

PART II: FORESTRY

When one buys a piece of property, choking with scraggly native trees being succeeded by conifers with an occasional exotic monoculture stand and acres of dense exotic brush (whacked but still alive), the first priorities, while not at all easy, are extremely simple. Thin the native trees, and kill both exotic trees and brush.

Simple in principle doesn't make for simple in execution simply because removing 180' tall trees (some of them leaners) requires heavy equipment. Moving big heavy logs capable of crushing exhausted people in too much of a hurry also involves hazards. Logging is the second most dangerous job in America (almost five times as deadly as being a law-enforcement officer). So far, I have been fortunate, but there have been a couple of close calls.

Moving big equipment and removing logs requires roads. Repairing old roads involves drainage. Neither roads nor drainages is a simple matter; both are major issues for those opposed to logging. Much of what I did here is definitely not legal on a commercial job much less what the activists want, but then on the other hand, you'll be able to see that it worked better than the alternatives they seem to prefer.

There are chapters in Part II for each of these topics: exotics, broadleaf forestry, conifer forestry, roads, and drainage. Yet once one gets such things under control, what kind of forests make the most sense for this land? Healthy forests are a lot more than trees; they have groundcovers, shrubs, and habitat for wildlife. Converting the mess we eventually brought under control back into productive forests completes Part II.



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Revision History [1.0](#) [2.0](#) [3.0](#) [3.1](#) [3.2](#) [3.3](#) [3.4](#) [3.5](#) [4.0](#) [4.1](#) [4.2](#) [4.3](#) [4.4](#) [4.5](#) [4.7](#) [5.4](#)

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

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WEEDING IN A BIG WAY



February 1994

In addition to the dead and sickly, the first trees to go were the “weeds,” some of which were rather large (the guy in the photo is 6’-6” and the butt is sunk in the ground). This *Eucalyptus* was one of three such monsters on our property. Logging out a big euc is an undertaking, one requiring heavy equipment, manpower, and time. The saw had a five foot bar with a skip-tooth chain and extra oil squirted on it to cool it while cutting (my job). In this and one other case, we needed a medium-sized bulldozer with a 3/4” cable winch to pull it down and guess who got to climb them to install the choker cables? Then we brought in a skip loader to get the pieces into a dump truck. Gaining access entailed improving both roads and drainage. So weeding big can be expensive too.

This is a neighboring property to the north of ours.

A new neighbor just bought it. For ten years prior I could not cut the acacia even though I wanted to replace them with redwood (go figure).

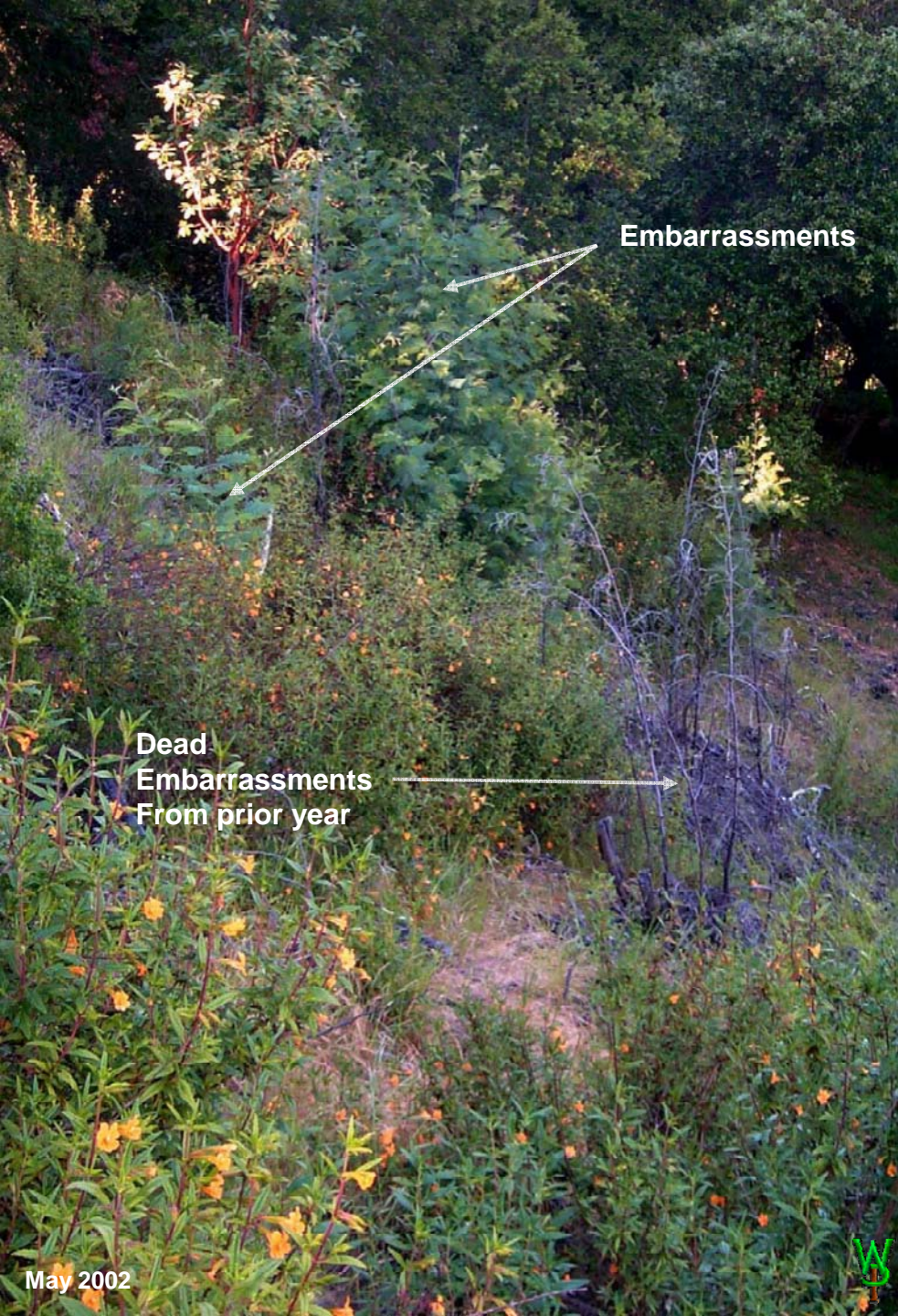
The only thing that did well here under the acacia was *Oxalis pes caprae*, a South African exotic of considerable virulence that took five years to get under control.



October 2013



The other “weed” tree here was acacia, also from Australia. In the case of acacia, I suspect they were introduced as quick and clean firewood because they are otherwise lousy trees. They bolt immediately, fall atop each other, and spend the rest of their lives dropping trash, making people sneeze, and sprouting (it is a legume). Cutting up a stand of these is dangerous, as they lay atop each other with slippery “spring-loaded” trunks. The loads on the trunks are complex and the likelihood of being be hit by a sliding tree is considerable.



Embarrassments

Dead
Embarrassments
From prior year

At left, this newly established patch of almost entirely native scrub was once a stand of acacia. This was a monoculture forest; nothing else was alive inside the stand. Monkey flower (*Diplacus auranticus*, used to be *Mimulus*) and yerba santa (*Eriodictyon californicum*) both colonized this newly exposed “clear-cut” site aggressively.

Needless to say, the acacia trees keep trying to make a comeback from their dormant seed and I get to pull, cut, and daub the seedlings every year going on 18 years now. Occasionally one escapes my notice (it is easy to miss a naked grey stem when weeding the ground in a chaparral), so they get to embarrass me when they poke their heads above the brush and then require a chain saw.

This site would be easier to maintain as a forest, but I do not have many good places for scrub chaparral that do not constitute a fire hazard. I usually maintain brush in horizontal bands no more than 60-80 feet up a slope to reduce the risk of a fire building sufficient draft to gather momentum (monkey flower burns like diesel). Unfortunately, the same properties that made these native shrubs so useful in colonizing this slope are a headache when it comes to keeping them from invading and converting the grassland fuel buffer above them. Goats would probably help here.

So as restorations go, these acacia clear-cuts were fairly easy. Just whack the bad trees, haul the wood away, burn the tops, and watch the native brush grow while weeding out the bad stuff (primarily grass weeds (here *Festuca myuros* and *bromoides*). In any case, there are really only two choices about what to do with a disastrous fuel load full of weeds: Wait until it eventually blows up in a catastrophic fire or remove the fuel and deal with the consequences. Fire is an inevitability; our choices are limited to how to manage it. I *would* like to burn this some day soon.

Now, on to native hardwood forests.

THE UNDERSTORY STORY: BRINGING A FOREST BACK TO LIFE

This chapter is important to me. I have loved forests since I was very small, with birds, animals, fungi, little flowers, and bugs. Forests were alive. My parents would have to tear me away. When we went camping, I got lost fairly regularly. One of the main reasons we bought this place was because of that love for forests.

As you may recall from “*Native*” is Not Enough, “Among the 145 native dicot herbs on our *species list*, *only 5* were still reproducing (barely) on our property when we moved here. As our project progressed, an estimated 23 species came up from the seed bank and 86 immigrated (a subjective determination) and are now reproducing here today. Over fifteen years I found and relocated 6 more here locally. I’d like to find the other 30 someday, but 8 have not been seen here since at least 1953, and all but two of those not since 1914. Most are probably locally extinct.

Among the 32 native shrubs on our *species list*, 15 were still here, of which 6 were almost gone (of which two are above). Once I thinned the forest and got our 10-acre French broom infestation under control, 10 more came up or in on their own. It took me a decade to find the next four. I’d like to find the other 7 someday but none have been recorded here for over a century.”

Obviously the stand at left does not resemble that description, but when we got here it most certainly did! It was so dark down here even broom could hardly live. There weren’t even ferns. The reason it came back is because I have a chainsaw and I know how to use it.

OK, it was more than that, but definitely a chainsaw!



October 2013 – Broom on a neighbor's property
I whack this back annually as a buffer.

Of the five types of habitat on our property, two are forests. Our oak/madrone woodland forests suffered terribly, primarily from three truly dominant weeds: French Broom (*Genista monspessulana*), hedge parsley (*Torilis arvensis*), and bedstraw (*Galium aparine*). Mind you, those three were quite enough. Broom took some 6-7 years to get to a sane level of hand control, the other two take thinning enough to get them to germinate and another 3-5 years after that. Yet there is another threat: The foreground in this image has been whacked with a brush cutter. In it, you can see several fir seedlings that can reach 100 feet in height in 40 years... That close together? They'll try! I took this photograph in the fall so that the broom would be thinner. Otherwise, it would be a wall.



June 2012

Like this. These “walls” line the County road. Simply because there were not full-sized French broom in the repeat images of our property, do not under-estimate what we faced with this awful weed. Just recall the number of seedlings on the ground in the “before” pictures, scale for how fast it grows, and multiply by area. **Our place was 10 once acres of this**, with 30 years worth of seed.



May 2010, on a neighbor's property

By 1993, I had cut all of our French broom and either chopped it in place or gathered it in piles and burned it while building a house, starting a job as an engineer, and adding our first child. I brush cut it for 1-2 years thereafter, allowing the seedlings and re-sprouts to shade the incoming natives. In about 1995, I sprayed 10 acres of it. Then I mowed for 2-3 years, allowing more broom to sprout and cover the natives from the spray. Spray again, and so on ([broom control document here](#)). This way, it took a total of but 3 gallons of triclopyr concentrate to get control of a 10-acre disaster. To this day, I am still pushing that perimeter back, here about to whack it on my neighbors' land (above). This French broom sprouted after five years of mowing. I had sprayed it for the first time the prior year (the dead stems you see in the foreground), yet there is more native yerba buena on the ground than the prior year and it is doing just fine. I will wait for more broom to come up and thicken to cover the natives before spraying again. Here, it is 2-4 feet tall, in flower, and ready for mowing. Altogether, controlling French broom, even here, is now a relatively easy problem to manage.



May 2000

My process was to whack it at least two years between sprayings to accumulate sufficient density to provide cover for underlying natives. Besides, whacking was simply several times faster. By 2000 I had run the cycle at least twice on the whole property, here three times, just using up broom seed, but you can tell that it is starting to thin out. Getting even this far took a decade. When you look at the timelines on this project, besides career work, broom sprouts are why there is not much change in those first 10 years.



July 2015

After 25 years, we are getting there with broom, although not entirely done. I probably removed a dozen seedlings in here this year, almost none on the grassland above. The monkey flower is getting rather decadent here and could probably use a whacking this fall.



This broom is about 60 feet beyond our eastern property line. It is ranked in two heights: the front rank is about 3-4 feet tall and the back one about 6-8 feet tall. This photograph depicts a history in which I beat the broom back in "stripes" parallel to the property line. The face of the back rank is the point to which I had brush-cut the broom the prior year. The front rank is about 8-10 feet in depth, which is about how far they can pop seed here.

Only a few years prior, the grassland in the foreground was broom. Every few years, I took another stripe and moved the control boundary backward toward a location of better tactical advantage (shade under the trees). I whack it for a couple of years, allowing the natives to establish and then, in the spring when the broom is about 2 feet tall and covering those natives, I spray it with a weak triclopyr formulation of my own design. The reason you see grass (mostly small-flowered needle grass (*Stipa lepida*)) and not broom is that triclopyr does not kill grasses and they do a good job of suppressing broom germination. In this spot over the succeeding years, the grasses were sufficiently successful in suppressing germination that I could control the broom by pulling. One or two spray applications is all it usually takes to get the numbers down to where the situation is manageable by hand. With good ground cover, there is little soil disturbance that might bring up new broom seed when I pull the seedlings.

As of 2013, the broom you see here was gone; I chased it back under some bay trees where it is so dark that it does not do well and the bay puts out hormones that suppress the broom. So for now, this is a stable control boundary (until the bay burns or dies). Sometimes you get lucky and find a reasonable habitat gradient like this one that can maintain a relatively stable barrier to an infestation (unless it burns).



June 2015

This is that boundary today, where I use the shade to keep the weeds down, but there is a problem here. Beautiful oak tree, isn't it? Well, if I don't take the broom down around it and take out that rat's nest, it's probably doomed in a fire. So, why don't I keep going? This "broom wall" is almost 100 feet beyond the property line. I'd love to save the tree, but if I cut the broom sufficient to do so, I would get a battle from far more dangerous weeds that would blow in under the trees and into my forest grassland just behind this spot. As much as I hate it, there just have to be limits. At least now somebody else gets to appreciate it. I wish the owner would.



June 2015

So yes, I still have to pull broom, such a bother! I went through here this morning and found about a few between 4" and 2' tall as the lemon/mint aroma of the yerva buena rose from my feet. Just terrible work!



March 2004

This is catchweed bedstraw (*Galium aparine*, so they say) getting started among native blackberry, snowberry, hedge nettle, and rough leaved aster. Our infestation was originally brought in by the garbage company. My first weed book, *Weeds of the West*, said it was native. At the time, I was overwhelmed with cat's ear elsewhere, so I let it go. Two years later, we had acres of 6-10ft long tendrils killing native vegetation. We rolled it into 3ft balls with rakes while slashing roots. Unfortunately, I had to nuke a lot of it with Roundup®, which took the natives with it. It was a terrible loss, from which the snowberry in particular is still barely recovering. Had I known at the time there was a better and more benign way to take care of this problem, I never would have lost those perennials.

I do not believe that this bedstraw ("*G. aparine*") is native here. As to why, consider this example:

Among the madder tribe (which includes all bedstraw species) we have two definite natives and four exotics. At right is one of the natives, Sweet California Bedstraw (*G. trifidum*). This bedstraw is no problem; it is about a quarter the size of the weed, tends to stay put, and mixes well with other groundcover species.

The three exotic madders just cannot "get along with other children." At left is a single *G. aparine* (the photo spans about two feet). It's grows just about anywhere, and buries most natives.



Tor ten years after we arrived, although it exhibits totally dominant behavior here now, "*G. aparine*" was not anywhere to be seen **for miles**. When it did get here, it took over in just a couple of years (until I went to war) and has been spreading in the area for miles exhibiting similarly dominant behavior. I don't believe native plants do that.

The other two virulent exotic madders are Field Madder (*Sherardia arvensis*) and Wall Bedstraw (*G. parisiense*). Both were dormant in the soil until we started thinning. When they did come up, they behaved like most other exotics, suppressing native groundcovers. After taking them down, the *G. parisiense* has been a constant but decreasing battle, as it is capable of breeding at less than ¼" tall!





May 2010

There is a bedstraw species very similar to *G. aparine* native to Eurasia (*G. spurium*). The State (conveniently) considers them the same species. This plant is very costly in agricultural crops, as it tangles in harvesting equipment and requires the farmer to segregate the weed seed from the product. If they are in fact different, and if the exotic had invaded this area an/or hybridized the native, how would our eminent State botanists have developed means to distinguish them? It wouldn't be their first such mistake. If the two have hybridized I may have a way to prove it by DNA analysis of pollen in mud strata. This patch is on my neighbor's property battling it out with exotic oats. It is so dominant, ubiquitous, destructive, and fast moving over large distances, that if it was native, there is no way it would not have already inhabited this area when we arrived.



March 2017

This is bitter cress (*Cardamine hirsuta* – the little upright pods). It lay hidden in the duff for 25 years until we got an enormous rain in 2016-17. This is a pest of both grasslands and forest understory. Unlike bedstraw, this is a clear-cut case of misidentification by the all knowing State and University of California, which **to this day still holds that this as native *Cardamine oligosperma*. *Cardamine oligosperma* does NOT behave like a pest.** There is no question about the ID, as the pest has four pollen anthers on the flowers, and the native five; this is negligence. Not a single expert at the State or University has taken the half hour necessary to look and report it. AGAIN, this is an economically significant weed. It has been here, causing massive problems for the nursery business, for FIFTY years without being correctly identified. WHY do we pay these people a decent salary with an unbelievably fat pension and opulent medical care if they won't do their jobs? Why do we trust this system to "protect the environment"? Why don't they stop importation of these catastrophically costly and damaging pests and pathogens? Their purpose is not about the environment, it's about money.



February 2009

This is bedstraw fifteen years after introduction under a tree near where I leave said garbage cans for pickup. I am not going to belabor with more examples the understory weeds I battled because there is a more serious purpose to recounting this horror. **Had I known** more about native plants and what was in the weed bank before I began, **much of what this job required would have been totally unnecessary.** Had I known that the “experts” were suspect, I would have killed bedstraw when it first appeared near where we leave our garbage cans for pickup. In this game, **early detection and control is everything**, because mistakes multiply, big time, but more importantly, an exotic introduction can be a difficult and costly problem for A CENTURY. Early detection is everything.



June 2004

This is how information helps control a new infestation. This is Sticky Eupatorium, (*Ageratina adenophora*). This plant first appeared in a drainage amid a stand of redwood. It grew 5ft tall the first year and was starting to set wind-blown seed (see inset). After getting it identified the same day (thanks to a digital camera, email, and Dr. Grey Hayes), I wrote the local control expert in Monterey for advice. He told me they were losing. Perhaps you can guess why.

After fifteen years' investment, I couldn't afford to lose; the risk of seed washing down the drainage in the first rain to germinate for the next half-mile was just too great. So I did some homework.

Eupatorium is a tropical plant, while most natives produce seed that need exposure to cold weather to germinate. So, after very carefully bagging all the seed I could (I lost some) and pulling the bush, I hosed the area with oryzalin, a pre-emergence herbicide that kills **germinating seed only**. Then I ran 500 ft of polyethylene tubing, tie-wrapped a sprinkler-head to a t-post, and watered it occasionally over the summer.

Next spring there was none, done, zero, nada... ERADICATED!!! I have never seen it again!

After treatment, the natives present were completely unharmed. So, I wrote the "expert" with my results. He intoned ominously that he could never use an herbicide because it might harm a native plant (as if native plants were not being harmed by the weed). By the winter, most of the herbicide had already decomposed and it is not particularly mobile anyway. I expect he is still taking a paycheck to fight it. He might even know that the weed is toxic to wildlife.





This is hedge parsley (*Torilis arvensis*), the other truly awful forest annual we suffered. It usually grows about 6-12 inches tall but can grow to four feet. It produces tenacious burs that get into everything (inset). I really feel for every mouse, squirrel, and deer that has to deal with this stuff, but I'm not exactly thrilled when they come here from elsewhere and clean themselves off (which they do).

There are a number of weed infestations of which I do not have good pictures and this is one. It is simply very hard to get a distinctive photograph of a large number of small plants dispersed over big areas mixed with other vegetation. They require high contrast lighting to even see well in a forest with patchy light intensity. Once you get a shot close enough to show the plants, you can't show the infestation over a large enough area to communicate the magnitude of the problem. Sorry, but until I get HD video with optimal lighting, a way to pan big distances without vibration, and very expensive lenses, photos like this were all I could afford, especially in terms of time.

Now, you may wonder about that, but here it is: **Any weed you miss reproduces and spreads next year. It is only as one approaches zero that one reduces weed germination in subsequent years.**

In the heat of this fight, there was never a time at which it was not a desperate battle. In the case of hedge parsley (at left), my two girls and I took out 37 garbage bags of this little beast (most under 8" tall) in one year, by hand, in addition to what I sprayed. Hedge parsley was a family victory. We no longer experience what you see at left.

Accordingly, some of these photos were taken outside our property, typically along public roads. However, those pictures do not express the dominance these pests exert invading a native habitat because in these outside locations they are competing with other weeds or an overgrown forest. Once you thin the forest up they come. Then you get to learn the unpleasant truth about its real condition. Effectively, **what little is left of the native biodiversity of this area is beneath multiple "layers" of powerful enemies.** Each is capable of taking over; each must be removed for years before what is left of native seed begins to express itself or colonizes from outside. This is the "weed bank," and it is not to be under-estimated.



Hedge Parsley

Cicely

Bedstraw

March 2014

They are not any easier to see in full sun. Amid this hedge parsley infestation along with rip gut and bedstraw is a native lookalike: mountain sweet cicely (*Osmorhiza berteroi*). Glare is fatiguing either weeding or spot spraying. There are more in this picture.



January 2013



I have since learned that hedge parsley is simply the first *forest* weed from the seed bank to respond to exposure to light and decomposition of leaf litter. It is by no means the last weed in the forest seed bank. If I took it back to grassland, there would probably be the compliment usual for that system. I can suppress hedge parsley with natives, and am doing so, but if there is ever a fire I should know what to expect and how to respond. Things might very well get ugly for a while. In our forests, removing hedge parsley is usually followed by scarlet pimpernel (*Anagalis arvensis*, now *Lysimachia arvensis*) and various cudweeds (*Gamochaeta* spp). Bitter cress lurks there too, as probably does *Oxalis micrantha*, but I have little doubt there are more. **How do I get them to come up and die?** What do I do in the mean time to prepare? Give the surface enough light to grow the weeds, stimulate germination in patches upon occasion with a pattern of sporadically located burn piles, and watch what comes up carefully. That way, I reduce the scope of the problem, develop more native seed to respond to a future event, and know more about what such a larger event might portend.



This oak... →

Broom coming up
after being whacked



November 1989



Where to start? Here we return to our repeat photographs. There is an opening behind the trees in the right background (red arrow) that was visible in the [aerial photos](#) back in 1991. Note the oak indicated (arrow). It was a nicely structured tree back then, with a classic “halo” of leaf litter around its root crown. I had no understanding of what was going to happen to it.



... is this oak



May 2010



I want to know why. Of all the groundcover types found here, this oak woodland carpet is my favorite, but I don't want its associates killing trees. This understory takes about a quarter of the time required to maintain even a pristine meadow. To keep it this way, I cull native coyote brush, fir trees, and some grasses; else it would soon be unmanageable. An acre a day three times a year is about all that is necessary to keep it like this. I must also continue to thin the oaks and madrone, as they spread their canopies when allowed the extra room. I am also propagating deciduous black oak here, which I believe I can grow in such a way as to maintain the groundcover because of the additional winter light while still shading out the grasses.



Toyon
(*H. arbutifolia*)

Monkey Flower
(*D. aruantiacus*)

C. cuneatis

C. papillosus

Manzanita
(*A. tomentosa*)

As to native shrubs, from a management perspective, there are effectively two types here: those that have adventitious buds and respond to coppicing (cutting them to the ground line) and those that do not (particularly *Ceanothus*), growing only from seed.





May 2015

To this day, we do not have as many shrubs as should be here for three reasons: (1) The understory brush was once virtually all broom. (2) The forest, although no longer a fire hazard, was, too dense to allow shrubs to grow. (3) Some native shrubs are hard to propagate.



May 2015



The easiest shrub to establish, without doubt, is monkey flower (*Diplacus aurantiacus*). It can also become something of a pest. With enough sun, this plant will form a solid wall of blooms. Do not grow it near a structure as it burns like gasoline, particularly when it gets old, dry and scraggly within a few years. This stand was whacked to the ground three years ago. It will get it again this fall.



Golden Yarrow
(*Eriophyllum confertiflorum*)

Burned It Here

May 2015

This monkey flower was whacked in fall 2014. It came back lush and green. Clovers (and weeds) came up on and below the burn spot.



Chamise
(Adenostoma fasciculatum)

Buck Brush
(Ceanothus cuneatis)

Hairy Manzanita
(Arctostaphylos tomentosa)

There is also poison oak woven into this hedge. It makes a dandy fence! (It's pretty in fall too)

Deerweed
(Lotus scoparius)

May 2015



Many, if not most shrubs here are transplants. The reason? Fire stimulates too many seedlings around a burn pile. So I transplant them, particularly *Ceanothus* spp. I also relocate coffee berry (*Frangula californica*), poison oak (*Toxicodendron diversilobum*), black sage (*Salvia mellifera*), toyon (*Heteromeles arbutifolia*), and chamise (*Adenostoma fasciculatum*). As these get larger and denser, hopefully they'll shade the groundcovers and deter the blackberry and groundcover poison oak, again for management reasons.



May 2015

The most difficult to germinate is the manzanita (*A. tomentosa*). Yet this species has two special properties that allow transplanting more readily. First, we found quite by accident that it can be propagated by air layering (circled): Scar a branch, bend it down into the soil, and it will root. Wait a couple of years for the roots to develop and part it off the main plant. It is then ready for transplantation. Second, *A. tomentosa* is also unusual among manzanita species in that it will sprout from the root crown.



October 2013

On the left is manzanita (*A. tomentosa* left) and on the right is toyon (*Heteromeles arbutifolia*) both show large boles indicating regeneration from a severe fire. Both toyon and coffeeberry may be started from seed by removing barely mature (only slightly brown) seed from the fruit and planting it immediately before it goes dormant, preferably with bottom heat. Manzanita is more difficult.



June 2010

This is chamise (*Adenostoma fasciculatum*), which seems to prefer extremely poor soil. Ceanothus, chamise, and manzanita in particular burn hot and fast. These fire-adapted shrubs all regenerate rapidly and leave considerable standing fuel after a burn. One wonders if, after 10,000 years of anthropogenic burning, their prevalence and distribution in California are largely due to occasional fires for purposes of harvesting fuel. The supply necessary both for space heating and the thermodynamically inefficient process of heating rocks for boiling gruel in baskets had to be considerable. Brush would grow faster than trees to a height that would make a good cooking fire and still be easy for (usually women) to break off and gather. Those properties would place brush fields in separate patches to maintain production cycles out of phase and at a safe distance from settlements. It would be a kick to burn and harvest a few patches to match that phasing to a specified consumption rate while weeding them carefully to witness the totality of cumulative effects after a few decades, while calculating the acreage needs for wildlife. I don't have that kind of habitat. Who's going to do it?



Untreated

Headed

Coppiced



May 2015 – The untreated toyon bush is so thin it is hard to see. The headed toyon bolted but also has red leaves.

It took several failed attempts at trimming toyon to accept that it was better cut to the ground (coppiced) than trimmed. The reason is the same “sun scald” problem we have seen with oak trees suddenly exposed to light. The bark on shrubs grown in shade cannot protect the cambium sufficiently for the stem to survive and the shrub can die trying to save it. Better for the shrub to put that energy into new growth. So when I thin trees with toyon nearby now, the toyon now usually gets cut to the ground first. The new growth is amazing. Effectively, to maintain this “hedge” I’ll try more shrubs in higher density, as some will be growing out while others are cut back.



May 2015



Ceanothus grows very fast (it fixes its own nitrogen hosting symbiotic *Frankia* Actinomycetes). It typically lives only 10-15 years but one can extend that lifetime considerably with pruning or animal browsing. This still-vigorous *C. cuneatus* shrub is at least 15 years old.



May 2015

With enough light, the Ceanothus seedlings can germinate very thickly. There are six in this photo within a space of about six feet. They transplant well, but until the groundcovers thicken, they will probably be as problematic as are oak seedlings. Why? Probably nobody but a hunter would notice in these photographs **the total lack of any sign of herbivory** on these shrubs despite the fact that this is one of the few sites in the entire neighborhood with young fresh plants! Both Ceanothus and chamise are favorites of browsing deer and antelope. Deer numbers in our immediate area have fallen precipitously, primarily because of overpopulated mountain lions, pigs, coyotes, and (other than suburban gardens) lack of food. Pronghorn are locally extinct (not that I am pining for them around just yet).



June 2010

Sometimes, the easy way to get the brush going is a burn pile. Where there is seed, up comes Ceanothus! This pile produced twenty seedlings for transplanting, yet there are still more than this spot can sustain. There are already small madrone trees starting inside. Note that, if this whole area burned, all I would have is a bigger patch of brush, a completely unmanageable situation. This is safer, provides the necessary browse for deer, cover for quail, food for rodents, and flyways for raptors. Over decades, this process will produce an uneven aged stand of oak and madrone with small patches of fire-adapted shrubs in between.



May 2015

Now that we've met some of the players, let's look at this power line right-of-way described in the phased forestry chapter to show the power of light to bring life to this understory! The main thing I wanted to learn from culling the trees here, is more about what the "ideal" spacing of trees and shrubs having particular aspect ratios and solar orientation might be with which to build a productive understory with shrubs and groundcovers that is also reasonable to manage. Shrubs in particular are perhaps an easier tool than oak trees (unless I can get more animal acorn consumption) because most do not germinate easily.



May 2015

The expectation is that groundcover types will graduate with respect to hours of exposure to direct sunlight dictated by slope, orientation, and both type and aspect ratio of tree and brush cover. Thus, the savannah architecture can induce a species richness achievable with no other system here. The goal of increasing the deciduous fraction of tree cover is meant to augment that diversity with spatial seasonal light variation.



February 2013



The corridor started out rather denuded due to overgrown trees. The slope faces northeast so afternoon sun is behind the hill, thus most of the light falls toward the right side of these images. Sunlight is the most powerful germinating force here.



Manzanita
transplant

Bromus
carinatus

April 2014



Not surprisingly, the grasses are most intense where there is the most light. Just below the image is our driveway, which represents another opening. Thus there is thus more grass across the bottom of these images. I harvested all of the grass, as I did not want more. The dashed lines represent the old orchard terrace edges.



February 2015

Here we are a year later, soon after our first month of truly wet weather in three years. More importantly perhaps, it was wet weather followed by warmth. Watch what happens!



May 2015

Eleven weeks later, after water, warmth, and light. On the right edge, there are now half a dozen *Ceanothus* and toward the top there are lots more and a few new manzanita seedlings I can move! So let's take a look at how this works with some other species here.



June 2016

Note the increase in grasses 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 replace some of the shade trees once provided. Hopefully, perennial cover will displace the grass. Until then, the slender tarweed on the right is easier to maintain.





May 2015

The following photos will depict species in the order of their preferences for shade. This California brome (*B. carinatus*) is great for soil and a source of seed for birds, but a problem to weed because of visual and physical occlusion. 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. Someday.



Bromus carinatus

Madia gracilis

May 2015

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





May 2015 – *Elymus glaucus*

These rye grasses growing through a monkey flower bush are six feet tall and represent an equally important food resource. Slowing down the grasses is critical to keeping the situation manageable but there other native annuals and perennials that are just as problematic when it comes to weeding them. Goats would work. Protecting them from coyotes and mountain lions here is problematic.



March 2015 – *Elymus glaucus*

This area at the head of the corridor is newly exposed to light . The yellowish herb is yerba buena (*Satureja douglasiana*) which is wonderful, smells heavenly, and moved in quickly. If you look in the back you will see two bunch grasses I added just as I was finishing this job in the late winter of 2013: *Festuca californica* (red arrows). I first found these grasses in an established oak woodland like this one. The idea is to see how they do with more sun and if they will compete with the bromes at lower fuel value.



April 2015


This is the shady side of our corridor, populated largely with *Stachys rigida*. This plant is of the same genus as others proven to exude sugars that feed nitrogen fixing bacteria in soil. That such bugs would be in the rhizosphere loose in soil makes doing experimental work on them very difficult, as one cannot know all the relationships they require with other bacteria and fungi to function normally with existing technology. Nor could one justify the expense of such a study easily without evidence of a potential economic benefit. We are testing it here as a companion plant in the vegetable garden to see what it does.



June 2015



Calamagrostis rubescens (pine grass), although not terribly productive, is WONDERFUL to manage! It is quite shade tolerant. It spreads by rhizomes, holds steep soils, and does well from transplanted root nodes, albeit spreading slowly (it rarely seeds). It also seems to suppress the blackberry while allowing groundcover diversity. This stand has held stable like this for five years.



Blackberries

Raspberries in white root sedges

July 2015 – Yes, that is a calla lily, a legacy of the people who once lived here.



With enough sun, native blackberry can make a mounding mess and a rather unpleasant place in which to weed. It tends to deter deer browsing somewhat, thus abetting the proliferation of too many young trees, putting the successional system on steroids. Fortunately, it is adapted to frequent fire and antelope browsing (although at times Indians directed their fires away from it to shelter rabbits). In this case, I've separated it from this native raspberry it was choking, simply because I don't have much of the latter.



April 2015



Another favored forest groundcover here is snowberry (*Symphoricarpos mollis*, foreground), effectively a low-growing shrub that gets no more than 12" tall here. Snowberries, while not at all tasty, are food for wildlife. It can be slow to start, but spreads by both air layering and rhizomes. This species suffered terribly because spraying to remove bedstraw and hedge parsley, but is now making a comeback. Yet in the background it faces competition from *Sanicula crassicaulis*, a weedy native that I have since made some effort to control.



June 2015

Pacific sanicle (*Sanicula crassicaulis*) is one physically obnoxious plant! It spreads like wildfire. It grows tall enough to get in the way while weeding. It produces sticky burs that get into everything. And it remains standing after it dies as a stiff branchy bunch of twigs. It is also potentially a valuable spice, producing a smell so wonderful one is tempted to use it in desserts in a manner analogous to clove (and potentially just as overpowering). Still, I pull off the seed and occasionally kill it but not in such a manner as to have eradication as a goal, a strategy I call "resistance." One reason it may be so overpowering as a plant is that its parasites may not be present. For example, there is a moth also known to be rare (*Greya reticulata*) that lays its eggs in both sanicle and *Ozmoirrhiza chilensis* (California Sweet Cicely, another truly wonderful herb). So, just because it is a native plant does not mean that letting it run wild is a good thing, particularly because the system as a whole is so damaged.



July 2015

Because it is so dense tight to the surface, perennial California bedstraw (*Galium californicum*) is far less obnoxious than its supposedly native cousin and may help keep the likes of sanicle under control.



June 2015

This is a pretty typical forest edge of blackberry (*Rubus ursinus*), rush (*Juncus patens*), coastal wood fern (*Dryopteris arguta*), slender madia (*M. gracilis*), strawberries (*Fragaria vesca*), monkey flower (*D. aurantiacus*), California brome (*B. carinatus*), sweet bedstraw (*G. triflorum*), and a sword fern (*Polystichum munitum*). I weed it passing by, but there is not much to do.



May 2015

This corridor experiment taught me a lot about how fast that response progresses and what I might do to slow it down, a picture that surely includes harvesting and/or herbivory as management tools. The slope above is the first application of those observations, albeit based upon gut feel at this point rather than quantitative analysis. One makes choices based more upon the prospects of the trees one has, with the “ideal” quantitative relationships as advisory considerations.



July 2015

If you are at all an ecologist familiar with this area, by now you are probably wondering why I left out poison oak (*Toxicodendron diversilobum*). That is because it is an amazing plant that doesn't fit in a graduated sun-to-shade model; it adapts well to virtually any condition. Thankfully, I have gained and maintain an immunity to the urushiol toxin. I transplant and weave it into hedgerows as a fence. It is a great erosion control with cable-like roots. It is also a great topsoil builder. I am not crazy about what it can do to trees, so with a few special exceptions, I keep it on the ground, away from trails traveled by guests. I don't allow it to become a fire hazard.



June 2015

To recap: the first thinning when we arrived was for purposes of fuel reduction and constructing a home. With the exception of a very few leggy toyon bushes, the entire understory was broom. Now that the weeds are under control, what I am now attempting with this high intensity corridor (axis dashed line) is what I used to do when I experimented with removing single trees after the first two phases of thinning: I want to establish a productive groundcover in fewer steps without so much of a weed problem as a way to get local plants breeding for nearby use and get shrubs going. The goal is to do this on larger scale as possibly a two step process: thin enough to get planted shrubs established while getting **all** the weeds before they drop seed. Then thin it the rest of the way while treating the shrubs in such a way that they provide both food and shade to slow down the grasses, blackberries, and tree seedlings. The eventual goal is a savannah with enough light to drive food production under the trees. Yet there may be hazards associated with that goal.



July 2015

Note the “halo” of barren leaf litter around most of the oak trees. When the “buttress roots” (the major radials that anchor the tree) are buried, they can put out laterals that grow across the top of other buttress roots. Arborists call these “girdling roots.” As they grow in diameter, they 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.



July 2015

Thin sufficiently, and one induces an “inverted halo,” intense groundcovers around the tree enjoying the partial shade and crawling up the trunk. Now, this may be what killed that oak in [the image on p24](#), in that the groundcovers may possibly (and I don’t know) stimulate the growth of what are called “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?



July 2015 – Nice tree, but nothing alive under it. I'll take the one in the middle behind it (X) to put more light in here and see what happens.

These questions are all about what kind of trees I want to grow for the forest I want to grow. I want spacing sufficient to keep the trees from getting too skinny and unstable, but I want trunks tall enough to withstand less frequent fire in the shrub understory. Taller trunks promote inverted halos. 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. These are tradeoffs.



May 2015

With more wildlife, there is more acorn herbivory. Yet one needs to keep the animals going all year which takes leafy groundcovers and shrubs. So I want to know about the relative safety of promoting inverted halos or how they are best managed. 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. Just dig around the trunk exposing about a foot of buttress root extending from the trunk and sever any girdling roots that are starting to develop. This tree had one. I probably need to do that job here again.



Phased forestry as practiced here was a necessity, both because of my limited time and money and because the problems with fuel loads, broom, and other weeds elsewhere on the property 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 thinks at that point, the result looks like it does at left.

As a result, I had fewer good younger trees or shrub seedlings with which to work than I would have liked and was forced to thin more aggressively later on than I might otherwise have needed.

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.

Site history dictated what we had. I started from there.



May 2015

As to my personal preferences, well... here you go. This entire area takes me but a day or two per year to weed, less every year. Now I can start more shrubs for herbivory and trees to replace the unstable remnant as there is finally enough light to grow them.



May 2015

Dense stands of bay trees were a hazard. I thinned for more hazelnuts, toyon, coffeeberry, buckeye, and elderberry. Pitcher sage once grew here too. I would like to burn it in stripes to test for the differences in timing and see what comes up on a manageable basis.



May 2015

For now, the maintenance is not so bad. I almost never want to go anywhere else. It's good exercise too.
Why "work out" when you can work outside?



May 2015

So the next big job is this overstocked cluster of redwood. Does it ever stop? Do I ever get to rest? Will it ever be "Natural" again? This is the Wildergarten. For the sake of the forest, hopefully not.

Power Lines Above



May 2015



If I can couple this type of thinning with the stimulate-weed-germination-into-short-duration pre-emergence-herbicide processes I am developing, I may have a way to restore a forest capable of responding positively to a fire event economically. I want productive shrubs and native groundcovers on much larger scale much more quickly, then to introduce herbivory once the system has established. I did this power line right-of-way on the north end the hard way and it was (and is) still a lot of work.

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