Fazed Forestry

January 1993

The introduction mentioned how this place was once so impenetrable that I had to crawl. I didn't have photos that could show how thick it was. Well I finally found some old video my wife had taken of a 35-year-old me attacking what I called "The Wall of $hit," a tangled mix of dying buck brush, broom and poison oak. I just chopped at it with a chainsaw, acres of it, lots of chains, gallons of oil and even more gallons of coffee. This place was so thick it had to be taken in phases, starting with making it possible just to walk around.

Wildergarten 6.3

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 4.7 5.2 5.4 5.5 5.8 6.0 6.1 6.2 6.3

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

Articles at Wildergarten Press: collected writings on Constitutional history and regulatory racketeering by tax-exempt "charitable" foundations

Wildergarten Press
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Revision Date: June, 2021

June 2010 – about 70 feet from the previous image

"Phase 1" removes dead undergrowth and dead or dying trees to reduce the fire hazard and to be able to move around freely. On the ground it was pretty barren (above). Clearly, this was never intended as the end product, so one must rightly ask why I stopped thinning at that point. The main purpose of Phase 1 was to buy time, keeping weeds from producing more seed while I got control of bigger problems such as French broom and catastrophic fuel loads elsewhere. Phase 1 greatly reduces fire risk, and is a very stable configuration because the canopy is still closed, allowing insufficient light for most groundcovers, especially weeds. Hence, this first step was entirely defensive in nature, meant to keep things from getting worse quite so rapidly, although the trees were still growing taller and skinnier. So in effect, this first step merely slows the degradation when occupied dealing with even worse.

This is immediately after a heavy Phase 2 thinning before groundcovers had a chance to recover. Phase 2 thinning (A) allows more mature trees to recover from over-crowding, (B) removes enough canopy to produce enough groundcovers such that, when the surface is exposed to more light in Phase 3, they will quickly cover the soil to suppress weeds without becoming a grassland that is much harder to manage. Hence initial phases are primarily a weed suppression strategy. The wood strategically laid across the slope is to retain leafy duff to adsorb rain impingement, slow runoff, feed fungi, and build topsoil but also to suppress weed germination. Both Phases 1 & 2 are fairly stable configurations.

This is two years later. I was able to make this cut heavier than is usual for Phase 2 because I left a screen of trees in the back left to block afternoon sun and slow down the response. I transplanted skullcap *(Scuttelaria tuberosa)*, yerba buena *(Satureja douglasiana)* iris *(I. fernaldii)*, and blue-eyed grass (*Sisyrinchium bellum* also an iris), to help get groundcovers going. Weed problems have been minimal. To take this area to Phase 3, I need only remove the shade screen and one or two more oaks to the right of this image, but I may never do that here because of the weeds invading the area from my neighbor's place across the road.

This is an 8-year-old Phase 2 treatment that had nearly reverted to Phase 1. Said sparse groundcovers came in as stunted individuals 0-3 feet apart, as planned. Unfortunately, the canopy quickly closed sufficiently that the groundcovers receded. Nor does the treatment do anything to stop scads of oak seedlings from taking over upper right). I had also left a substantial number of stumps untreated. Having since learned better, both of those problems are now on the wane.

People, fire, and wildlife once consumed acorns and madrone berries. The Indians are dead, the grizzly bears are gone and coyotes and mountain lions get many deer fawns. But while the trees were over-populated and the understory infested with broom, NOTHING was eating the bulk of that annual acorn drop except rats and squirrels, in effect comprising a weed bank of its own. Guess what happens? You get LOTS of seedlings that kill off those groundcovers. In this area, I removed and counted the equivalent of 8,000 oak seedlings per acre! But it doesn’t look that bad, does it? Remember**:** “Fast doesn’t stop.”

Only fifteen years prior, this was a road. One either needs animals to eat more acorns and berries (and therefore management of their predators) or a way to cull the seedlings. Oak is so hard to kill with sprays, that the process is deadly to non-target plants. So, I invented a tool that is fast, cheap, and more effective than spraying with which to sever roots and pull seedlings.

This is about 30 feet to the right of the prior photo. One of the consequences of tree seedlings is that they ***all*** want to grow. I counted about a dozen oaks on the left about six to eight feet tall in a space of about five feet. Once the stems get over 2" in diameter, they are hard to cull by cutting roots and must be cut and treated at the stump. This had to be done soon.

This Phase 3 thinning began the next year. Note that I saved this oak instead of conifers. I want *fewer* conifers here to keep the space open for conifer removal on the slopes below. I may not need this oak for shade, but in case I do, good small trees like this one are unusual here. To protect it from "sun scald" (the shock of extra light from thinning), I left the 3 madrones. If you look carefully, you'll see that the oak top scorched a bit anyway with the extra sun and drought. In 2017 I took out the 3 madrones. I may grow a future fir here as a gin pole (also called a "spar tree") to facilitate logging the redwood back to a sane stand density at the bottom of the slope below.

November 2013 – A madrone as it should be, with birds to appreciate the crop

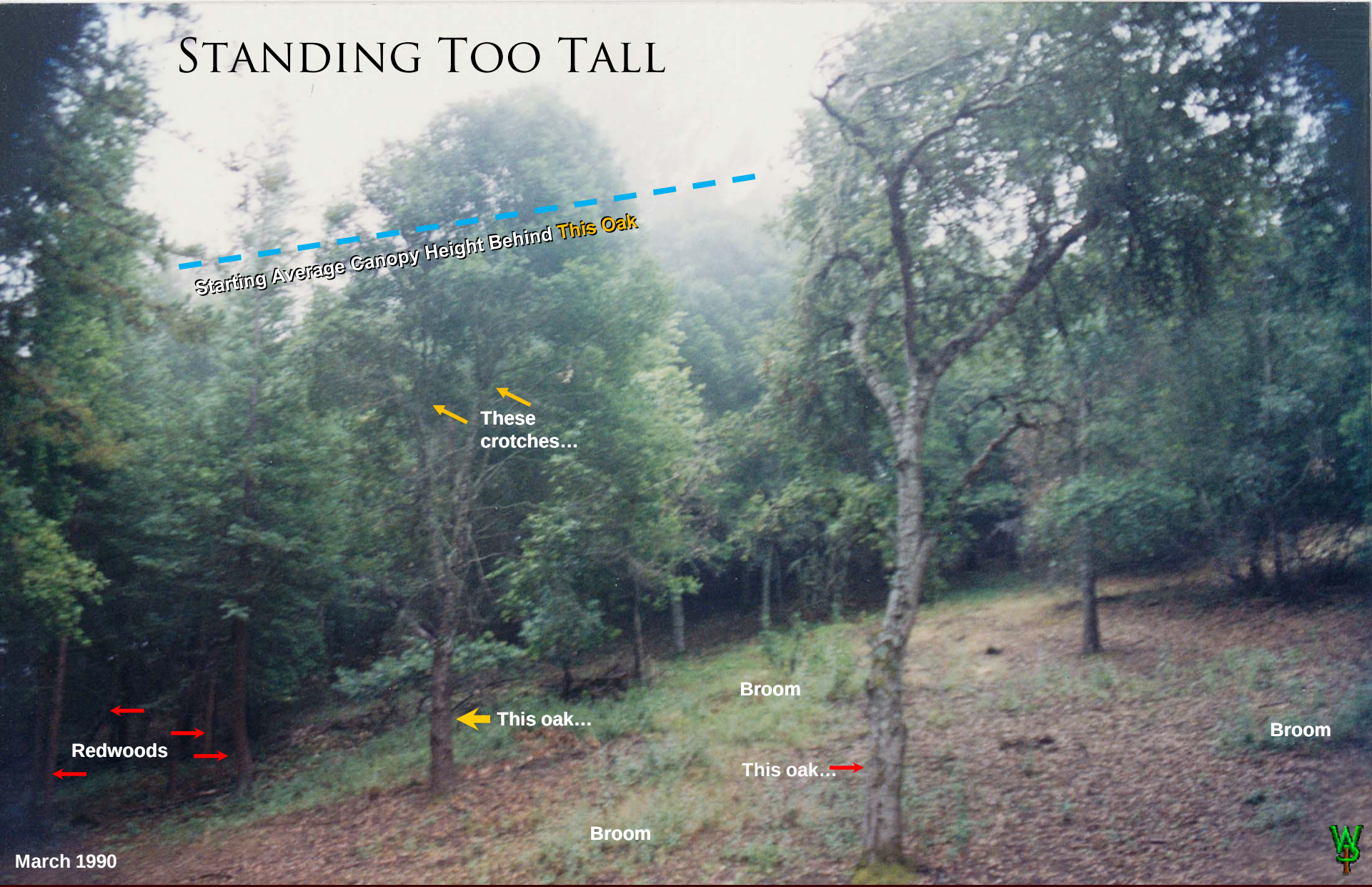
So I try to attract acorn consumers. Deer are under pressure from coyotes around here, about which I can do relatively little considering their numbers (I don't emulate a wounded rabbit convincingly). Yet we also get acorn woodpeckers, squirrels, and band tailed pigeons (eating madrone berries here). We have a redwood that looks to be becoming an acorn granary, so I am hoping to make it into a woodpecker roosting hostel cutting nesting pockets with a chainsaw. More elderberries would help keep band tails year-round.

This patch is a couple years after A Phase 3 cut. I opened it up enough for patches of perennial groundcover and some shrubs with annual lotuses, clovers, blue dicks, and sanicle. There are two grasses that usually populate here**:** pine grass blue wild rye *(Elymus glaucus)* and *(Calamagrostis rubescens)*, both well adapted to shade. The pine grass is low-growing, thick enough to make weeding easy, and a tremendous erosion control (my favorite grass here). The rye I resist here, preferring sedges, irises, lilies, and numerous herbs to facilitate weeding. Just keep the brush and tree seedlings down and the other grasses out and it's easy to manage. Note that the trees are putting out new growth lower down. Their crowns will spread and a few will make decent trees as I thin the rest.

Phase 4 focuses upon developing groundcover and the few trees we have with a decent future. In this case, I retained this small oak because its lower branched structure gives it a better chance to be a sound mature tree than most of what I had. When I removed the adjacent leaning and top-heavy oaks and madrones, it recovered immediately. I may yet take the top out of it and head off a couple of branches, because without treatment it is likely to bolt. The question relates to how many trees over what type of groundcover makes for the best combination of easy maintenance, fuel control, and productivity. With shade, a groundcover can take 5+ years to develop.

There is a peril to Phase 4 in that the brush seed bank starts to express suddenly or gradually depending upon light and species. Similar to the “weed bank” this is partly a legacy expression of a site that was at one time probably choked with brush before it crowded out by oak woodland. Hence, making decisions about such things is a bit of a delicate balance. So I’m taking my cues from what it appears the Indians did, which is to manage brush in patches as combined with my needs for particular locations. The overall goal is food and cover food for wildlife while providing Swallowtail butterfly caterpillars habitat for birds to use to feed their nestlings.

Standing Too Tall



Primary succession toward conifers began with the Spanish burn ban of 1793 (site history). By 1990, there were 24" firs just up the slope. This image from the repeat photos chapter shows that successional process in which conifers shaded this oak to death. The stand in the background was thinned to Phase 2 in which the firs were removed because there was only so much I could do at that time. Notice the height of the oak in the mid ground I wanted to keep and the redwoods behind it. Unfortunately, my first priority was broom (the lighter green) and (back then) the redwoods were only 6-8". So the conifers had to stay until I got broom under control.

By 2002 (12 years later), those once small redwoods threatened the foreground oak-madrone woodland with shade, ideally (to me) dense groundcovers among multi-aged trees and occasional shrub thickets. This is just after a Phase 3 thinning in the foreground and Phase 2 in the far background (where it is lighter) during which I had removed the fir. I left the redwood as part of a "dark barrier" to minimize weed transmission between the two thinned areas until I had both under control. I wanted to keep the oak with the gold arrows, but the redwood and oak was already shading it to the point that its crown was starting to thin.

On the far side of that “dark barrier” has been this open patch of groundcovers. These open patches are of their limited size to keep them shady so as to keep the grasses down because they are harder to weed. In some instances I plant new trees, but I prefer to start those in brush patches because they offer tree seedlings protection from browsers and induce them to develop straight trunks.

Eight years after that first thinning, root rot took down that oak, which then put the groundcover at risk of becoming a grassland. The concern is that this type of oak understory takes about a quarter of the time to maintain as even a pristine grassland: one half-day, three times a year, is about all that is necessary to keep it like this. To keep it, I cull natives: coyote brush, fir saplings, deer weed, and some of the grasses; else it would soon become unmanageable. I must also continue to thin oak and madrone seedlings, as they grow fast when allowed the extra room. I am also propagating deciduous native black oak here, which I believe I can grow in such a way as to maintain the groundcover while still shading out the grasses because of the additional winter light. Accordingly in coming years, I'll start burning here to deter grasses and see how remaining weeds and natives respond to periodic disturbances.

Note the “halo” of barren leaf litter around most of the oak trees. When radial “buttress roots” are buried in duff, they can put out laterals that grow across the top of other buttress roots. Arborists call these “girdling roots.” As they grow in diameter, girdling roots press against the buttress root to the point that the two root cuticles are broken, thus exposing the buttress root to infection by root fungi such as *Armillaria*. About ten years later, down goes the tree, which is why it is so bad to bury an oak root crown.

Thin sufficiently, and one induces an “inverted halo,” of *more* intense groundcovers around the tree enjoying the partial shade and crawling up the trunk. Yet the groundcovers may possibly (I don’t know) also stimulate the growth of “girdling roots.” Yet the same process happens with sufficient leaf litter accumulation! Is fire the only answer? How often should there be a burn with each of the two groundcover types? Sounds like another experiment to be done, doesn’t it?

Here is a good spot for such an experiment. This tree had girdling roots because of fill dirt from the road above about 8 feet away. I dug out the root crown and removed a 1” diameter root about 10 years before this photo. Funny thing, the tree grew so fast that it now needs the treatment again. So now I want to know about the relative safety of promoting inverted halos or how they are best managed and this tree developed a wonderful groundcover of yerba buena *(Satureja douglasiana)*. It may be something that only works if one burns off the excess leafy matter at a particular frequency, groundcovers or not. One does not need to wait for the tree to die to find out.

It was rewriting this chapter (again) that led me to note from the prior photo that this dug-out root crown presented exactly such an opportunity! One does not need to wait for the tree to die to find out; DO THE EXPERIMENT! The tree had grown so much that it needed its root crown dug out again instead, but there were no girdling roots present.

July 2015 – There are other opportunities nearby for the same burning experiment, and for similar reasons.

These questions are all about what kind of trees I want to grow to promote the forest I want to grow. I want spacing sufficient to keep the trees from getting too skinny and weak, but I want trunks tall enough to withstand less frequent fire than Indians employed. Taller trunks promote inverted halos, but do those pose a risk? So do I want spreading trees with the leaders taken out? How high? Do I need more verdant groundcovers and shrubs to feed wildlife so that they eat the extra acorns? Do those aspect ratios change with slope? Obviously, I'd rather have an array of ages including a few craggy monsters with some younger trees around to replace them if needed.

Two years after the oak fell, the foreground open area is now relatively free of weeds. The oak canopy in the background had closed, thus shading out the groundcovers, reverting to Phase 1. I had removed one redwood (the wad in front). The plan was to remove the "dark barrier" and thin the stand behind to produce groundcovers for wildlife forage. The rationale for removing redwood from a deciduous woodland can be either that they are not doing well, or that they are doing **too** well, shading out an oak forest I want to keep.

October 2013 – Removing the redwood Dark Barrier, just before thinning oak woodland

When we got here, none of these redwoods was over 15 years old. There were no old stumps, nor was this area terraced for apples. As mentioned in the site history chapter, when the Indians managed this area, the plants here were mostly bulbs, some of which are now coming back. From analysis of those species, I doubt redwood has been on this upper slope for at least 10,000 years, judging that the presence of conifers on this upland at all was an artifact of fire-suppression. There weren't any fir trees here at all until 1931.

This was the Phase 3 thinning in process behind that “dark barrier.” The tops had been piled and burned (else one can’t photograph it for all the material). This kind of thinning must be done in stages, in that one accumulates so many logs and tops that they tangle, making pulling them out a pain. After the mayhem, in go the plugs and transplants (black oak in the cage), particularly in burn spots. Foresters often wonder why I don’t simply slash the material and let it rot. Weeds can seed undetected under slash until it rots (which can take the better part of seven or eight years after which one must deal with more weeds anyway). I wanted the weeds to germinate to kill them with less damage to returning natives. After a couple of years (and rain), this understory was carpeted with life.

The groundcovers really did spread. I'll continue to develop shrubs in patches for deciduous seedlings. The downed oak in the right foreground had suffered from root rot for at least fifteen years and finally went down (repairing the road probably abetted the rot). Once a beautiful old tree, it became beautiful firewood, but I did have to rebuild the adjacent culvert inlet.

The response was rapid**:** blackberry, grasses, more clovers, weeds, and lots of *Sanicula crassicaulis*. I'll continue to develop shrubs and deciduous seedlings to shade the grasses. My dear sweet wife in the photo is weeding hedge parsley *(Torilis arvensis)*.

An arborist friend of mine had a maxim about oak trees**:** “If it’s over 30 feet tall and only 6 inches in diameter, it will never be any good.” Of course, that depends upon what one thinks is a “good” oak tree. None here will ever meet that standard, nor should they. These are not *architectural* oak trees.

These oaks had grown so tall and gangly that few had sound structure. Yet there are some benefits to that. A thinned stand of oaks with long trunks reduces fire hazards, making both openings and shade with which to maintain an intense ground-cover. Straight trunks and branches make firewood that is easy to split (having fewer knots) and produce less foliage to drag and burn.

Yet to grow a stand of trees like that means no understory until they are thinned, they don’t live long, and they are more subject to breakage. In either case, tons of acorns are a problem. So in essence, my preferences in oak trees here are a compromise between that arborist’s standard, growing for firewood, forage, and reduced fire intensity. varietal groundcovers, lower hazards, and ease of maintenance.

Unfortunately, these are so skinny they will never meet that compromise. Over the long run, this stand needs to be restructured from scratch. The preferred tree is black oak, of which there was but one left in this whole stand. Deciduous oaks allow groundcover growth in winter and their leaf litter decomposes more quickly into soil.

How far it will get is unknowable right now. This is the last major thinning on this upper slope in my lifetime. The future will be culling individual trees, weeding, developing shrubs, shaping seedling trees, weeding... In other words, the fun part of restoration. That is Phase 4.

There are still too many trees.

Phased forestry as practiced here started as a necessity, both because of my limited time and money and because the problems with fuel loads, broom, and other weeds elsewhere were so serious that the weeds in much of the seed bank had to go before even thinking about native shrubs or (in places) even the eventual forest structure. We did pay a price for the wait in that the trees in earlier phases merely grew taller and skinnier while closing up the canopy. Nor did we establish as many shrubs with as much variety as is desirable. When one thins at that point, the result looks like it does at left. As a result, we had few good young trees or shrub seedlings with which to work and was forced to thin more aggressively later on than I might otherwise have preferred.

At that point I had to replant new trees with sufficient space for them to develop which itself resulted in delay, more grasses, and more weeding. I learned a lot about tree spacing though, and how fast it all grows no matter what.

The site history had constrained what could be done to fix it. Even so, the results on this slope were among the most satisfying I have done, simply because it was so easy to establish native cover by comparison to other projects here.

One reason is that this slope was never grazed or terraced for orchards. That meant the number of weed introductions was considerably simpler, albeit some, such as Spanish brome, remain a challenge because my neighbors across the road don't give a rip about their land, a situation that promises to get much worse because of the foolishness of popular wisdom.

Same slope, 4 years later from lower down to the right. I'm already starting to cull brush Obviously, it is beautiful and getting healthier, and that aesthetic is important, but why do this if it only means extra work? Wildlife forage is important, not just to have more animals but to save labor: I wanted fewer trees. That means I have to reduce the reproduction rate of trees. A moderate -sized oak drops hundreds of pounds of acorns in a few months. To keep animals here to eat them, I need good forage all year.

Now to me, this looks more like a forest**:** Lush groundcovers, trees putting out lower branches, and only occasional brush. So this project went great because of the way it was less infected by the exotic seed bank AND I had weeded the few obnoxious invaders for many years prior (especially hedge parsley, *Torilis arvensis)*. As these skinny leave-trees broaden to reduce the light I'll remove them as Phase 4 in favor of the saplings that either come up or I plant. Of the natives, the deerweed is a pain. It is invasive, hides weeds, and lives only a few years leaving a mat of tinder on the ground. Toyon, manzanita, *Ribes*, hazelnut, and *Holodiscus* are preferred.

More Meets Eye

May 2015

There are aspects to hardwood forestry that interact with the conifer stands I want to keep. While a redwood forest suffers similar overstocking problems the hardwoods once had, overstocked redwood makes better lumber (see chapter on conifer forestry). In essence, the broadleaf forest at right is also being configured to facilitate thinning the conifers at left by two means. First, the two firs to the right of the road are to be “spar trees” capable of supporting a cable block placed about 30 feet up with which to pull the redwood logs up the slope without tearing up the ground. The trick is to find trees behind them to anchor the backstays to support the poles.

Second, “felling pockets” are cut into the hardwood stand (inside the dotted line) into which to drop the redwood and pull the logs to a truck with a self-loading crane. I left no hardwood logs or stumps in these pockets so as to reduce redwood breakage when they fall and to preclude snagging when dragging logs out. Note the patch of Ceanothus; 20 years ago, that was a burn pile (next slide).

The easy way to get a tree seedling going with good structure and in a selected spot is to start with brush. Where there is seed, up comes *Ceanothus*! This burn pile produced twenty seedlings for transplanting, yet there are still more than this spot can sustain. Small madrone trees are starting inside, sheltered from deer by the bushes and bolting straight up for light. Once I pick one or two saplings large enough to escape browsing, most of the Ceanothus will come out. Over time, this process will help produce an uneven-aged stand of oak and madrone with decent trunks and small patches of brush in between. That is the essence of Phase 4.

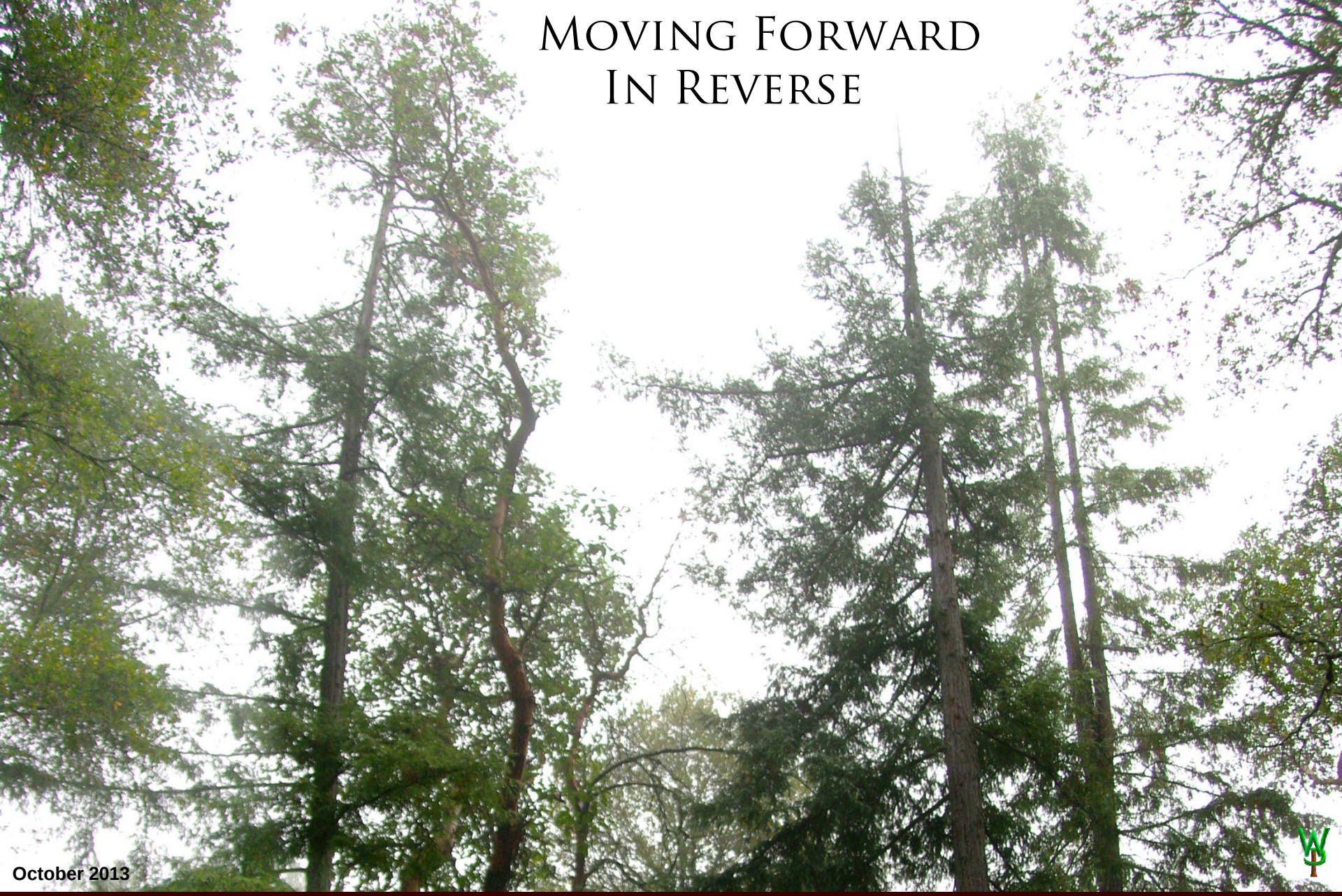
This is farther back yet and to the right looking through what was the “dark barrier” which began in the foreground. After three winters, the groundcover is luxuriant. Tree removal reduces competition for soil moisture, which is important given the inevitability of occasional drought. Thinning before logging gives the toyon shrubs a couple of years to get used to the extra light without scalding. Then, just before logging redwood, I will cut the toyon to the ground which will force them to rejuvenate with strong densely foliated shoots more tolerant to the extra sun (it also gets them out of the way for yarding logs). Phase 4 has begun here; the main activity beyond weeding is culling seedling trees and shrubs. Cultivating saprophytic fungi also begins with logs from Phase 4 thinning.

“Easier” just may be possible. This spot started as a small patch of planted native perennials next to a box of redwood timbers made to protect this oak’s roots. In 1998, this was as close to contrived “landscaping” as there is here, with irises, snowberry, and yerba buena. Now it is overgrown with native miner’s lettuce and grasses. Outside this patch , oak seedlings sprout like crazy, whether on a rocked road or a patch of loose soil on the other side of an asphalt walkway. For nearly 20 years, removing scads of seedlings from under this tree, I had never realized that I had NEVER seen a single tree seedling in this patch of plants. Call it OCD-related blindness because it wasn’t a planned experiment. The point is that something in this native system is very efficient at rendering acorns infertile. Is it weevils? Mice? Rats? Pathogens? I’m leaning toward the bugs, but the one thing that is sure is that nobody knows for sure.

October 2016
Aerial Photo of the Summit Fire
About 15 miles from here
Photographer unknown

Such research opportunities may not be insignificant. This ridgeline is covered with trees where once there were few to none. Amid the trees is a neighborhood peppered with million-dollar houses surrounded with fuel. Consider of what happened to Paradise California, Malibu, Santa Rosa, Santa Barbara, Redding… $12.4 billion in losses in 2017 alone. One would think learning to control sprouting acorns with combinations of native vegetation, bugs, animals, fungi, or whatever would be a big opportunity. That nobody knows how to manage the process reliably shows how alienated from reality the research priorities of our major universities really are. We either learn how to live with our surroundings, or the potential exists for the surrounding consequences to destroy all we possess, if not kill us.

Moving Forward In Reverse

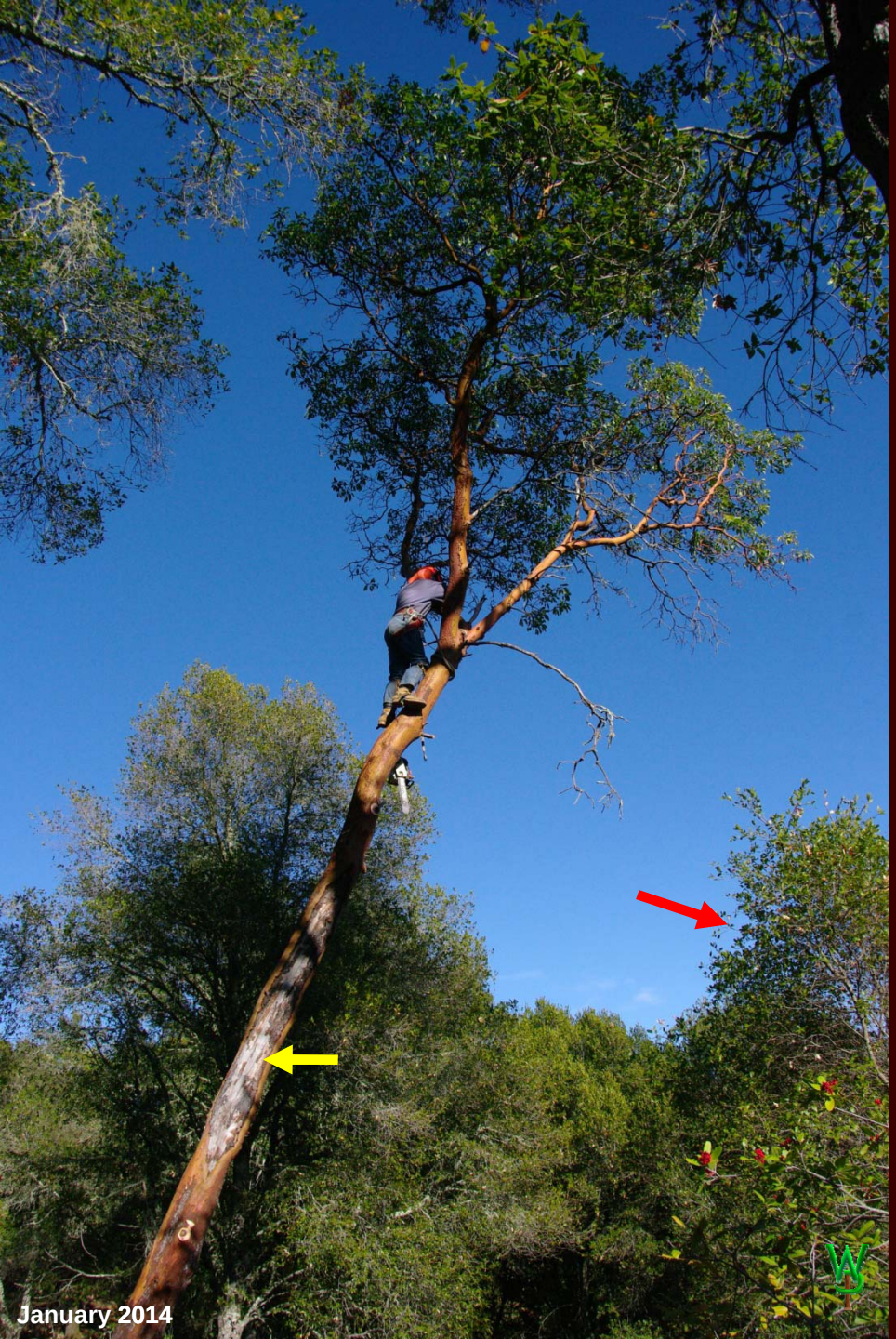


October 2013

This area is just south of the entry. Thinning here started with reversing that other successional condition with redwood**:** These 50' trees were *not "*doing well." As soon as they penetrated the oak canopy their tops were frying, even in the late afternoon shade of a healthy cluster of redwood on the other side of the road. Therefore, these were the next to go… *after* the nearby forest yellow-jackets *(Vespula acadica)* were done for the year! (At that time, I had no safe and effective yellow jacket control method; I do now.)

January 2014 – A good view of how gangly overstocked hardwoods can get when forced to seek light

Looking along where those redwoods stood shows a good example of an oak/madrone forest in the midst of transition to a multi-aged savannah of broader trees with primarily perennial groundcovers for forage and easy maintenance. The taller trees along the road are among the last of the original stand structure yet to be removed. The skinny madrone (blue arrow) overhanging the nicely shaped young oak below it (red arrow) was the next to go. I'll remove the rest of these "spindlies" slowly, as they are for now a source of partial shade until the groundcovers and shrubs have recovered from the transition. Spindlies make great firewood.



The madrone was the last hazard tree removal of the season. It was rotting in the middle of the trunk and leaned over our 240V main power lines. Hazard trees like are very common in these mountains. They cost $500-700 each to remove. Eventually, it would have broken and fallen on both the power lines and said nicely shaped young oak tree below it. Young trees with good structure are rare here, but this one had benefited from early thinning of the adjacent power line right of way.

Climbing leaners is scary; the flip rope tends to sag and slack as you climb making it easy to roll off to the side hanging upside-down (not good). I was also concerned about the weight I would put on a trunk with rot in the middle causing it to snap while tied to a log 40 feet up. I called in a tree service. Their lead came out to look. Nice guy! He got out of his truck, turned around, and just stood there, staring at the forest. He knew how much work had been done, so his silence was a compliment. After a pleasant exchange, he looked at this one and said, “I’d climb it, but then,” (with a smirk) “I weigh 140 pounds.“ Knowing my trepidation (and that I’m 180), he suggested wrapping the flip rope around the trunk once to keep it from sliding so easily. We shook hands and he left, no charge. To him, it was a job too small to bother with, one he knew I could do anyway. To me, his appreciation was an honor and his advice a potential life-saver.

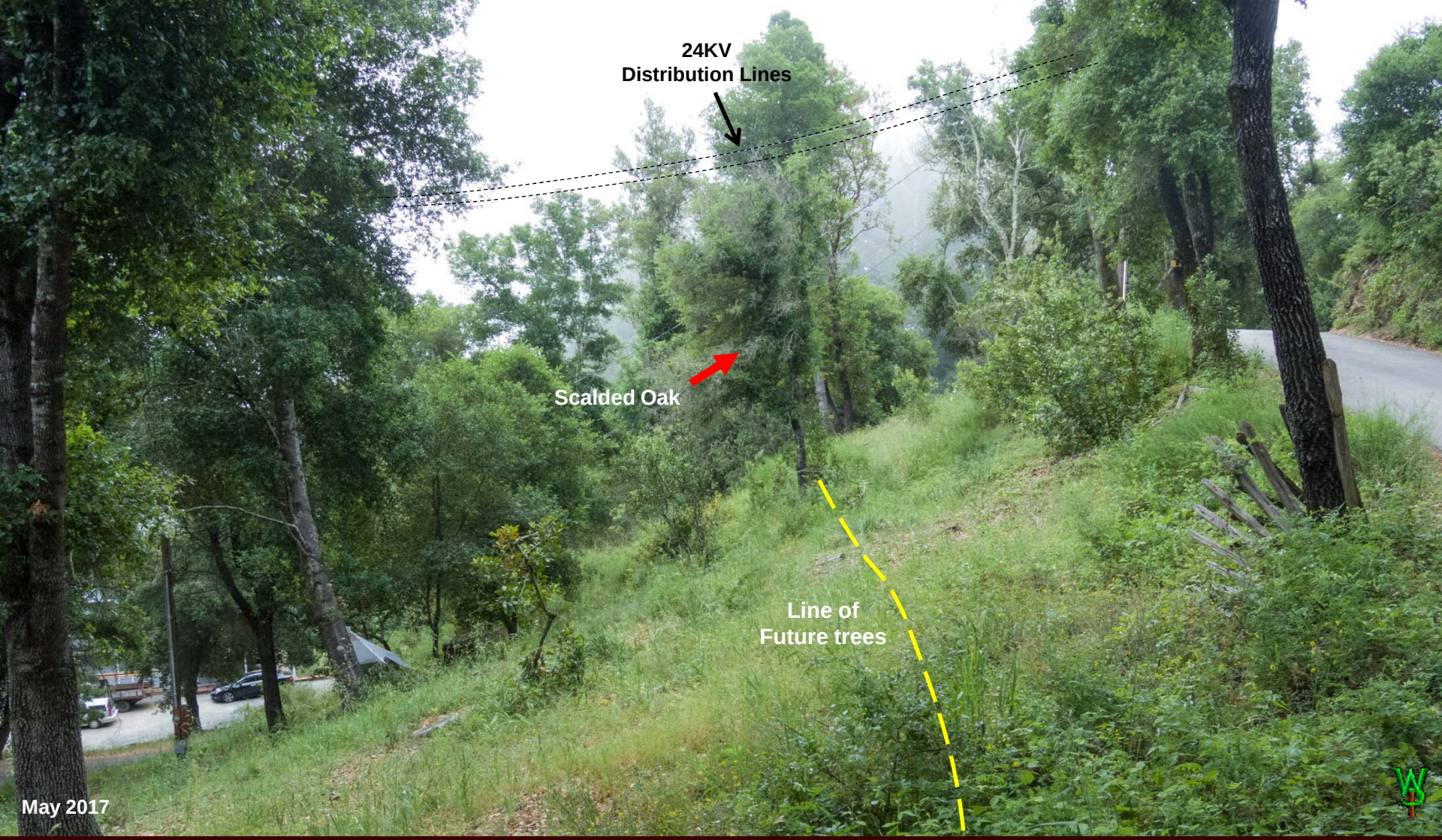
So I bought a longer flip rope and waited for a Sunday to do the job so that my wife could be around in case I had a problem. Among other things, giving her the job of taking pictures might make her a little less likely to fret (it’s not good to be listening to your wife stress out while you’re up a tree). Besides, I don’t get many pictures of me working, so it’s nice to have one to share with people to give them an idea of what I do. So… I sent this photo around to some friends and, frankly, their reaction was stunning… “Is that you???”

Really, after all these years, I thought they knew better.

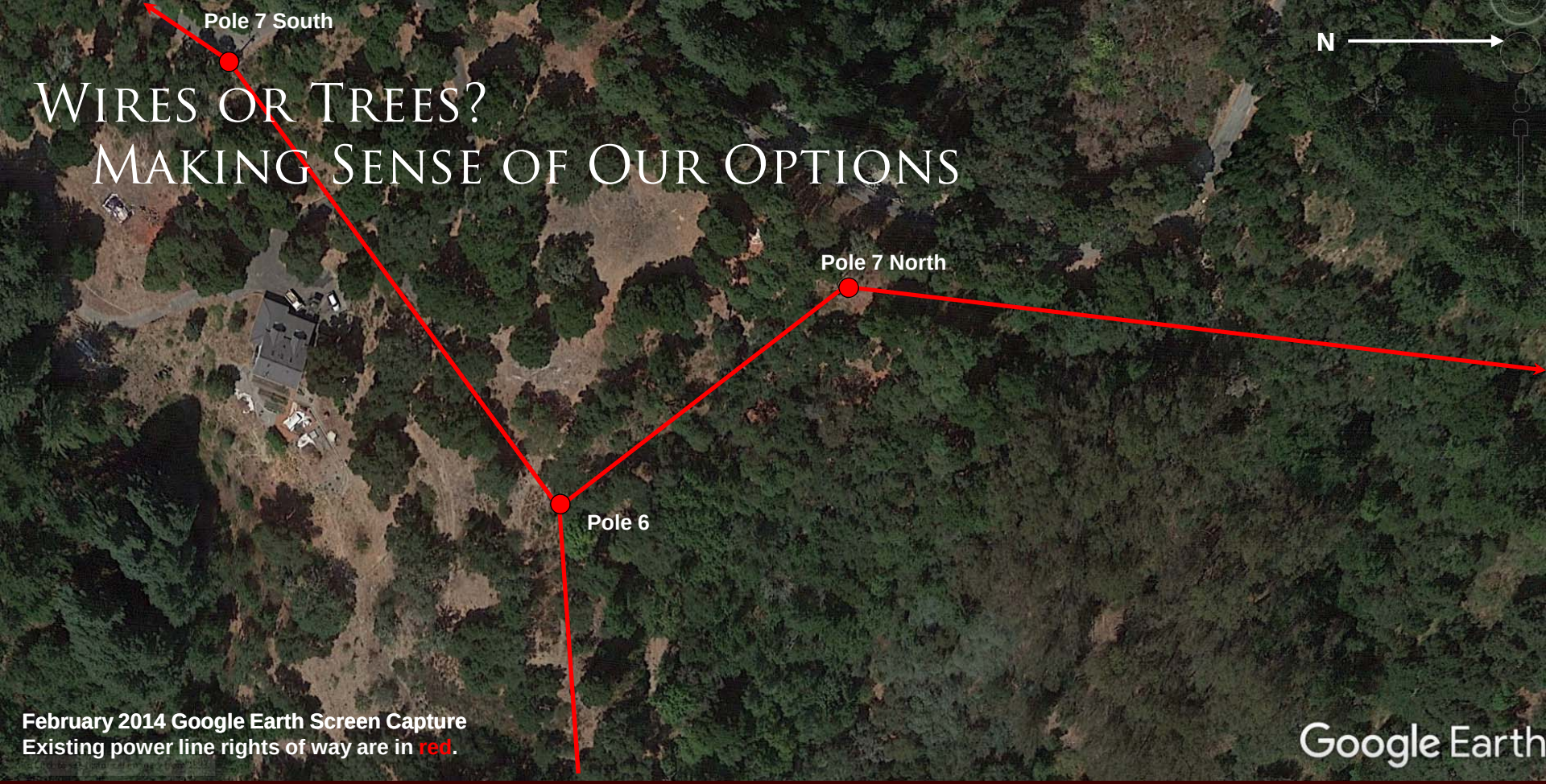
There is a lot yet to do. In places, we are getting there. But there is always the unexpected.

Despite my good intentions, trouble, and risk, this young oak came down with sun scald, in which the removal of the canopy over the tree left it unprepared for extra light. Now this was strange in that the solar arc would not have suggested this reaction, but the good news is that this one is not dead although full recovery took 6-7 years. How long it takes depends principally upon rainfall.

Look at the response in only one year! The herbs are hedge nettle, blackberry, yerba buena, and sedges in between occasional shrubs and trees. Two species in particular responded intensely, sweet cicely *(Osmorhiza berteroi)* and blue wild rye *(Elymus glaucus)* (prefer the former). There were a fair number of mountain lilac seedlings *(Ceanothus papillosus)*, some of which were transplanted. There are now too many under this power line right-of-way because *Ceanothus* can burn hot enough to melt the aluminum wires overhead (discussed later). I planted some skullcap tubers *(Scuttlearia tuberosa)*, a manzanita, and added some plugs of California Fescue grass. 2014 was a terrible drought year, so that these transplants survived at all was simply amazing. Yet a problem remains.



In addition to weeds, removing the redwood brought grasses. From a management perspective, brome grasses are undesirable here because it is harder to weed while dense bunch grasses such as California fescue *(Festuca californica)* or *Calamgrostis rubsecens* are not such a problem. Grasses also attract gophers, which turn up weeds. I am hoping the perennials will take over the grasses until I can start some trees to replace those that will be removed along the road to the right. So exposing this area to sun was a gamble from a management perspective in that one is hoping perennial groundcovers fix the problem until a newly planted row of eventually 3-4 hardwood trees about 20-30 feet from the road become big enough for the shade to retard groundcover growth. Hence, other brush would protect them from browsers until they grow out of that canopy. There are at least 15 stumps here with 4 trees yet to go at right, but the scalded oak is now recovering nicely. Now, let's take a look at that power line right-of-way.

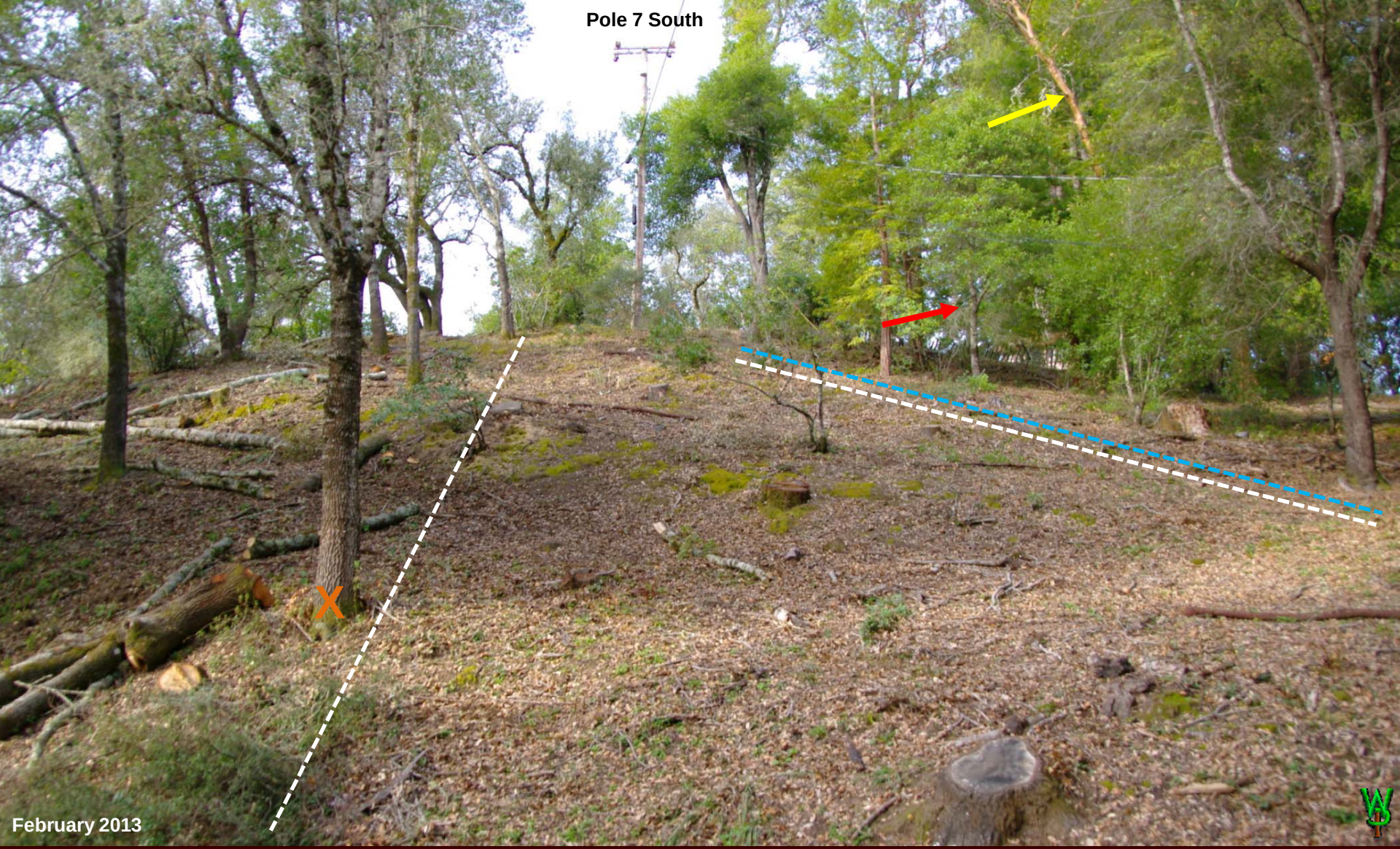


Wires or Trees?
Making Sense of Our Options

As should be obvious, these power distribution line rights of way are at risk from falling trees. This next section about vegetation management in and around distribution line rights-of-way will reference this map by PG&E pole numbers.

In the wake of the Paradise, Santa Rosa, and Red Bluff fires, the hazards posed by power distribution lines in forests have become big politics in California. Do not expect “solar” to fix that problem. Until batteries or capacitors are sufficiently safe and affordable to store sufficient continuous power to abandon overhead wires, corridors for high-voltage overhead distribution lines will remain a costly management issue. If their proponents realized the magnitude of the environmental impacts of sufficient mining to make base-load capacity of solar power generation and storage along with the military cost of securing safe access, extraction, and delivery of said minerals (not to mention the child labor often involved), they might not be so enthused. Yet the costs of maintaining these line corridors is more than what we pay for the electricity. So this is also a social inequity when it comes to inner city renters subsidizing rural line maintenance. Meanwhile, that cost arises because the vegetation belonging to the landowner is growing *into* the distribution right-of-way and poses catastrophic risks to surrounding property. But ‘the trees were there first,’ weren’t they?

This is the main ridge on our property in 1989 at the north end of the span from Pole 6 to Pole 7 South (map). In 1989, NONE of these trees was over 40 years old. Before that, this was an apple orchard (see aerials chapter). I am starting with this photo to show that when these power lines were installed there were **no** trees here except apples. ALL of the trees that threaten the power lines on this ridge belong to owners who grew trees *into* the PG&E right of way *after* the distribution lines had been installed. We are expecting the power company to bear the total cost of neglect not to mention the risks involved in delivering electricity to the very owners who allowed said risks to develop! What to do? First, we need to characterize the process of brush and tree invasion to understand how it behaves.

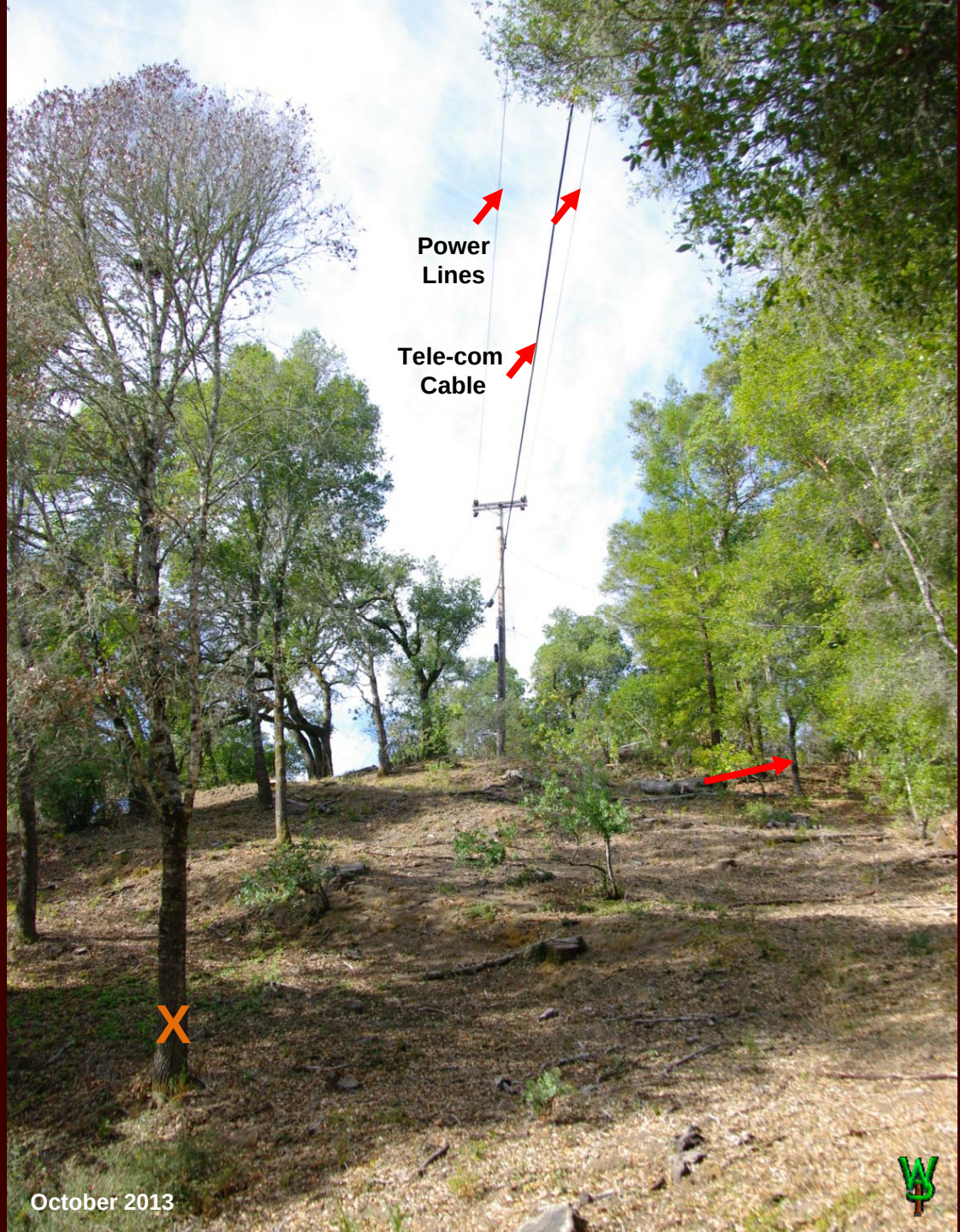


This is the other end of that span just before thinning the area to the right (note the yet-to-be-scalded oak and leaning madrone discussed earlier). This is the third time in the 30 years we've been here that I have entered this stand to thin. The groundcover is denuded due to canopy closure since the previous Phase 2 thinning. The virtual "clear cut" in this corridor is an experiment to learn the degree to which understory shrubs and forbs respond to light with the goal of keeping groundcovers reasonable to manage. Shrubs can be a more effective shading tool than trees to suppress grasses because most shrubs (but not all) do not germinate easily and make shade at a younger age. But shrubs can also be a fire hazard in sufficient size and density. This slope faces northeast (afternoon sun from behind the hill), thus most of the light falls toward the right side of these images. Note the tree marked "X" at left.

Sometimes weather can change the response to tree thinning. As the prior slide suggests, this logging job was started in January and February, prior to the weed season. Yet just as these trees were breaking new buds, we had a 105° heat wave. Like the smaller oak in the previous slides at right, this oak also suffered sun scald so severe that by the following fall it died despite trees above offering shade from late afternoon winter sun. Sun scald is more common in trees and shrubs having thin bark such as madrone, manzanita, coffeeberry, or toyon. In 24 years of thinning, I'd seen this problem only once before in an oak, although to lesser degree and the recovery was very slow. That first time, I didn't understand the pathology. Even now, the literature on the topic is still sparse because actual forestry is considered by so many to be destructive to Nature that it doesn't get much study.

The eventual conclusion was that spring is a risky time of year to thin, but like so many inferences, such risks can be a necessity. In years past, for us to confine forestry operations to the fall was not an option. The condition of our stands was so dire, so much broom needed control, the time for felling, bucking, dragging, loading, and piling was directed by winter burning (I didn't have a $20,000 chipper nor do I want one). I could not have known I was working into a heat wave nor was that risk commonly understood. We do learn from these problems with which to guide future plans.

Although taller and closer to the corridor than I would have preferred, this tree at least had a balanced top with the potential to be a beauty. As a result of its demise, much of the parallelism in the walls of the corridor originally intended had been lost which meant that interpretation of the resulting recovery might be less explicit, but it did allow more dynamic range in response to solar exposure.



The next year, grasses were most intense on the right and to the bottom where there is more light. I harvested all of the grass, as I did not want more, but this system had other ideas. Note the prostrate *Ceanothus* on the left, the shady side of the corridor. This shrub had been there for 10 years before thinning this corridor.

After water, warmth, and light, on the right edge, there are now half a dozen new Ceanothus. Toward the top right there are more and a few new manzanita seedlings I can move! At the bottom are more grasses I didn't want, despite having harvested all the seed the prior year! At the top where it's narrower, there are relatively few grasses, but more shrubs.

This kind of response is what I wanted to see happen with the whole forest, although as you will see, this went TOO fast, which is fine in terms of generating more information sooner to be applied elsewhere. The idea was to create a graduation of the response rate from which to learn how to manage light in the forest as a whole. This question occurred to me because the groundcover at right had taken 15 years to develop while you see a stronger response in the corridor in only two years. By studying the corridor from shady side to sunny, I might infer what is ideal between those two extremes with even more information as I change the composition of species.

Note the increase in grassland species the next year. This an undesirable (to me) but probably unavoidable phase as it increases the time required for weeding until the trees broaden their canopy cover and the brush grows sufficiently to offer some of the shade trees once provided. Eventually, perennial cover will displace the grass. Until then, the slender tarweed on the right is easier to maintain.

May 2015 – *Elymus glaucus*

These rye grasses are on the left. Rye is relatively shade tolerant. These are six feet tall, and an important food resource. Slowing down the grasses is critical to keeping the situation manageable but there other native annuals and perennials that are more difficult.

This California brome *(B. carinatus)* is great for soil and a source of seed for birds, but a big problem to weed because of visual and physical occlusion while also permitting more weeds to inhabit them than with most other native perennials. I wish I could deal with grazing it and would love to run targeted grazing experiments as long as somebody else deals with the animals. Goats would work. Getting them clean enough of weeds is problematic as is protecting them from coyotes and mountain lions.

Some grazing is free. One might think that tarweed would be problematic for weeding, and elsewhere it can be. But here, deer and rabbits like browsing it so much that it actually helps keep the grass cover down. I'll help that process by harvesting the grass seed.

The next season started with 90 inches of rain, developing sufficient grasses that gophers started to move in. What this did was bring up weeds from seed buried while tilling the terraces 90 years prior. It became a battle with biter cress (C. hirsuta), pimpernel *(Lysmachia arvensis)*, and hedge parsley *(Torilis arvensis)*, which were anticipated due to the weed experience encountered nearby. Note that the *Ceanothus* shrub on the left, which had been kept low for 10 years, is now starting to bolt upwards. Why? There is enough forage here now that browsing deer *can't* keep it down. Watch what happens.

Ceanothus is a nitrogen fixer. In back, it had grown from but 2 feet tall (which was hardly a concern) to as much as 8 feet tall in only three years, sufficient fuel to pose a hazard to the aluminum lines overhead. As the brush matures, it develops into a mass of dry and oily twigs. To keep it fresh at this stage someone must trim (or eat) about 25% of the plant every couple of years. Monkey flower moved in too. After 2-5 years, it too goes decadent and should be cut to the ground. Both of these shrubs burn like diesel . With the increased shrubs, the grasses are virtually gone, thus confirming the hypothesis about shrub competition suppressing grasses. Initially, I wanted to grow toyon *(Heteromeles arbitufolia)* or coffeeberry *(Frangula californica)* which grow slower and are not such a hazard, but are hard to start. I did want to see how much faster *Ceanothus* would grow with more light. So I let this happen deliberately.

And so succession proceeds until I take action. The grasses are nearly gone. There is now no groundcover under the *Ceanothus* and they are becoming impassible. The older shrubs are getting woody and decadent. This has become a fire hazard. Time to take them down. Interestingly, I don't have a ton of tree seedlings, as has happened elsewhere. I plan to start some coffeeberry cuttings this fall, but I don't have much available from which to get them. I do have toyon I can transplant. And so on. I'll probably keep a manzanita or two and only a few *Ceanothus.* Then we'll all get to see what happens next.

This probably looks a rather radical change, but taking down the Ceanothus was only a first step. It is not as if I am back where I started, because the seed bank has changed. The “first responders” here were now monkey flower and poison oak, neither of which I want over the long run because of the fire hazards they pose. Then there are the oak seedlings, which in places are less than an inch apart. I transplanted *Calamagrostis nutkaensis* grass nodes into 3X3 tubes to be divided and planted either next fall if the ground is soaked early enough, and next February if not. It is looking like grass cover here may be key to reducing the rate of forest overstocking.

This is a close-up within that right of way the same year I removed the Ceanothus. These seedlings are oak trees, inches apart.

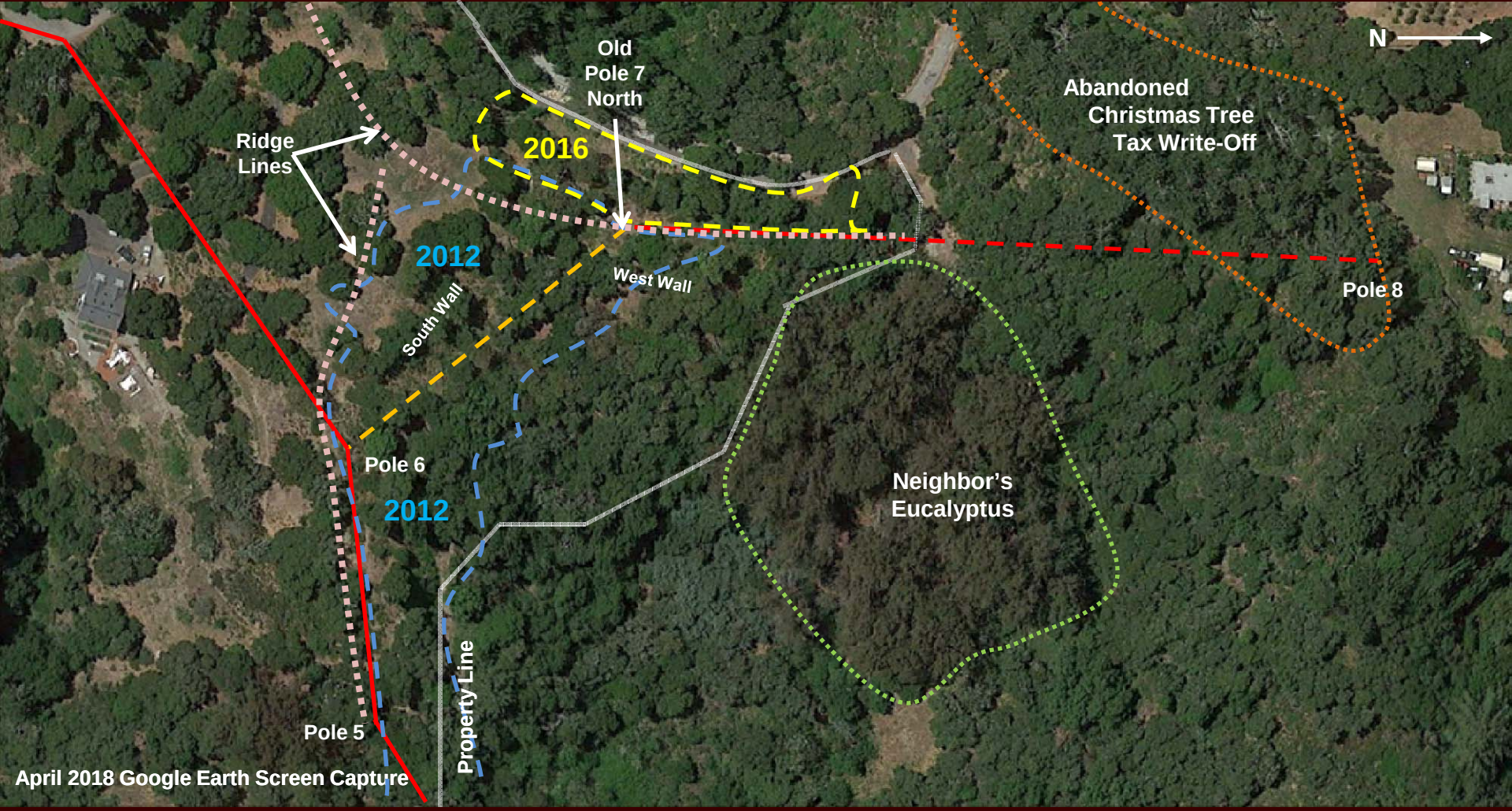
The experimental corridor you just saw is at the top in blue. It was a lot of work and to many it probably looked like a big impact, but look how small it is! The real difference it represented compared to other new forest openings I had made up to that point is that it is wider, allowing more light between trees that germinated the *Ceanothus*. What about the rest of the lines? The year 2020 was special here, in that PG&E replaced ALL of the poles with taller fiberglass tubes fitted with fire-retardant wires. Getting the equipment for the project up here afforded the opportunity to address the historic problems that had arisen because of lines badly-routed for a forest that was not here when they were installed. The pink **X**'s are the poles PG&E was proposing to add as part of the project to reduce "line swing," cited as a cause of wildfires far from this area. Once I had explained to their surveyors how that approach would have made things worse that opened up a conversation entailing re-routing the lines as a way to minimize cost and reduce risk.

We will first look at the line between Pole 6 and Pole 7-South to explain why.

This was the pre-existing span, an instance in which communication worked. Prior to the job, there was only one oak directly under these lines which I had shaped 20 years prior to minimize the need for pruning about with but one quick trim since. PG&E planned to put another pole at the bottom of this draw to reduce line swing, but that would have pulled the lines down among the trees, requiring likely removals of four more trees, three of which I wanted to keep and MORE trimming thereafter. Instead, the new lines will be 8 feet higher flying over these oaks, making “line swing” irrelevant. There likely won’t be any need for trimming here again for 40 years.

March 2020 – I had climbed and taken out the vertical leaders on this oak 18 years prior. It has required but one trim since. This was photographed before raising the lines another eight feet.

Properly routed between ridges, lines across draws like this can go over the trees at the bottom. Over the years, I have removed at least 20 oaks along this span. The few I had retained were well under the lines and remained unlikely to get tall enough to pose any hazard, with but **one exception**. I shaped that one tree to grow outward 18 years prior. It sits next to the driveway with excellent access and easy climbing for the light trimming it had since required only once. With the new taller poles in better locations, the problem here is over. This is the benefit of integrating forest design considerations into routing distribution lines in rough terrain.



Moving on to the span between Poles 6 and the old Pole 7 North, there were two historic 'forestry problems' related to the right-of-way addressed in 2012 and 2016. The first was addressed in 2012. The original line was routed traversing a steep slope. The trees above the lines grew tall enough to have fallen on them. Thin below the right-of-way and it was too narrow of a space for a forest below it. In any case, the forest was too thick to support a groundcover, a risk to the lines, and way too much fuel, so I thinned it.

The project in 2016 addressed the part of the line between Poles 7 North and Pole 8 North on our property. This span ran along the ridge, without enough room for trees between the ridge and the County road. This stand was thinned as part of the preparation to reshape the embankment between the ridge and the road discussed in the roads chapter.

These problems were restructured in 2020 by relocating Pole 7 North, yet when I started in 2012, for all I knew there would never be a such an opportunity, hence this will be discussed accordingly. The span between poles 7&8 North is on both our property and two of our neighbors, one with Eucalyptus and the other conifers, so those latter two situations will be discussed later on.

This is the ridge above the original span between Poles 6 and 7 North with the lines below the trees at left. In 1949, when the poles were installed, cattle still grazed this ridge; there was no forest. In 1989 (inset) one could still see Pole 6 and the lines to Pole 7 South. In 1994 I performed a Phase II thinning to down the slope to the left to reduce fuel. In the 15years thereafter while I was getting control of the grasslands on the ridge**,** the canopy had shaded out groundcovers and was encroaching the grassland on top. So in 2012 I resolved to get to thinning the forest before I became too old to do it. Hence, the 6-7 North span to the left complicated the project. Beyond a matter of mere safety, the challenge was that thinning a canopy which had suppressed weeds for so long would then allow weeds to express in the forest over a much larger total area. Overall, the delay may have been wise, in that by 2012 I had learned enough to manage that response.

May 2012 – The flags represent a soil experiment discussed in Part III

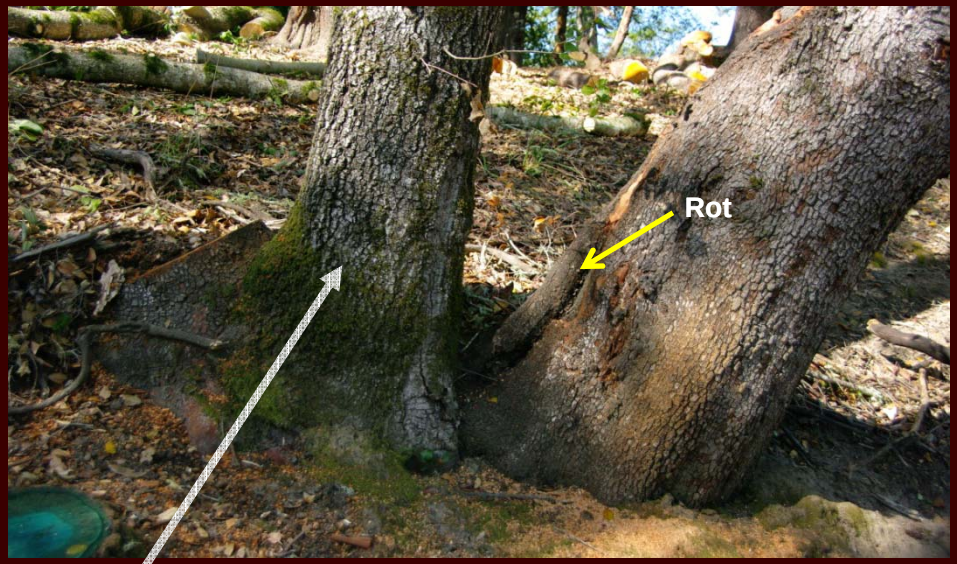
The plan was to be in three steps**:** Leave the trees at the top crest to shade the slope and slow growth. Plant the shrubs to take over that job. Then, once the shrubs are established, I will remove the trees at the top. Since we moved Pole 7 North, I no longer need to fret about dropping trees on the lines when removing them.

May 2012 – The ridge in the prior slide is at the top of this slope

The right-of-way on the ground between Poles 6 and 7 North traversed a south wall with up to a 100% slope. Trees growing on a slope like this lean out for light. As a result, there was little room for a forest on this slope. With the lines only 30-40 feet above the ground, trees leaning from above the lines could fall on them. Directly underneath the lines, there could be no trees at all. Below the lines there were only a few leaning away and were therefore not a hazard. The goal of this 2012 Phase 3 cut was low groundcovers under the line because fire burning in brush below aluminum wires can melt them, not to mention incinerate ancient creosoted poles. Coffeeberry, toyon, hazelnut, and ocean spray would shade the slope below to slow growth of both brush and trees.

PG&E spends enough money managing their rights-of-way to make our electricity effectively free, as subsidized by people renting apartments in the city. My operational goal has been to make that unnecessary. The aesthetic goal was to make the right-of-way so much a part of the landscape that it was invisible, which took a decade or two because I had to wait for trees to become a hazard before the tree company would remove them (I am not allowed to remove trees within their right of way) and then complain to the inspectors about the ones they would not remove until then. The delay made starting replacement trees more problematic.

Hazard trees in forests with power lines are *way* too common, because problems can be hard to see among so many others. The tree at left had the specified 10-foot clearance from the lines, but it also had co-dominant trunks tall enough and with enough windage to break at their common crotch and fall on the lines.



This oak straddles the root of a madrone overhanging the lines, holding down its rotting trunk on the tension side like a big staple. To get these trees removed took a rather pointed letter to the Board of Forestry, and I suspect I got help because it made a constructive observation:

In 1994, I had removed what I had thought were all the problem trees along this corridor. I had had missed these two, and so had the ALL of the foresters contracted with the power company who walked these lines **every year** inspecting for adequate clearance. When an inspector is looking *up* at wires, a tree with co-dominant leaders on an included-bark crotch obscured by so many trees is hard to see. A bad stump is equally easy to miss. Eighteen years later in 2012, thinning revealed the bad news.

So, removing hazards to the power line was the second reason for thinning. The “forestry problem” here is the distance between the ridge and the power-line on a steep slope does not allow room for a forest. I needed shade for weed control.

Power Lines

Tel-com Cable

Weak Crotch

March 2012

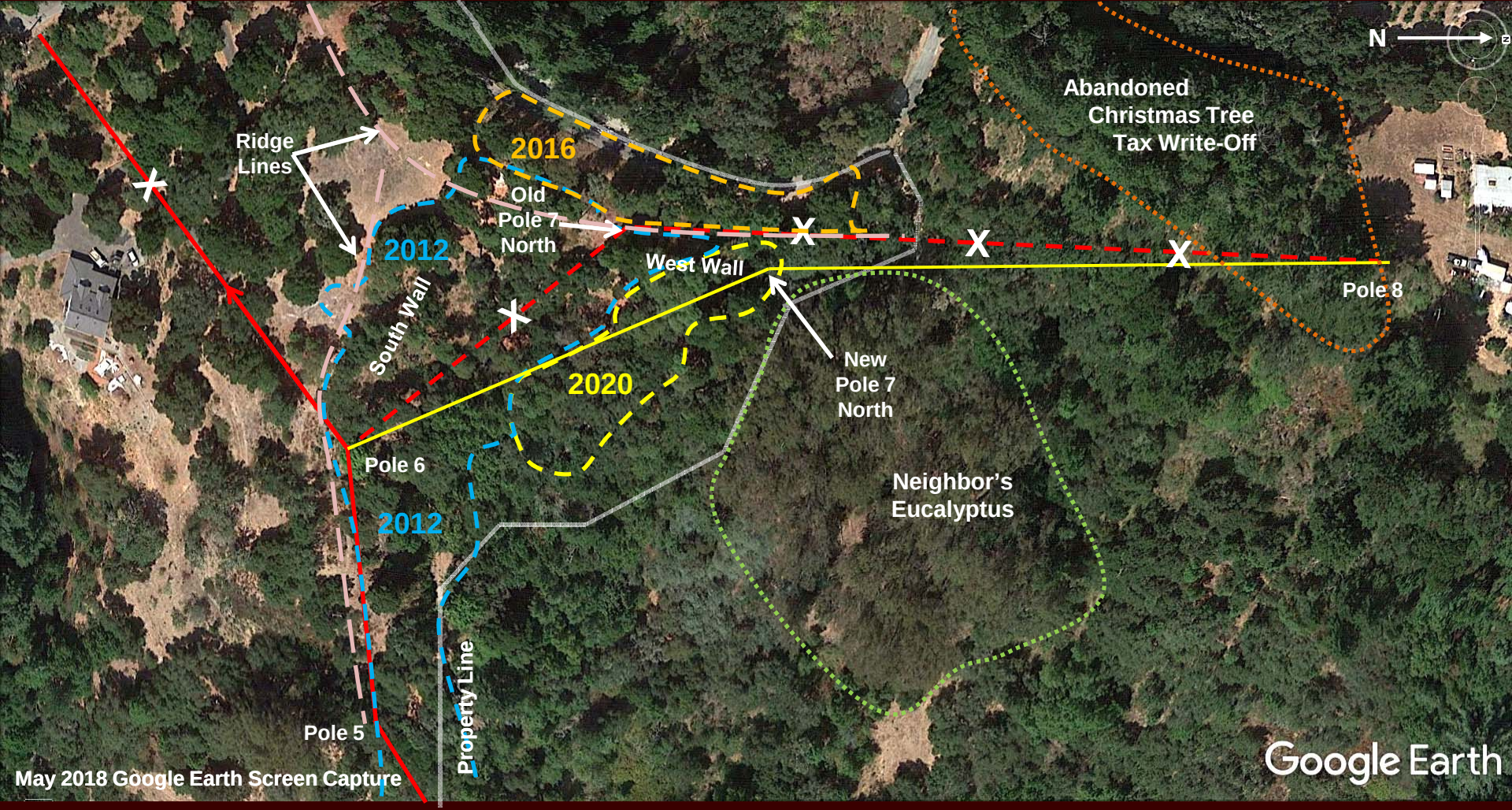
March 2020 – The line turns to the right at the far end; the tree you see there is behind it

After 30 years of steady removals, the old corridor traversing the south wall of the North Draw was close to ideal in terms of risk to lines in a forest. It remained possible for trees to fall on the line, but they were structured such that it was unlikely. Importantly, since the 2012 thinning, I had purged most of the exotic seed bank over the ensuing 8 years while native annuals were beginning to spread. That and similar work done on the ridge supporting the Pole 7 shown supplied the seed for the 2020 North Draw Project.

Over and Really Over

July 2020 – Photo courtesy of PG&E.

This photo was taken during construction looking from the old Pole 6 up the corridor toward the yet-to-be-abandoned old Pole 7. The new right-of-way proceeds off to the right (new pole location in black). It doesn't look like that much of an improvement, does it? To me, it's huge, but to explain why will take going back to the satellite image.



The new span crosses from atop one east-to-west ridge (pink dashed line) above the "South Wall," across and over the bottom of the North Draw, and up to another adjacent north-to-south ridge (pink dashed line) above the West Wall. This image was taken after both the 2012 and 2016 thinning projects but before the 2020 North Draw Project, thus the canopy at the bottom of the draw is quite closed.

To us, it didn't seem so closed. This is the North Draw, the view with which my wife and I fell in love the day we first saw this property. At the time the "groundcover" was **all** French Broom, soon 8ft tall. Compared to the rest of the property, many of the trees here were huge and had good structure. 30 years later, the larger madrones were showing signs of imminent death due to an exotic fungal pathogen (what could have been beautiful trees or made marvelous hardwood, is rotting to death thanks to lack of controls in global trade). The new right-of-way looks like a pathway clear of trees, doesn't it? Well, not really, as you can see it is mostly shaded. Despite that you don't see any weeds here, they are lurking in copious amounts below the surface in need of more light to germinate.

August 2020 – The oak behind the one that got topped starts so far down and is growing so slowly it won't be a problem

Here are the new lines with at least twice the required clearances. Sadly, the Internet cable was not moved to the new poles because it is likely to be abandoned when satellite services (Starlink) become available. But the cable doesn't matter in terms of clearance for trees. There are trees in the mid span that got a severe topping, something I would never do if I intended to keep them for long. The madrone was topped, but still an eventually unstable leaner. These remain to shade the ground while developing new trees with a better future. It only takes 5-10 years for promising future replacements to become evident enough to cull their competitors.

More to the point, the relocation of the old right-of-way was justified beyond forestry or line maintenance. Establishing native annual groundcovers is the principal focus of the *Wildergarten* as a restoration project. This project was about putting it all together**:** It was the last large area we had left still having an undisturbed exotic "weed bank" similar to what we first encountered here but with a difference**:** This time we had a native annual seed bank on the two "Walls" above the draw to repopulate the bottom, a condition more resembling what most people face compared to ours which was an advanced case due to the 220 years since the Spanish arrived. The goal here is to develop a process with the potential to offer more landowners an affordable means to restore their grasslands populated with native annuals within an acceptable time frame. Instead of the 20 years our first attempts required, this project is intended to reduce that project duration to less than five years.

June 2018 – The success of small projects like this help develop the confidence and the time with which to tackle bigger risks.

The broom alone represented a huge exotic seed bank. Strangely, in subsequent years, it didn't germinate here like it did elsewhere, perhaps because the soil is terribly poor, but that has never restrained it anywhere else, nor has the lack of sun. The broom seed bank was still here.

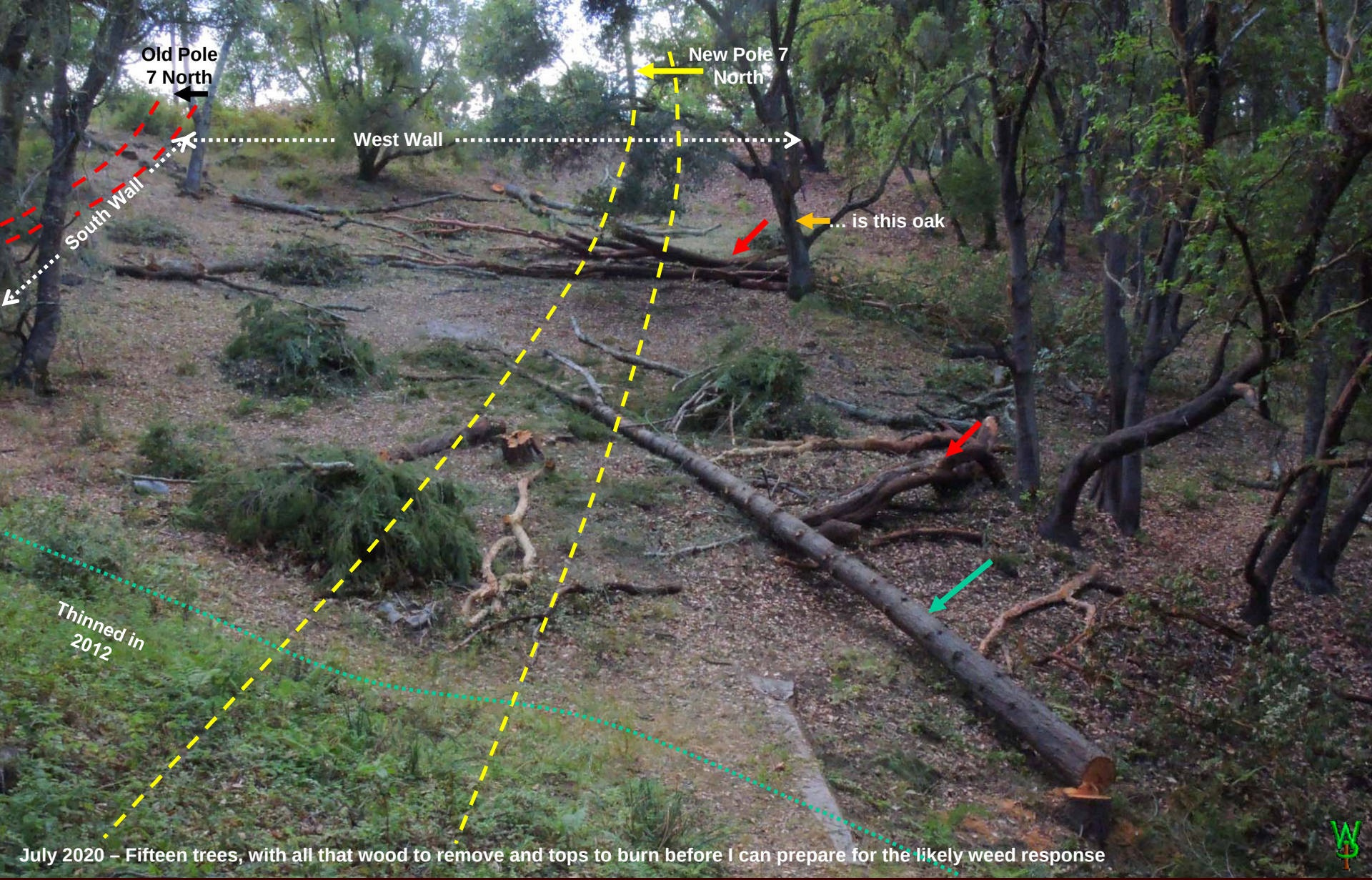
Long before thinning the old right of way, I had fought long battles in the forest below this draw with catchfly, catchweed bedstraw, chickweeds, hedge parsley,… So when I thinned the side walls in 2012, it was no surprise to meet much of that usual "onion" of weed hierarchy. It was controlled with early pre-emergence treatment, followed with springtime micro-applications of glyphosate and triclopyr from squirt bottles changing to hand weeding as fewer weeds matured. The results were an improvement over our earliest efforts in that it had taken "only" eight years to develop a majority of native annuals, with a few patches of native clovers, lotuses, and hedge nettle while most of those exotics are now fewer. Early 2020 even saw an irruption of native brome grasses on the south side.

So, what's the challenge? There had been hardly any disturbance of the soil at the bottom of the draw, while long ago the area had been tilled annually for the orchard, and then had cattle grazing it during the 1940s and 50s. That weed bank was still there. If I could attain native annual cover it at the bottom of the draw in less than five years, I saw that as a target many landowners would consider as "possible."

Yet if I do get a native grassland going here, gophers and ants will invade, likely to bring dormant weed seed to the surface every year. That risk is why we do experiments. I had to simulate that level of disturbance to test the capability of the process. The North Draw Project provided that disturbance.

May 2020 – This is looking along the outside edge of the forest stand on the northeast side

Another reason the weeds had not fully expressed can be seen in the previous satellite image. Note how closed the canopy is, with smaller trees compared to the rest of the property. This stand has never been thinned. Why? It was in better shape than others, with a few big madrone trees having decent structure and only a "few" others in between to remove. There is also a groundcover under it which in recent years has been close to ideal, having recovered from that long weed battle. Why mess with it when I have so much to do elsewhere? Well, while we were enjoying this area for decades, and spending that energy elsewhere, several of these big trees had developed infections and were nearing the end of their lives. So besides the fact that they needed removal before the new lines were installed, and the resulting opportunity to improve the forest on the south wall, this was also my last opportunity to purge a deep exotic seed bank over a large area immediately after a disturbance, a chance to test and extend process capability.



If one is going to the trouble of routing a power line through a forest in order to be able to have a better forest, it is safer to structure the forest before the lines go in. This isn't about the forest I have, but about the one I want to grow, which will have trees trained in such a way that they will be unlikely ever to threaten the lines. The two failing madrones and the fir in the foreground posed an imminent threat to the integrity of the new lines. The fir, like so many others here, had multiple tops that, had they been allowed to grow unabated, would have posed a critical threat to the lines. The rest were a matter of cleanup for a healthier forest with a vibrant groundcover.

July 2020

Sometimes one is relegated to learning from experience what one should rationally have anticipated. I had been too busy logging to see that the bucket/drill truck would need room to work, nor did I know how big it was. Yet this lesson raises issues that are also germane to line maintenance and safety.

First**:** the reason this large truck had access with which to drill the hole and place a 55-foot pole is that only four years prior, I had graded this ridge to be an access **road** so that I could get down here with loads of brush to burn in our sand hill areas. I surely wasn't thinking of clearances for full-sized PG&E trucks. I wasn't thinking of bearing capacity of an uncompacted fill. I wasn't thinking of them losing traction on a steep slope. And I surely wasn't thinking of nearby room for such a big truck to turn around. It turned out these features were adequate, but I had planned such infrastructure only for my pickup; the access surely wasn't planned for this kind of equipment!!!

Second**:** I had made no plans to accommodate the amount of room around each pole needed for a truck with a **boom** to swing its extended elbow to drill and place said new 55' pole, nor space for the bucket for line hanging and hookup.

PG&E can do without that extra room (and did on one of our other poles), but only at much greater expense, not to mention risk to the safety of their line-technicians. One guy in a bucket beats three guys thrashing around climbing on a pole yard with a 40-foot drop.

March 2020 – The old pole is behind this photo point. This ridge ends abruptly (and steeply) just behind the madrone in the background

So on to the next power line disaster! Unfortunately, the new Pole 7 North location forced the lines *into* the Eucalyptus, thus forcing removal of at least a few of the trees but adding poles in this span as they had planned pulling the lines down into scads of trees would have been far worse. Although the result allows me to grow trees now where I'd gone to the great trouble to remove them in 2012, that latitude hardly seems like much consolation now that I have been tending and growing several beautiful trees for 30 years (like the madrone in back) that now had to be partially removed. Had they asked 25 years ago when I still had forest under those lines and was offering to pay for a pole relocation, things would be better. PUC rules preclude Davey from removing tree **X** because its "undivided stump diameter" is large enough to be a "heritage tree." So they took one half and I'll do the rest after a replacement develops. I also had to remove another oak here, again to allow the truck room for the boom.

This 700-foot span north of our property exemplifies the expensive consequences of 100 years of forest mismanagement. Atop the ridge is a stand of conifers that don't belong there, representing an abandoned Christmas tree "farm" (probably a tax shelter). Below it and to the right is a 2-acre grove of Eucalyptus planted in the bottom of a steep draw in the 1920s per the US Soils Conservation Service. The way Eucalyptus competes with other trees is to grow fast and drop branches on them. These branches overhang the power line span. The draw collects and focuses **dry east winds** in late summer and early fall. Together, the two groves form a blast furnace that can toss burning embers for over a mile.

Every year, I bitch about this to Davey **Resource Group**, Inc. as contracting foresters to PG&E, begging them to "force" Davey **Tree Expert** Inc. to remove them. Why don't they? It's not that the trained "foresters" cruising that power line every year don't understand the risk; no, their hands are tied. This span was compliant to the 10' minimum line clearance specified per the California Public Utilities Commission (PUC). So Davey Tree Expert, Inc. gets to climb and TRIM them every few years. Remove the trees and they don't get that expensive job. The resulting cash flow goes into the "rate base" for PG&E on which they get a "fixed" return. PG&E will send the bill to renters in cities.

So, WHEN the usual dry east winds in early fall are sufficient to break off a branch... If you have seen the roads up here, you would know that they are in no condition to accommodate a flash flood of panicked drivers trying to escape incineration. One car can jam the road with no escape. People WILL be trapped wherever they stop, amid a rain of burning pine cones and eucalyptus pods igniting an outrageous fuel load surrounding them from both above and below.

How can the authorities accept this? Yes, I have written a letter with this very picture to CalFire, the Board of Forestry, and PG&E just after the 2017 Tubbs Fire in Sonoma. The BOF lawyer sent a copy to the PUC lawyer, who spent an hour on the phone with me. Their solution is not to do anything significant about the trees. So communities burn, on which insurance companies also get a "fixed" return. Ladies and gentlemen, this is what fascism looks like. But it gets worse!

August 2020 – Both trees on the left should go, at least

Panning left, we are still looking north at Pole 8 from the new Pole 7 **AFTER the new lines were installed**, after I managed to keep them from pulling the lines down *into* this forest with another three poles (thus saving PG&E **LOTS** of money), after negotiating with my next door neighbor promising to build him a gate for his road in return for his cooperation with this new easement over his property in the foreground this perhaps six feet to the right), after detailing the new right-of-way and getting it notarized for recording, after climbing, taking down, and dragging tops of 15 trees constructing the new right of way, after making arrangements with PG&E and Davey to deal with the few trees I couldn't handle, we got the new poles, with the new wires, and…

Here we see the new Pole 8 North. They've got their 20 feet of clearance for " line-swing," but what good is that when they leave huge branches atop leaning pine trees overhanging lines, one with a likely stem defect? Don't you think they should have dealt with this while the lines were down to install the pole?

I texted the job supervisor. I contacted the project coordinator. I begged the lead for Davey Tree. I contacted the Vegetation Management supervisor for Davey Resources Group, Inc. I find the name of the Vegetation Management Director at PG&E (they've at least three groups working on such) and what does he do but beat me up demanding to know how I got his phone number!

The good news is the pine tree died before dropping the branch, so they took it down in 2022. Yet despite spending tens of thousands, the situation is as dangerous as ever because those Eucalyptus with the defective tops overhanging the lines are still there.

Ladies and gentlemen, this is what fascism really looks like. You will never find personal accountability in any collectivist system, whether corporate or socialist.

The word, "holocaust" is derived from the Greek word meaning an "accepted burnt offering." My forest won't kill me. I don't have a personal stake in any of this, although that fire would incinerate the north slope of our property. I merely feel a sense of responsibility for the fact that I can look at this and know it's wrong. What to do?


Phoracantha recurva

June 2022

Document it. As to those “defective tops,” look at these trees carefully. The two closest to the lines change suddenly in diameter just above the arrows, with multiple leaders tuning into long leaning branches, some overhanging the lines. This is because I got PG&E to top these trees, many years ago. Unfortunately, they were still too tall for me to drop without hitting the lines. When one tops a tree, it leaves a wound that is open to attack which the tree tries to heal, in this case by the longhorn Eucalyptus beetle (inset).

So here is a sample of the defective trunks holding up those tops against said dry late summer-to-fall northeast winds.

There had been a third tree even closer to the new lines I had managed to talk PG&E into cutting down when they put in the new poles. After they did, I parted it for firewood I didn't need. Here at right you see a cross-section of the defect where wood supporting the new tops had grown around the cutoff trunk. Here it had been invaded by the Long-Horned Eucalyptus borer beetles *(Phoracantha recurva)*. It's from Australia too.

Do you see much remaining cross-section at right to hold up the whole top of the tree when the wind starts to blow? No?

So I sent them this picture. PG&E sent out a forester and an entomologist to look at the two trees on the previous page . Of course, the entomologist didn't *climb the tree* to look at the defect up close; she pronounced it as not needing removal while safely on the ground.

You'd think they want these disasters. Well, it has been a bonanza for the ol' cash flow. We're all paying for this kind of thinking, because the forest that was never here before it was planted must now be protected. You see, it's "Natural." Just ask the political appointees at clown show we call the California Public Utilities Commission. And oh by the way, if you disagree with their rulings your only appeal is to the State Supreme Court. This is how fascism really works, and why it doesn't. What is it going to take to fix this? Change public opinion.

November 2017 – Santa Rosa, CA This was the only house to survive in this development. The 70-year-old Japanese owner stayed to fight the fire, wetting his shrubs and house with a garden hose for a half hour before the flame-front of his neighbors' burning houses arrived. You can see from the conifers that this was not a forest fire but from house to house. But this one still stands. The "firefighters" were seen cruising the hood at 10mph with no lights or sirens. The owner told me they never showed up here.

Unfortunately, pursuant to the aftermath of the enormous fires that cost so much in lives and property, a bankrupt PG&E "subject" to a complicit PUC as cowed by "environmental" groups funded by tax-exempt "charitable" corporate foundation investor/lawyers, is now saddled with the financial opportunity for both PG&E and insurance companies (accountant/lawyers) to cash in on a regulated "market" offering only higher rates on your regular bill. They blame "climate change" for the fires even though carbon dioxide massively accelerates vegetative growth rates. Typical of the "what caused the fire" outcry, the State blames PG&E instead of the managers of the catastrophic fuel levels that probably dropped a tree branch on distribution lines in 90mph winds. Ahhh but don't blame them, the PUC specified distribution lines needed to be only 10 feet away from the trees. So they made it 12 feet minimum clearance with big plans to "fix the problem" that will (at least here) make the distribution line fire hazard nearly as bad as it was.

Where The End Is A Beginning

January 2017 – Nearly pure native annual germination elsewhere after selective pre-emergence treatment for bitter cress…
…followed by rigorous hand-weeding.

The North Draw Project is perhaps the most ambitious thing we have done here. Instead of spending most of two decades I don't have left to cleanse an exotic weed bank (first with glyphosate and then by hand), at the bottom of the draw I used an experimental twist on a pre-emergence herbicide process described in the grassland chapters. The goal was to purge the exotic weed bank and simultaneously disperse diverse cover of native annuals within 5 years. Personally, and by only intuition, I see 5 years as the "magic number," a target many land managers would find worthy of consideration to attain native annual cover. Between the chemical and manual processes developed in this picture book, early experiments have indicated that these goals are achievable.

January 2013 – The winter after thinning the south wall of the North Draw; 12 species of annual seedlings, 6 native and 6 exotic

It was the experience after the 2012 thinning trees for the old right-of-way on the slopes containing this draw to the south and west, that suggested what is in the weed bank across the bottom. The hierarchical weed "onion" I have seen elsewhere on the property behaved fairly normally with but one exception: there was surprisingly (to me) relatively little broom here. Hedge parsley was the first dominant weed, followed by bedstraw *(Galium aparine)*, the chickweeds, pimpernel, wall bedstraw *(G. parisiense)* and then bitter cress. Interestingly, there were also relatively few weedy grasses here despite that this specific area had been grazed. That lack could be a warning, as I have seen changes in soil conditions suddenly "set off" a dormant exotic seed bank.

April 2022 – At the base of the west wall of the North Draw: lupine, 3 lotus species, filago, 2 clovers, California brome, a cudweed, and a Madia

So far, the results in the North Draw have been beyond expectations. I had dragged the logs from the 2020 thinning project up this face of the western wall, some of them literally plowing their way up the hill. I tore the hell out of it. The result you see here at the base of the western wall toward the top of the draw is nearly pure germination of native annuals. It worked. Getting the exotics to the point you see here, not requiring a backpack sprayer at all took only two winter seasons.

Material Pyromania

August 2020 – One of three such piles from the North Draw

A few words must be said about how to manage all that wood. Here again, roadways along ridges with a few stout trees along the top on both sides are enormously valuable assets, as a truck towing a log on a cable is much faster and safer than winching. This west wall needs but two trees on each side to serve as spars for both slopes. Getting the cable block at least 8' high greatly reduces the load of dragging a log because it lifts the nose off the ground to keep it from plowing a ditch and keeps the log cleaner, which protects the chainsaw from dirt. Bundling the logs with a choker reduces cycles, so it helps to keep that in mind when cutting off branches. Yarding this pile of 4-6 cords took only two hours by myself. If I had my old dump flatbed with a crane rebuilt, I could have yarded, bucked, loaded, and hauled the wood out of this draw in two days. A well designed forest is not only beautiful, it is a pleasure to tend.

Our home needs only two cords of firewood to heat it. We donate a few more to families in need. Some of what is left is used to slow down the runoff from rain (above). Some is used to retain organic matter, feed bugs, and build topsoil (upper right). The rest gets an accelerated process with which to return it to the soil, and here is where things get a little “out there” for most restoration people.

I split it, stack it tightly, and…

April 2013

Considering all the work it took, it looks rather wasteful, doesn't it? What the hell is he doing?

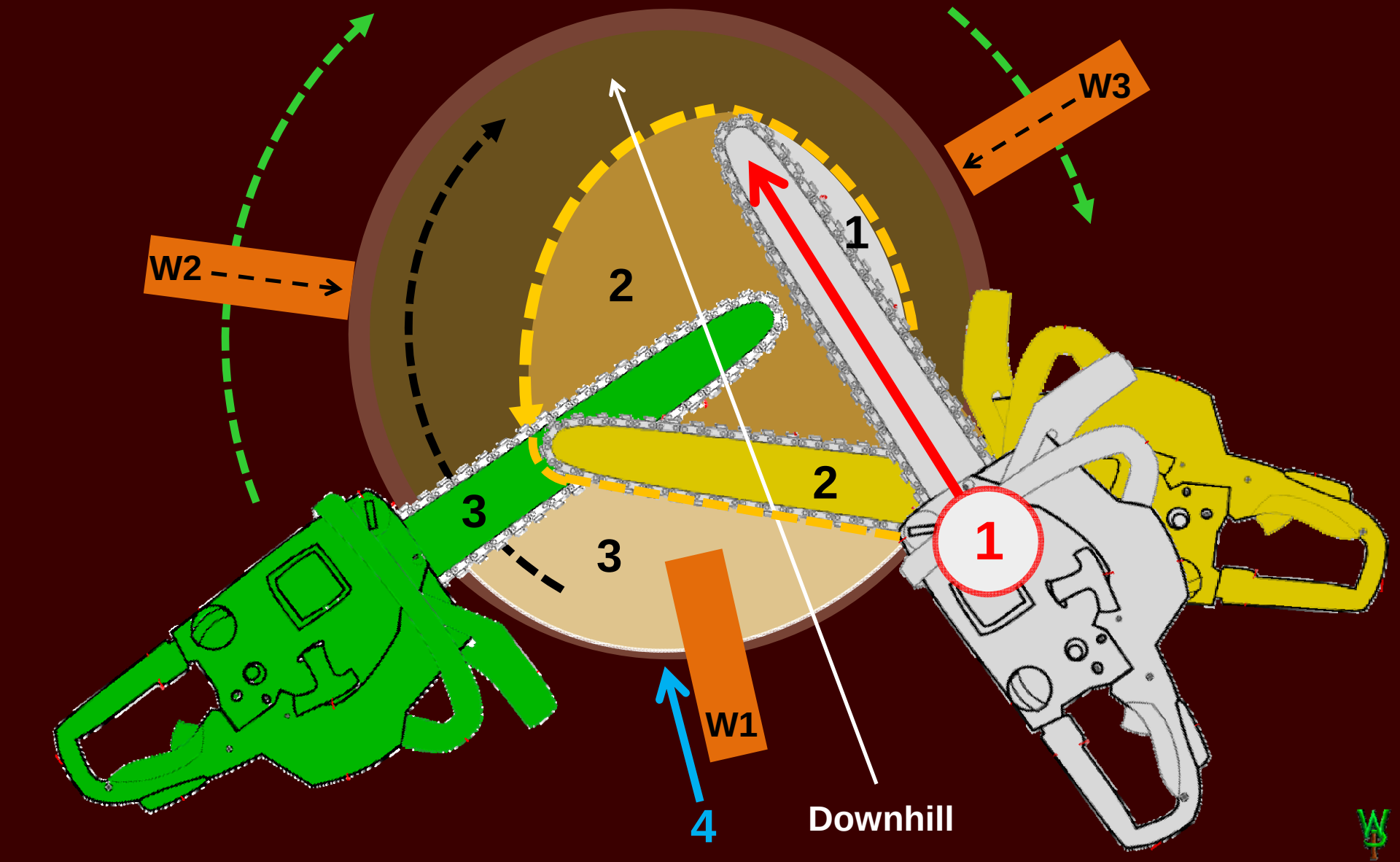
Making charcoal, lots of it, as a soil amendment called “biochar.” Charcoal retains water and nutrients to keep them accessible to fungi that can then transport the nutrients to plants with which to make sugars for the fungi. The process builds soil organic matter that consumes additional atmospheric carbon. In an agricultural application, these factors together retain pesticides for microbial decomposition and reduce agricultural water consumption. Converting fuels into charcoal is therefore both a way to make things safer for houses at lower net cost, improve groundwater quality, and make agricultural water available for other uses. Sounds like an investment opportunity for insurance companies, doesn’t it? We’ll get to the other reason why charcoal in soil is important in Part III, with a chapter section discussing grassland soil chemistry.

Getting Stumped Again, and Again, and Again…

With all this thinning, a few words on stumps are necessary. When we started in 1990, most of the stumps were rooted out with a bulldozer, so I didn't have much of an appreciation for what a mess stumps can make if left untreated. I kept thinning. Most of those stumps sprouted into wads of new trees as did those cut for PG&E (above). Said wads can be ten feet across and six feet high (how I learned I should treat stumps), then requiring an expensive and destructive dose of herbicides, often twice or more, and then whacking off the dead stems. It makes life easier to treat stumps such that I don't have so many ugly wads to dodge or kill.

November 2017 – The oak above this madrone coppice wouldn't want this failed stump treatment

Other trees don't like them either. Treating stumps chemically is sometimes easier said than done. Fir requires no treatment. Bay and madrone are hard to kill. Oak is easier. Redwood is almost impossible (more on that later). It can take multiple attempts. The key turns out to be timing**:** best in early fall when the flow of sap is downward. This is yet another reason besides sun-scald to do forestry in the fall, accumulating and drying as much material as possible for burning without a fire hazard lying around all summer.



Cutting big stumps takes a powerful saw. During the cut, sap falls from the stump onto the bar like releasing a finger on a straw full of runny glue that gums up the bar and chain (I'm trying release agents to pre-coat them in addition to a remover). Cut plane parallel to the slope, as low as possible. To keep dirt out of the chain and bar, first (**1**) I plunge the bar (**DO NOT try this if you are unfamiliar with plunge cuts**) and (**2**) I cut out the heart from the inside, *pulling* the chips out (cutting on the top of the bar pushes dirt *into* the cut and builds up a wad of chips to clear on the inside that can otherwise jam the saw. Once the core is removed, then (**3**) cut around the remaining perimeter sap wood, along the way adding wedges (W) to hold up the stump. Wedge off the butt when done (4).

October 2011

Chemical stump treatment must be done IMMEDIATELY after the cut. A fresh cut calluses over with oxidized resin in less than five minutes, which then inhibits penetration of the chemical treatment. A big cut takes long enough that I shave it off with the saw edge, cutting across the slope to make ridges to inhibit the treatment material from running off. Brush off the chips and treat it as soon as possible, twice. Hardwoods get a 3:1 mixture of turpentine to Turflon® (the active is triclopyr) along with a dye. I coat the phloem and cambium tissues twice. After it's soaked in, I grab some dirt and chips and rub it into the surface to inoculate the stump with fungal saprophytes. Then I mulch the surface at least two inches deep to keep it moist and keep the sun off the fungi.

October 2011

When it's done, it looks like this. What stump? With stumps that are hard to treat and have thin bark (such as madrone or bay) I paint the remaining bark down the sides or even peel it with an ax and dribble the material in the crack. Triclopyr does not kill redwood; I would have to use glyphosate and sever the roots between trees first to which there may be an alternative which is still experimental.

3-1/2 years later, this 24” oak stump had rotted to the point that it made a six inch deep hole when I stepped on it. Between the immediate inoculation and covering it with leaves, this process really works on oak; madrone takes quite a bit longer to rot.

November 2017 – This bay is an old coppice (10-14”dbh), probably from a fire in 1941. Let a coppice go too long and this is what one gets. Dealing with this was very scary.

Sometimes it is useful to force a stump to sprout if I need a temporary bush or simply wish to regenerate new trees from one that has adventitious buds on its roots. Both bay and madrone sprout stems vigorously. Oaks make messy wads that don’t do well.

This cluster of bay was hanging off the crest of an almost-vertical drop. I am coppicing it for several purposes**:** First, as a matter of safety to get it out of the way to thin a clump of redwood. Second, the temporary loss of cover will help more hazelnut get started below. Third, it will reduce the weight prying this stump out of the slope to reduce the chance of the whole mass landsliding with a lot of dirt. This huge stump some 15 ft across and 10 inches high can then stabilize the crest of this almost vertical slope at the scarp of a rotational failure (slip-out) below.

Effectively, I’m using this root wad as a living retaining wall. Simply cut the stems to the ground every 20 years and it will do that job for many decades, if not more than a century.

Dropping arching bays like this can be deadly, even on the flat. They are brittle and tend to split (barber chair) as they start to fall. Some bend back overhead (corkscrew), making the behavior of the fall far less predictable. There is no good place to stand; it takes a rope and saddle to even get to it, making an escape from something unpredicted unlikely and dangerous. I looked at this mess many times before starting.

Worse, this cluster had one last stem I had to climb. Suddenly, about ten feet below where I wanted to part it, Someone told me “STOP!!!! Go no farther. Part it here.” It was really clear.

November 2017 – This visible rot section was invisible at the time. It was on top (the tension side) about 4 feet above the cut.

July 2018 – Same coppice as the prior slide from just above. There are now 5 hazelnuts, where last fall there was one, with a new toyon and lots of new ferns for good measure.

"Stop!!!"? Here??? At this point the stem was about 10 inches in diameter at about 30° off vertical, with a lot of weight hanging out over the canyon wall like a bent fishing rod. It's an enormous bending stress in the trunk. Bay is brittle; it breaks completely with little warning. Cut it too large and, as it splits a big flap of wood can either slam against your body if it pops out on your side or tears away a big shred with the falling log on the opposite side with you cinched to it with a cable. If either scenario doesn't kill you immediately, the subsequent fall of some 60-100 feet (subject to trajectory) surely will. It's usually safer to go higher and cut it smaller. Less weight means lower forces while cutting on a smaller top parts it before it falls with less force involved...

"But I really should go higher…" "STOP!!!" I've learned to obey that kind of clarity. There's a very trustworthy relationship involved that's been right every time no matter what I couldn't have known. I reached above my head with the saw making a weird triangular section cut to reduce material before starting the back cut. Then I parted it as fast as it would go. The trunk popped up like a fishing rod under load.

It wasn't until later when I hauled that log back up to the ridge that I learned the source of my peril (top). Just above where I had cut it, the core of that stem was rotting. I couldn't have seen it because the visible defect was 3-4 feet farther up from where the rot was structural.

I have yet to complete the coppicing, as I'm still hauling logs out, but it's already sprouting nicely with five hazelnuts where last year there was one. Would you risk your neck for this?

The number of tree workers who die every year is far more than peace officers, firefighters, and “first responders” COMBINED. More tree guys die than any other occupation (with the exception of fishing in Alaska). You’ve seen those commercials with firefighters calling in the power company to de-energize hazardous lines. If there are trees involved, guess who goes in first climbing in trees with a saw in bad weather?

So if what I’m doing looks dangerous, it is. Conifer forestry (next chapter) is even more hazardous because the forces due to taller trees are much higher, they fall farther, and involve more uncertainties. Moving them takes heavy equipment. Conifer accidents are therefore bigger, and things go bad over such a big area that it is harder to escape injury.

This hatred so many people hold for the poor guys who do tree work has got to stop. The work is hard and dangerous, they’re badly paid, and their working lifetime is short. Yet forests are in such awful shape we need them, badly. There is nothing “Natural” about letting a forest run amok until it destroys biodiversity. There isn’t anything optimal about it; it’s just bad policy. If what you want is for the industry to provide more detailed and artistic service, they would be happy to do that. Believe me, tree guys would love to make beautiful forests. I have never seen a tree worker come here who didn’t like what he saw (they’ve always been men). The problem is, it isn’t cheap and the customers don’t understand or appreciate the benefits of spending that time and money.

Perhaps the residents who have lost their homes due to wildfires might understand that it’s worth the effort? I am continually stunned at news reporters blabbering about the source of ignition as “the cause” of a fire. IT’S THE FUEL!!! No one can reasonably expect to put a wooden house in a dense forest or chaparral with the expectation that it will be totally safe from fire without need of doing something to manage the density, age, and spacing of that fuel. It takes people to manage that fuel.

For these reasons and because the invasion of conifers has done so much damage to hardwood forests here, this project is reducing the number and area covered by conifer trees, confining them to north-facing slopes where they grow slower anyway while doing less to shade out other types of habitat. You can learn more about that in the chapters on Conifer Forestry and Vegetative Maps and Aerial Photography.

November 2017 – Aftermath of the Santa Rosa Tubbs Fire

Phased Forestry Overview: An Explanation of the Graphic (next page)

Parts of the graph on the next page are the same as others previous, but much of it is completely different in concept. These are dated, but very tedious to draw, so please forgive my indolence. The first two lines again display emphasis upon forestry activities by type**:** conifer or hardwood. There is an important reason conifer work is included in our treatment of oak madrone woodland because large firs (and in places redwoods) are commonly found invading oak madrone woodland here because of fire-suppression. Unfortunately, I do not possess the equipment to deal with large fir logs easily; they are way too big and the terrain is very hostile to getting heavy equipment in there to do it. Hence, that type of "logging" is an activity specific to having the equipment on hand and therefore on a separate line from hardwood management. Hence, fir log removal from hardwood stands had to be lumped in with actual redwood logging elsewhere.

For example, the redwood timber job in 2000 was almost exclusively for the purpose of illustration for writing *Natural Process,* albeit I used the wood and learned a lot more from that job than expected, as is explained in that chapter. At that time I had several large fir trees removed from hardwood forests on other parts of the property.

Fir trees higher up on ridges here were removed as artifacts of historic fire-suppression. None were older than 80 years when we arrived, while the larger redwoods I've cut were about 110 years old. Hence, as little as 50 years ago, Douglas fir trees were not found where oak madrone woodland is today. As the site history pointed out, oak madrone woodland may not have invaded here that long ago either. The choice to emphasize the hardwood was made primarily because woodlands are so much easier to maintain than are grasslands, of which I can only handle so much depending upon conditions and because inter-digitating different successional stages yields much more information. Besides, I like trees too, along with everything else that belongs in a forest.

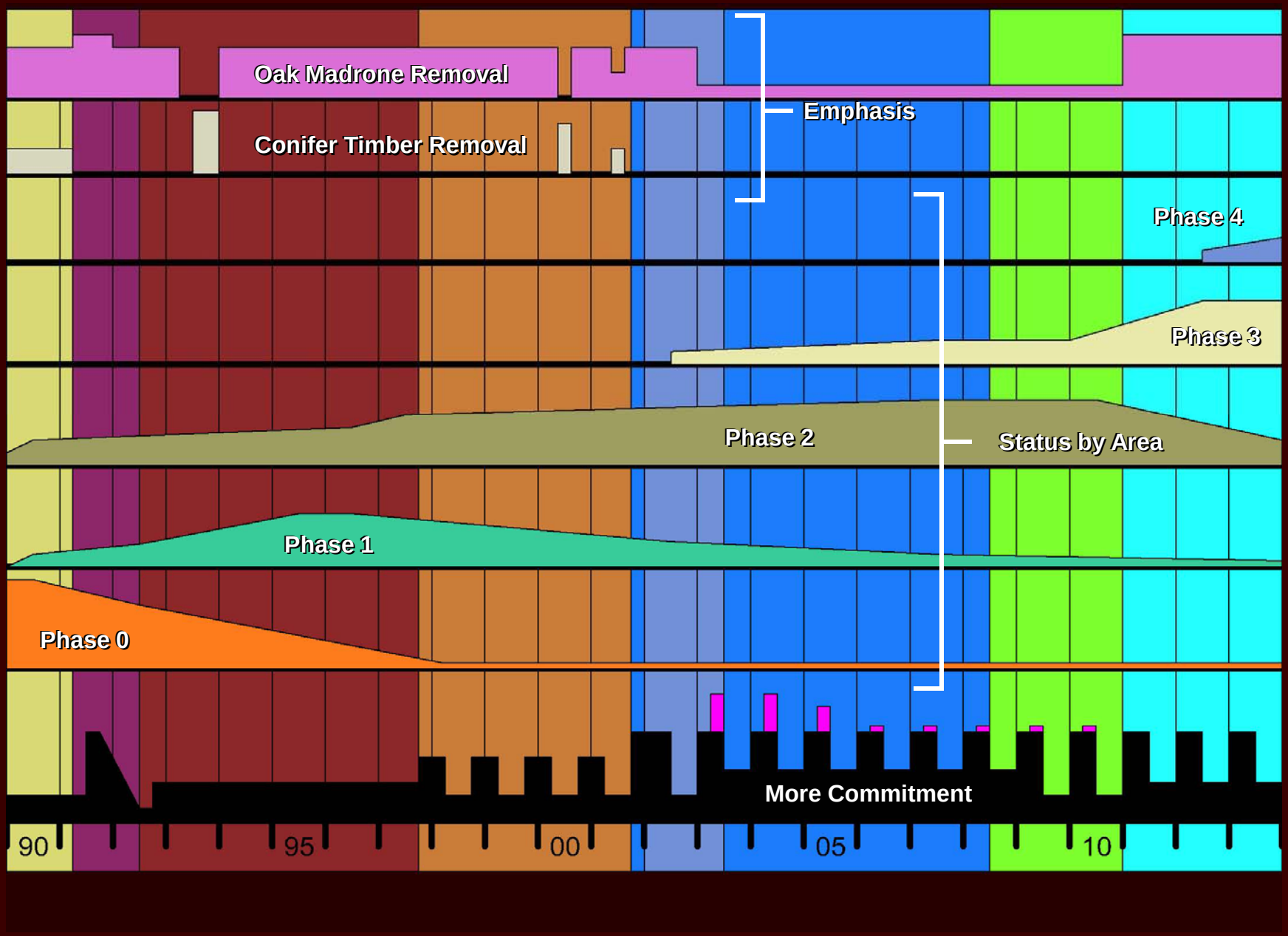
Said lines of emphasis are in the charts to show that from 2003 to 2010 I did relatively less hardwood forestry while I was focused on getting control of our grasslands. During those "middle" years, I harvested 2-6 cords of firewood per year, not the 30 of the first year or the 15-20 cords per year typical between 2010-17 (a cord is 128 cubic feet of tightly stacked firewood). During that time, the status of the phases below do not change much.

The other lines lower on the graph roughly depict Phase status as a function of time; i.e., any particular line depicts the approximate fractional area in that particular phase. The top two lines of the graph map onto those below them as does the time available at the bottom.

And all of that is why we call it a "convolution." My only problem with it now is that it was such a hassle to draw it's become terribly dated. For a spatial summary of the progression of phased forestry projects, please consult the chapter on vegetative maps and aerial photography.

Phased Forestry Overview

If these graphs don't work for you, please let me know.



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