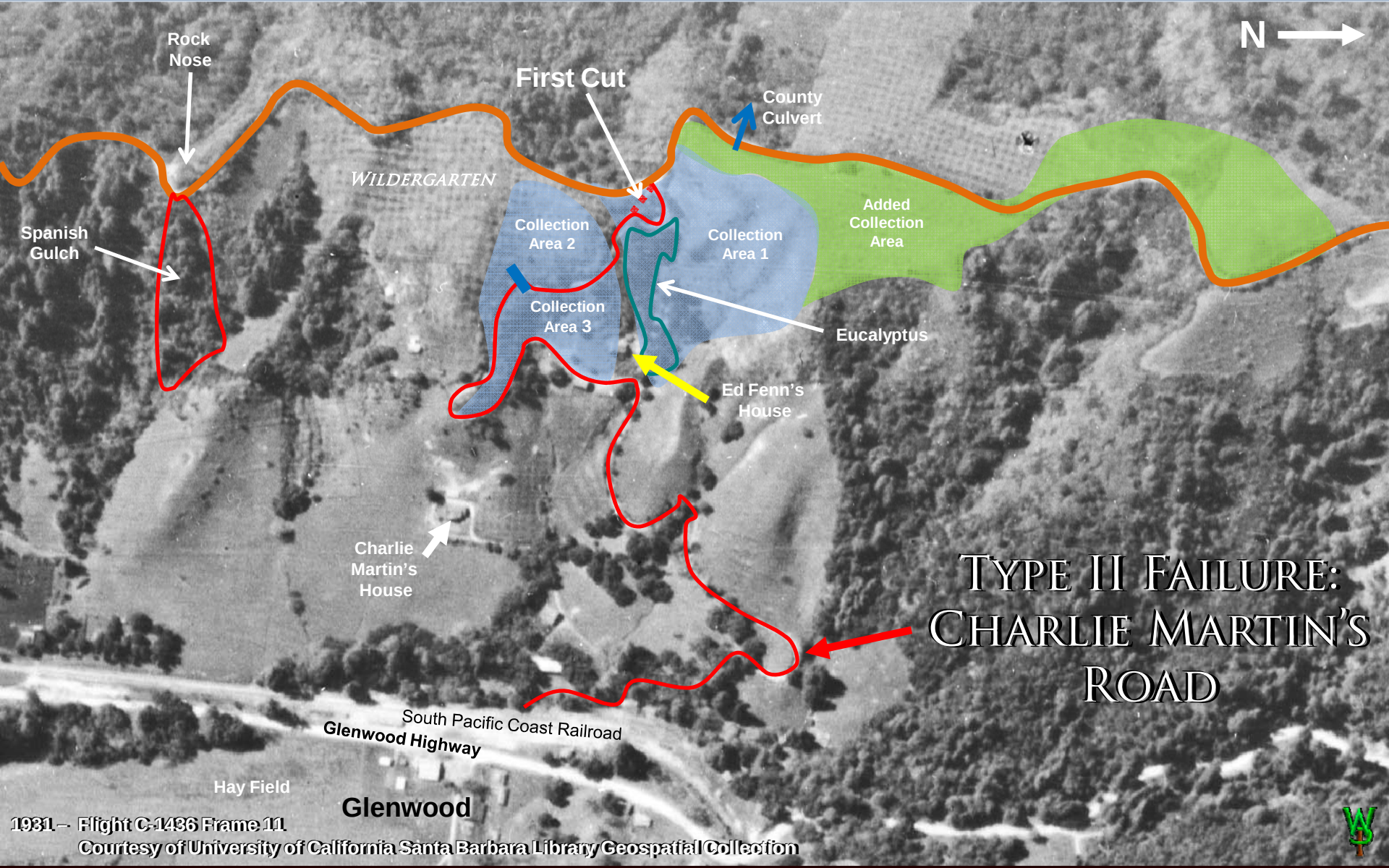
Yes. Trees both hold this headwall and undermine it when they fall. We are to the north and down-slope from the second headwall looking across and uphill from the right sidewall. On the far side on the north-facing wall are older trees, of which the leaning madrone is archetypical**:** it grew outward from the loose sluff, fell, and *then* it grew upward again, now putting considerable leverage against the slope and threatening to tear out the root wad. That soil material is so soft one can dig it with bare hands.

So, subsequent to the Spanish bad road drainage that made the lower headwall, the upper headwall resulted from inadequate vegetation management, in this case fire-suppression and the introduction of trees (see aerial photos). In this picture are clues to what should be done to slow this process 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. I will NOT grow hazelnuts here. Why? They attract burrowing animals.

To simply “leave it alone” will guarantee that this slope and road fails sooner, sending significant amounts of sediment downhill 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. That’s me.

On the north-facing side of the Gulch, half-way down toward the main drainage, we have 60-70 year-old redwoods (background). There is a problem with redwood**:** Except for the lower slopes on the bottom of the gully, tall trees are susceptible to windage, on a weak substrate potentially suffering what is known as “blow-down.” 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 grow something else higher up. On the steeper south-facing side, I’ll could grow toyon and coffeeberry at the top because they are light, deep rooted, don’t burn easily. Both regenerate rapidly from roots when coppiced or burned, as will madrone. The fir and redwood on the south-facing side probably have to go because they will shade out low-mass deep rooted trees and shrubs. Firs do not do as well to the north of redwoods anyway and burn much more easily.

One last thing: A steep gully loaded with fir, madrone, bay, and Ceanothus makes for a dandy furnace chimney that 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” bitching about it while a guy pushing 70 is risking his 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.



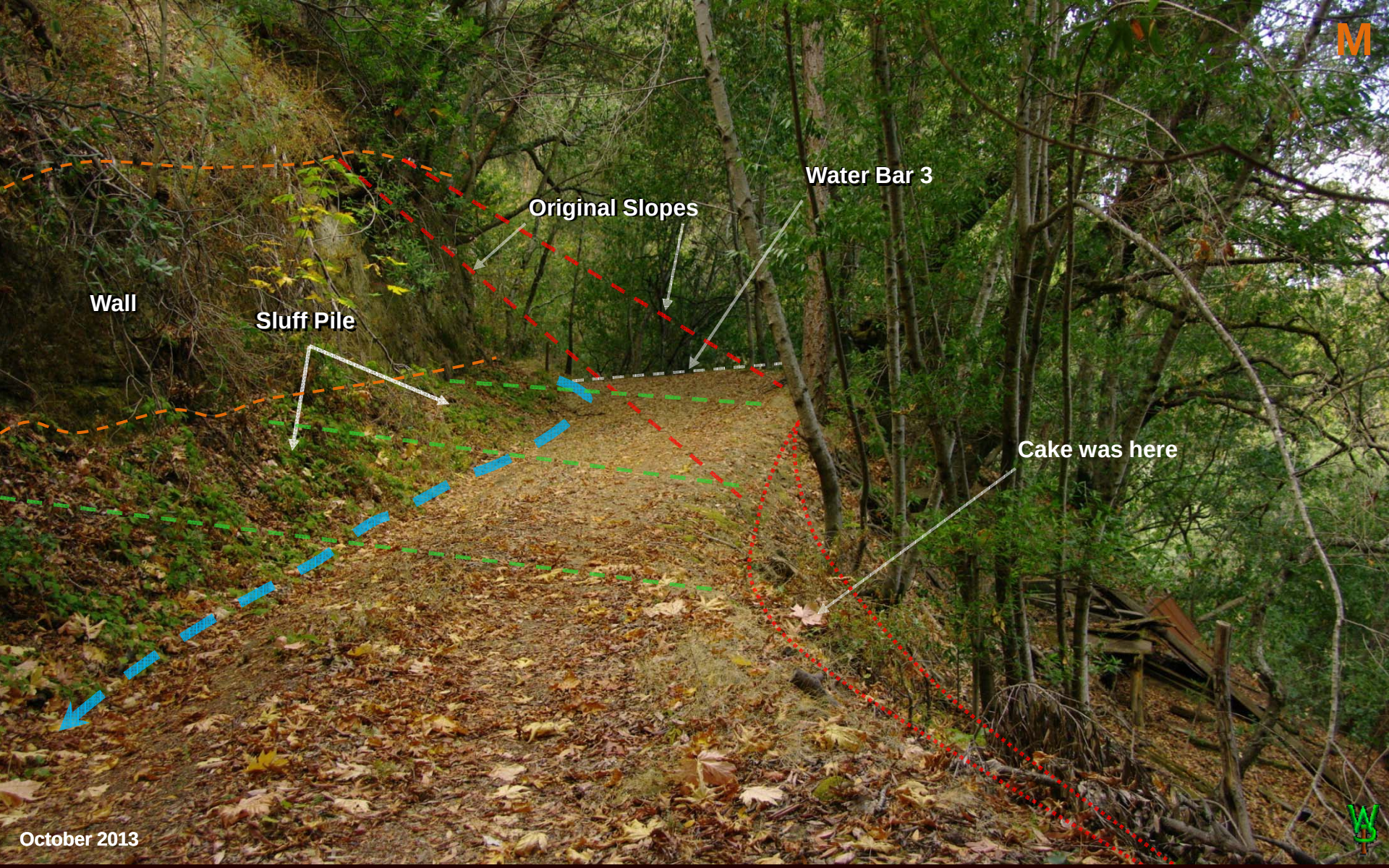
Our first Type II case is the middle third of Charlie Martin's road (site history). The original collection area 1 above it was about 5 acres. Charley McKiernan's road doubled that collection area channeling runoff into that native watershed. At the top (marked **First Cut)** is the original entrance to Martin's Road. It was a channel using the road for drainage. It was too steep for horse wagons with all that water coming down and was abandoned for the curve that dumped the water into the original drainage in front of Ed Fenn's future house. When the Glenwood Highway was built in 1915, eucalyptus were planted in this draw to stabilize the channel. Today, those trees are 150' tall, some with 4' trunks. The County since installed a culvert dumping that runoff into another existing drainage.

About 100 feet down Martin's Road, this was First Cut (that original entrance cut for Martin's road), which then turned into a useless gulley. This was a classic Type II failure. I retired it in 2003 by talking the County into filling the channel with ditch cleanings I then graded out by hand. This kind of project takes a lot of fill, 6-8 dump trucks worth. The County lawyers ordered the Department of Public Works (DPW) to stop doing it because somebody sued them for fill contaminated with wood despite having signed a release agreement to take it as is. Without this fill, the County would have been forced to truck it 35 miles to a landfill. We all have a harder time getting fill to fix old problems and the dump fills up faster with dirt. Much of your road taxes go toward similarly wasted energy.

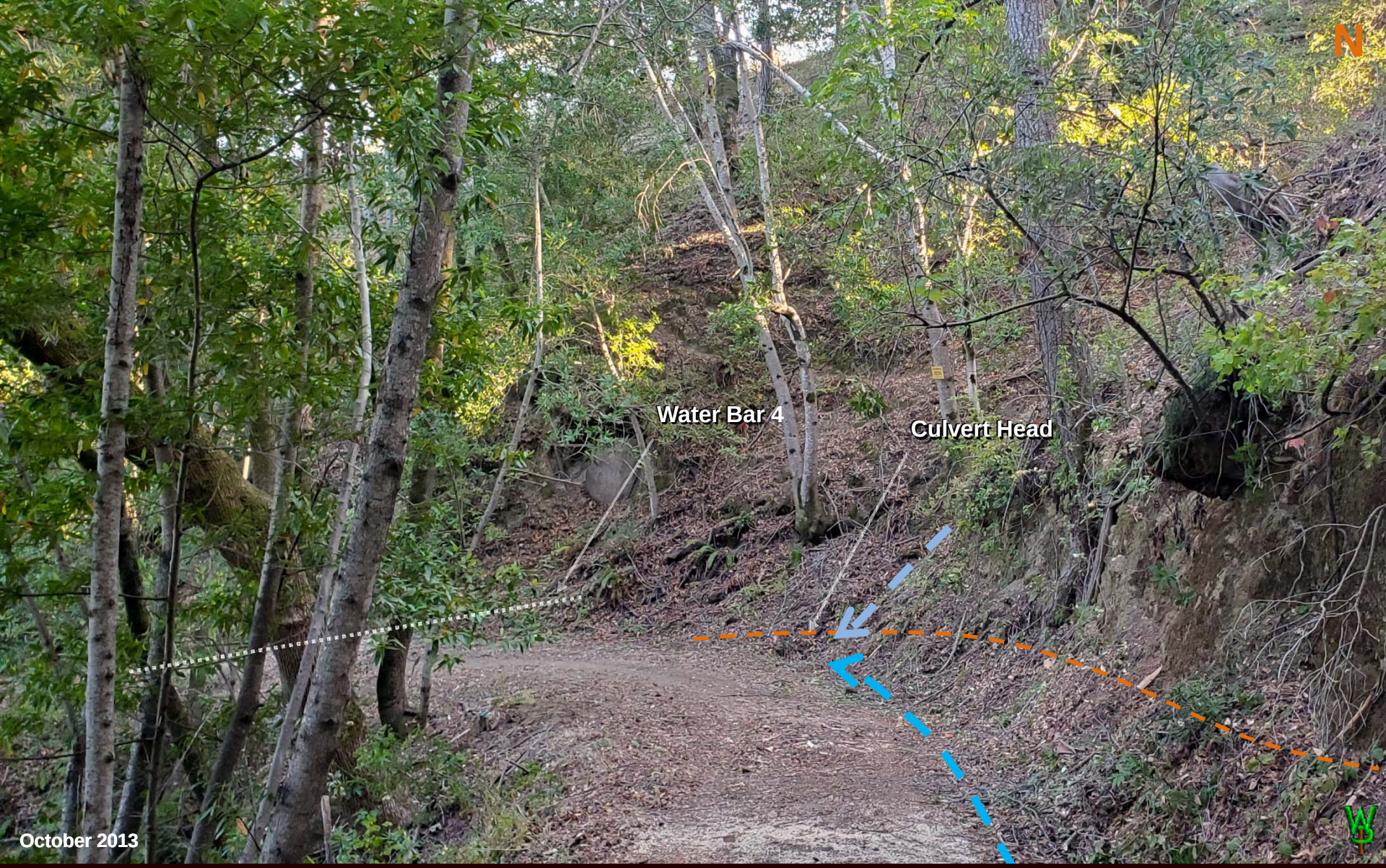
This was the original fix for **First Cut**, which channeled the water into the drainage past Ed Fenn's house, then necessitating planting the Eucalyptus. If you go back to the previous 1931 aerial photo, at the top you will see where the County put in the culvert (probably in the 1970s) to reduce the runoff into the watershed draining into Glenwood. If that culvert plugs, guess where the water goes? Yup, back into what was Charlie Martin's road entry. And this was an improvement!

To reduce erosion on Martin's Road I diverted the flow of water onto it at the entrance and distributed the rest. Since the County put in the culvert up above, most of the time, there is very little water here. Yet in the event that culvert plugs (it's happened), this diversion into the Eucalyptus stand entailed a requirement for sufficient capacity to take all the water coming down the County road. That collection area is about 10 acres because so many landowners along that stretch dump their water onto the County road… because it is a commons. So I simply made the best of things until we can grow redwood trees to replace the Eucalyptus.

Down the road, I distribute the runoff. I installed and maintain 2 concrete culverts (plastic pipe burns) with water-bars behind them in case they plug (the culvert at left is above Water Bar 2). Farther down the road at outside corners (right), I also had out-sloped water-bars made to shed the water. 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 build up an out-sloped configuration between water bars which will eliminate the remaining concentrated flows.



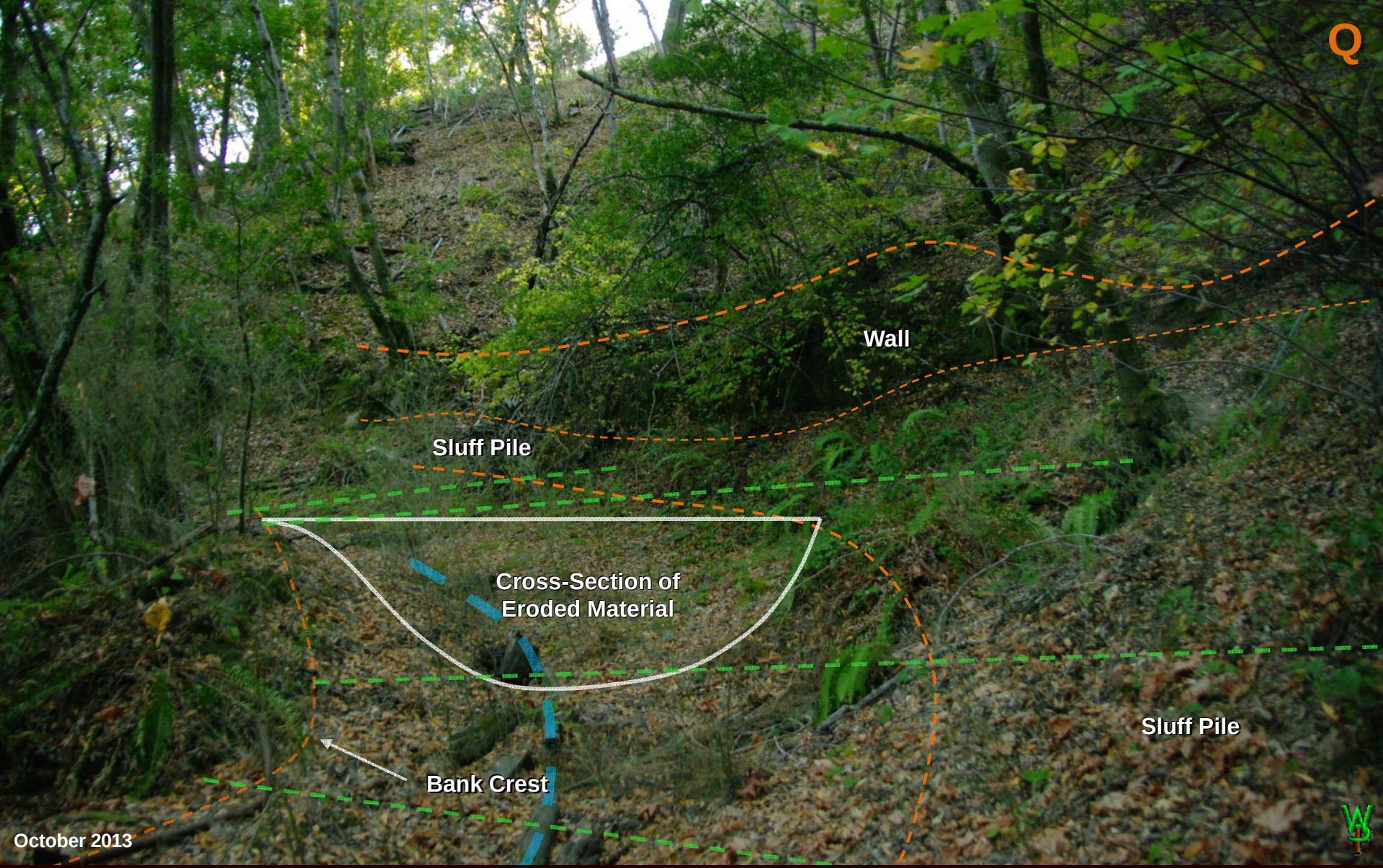
Originally, all of the flow from Charley McKiernan's road came this way (blue). Once that original entry was abandoned and the existing route was cut, they dumped the water down the original watershed passing Ed Fenn's place. Here, this upper section of Martin's road had suffered a minor Type I failure**:** Runoff came down the in-sloped road from the entry until the combined flow ran to the outside, and just took the cake. Since I put in the water bars, loose fill material has slowly accumulated as a sluff pile on the left. Over time, I will deposit that sluff plus what fill I have available working down from behind the water bars with an out-sloped grade. It will take hundreds of yards of fill to finish the job. It's a matter of steady improvement and a very good use of sediment.



Looking down the road from about the same spot, originally, all of the flow from Charlie McKiernan's road came down the in-sloped road. Here, runoff from Collection Area 2 (p34) added to that flow. Originally, there was an 8" square wooden culvert I had replaced with 12" concrete with Water Bar 4 behind it (so far, never needed). My guess is that the road level had dropped at least 6-8 feet being graded, eroded, and graded again over the years. With this new water bar system, loose fill material slowly accumulates as a sluff pile on the right. Over time, I will deposit up that sluff plus what fill I have available starting behind the water bars and working downward with the new grade. Because of the flow from Collection Area 2, even with the out sloped surface above it, the culvert will be needed.

Farther down Martin's Road adjacent to our property is this Type II channel. The cut extended over 150' 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 embankment.

This cut channel was a Type II classic**!** The road was graded to make it possible for horse-drawn wagons and early vehicles. Drainage was a lower priority. When it got nasty, they just cut it deeper until these walls were 7 feet high on both sides. I saw that overhang on our side as an opportunity to correct the slope and make water-bar 5 on the preceding page. Fortunately, I had little respect for the usual sediment mitigation methods required for projects under permit (this project involving less than 100 cubic yards). Five years later, here is native blackberry and nodding brome grass *(Bromus laevipes)*. But I had to wait for them to establish, which in this case took four winters, starting with an exposed rock surface. How? When I was done with the backhoe, I used it to sprinkle some blobs of topsoil onto it and smeared them into cracks, digs and other flaws I'd left on the rock face. Up came some of this grass the next winter. I weeded it, sprayed whatever catchweed bedstraw *(Galium aparine)* or hedge parsly *(Torilis arvensis)* came up, and that is all I have done. Restoration really can be this easy. The most important thing is to know how to identify the plants and to weed it on time.

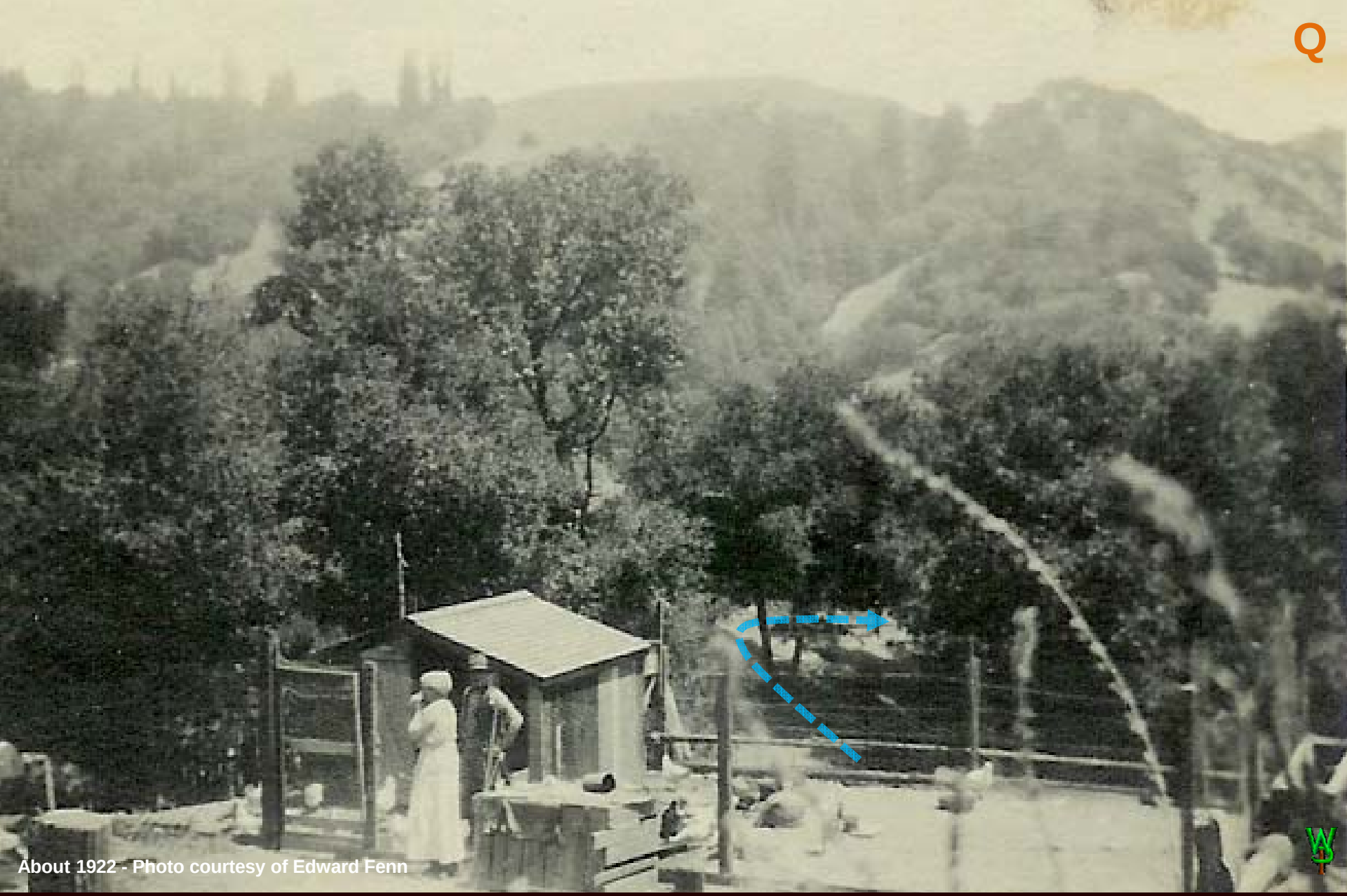


From that switchback down to this point, the road was fine. A small collection area draining onto solid rock meant no ruts. Here, it suddenly channeled like crazy into a classic Type II failure. The reason is that water from Collection Area 3 through that wooden culvert added to the runoff to this point. 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… channeling the water running down the middle of Martin's road below said switchback leaving an embankment on the left. My estimate is that the loss of material from the original road grade is 3-4 feet deep here and is borderline impassable by truck. This is no longer cutting because of how I did the diversions above.

About 1922 - Photo courtesy of Edward Fenn

Another 300 feet down the road, this was Ed Fenn's house along Charlie Martin's road**.** It was graded level across and then rutted and eroded as the water channeled down the road to the right, leading to "deeper." The drainage channel with the Eucalyptus came down to the right of the stairs accepting that water and ending the Type II failure where the channel crossed the road. Despite the diversion from the County culvert. Note the embankment of blackberry below the house, the eucalyptus behind, and the stairs at the right front.

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



To the right of Ed Fenn's house in the last old photo was his chicken coop. Below it is where the drainage channel cuts across the road combining with the water from above and to the right. Below it you can see the outside of his road to Glenwood (arrow). There was probably no outside shoulder originally until the road started to rut. 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 into which the water returned is indicated in blue.

About 1922 - Photo courtesy of Edward Fenn

They unloaded the car in front of the house, checked the radiator....

About 1922 - Photo courtesy of Edward Fenn

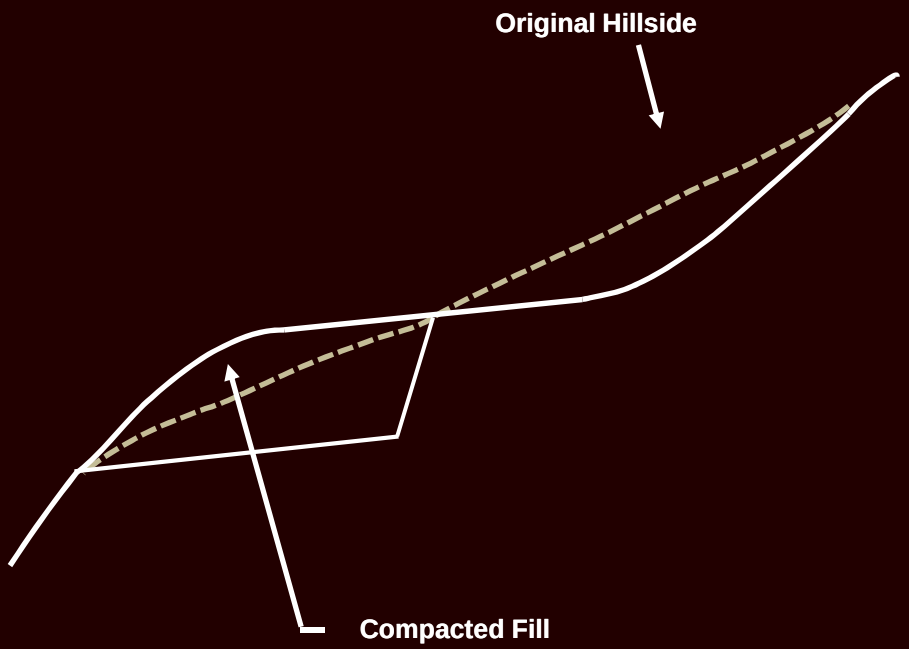
… and after assisting the lady, Ed parked The Dodge under the tree on the right.
Note the stairs on the left under the horse's massive chest. This is the same spot as…

…this. Here is the repeat cross-section photo (I would need a ladder for the original perspective). Water from the draw above crosses here, combining with what water came down the road. Altogether, I estimate that over 2,000 cubic yards of material were 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 could 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 additional emergency evacuation route. Why can't we do that?

In two words, "legalized bureaucracy," the same people "protecting the environment."

June 2022 – The concrete for the outfall will be discussed in the chapter on drainage

I am using this road section as a drainage channel for a substantial amount of water, but it is unlikely ever to suffer a Type II Failure because there is a grade for drainage channels below which they collect sediment and above which the bottom erodes, depending upon the type of sediment and the flow rate. In most cases here, I have found that in channels where there is no wood in the bottom, the ideal grade between those limits is about a 10% slope (drop over run). The road grade in this spot is below that, but there is little silt accumulation because I have an even flatter and wider area above the rocked drop where I collect that material and dig it out upon occasion. Instead, it collects woody trash from my neighbor's Eucalyptus (left), which means I get to clean it out periodically anyway.



Above that drainage outlet, I reshaped the 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 and any dirt project adds to weeding.

This road was reconstructed in 1993 to gain access to the redwood forest at left because it had blown out at this stream crossing long before. That job was followed with a series of improvements as I learned more about road design. I sloped the road grade outward in 2004 (next slide), added the rocked backup crossing surfaced with 3X5 granite gabion rock atop filter fabric in 2006, and finished with a splash channel and wall around the outlet of 5X10 gabion rock in 2015 when the tree at the culvert inlet finally went down. The culvert itself is now of current Forest Service design and otherwise unremarkable.

This old road was re-graded to get equipment in and material out for both forest thinning and fuel control. I first changed the grade from an in-sloped to this out- sloped configuration, making more room to turn around and reducing water through the culvert. It has has required no maintenance at all other than weeding. The two fir trees on the right were left as a windbreak and for high-lead yarding redwood logs out of the stand on the left. The young redwoods invading the upland to the right are now gone.

What made this crossing particularly trouble free is how the water gets to it. The upper drop of mortared broken concrete is tall enough to allow a lower grade below it for slower water flow. I have rushes in that channel to act as a filter and slow the water down so that it won't carry twigs and such into the pipe inlet box. The channel grade has sufficient reserve capacity in its cross section that the water stays in it even if the vegetation captures something. Roads before drainage, drainage before roads…

This culvert is plastic. When the 2020 CZU Fire north of Santa Cruz got out of control, I bought some Hardiboard® and made shields to fit these culvert openings, figuring that if gases couldn't flow through they wouldn't burn. To lock them in takes only a sand bag. I never did find out if they would work, but I kept them as they don't take a lot of space and are quick to install. Because of the inlet design and vegetation to the left of this picture, there is no need for a trash rack here.

This project was to recover the use of a pre-existing road up to that crossing which wrapped around the redwood stand to the left. We also cut in a flat on the right under the madrone for a goat pen and small barn with a chicken coop below it to eat fly larvae.

This was classical road construction as effected by the bulldozer operator I had hired. Roger was a jewel of a human being. Per my request, it had hipped-in drainage channels to collect ALL the runoff to a culvert, which then eroded the slope below the discharge. Note the many trees yet to be taken and ask yourself on the next slide, is there that much less tree cover?

I repented of that old road design in steps. In 2004 I added fill along the base of the slope on the right and moved the old drain because I never liked Roger's notch for water. I didn't have the fill to slope the road, so I used 4 cross ditches to divert water away from the culvert, which stopped the erosion from the discharge. I added another 60yds of fill in 2016 from the embankment job (to come) to slope the grade outward, eliminating all but one of the ditches. I plan to add another 40 yards I acquired from the County's reconstruction of a failure in February 2017, now stockpiled to finish that slope and ease the transition turning up the ramp to the flat.

This narrow ridge extending eastward from the same flat has very steep sidewalls. If the culvert above fails; then there is no good place to drop the water from the flat above off to the sides. So the road is graded to carry drainage down the spine of the ridge while slowing the water and retaining it atop the spine of the ridge with strategically placed and angled branches, losing altitude until I could divert it to the right into where the slope to the channel below was much more gradual. Still, the propensity for a convex surface is to break up the flow into smaller and more chaotic flows, thus reducing concentrated flows. The branches last about15 years.

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 better place to run the water down. Sometimes you have to make one, as we did in the case of the rock drainages you will see. That just takes time and money to get done. I've done two channels 7-10 years apart with this and another left to do. Hopefully I will have the situation corrected within my lifetime. In any case, as I reduce the collection area above it, this one gets its ditch and culvert head cleaned.

Roads Be Trails

August 2016 – This was photographed before ‘paving’ with leafy duff; else, the trail is hard to see

In addition to roads we have trails, basically small roads. They have similar drainage and stability issues but lower loads and surface wear (although raindrop impingement is an issue, as are gophers). The first time I thought about trails was at the suggestion of a visiting docent from Jasper Ridge. Had I known how affordable and useful they are I would have done this many years before. Picking trail routes is one of the more satisfying art projects I’ve undertaken in a very long time. Animals love them too.

Making trails is a lot of work. A small 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 were broken with a vibratory plate. Then hand-rake the surface. Water and pack it with the vibe plate. Then “pave” it with leafy duff to protect it from raindrop impingement.

Trails teach how fast surface erosion in these Mountains really is. The inside edge builds a sluff bank over half its width in only a few years, then demanding a transit with a shovel, packing gopher holes (and setting traps), spreading seed… makes for a nice day.

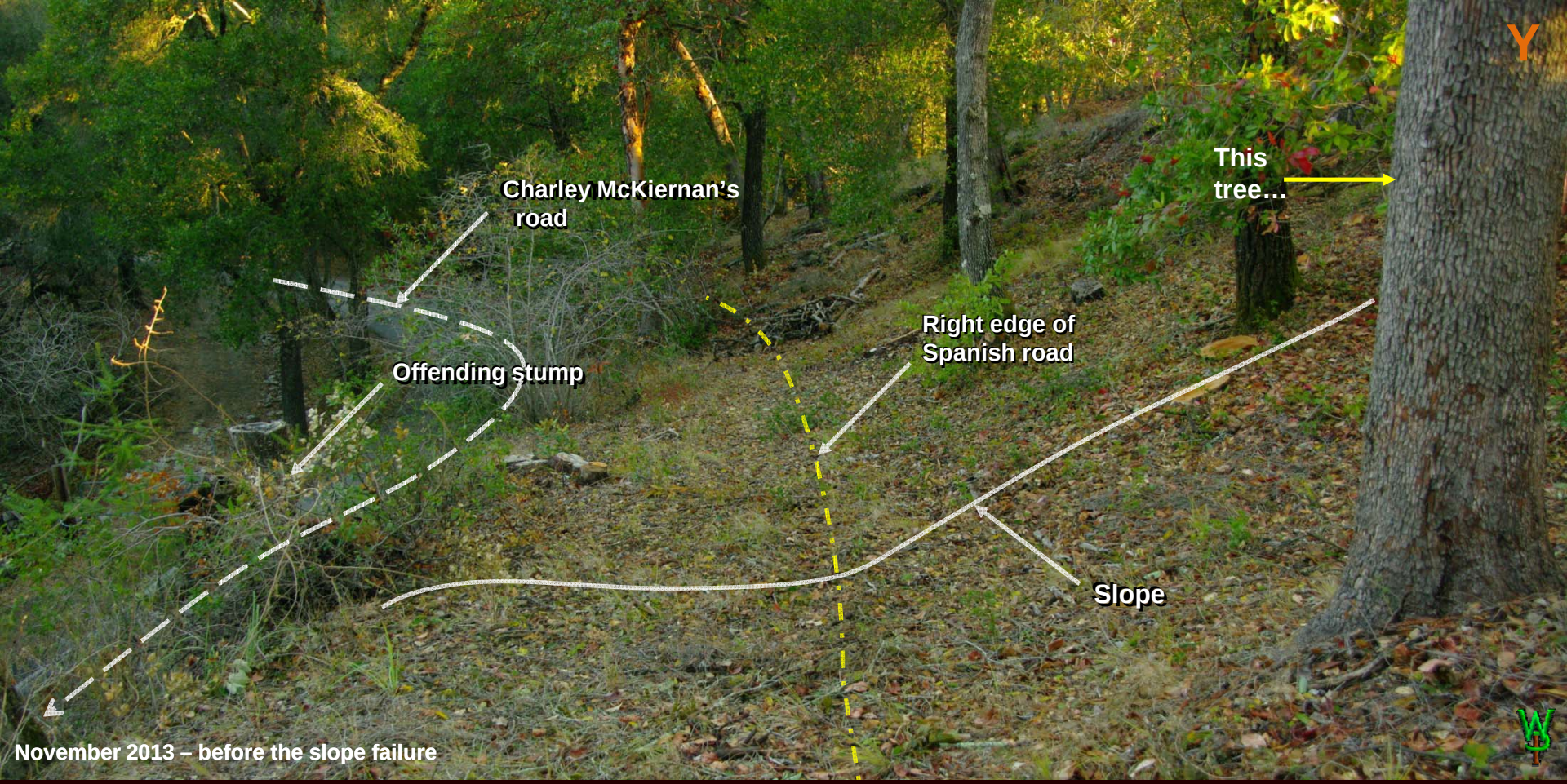
Trails can have stream crossings too but culverts often carry the risk of plugging. I made this crossing out of a redwood log into which I'd ripped a slowly dipping face. The bark and sapwood is likely to erode and rot, while the dip keeps the bulk of flow in the middle, distributing the flow as a thin sheet that resists plugging with twigs the way a pipe could more easily do. This crossing is six years old.

Getting the log to the north draw from the far southern end of the property demanded a bit of improvisation. I raised the bed (it dumps) and strapped the front end of the log to the rack over the end of the flatbed while in raised position. Then I lowered the bed, which didn't work because the front of the bed needed weight. So I added most of a burn-pile-to-be worth of trash to the front. That was enough to pick up the end of the log. I blocked the log in place and repeated the operation until the nose was high enough to get onto the bed. I strapped that end of the log to the front of the bed, dragged it across the dip at the rocked stream crossing, and then backed up the truck against the butt seated in the dip. That shoved the log over the top of the cab. Then I drove it to the ridge overlooking the north draw, chained the butt to a tree, and drove out from under it. That dumped the log, and it rolled it down the hill as desired to within 50' of the stream crossing. The Kubota mini-excavator that installed it did the rest. I miss that dog. Dax was a good girl.

These stairs helped keep the trail grade above less impactful and more manageable. Making the stair frame is one thing, bringing in the fill is another, and the height of a cut bank without the stairs yet a third. By the time this part of the trail was compacted, the landing below them 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 later onto the trail. It's about tradeoffs.

This Is Your Road Too

This was a different type of problem in part due to an old trail! Although it was inevitable, was made more urgent and complicated by environmentalists and lawyers. The first cause was our stump; although I had removed the weight of the tree, it was doomed to slide. As the stump sagged, its roots tangled with others and started to pull off the whole slope. However, the second problem was that County lawyers ordered the ditches "cleaned" two feet from the pavement edge to keep the water off the pavement. The problem with that "logic" is that anybody driving fast enough to hydroplane on single-lane, windy roads like this deserves what they will get. The third cause was that the entire slope had been saturated by drainage for that old trail. Oh, and then there was the 90 inches of rain we got that winter. 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. The customary landowner practice is to allow their trees to fall, block the road, and then complain to the County. Then the County (after dealing with bigger problems elsewhere) 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 all 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 DPW.



Yet there was a complication to beginning the job to which you are now a witness, a moral obligation to do a bit of extra work 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 the same course as the County road below. The natural slope would never have been level across it as it is here and the pathway is wrong for a terrace for a row of apples. The soil beneath that yellow line is very soft and dark with organic matter, as if it was an old drainage ditch that had filled in, absorbing water like a sponge. It is as if this was an older road, abandoned long ago… except the only older road made before the 1850s when Charley McKiernan built the one below was opened in August 1791, made by Indians of Mission Santa Clara with sticks and baskets. Accordingly, it seems to me that this may indeed be that old Spanish track. Unfortunately, the repair to reslope that overhanging embankment would remove just about all of the old road. What to do? Get the permit, check it with a metal detector, document it for the archaeological record, 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 222 years previously, but it's just how things have to be.

Getting rid of the mess is of course was not at all free for us. This Case backhoe rented for $2,000 a week (of which almost $500 was 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 and government projects. Taxes.

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 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 in It 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 another $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. The next morning, she jumped in the bucket to ride to the job, as usual. I started the tractor and raised 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 it 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*.

December 2016 – Semi-transparent tarp installation in progress

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 drainage chapter. Note the date. Unfortunately, I was too late.

September 2017 – From 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. That winter, 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 received a classic seed and mulch treatment and was watered before being again covered with timbers, tops and plastic as before.

September 2017 – Just down the road from the prior image

In the same project, I had sloped off an overhang to improve visibility around this blind corner, having witnessed a cyclist hit by a car here. This part of the project got rain in early fall, and was then 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 native bunch grasses are green. Had I watered it over the summer, they would have met that full cover expectation with more soil-holding power than do the annuals the County uses. We have only to wait.

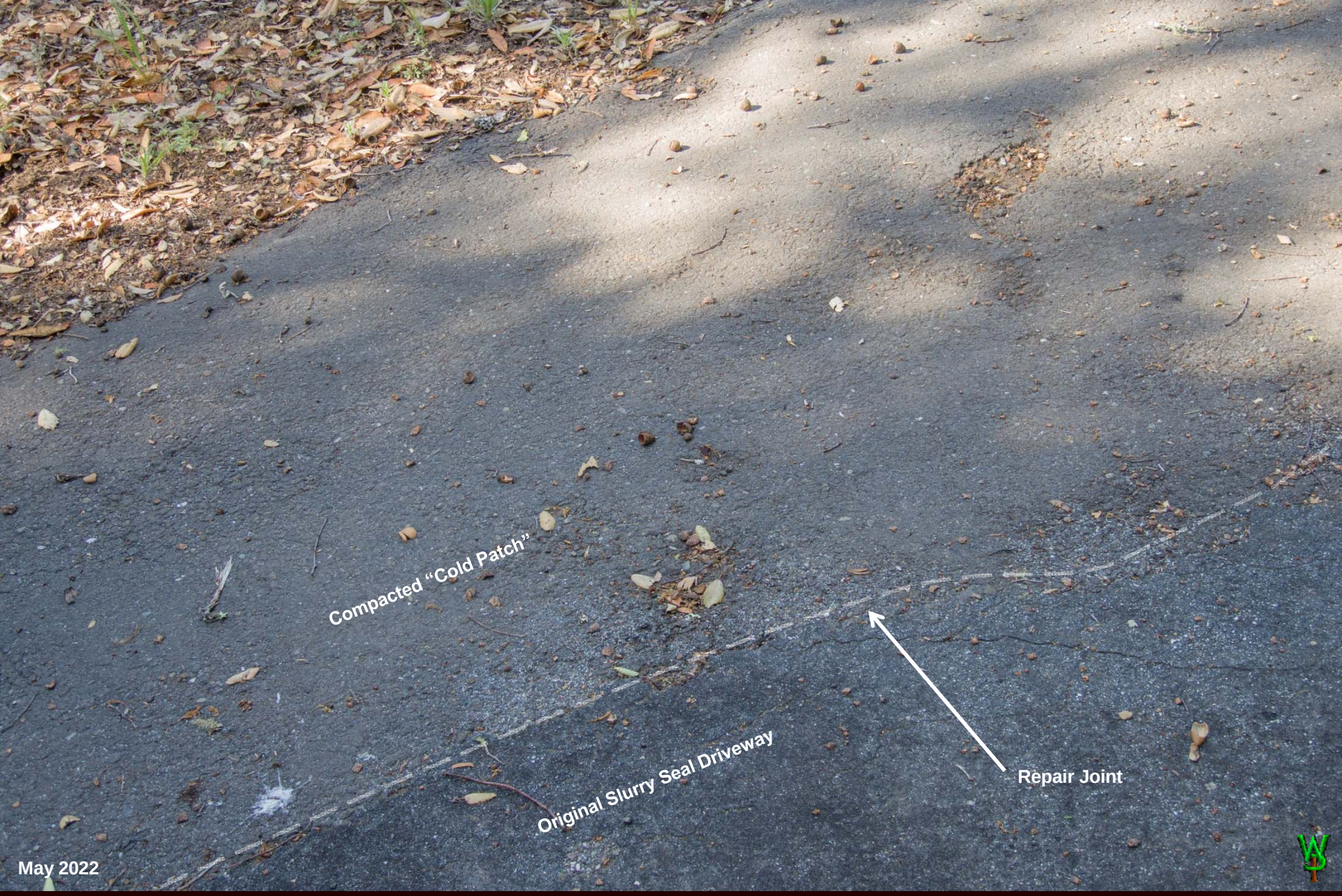
Thin Skinned

May 2022

The principal determinant in maintaining good roads at lower cost is paving. The original construction method for County roads up here was typically oil and screens on bare dirt built up to about a half-inch thick. It was a huge improvement over dirt, and a thin skin is not necessarily deficient. As long as the substrate is good, a good surface skin is all that is necessary, particularly on straight sections where the tires do not scrub against the surface nearly as much as in corners. In some places on bare rock, that coating has held up with a very occasional refresh for decades longer than places with 2” of asphalt concrete on a poor substrate.

When we built our house, if one kept the grade below 15%, six inches of compacted base rock (a relatively impermeable mix of sand, gravel, and clays) was all that was required (and therefore all it received). Once I had made concrete curb gutters along its entire length, it was oiled with a special mix of oil and “slurry seal aggregate #2.” Together with the oil that penetrates the base rock, it forms what is effectively a ½” thick micro-base-rock asphalt concrete bonded into the base rock. There is a lot of labor involved sweeping up the chips and redistributing them to be rolled in by tires, but the pavement has held up very well for 15 years (now starting to spall in a couple of spots). The only place where there have been serious failures are where incompetent delivery trucks drivers turn their wheels to turn around on a hot sunny day while sitting dead still. The reason for the failure was that the surface was able to slide on the substrate. The fix to that is to bond the skin to bigger rock.

I have concluded that in places where that extra shear is put into the substrate, a larger aggregate in the base is would inhibit movement near the surface. Accordingly, in places where I added to the paved system, I went to 1½ “ base rock, where there has been no problem since. However, on a compliant substrate, the 1½ “ base-rock/coating system is more subject to cracking. Even compacted fill will eventually settle and crack the surface. Then there are gophers. Any process has its tradeoffs.



Patching this coating works the same way as with regular asphalt concrete, but requires less material. I blow the dust and organics out the hole to expose the compacted base-rock, tie up the base-rock with an emulsion of hot water and oil, spread in some cold patch, pack it down with a vibe plate, and then seal the joint with oil and slurry aggregate which inhibits cracks developing at the joint. This is how the County should be finishing its repairs. The patch above is seven years old.

Any gutter I would build in the future would be constructed in a manner similar to this, something I wish I'd done on the whole system instead of forming full concrete gutters with a backsplash. I simply formed and poured edge with a #4 bar in it while making the back splash out of similar pieces "grouted" with a mix of base rock and Portland cement. I then laid down broken concrete from sidewalks (bottom side up) for texture in the bottom, and poured dry sack concrete into the joints. Rain set the concrete. The bottoms of the chunks look sort of like rock and slow the water down. Recycling at its finest. Broken concrete slab material has many uses here.

Turn On, Turn In, Turnout

March 2022 – Same corner; note the groundcover

This is the same blind corner I had sloped off, illustrating one of my pet peeves on one-lane roads up here: a lack of turnouts. This one was the first I made back in 1990 to give the mailman a safe place to pull off the road and deliver until we had a driveway to the house we had yet to build. Because it sits at the apex of a blind corner, I'd like to pave it to 2-lanes wide, giving drivers a place to avoid an accident when meeting an opposing driver from the other side, thus making head-on collisions less likely (it has happened).

This is, after all, a one-lane road with serious consequences for falling off!!! On most of it, one can barely squeeze past oncoming traffic at all. There are many sections of it, (the one above is immediately to the south our next turnout), where it is impossible to get past oncoming traffic for some 150 yards with a blind corner at the end (where the first turnout is). The State traffic laws say the driver headed uphill has right of way. On this road, that rule is often more of a hazard than a way to facilitate working things out with the opposing driver. First, if one is headed downhill, a sharp blind corner behind makes the operation of backing up very dangerous. Second, the topography on this road usually has the visible hillside to the right of an uphill driver. In that case, it is safer for uphill traffic to back up toward a visible embankment than it is for downhill traffic to back up toward the edge of an invisible precipice.

This is our largest turnout at the north end of our property. I built it in the early 1990s. Back then, the chief reason was that it was one of the 5-6 places along the over five miles of the County road that one could offload or stage heavy equipment to do forestry or maintain private roads. For the most part, it was already here, but I enlarged it, brought in a double “transfer” truckload of base rock, and had it rolled. I later oiled it so that it wouldn’t grow weeds. It has required no maintenance since. There is a private road that crosses the County road here that makes enough room to turn a tractor-trailer truck around. As you will see, we all need to do this.

I later realized that the biggie for making big turnouts is when there is a genuine emergency. The rains of early 2017 caused landslides of such magnitude that the State closed Highway 17. Thousands of commuters were stranded, and what did they do? They asked Google, Waze, or MapQuest for an alternative route. This one-lane road was it, complete with its own washouts and slides. The traffic jam of scared and desperate drivers was almost 5 miles long. How would an emergency vehicle get by without frequent turnouts on which to park the cars? With this one at 130' long X 20' wide, I had the cars park diagonally so that "convoys" could get by each other. For emergency vehicles such as an ambulance or fire truck, turnouts can mean life or death.

The top of our driveway forms an automotive turnout (too short for a tractor-trailer truck). It too forms a T junction (a.k.a. “hammerhead”) into which one can back in a trailer to turn around. The driveway and paved road system could easily hold 20 cars. If I included parking on dirt, that number rises to perhaps 50. In a real emergency, just knowing those numbers matters.

This is the next blind corner along our place to the south has the potential to be two lanes wide once I remove these two trees (it's too short to be legally qualified as a turnout). That will happen after I get more shrubs established along the roadside to help direct animal crossings, provide a visual screen, and to inhibit exotic seed from my neighbor across the road. Unfortunately, to grade it off flush will require the stumps to rot first. I may get some chips dumped here to accelerate that process.

To the left is what *could* have been a "legally qualifying" turnout, again with the driveway as a "hammerhead" long enough to turn a trailer. It sits between two stretches of the road too narrow to pass, each over 150 yards. In 2020, PG&E replaced the power pole. This was an opportunity to relocate the pole behind what could then be said "legally qualifying turnout" capable of handling a truck delivering heavy equipment or to allow a fire truck to get by a line of evacuating cars. Yes, I told the owner all of those reasons to move the pole in advance so the job could be done for free. No, he didn't do it. Wait until he finds what that mistake could cost him.

What is a “legally qualifying turnout”? The California State Board of Forestry is in the process of mandating all roads to houses to be defended by CalFire MUST have turnouts every ¼-mile (**max**) between sections of road 20’ wide or those neighborhoods will not qualify for building permits (including for improvements to improve fire safety). Virtually NONE of this County road is 20’ wide, which means we MUST have turnouts less than ¼-mile apart along its entire 4.3 mile length to the next two lane intersection or NO permits will be issued including any branch roads off of it. “Turnouts shall be a minimum of twelve (12) feet wide and thirty (30) feet long with a minimum twenty-five (25) foot taper on each end” (80’ total). My neighbor did nothing to get PG&E to make that turnout affordable.

Just below the Spanish Gulch beyond our property line, just **over ¼** mile from our qualifying northern turnout, is this qualifying turnout I made with the owner's permission. Hence, the entire road and any branch roads off of it would not qualify for building permits without one in between. Had my neighbor asked PG&E to relocate the pole, we could have covered this section very inexpensively. Now it will cost in excess of $30,000 just to move the pole in addition to a bit of compacted fill he would need to make it 12' wide. My guess as to the reason for the rule is that the firefighters' union demanded more turnouts, because a total of 3 firefighters (nationwide) have died in traffic accidents in the last decade. Turnouts matter to firefighters. Hopefully, now they matter to you too.

This “bump” of dirt is just above the headwall of the “Spanish Gulch” (see the chapter on drainage). Uphill traffic has the right of way. If you were driving down this slope into a blind corner, would you like to back up to this crest behind you with no escape? If you were driving uphill, would you use a turnout to avoid a clueless driver suddenly heading downhill after a long straightaway ending at a blind corner they can’t see coming? I asked the County for permission to build it. They said I would have to install a $10,000 guardrail. Consider the depth of hypocrisy in demanding a guardrail for a turnout when they don’t have one across the top of Spanish Gulch!

August 2016 – My neighbor could get his fill here.

But, the six turnouts we would then have in 0.6 of a mile would still not be enough for the new CalFire road standard, a spec the County road cannot ever meet for a problem I've been hammering on for decades**:** They want a minimum 40ft inside radius for ALL turns, including driveways, twice what they required when we built. The radius on this corner on the County road (at left) might be 15'. Our "rock nose" poses a similar problem. There is one other turn with a massive "old growth" redwood in the way nobody will cut. Together, in the event SR17 was closed, these 3 corners could prevent CalFire from getting a bulldozer from Scotts Valley to Summit Road with billions in real estate value at stake.

Similarly, CalFire also wants ALL residential driveways, to have a 40ft inside radius "turnabout" within 50 feet of any qualifying residence. I'm guessing over half the houses in these mountains could never qualify.

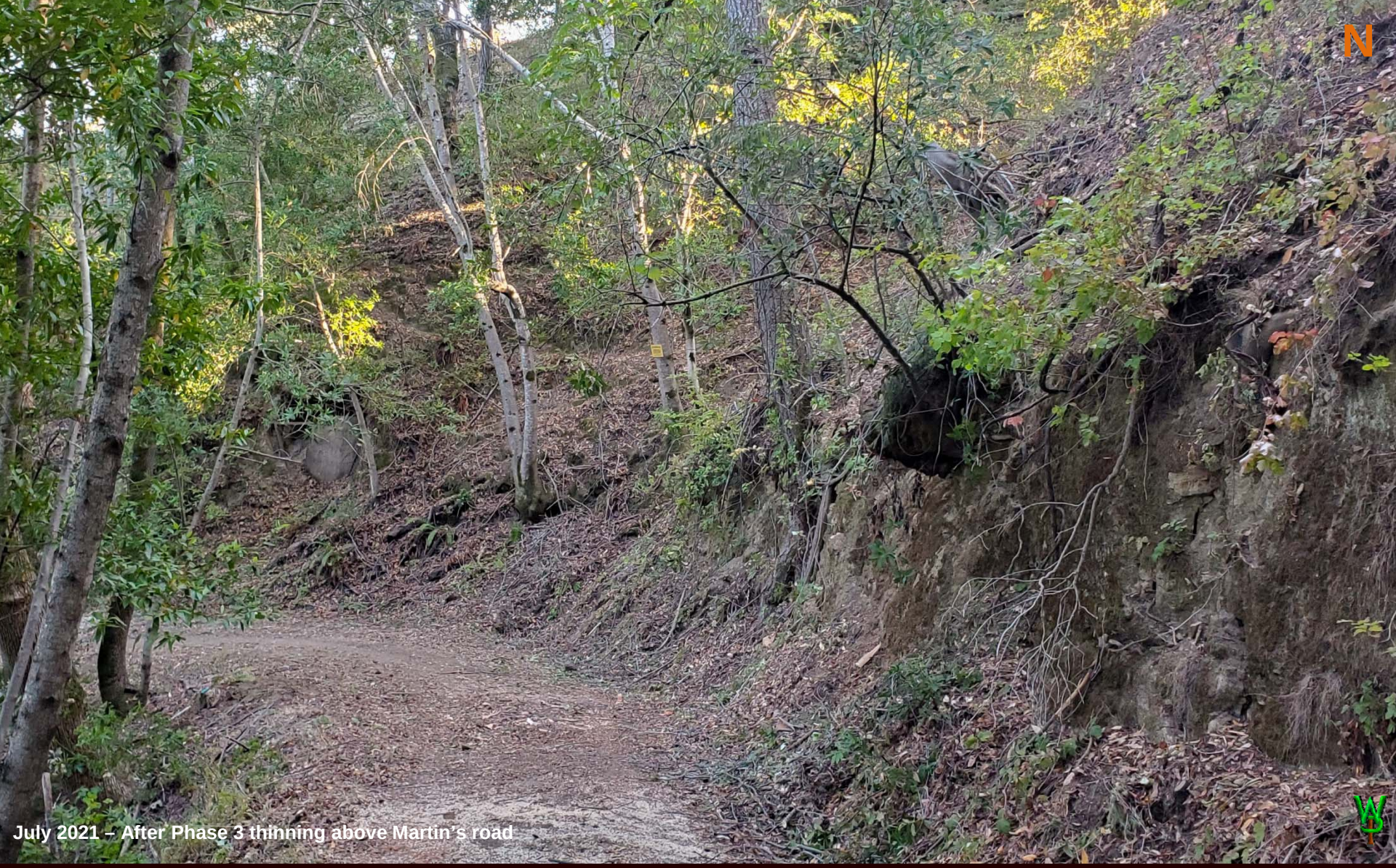
If you think for one minute that this initiative is really about fire safety, and not a way for political donors to make money buying cheap after disasters and making you pay buckets of money to live in a crappy dangerous urban tenement, well, you aren't paying attention. After all, this is about protecting "the environ-mint" from you. At that point, who will care for the land? Who will battle weeds, thin forests, and manage habitat for wildlife? The real estate titans pulling the bureaucrats and politicians'' strings think it will all be fine as long as it is "Natural."

And what can disabuse them of that notion? That is the "why" of the *Wildergarten*.

This has always been about money. The point of all this ranting about failing roads is that “General Public” has been in command of this situation all along. The agents of General Public at the State asked investors to build toll roads because General Public wouldn’t pay the State or County enough to do it. Said 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 both our State and Federal agents helped the railroads gain rights of way that put the toll roads out of business and we “bought” those toll roads for $0.10 on the dollar. Then our agents built Highway 17 and ignored that old County road, which they “improved” with a cheap skin of oil and screens they wouldn’t let anybody else get away with to increase tax revenue on new houses.

February 2017

The job for which General Public is supposedly asking is ultimately impossible**:** Roads are fixed assets, but the land is not fixed. When the land effects a change, those fixed assets must continue to serve their purpose. With roads, changes cost everybody a lot, with a lot more hidden in the charge. Hence individual landowners are generally dissuaded from risking to make improvements to collective assets. These issues are about collective claims against individual interests (and vice versa) in a collective comprised of individuals. That paradox is what makes everything collectivized political. The problem with the problem is assigning collective accountability when General Public screws up. General Public doesn't know everything because nobody does, especially in a world with rapidly changing technology. Oh but "we" don't need roads as much as we once did, except for moving supplies and big heavy things, like logs, lumber, garbage, roofing, concrete, fire trucks... In other words, as long as we use wheels to move heavy things, we will still need to fix roads.



July 2021 – After Phase 3 thinning above Martin's road

Some of these old problems (like Martin's road) are on private property. I am not asking you to fix those; landowners have to deal with the resulting steeper slopes anyway. I am asking you to leave those of us who want to fix these 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 an often flimsy claim to protect public health and safety without any 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 animal.

Other Books by Mark Edward Vande Pol

Quick Read Picture Books

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Zion National Park

Canyonlands National Park

Deseret Ranch

Fuels Management, Succession Run Amok

The Cone Fire (the benefits of active forestry)

The Warm Fire (what happens without it)

Fire Aftermath: Mesa Verde National Park (weeds)

The Croy and Summit Fires (the wildland urban interface)

Socio-Ecological Paradigms

Environmental Consequences

Meadow Encroachment in Yosemite Valley

Why we can't accept how the original forest as it once was got that way

Living Sheepishly

Why we need a culture of animal husbandry

Sustained Development

Cities are becoming prisons

Katrina: What Did You Expect?

Environmental bureaucracy can be deadly

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

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. http://www.shemitta.com

Articles at Wildergarten Press: collected writings on Constitutional history and regulatory racketeering by tax-exempt "charitable" foundations. http://www.wildergarten.com/wp_pages/articles.html

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