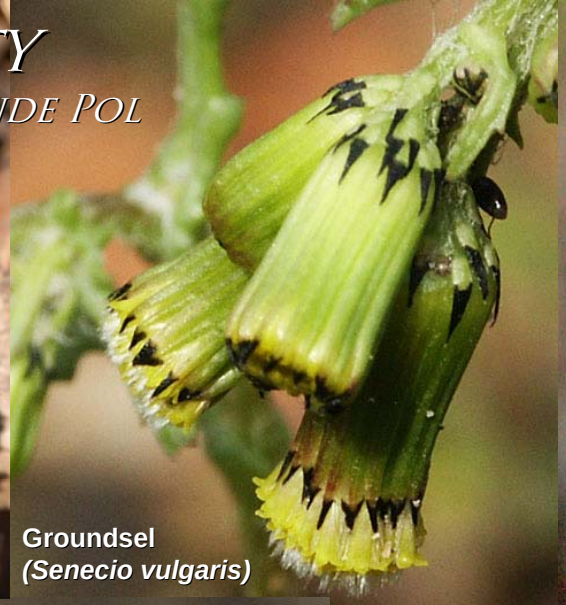
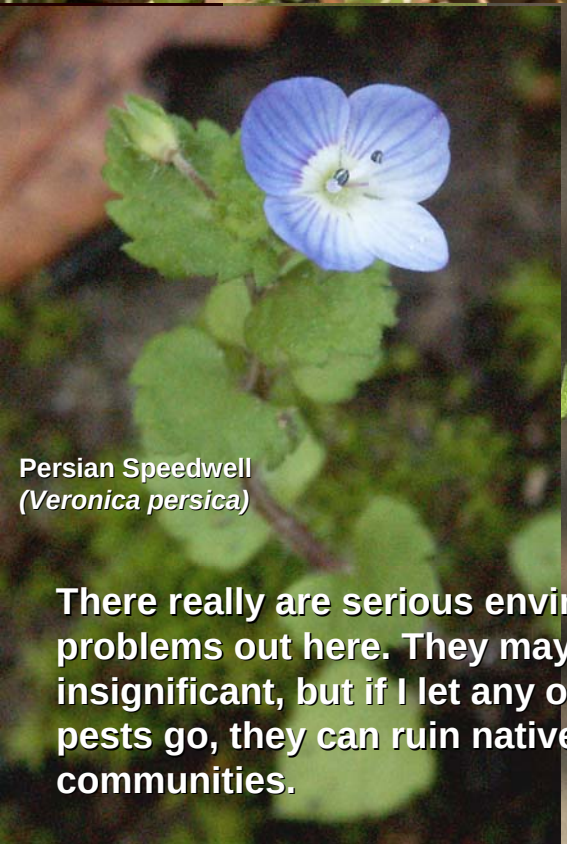
The Responsible Party

Four Leaved Allseed *(Polycarpon tetraphyllum)*



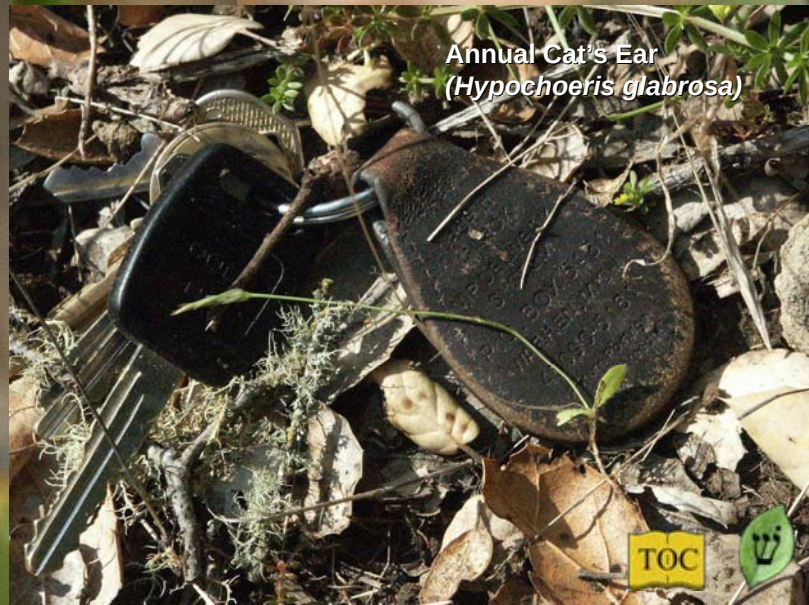
Groundsel
(Senecio vulgaris)

Catchfly, *(Silene gallica)*



Persian Speedwell
(Veronica persica)

Mouse eared chickweed
(Cerastium glomeratum)



Annual Cat's Ear
(Hypochoeris glabrosa)

There really are serious environmental problems out here. They may seem insignificant, but if I let any of these little pests go, they can ruin native plant communities.

TOC

This is a view along a typical rural-suburban bicycling path… er… ***County road*** around here. The shoulders are dominated by wads of various weed monocultures. On the right, is French Broom. On the left are patches of foxtail barley, tall oat, and Italian thistle. They all share several things in common: They were introduced from abroad, they have crowded out native plants, and they sit poised to spread into the surrounding woods after a fire.

So, if this is so infested, why do these people come all the way up here to ride, walk, and run? Others pay a fortune to live here. Is it to see the weeds? Of course not. They either don't know native from exotic, or don't care. Most are looking beyond the shoulders at the forest. Most don't see weeds as a serious problem; they're just something the County should mow if they grow into their way.

For now, the forest is containing the weed problem for the most part. It is so densely overgrown that most of the usual weeds can't germinate and disperse in the duff and shade.

In this instance, the embankment on the left has Italian thistle and bull thistle that have established on the far side but not gone further in many years.

This is a phenomenon that is easy to see but difficult to photograph, in that the shady spots are usually so thik that one can't see that they don't have much weed. The lighting conditions also usually suffer from extremes of contrast. Given that the road is near the top of a very steep ridge, most shady spots are on the low side of the road in the shade where it is difficult to show road, weed, and native backdrop.

What I can tell you is that this condition severely understates the threat this system actually faces. If we have a fire, there will be NO shade, NO duff, and NO competition for species as aggressive as Italian thistle. There will be nothing in the way of its seed dispersing far and wide. The germination bed will be perfect. Once it or succeeding weeds establish, the native annuals will lose. The loss of their remaining viable seed will be only a matter of repeated disturbance.

You have witnessed the disastrous aftermath of the Mesa Verde National Park fires. That was due to only two (2) weeds: cheat grass and musk thistle. Within our control boundary, I have identified over **110** exotic weed species with varying degrees of threat. Virtually all of them are under control on our property. Outside that boundary, those weeds continue to rage, plus perhaps a dozen more lurking along the County road that haven't made it here, yet. To give you a sense of what we face here after a fire (or should people clear out some of the excess fuel), I'll go over a few of our travails. This is how things are in our neighborhood.

Among these local weeds, French broom is perhaps the most concerning. The reasons are several**:** It can grow to 27 feet tall in but four years; for the most part it reaches 6-10 feet depending upon soil and sun. Each flower produces about eight seeds. These plants are yellow with flowers every spring, producing between 500 and 5,000 seeds every year. The seed can remain viable in soil perhaps as long as **a century**.

Once they get top-heavy they start leaning into the roadway. The County cannot spray them because environmental activists object almost violently to even the most benign herbicides. So the Department of Public Works dutifully mows every mile. Flail mowing spreads the seed, along with every other weed, some of which are even more capable of destroying entire systems.

Broom is a legume; it fertilizes the soil with nitrogen. Nitrogen facilitates germination which favors other fast spreading annual weeds that are pre-positioned all along the roads, constrained only by competition and shade of existing overgrown forests.

Broom rapidly fills a forest understory with a dispersion of highly combustible fuel. Once the inevitable finally happens, the combination of sun, ash, and nitrogen will provide a *very* fertile seed bed for both itself and other weeds. With no vegetation to catch blowing seed, deflect starving animals, or slow winter runoff, there would be no barrier or competition to constrain the rapid spread of every other weed in the region. This turns the prospect of a ground fire into a certain catastrophe, **even with a fire frequency of but a few years**. Even if the frequency was annual, some of the broom would still breed.

Ten acres of our property had been infested with broom for over 30 years. Within three years of finishing our house, we had brush cut **ALL** of it, gathered it in piles, and burned it. The seedlings came up as thick as 200 plants per square yard. I sprayed acres of it 2-3 times spaced 2-3 years apart with mowing in between until the natives filled in to bury the seed. Since then, it is easily controlled almost entirely by hand-pulling. Had we "won"? No, not by a long shot. I had a bigger enemy**:** my own ignorance and inattention.

This is cat's ear. We have two varieties. The first *(Hypochoeris glabrosa)* is a small annual.

This weed is a monster, but it doesn't seem like a huge problem because virtually all the meadows in this region are now gone, principally due to fire suppression and exotic grasses. Other weeds keep it from dominating.

It doesn't look like much, does it? It is easy to miss.

While I was in the crush of finishing up my first book, *Natural Process*, smooth cat's ear was quietly colonizing this sand hill from pioneer seed blown in from our neighbor's land. Up until then, my principal enemy had been broom, followed by rip-gut brome that went crazy on the nitrogen the broom had left behind. I had no idea of the magnitude of this problem. When I first saw it from a distance in 2002, I thought it was grass.

Here is the same spot from above. I estimated this infestation to be in its third year. When the seed heads opened, the land looked like it had snowed. Having written a book claiming to have a better way to manage the environment, it wasn't as if I could let this go. It took me three years to control this disaster at great cost to our meadows.

This patch is more like four years in the making. Astonishing, isn't it? With several acres of a problem that spreads this fast, hand weeding was out of the question. The land is too steep and erosive for tilling. The weed regenerates and seeds too rapidly for grazing to control it either. The herbicide manufacturers *said* we could kill it without killing grass with 2,4-D. It didn't work; the leaves browned, curled up, and then seeded anyway. From what I can tell, it was wishful thinking in pursuit of the golf course market.

This is the other form: hairy cat's ear, *(H. radicata)*.

It gets almost two feet tall and makes lots of heads. It is also perennial, which gives it the potential to be the dandelion from hell.

I've counted as many as 70 heads in the making on one plant, each capable of producing about 50 seeds.

So, you are probably wondering why I regard the little guy as so much more of a serious threat. Well, left alone, it might be true that the bigger weed is more of a problem. Under management however, this one matures far more slowly.

So hairy cat's ear is both easier to detect and I have a lot more time to find it before it blows all that seed. The serious problem with smooth cat's ear is that it is so hard to find.

I’ve seen them two inches tall with a single head.

The one on the right had been treated with 2,4-D. The real keys to controlling this little beast are knowledge, proximity, and a demanding accuracy spot-spraying with RoundUp.

Places with more sun develop the weed more quickly. Steeper ground facing neighbors acquires more seed (I’ve been unable to get my neighbor to control his vineyard). Think about finding them all hidden in clumps of other plants over 5 acres. They often start underneath other plants, which means that your first notice is the flower-bearing stalk. The yellow bloom is only about 2-4mm, only open in warmer parts of the day. In sunny spots, we have two weeks to find them all from the time the shoot first appears to when they blow seed.

The specimen at right has about 15 heads, each supporting 15-25 seeds. Germination is very high because the seed only remains viable for about two years. If you have a 95% discovery and weeding rate, that means you are losing. With average plants, you need to get over 98% to break even. Thus, if the best one can do in a weeding session is 95%, one needs to weed 5 acres thee times in two weeks, or about every 4-5 days.

One has to know where they are, how mature, how many, how much sun has been on each spot, and the local weather forecast, to cover enough ground fast enough to win. It cannot be done without living on the site.

This is the same place I had thought was grass. The cat's ear is gone, but then came Chilean brome, red brome, rattlesnake grass, catchfly, horseweed, *Filago gallica,* scarlet pimpernel, and wall bedstraw. Each required its own process with its own timing. Early on, control efforts were by species, to deal with the speed with which the dominant weeds spread. As we gained more control, we were able to get more comprehensive, focusing upon control by location, but that meant combining those control processes. In this immediate area we have *Filago californicia,* miniature and small-headed clover, miniature lupine, two camissonias, stonecrop, fairy mist, various lotuses, cottonweed, and three species of *Navarettia*. The **Santa Cruz Sand Hill habitat** is especially demanding because it is wide open for weeds. We had more challenges than just sand hills, but none so tough. The key to winning was not just getting weeds here, but also whence they came. That meant broadening our control area.

This is a vertical sandstone wall down the road. Cat's ear is so tough it can root under moss on a rock just as easily as it can ruin a meadow. The significance is this: from a spot like this up on a ridge, a seed can blow a very long way (the vineyard is below our property).

I not only had to clear *our* property of cat's ear, I had to find the places like this one from which it blew in and treat those too.

Anybody in for weeding while climbing on the face of a cliff overhanging a road below a blind corner? No? I do.

Once I had, control was a matter of vigilant maintenance at the edges of the control area.

So, were we done? Hardly.

There were two problems: infestation and ignorance, mine.

At the beginning of this process, I knew little more than most people what was a weed and what was native. Although I had grown up in the Bay Area, I did know what I did not recognize. As it turned out in some cases, experts were not exactly certain about what was native or not either. So, as soon as I had a handle on cat's ear, I spent a year allowing some weeds to spread while I cured my ignorance, photographing everything so as to get it identified. Short term, it was disastrous. Over the long run, it was the only way possible to succeed.

Here is that same wall today. With my newfound knowledge I had made sure all the plants were native.

So, are we done? No. I now have a choice between the wire lettuce, the Cammissonias, or the silver puffs. The Cammissonias make more food for wildlife. So I'll grow more of that one.

That is what the Indians did with this land. That is the blessing of knowing it intimately.

That knowledge comes at a price that is TOTALLY unnecessary. Were our environmental activists actively focusing upon learning and teaching how this system works, that knowledge would have been more available. As it was, the consequences of ignorance wasted about three years of total hell seven to eight months per year.

We had endured the spread of several nasty critters while I gained the knowledge to know what I was looking at. First was Field Hedge Parsley *(Torilis arvensis,* next page). This stuff spreads by burrs, which means the seed goes very long distances very rapidly on deer, and everywhere on mice and squirrels.

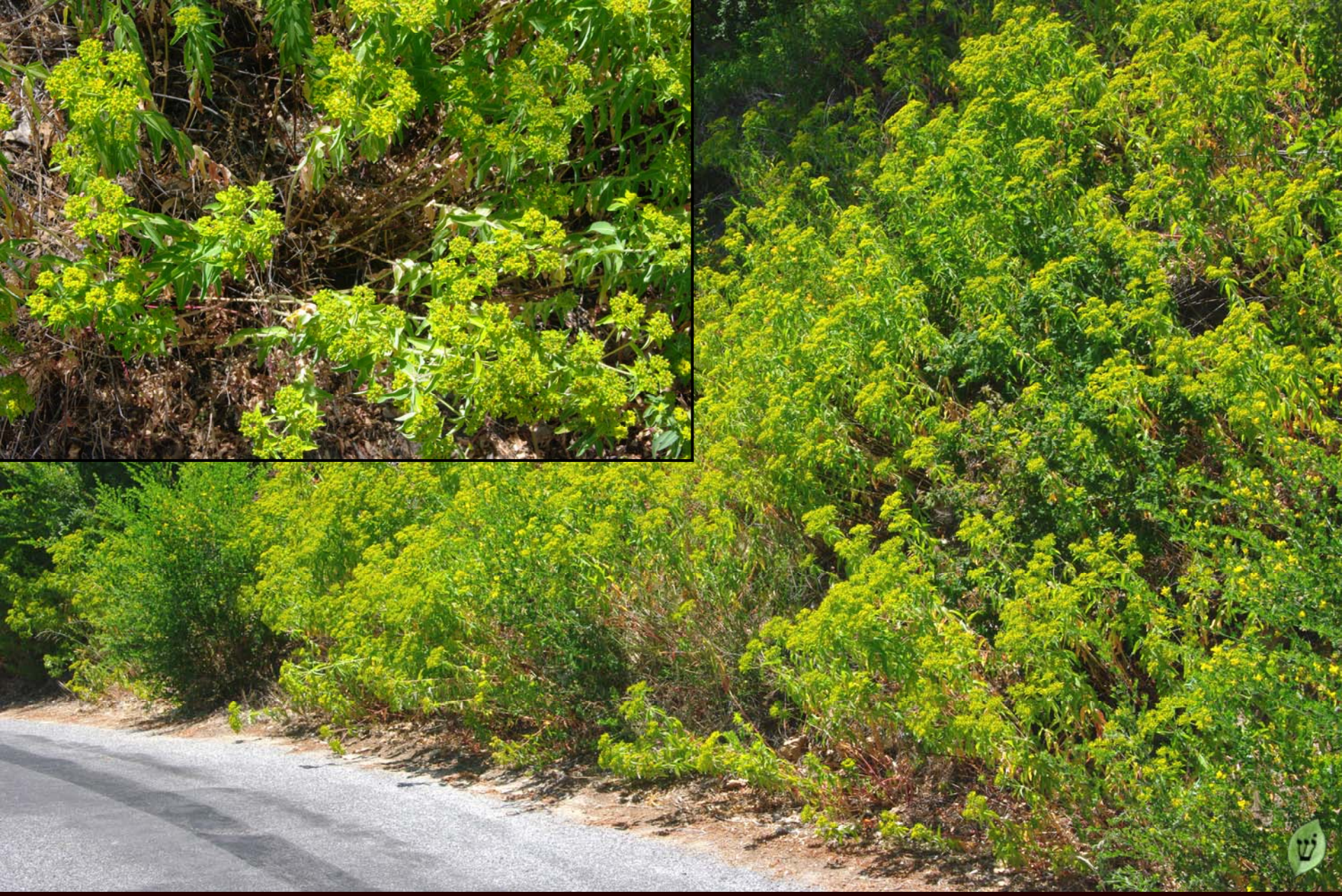
Torilis arvensis. Hedge Parsley burrs are tenacious and get into everything (see inset). I really feel for every mouse, squirrel, and deer that has to deal with this stuff. It's nasty.

There are a number of these infestations of which I do not have good pictures. That is because they were dispersed over large areas, or because they are hard to photograph as they are usually sparse or tangled in other plants or required high contrast lighting to see well. Once you get a shot close enough to show the plant, you can't show the infestation over a large enough area to communicate the magnitude of the problem. Sorry I didn't have a better way to give you a feel for it. Photos to capture the magnitude of the problem were impossible. Photos for identification were all I could afford.

Now, you may wonder about that, but here it is: Any weed you miss reproduces and spreads next year. The closer you get to zero the more you gain in terms of how much less there is in subsequent years. In the heat of this fight, there was no time at which it was not a desperate battle requiring every available minute. In the case of hedge parsley (at left), my two girls and I took out 37 garbage bags of this little beast in one year, by hand. This has been a family victory.

Thus, many of the photos to come were taken away from our property, typically along public roads where there is access. However, those pictures do not express the power these weeds express when invading a native habitat because in these outside locations they are in competition both with other weeds and overgrown forest. Effectively, **what little is left of the native biodiversity of this area is beneath multiple layers of powerful enemies**, each capable of taking over, each of which must be removed for several years before what is left begins to express itself.

The situation is that bad. So forgive me if some of these pictures do not communicate the degree of threat I describe, because that's just how things were.



This is leafy spurge *(Euphorbia esula)*, which is so chemically aggressive it suppresses even broom germination. It is very hard to weed out, as it can regenerate from roots that can extend thirty feet making for a very difficult kill. The plant has a mildly toxic and somewhat caustic juice. Little else grows in it. The owners of this patch are afraid to kill it. It has spread nearly a half mile since.

This is Italian thistle, an annual that also readily forms monocultures. Italian thistle can breed while very small (see inset with flower). It also has the nasty ability to adapt to shade, making it capable of colonizing a forest. This is another pest our neighbors and the County would inflict upon us, but for efforts expended on other people's land, every year. It matures early enough that it is transported by roadside flail-mowers very efficiently. I once took out two garbage bags of just the heads (they detach easily) from a patch that had colonized a bed of poison oak. How many people are nuts enough to do that?

Most people recognize foxtail barley *(Hordeum murinum).* We have almost eradicated this pest within our control boundary (even from our neighbors' land). There is rip-gut brome *(Bromus diandrus)* in here too, which actually tends to be more aggressive. Other than these two grasses, there is nothing else here.

Rip-gut and slender oat *(Avena barbata)*. That's it. Little variety at all.

Now, if you let it all go, this is one form it takes**:** dying madrone *(Arbutus menziesii)* and broom. I promise you, a fire in this stuff would be extremely hot. After a few fires it would probably succeed toward eucalyptus. Interestingly, the reason the madrone looks so bad is yet another exotic pest, a pathogen by the name of *Botryosphaeria dothidea*.

Removing disasters like this is what made our weed problem such a big deal on our land. Thinning put enough light on the ground to germinate dormant weed seed. The reason we don't see more weeds in places like this is that most people don't do anything about such an explosive fuel load. I don't even want to visualize what could happen here in a fire.

Speaking of “burn hot,” this is a eucalyptus grove just north of our place. Eucalyptus are effectively, large weeds. They are invasive too; if it burns, the seed can spread half a mile. As you’ll note, there isn’t any groundcover. That’s because eucalyptus drops a ton of trash and puts out hormones that keeps out most everything else. So, you might be surprised to know that for us, this grove represents a weed BARRIER. Until I get cooperation from the landowner to replace them with redwood it will stay that way.

This is English Ivy in Fall Creek State Park, doing a marvelous job of keeping a fire from getting started, but also not doing anything to stop one that is already started. Of course, it's killing everything else in the process. Where is the Sierra Club?

This is catchweed bedstraw *(Galium aparine)* just getting started, among various native berries, hedge nettle, and rough leaved asters. It was probably brought in by the garbage men. My original weed book said it was native. When we figured out better, we had acres of mats of 6-10ft long tendrils. We rolled it into 3ft balls with rakes while slashing roots. It later turned out that this one is subtly different than the native, but that small difference turned an annoyance into a monster. Unfortunately, I had to nuke a lot of it with RoundUp, which took a lot of natives with it. Recovery took several years.

As to this “native v. exotic” question, consider this example.

Among the madder tribe (which includes all bedstraw species) we have two 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 in shady spots, and does not displace other species.

Among the four exotic madders, three just cannot get along. At left is a single *G. aparine* (the photo spans about two feet). It’s definitely not fine, grows just about anywhere, and buries most natives.

This plant was not anywhere within miles of when we arrived. When it did, it took over in just a couple of years (until we went to war)

The other two baddies are Field Madder *(Sherardia arvensis)* and Wall Bedstraw, *(G. parisiense),* the latter of which was lying dormant in the soil until we started thinning.

Look at how many bedstraw seedlings there are here! I had cut a tree here and this is what came up when the sun hit the ground, so you can only imagine what would happen after a fire. This represents what I call “drag-in,” seed that comes from other people’s property. Each seedling is about three inches tall. The photo was taken in a spot where the deer like to clean themselves as they enter our property. I’ve deliberately built such “cleaning stations,” by developing “fences” of shrubs along the property line with “seed traps” shaped like pockets for them to drop to the ground to rub and roll off the burrs (which they do; they hate them too).

It may be hard to see in this photo (unless you increase the screen magnification), but the foreground has a mix of bedstraw and hedge parsley while the background, not yet infested, has a diverse mix of perennials. Only two or three years ago (before a tree went down), the two areas were the same. The ferns and snowberry in the background are now nearly missing in the foreground. They lost. You should see the difference in soil moisture as a result. All other factors are equal at the transition.

This photo was taken on a neighbor's property. I had to find and treat this breeding ground to reduce the rate of infestation of our property. It represents a source of the "drag in" I was talking about, but there is a more important point**:**

Clearings like this from decadent trees finally dying create openings where the weeds go nuts, even in an overgrown forest. Like roadsides, they are poised to infest the surrounding area should a major disturbance occur. Here, there are bedstraw, hedge parsley, and bull thistle, each easily capable of colonizing the area for over a mile the first year after a fire.

Give it another year or two and the background will join the foreground, unless somebody does something about it.

Here's your big chance to "be somebody" in your neighborhood!

June 2004

This could have been a horror story, but turned out to be a success. This is Sticky Eupatorium, *(Ageratina adenophora)*. This plant grew 5ft tall the first year. It had colonized in a drainage and was starting to seed, which blows on the air (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 almost fifteen years' investment, I couldn't afford to lose, with seed washing down the drainage in the first rain to germinate for the next half-mile. So after bagging all the seed I could, I hosed the area with oryzalin (a pre-emergence herbicide), then ran 500 ft of polyethylene tubing, tie-wrapped a sprinkler head to a fence post, and watered it for a couple of months.

Next spring there was none, done, zero, nada...

ERADICATED!!!

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. I'm sure he is still collecting a pay check for fighting it too.

Pre-emergence herbicides kill only germinating seeds. The natives here are all perennials; they're fine. Most natives produce dormant seed that requires cold weather to germinate. I did the process in summer. By the winter, most of the herbicide had already decomposed.

To you, this might not look like much. To me, this is an indication of hope for a returning foundation after years of work. It is also a serious warning, and a cry for help. This photo represents a rebuilding process that takes many years because the supply of native seed left in the soil was so depleted. This is a patch of Few-Flowered Clover *(Trifolium oliganthum)*, perhaps the only one like it in the world. Clover seed can last a century, but development has been here for 140 years. **If a clover seed bank was that depleted, so are a great many other species** (there's your warning cry). This is 2008, showing about ten times more in than last year. What made it happen was separating tiny mouse-eared chickweeds, and rat-tail fescue grass from these tiny thread-like clovers.

This is the job. The visual demand is intense, especially when spraying. It requires enough concentration that after a few hours, you want to run for the exits, drained. The reason I'm doing it is to clear the soil of weed seed, effectively using up the "weed bank" while propagating native annuals. It's the hard way, but my guess is that it beats sterilization and seeding with collections, in part, because we just don't know what might be there.

In this picture are (weeds in red)**: Mouse-ear chickweed *(Cerastium glomeratum)***, the few-flowered clover (T.oliganthum), pinpoint clover (T. gracilentum), Notch leaf clover (T. bifidum), **little hop clover *(T. dubium)***, small-flowered lotus (L. micranthus), Spanish lotus (L. purshianus), California brome (B. carinatus, which I have been pulling until I get the foundation put back; brome grasses have a fairly powerful allelopathic chemistry that excludes other plants), small-flowered needle grass (N. lepida), **rat-tail fescue *(Vulpia myuros)***, pop-weed (Cardamine ogliosperma, supposedly native, but I hate it), **wall bedstraw *(G. parisiense)*, two non-native vetches *(V. disperma and V.tetrasperma)***, slender madia (M. gracilentum), and **coast tarweed *(M. sativa,* of disputed origin)**.

The worst are the wall bedstraw and the rat-tail, but the chickweed is not far behind. We're getting rid of the chickweed first, because it is the earliest to germinate and set seed.

So, is this just an aesthetic exercise for a would-be intellectual with nothing better to do? Are the non-natives really so bad? After looking at this and the other picture books, I hope you share my opinion that the damage weeds do is far beyond the mere aesthetic. If exotic species are truly responsible for one third of all extirpations in North America, and I promise you, THEY DO NOT STOP SPREADING ON THEIR OWN, then this is the most critical environmental issue we face. If all the greenies in your area can offer is futility, they need to be shamed, loudly and publicly. It is time to take the moral high ground away from the environmental movement.

This is about the same spot the next year (January 2009). Not only is there few flowered clover, but also *T. gracilentum* & *T. bifidum* (we have two varieties). The great news is that there is minimal rat-tail *(Vulpia myuros)* compared to last year. The wall bedstraw and chickweed are diminished. Given that the two mature at different times of the year, we're going for both this year.

At first appearance the stuff on the left might seem to be grass. This is ookow *(Dichelostema capitata),* one few species on our property whose seed did survive being buried under weeds for hundreds of years. Now that the weeds have been removed the ookow have started to express their seed in patches extending over 70 feet. In fact, that breadth and density might be indication of historic Indian farming on this site. It takes a few years for them to express their flowers (right). Soap lilies, also once farmed by Indians for food, are just down the slope from here and in large numbers.

This is what wall bedstraw does (the little guy with dormant seed in the soil). Each of these seedlings would grow to about four to six inches (they get bigger when they are more dispersed) ending up as a dense mat (until the rat-tail fescue takes over). In this spot, there were so many I just nuked it. Things get more interesting at the transitions.

This is a needle grass seedling infested with wall bedstraw (*Galium parisiense*, in red), most of it from the “weed bank.” At this density, G. parisiense produces about 100 seeds / plant. If I don’t get them ALL, they’ll take over completely, producing a carpet nothing wants to eat (it’s coarse and mildly toxic). This spot has been weeded for years and is responding. I counted 9 species here.

The pots are for masking native plants for foliar application of glyphosate (RoundUp®) in what we call transitional habitat (the tall pots are for grasses). It is a painstaking process. Still, it really is a lot faster and has a higher yield than hand weeding. We seldom have to do it more than two years in a row. The idea was that once enough weed has been used up and the natives are more numerous and well enough established, then we can hand weed. From beginning to end, meadow transitions typically take 4-7 years. The exception is when a year with unusual weather abets the expression of one particular weed. That 4-7 year term also depends upon how many “layers” of weed seeds there are to remove during which we broadcast or spot spray and kill most everything. This is why we can only handle so much transitional habitat in any one year. It is far more labor intensive than maintaining either a fairly pure area or a heavily infested patch. There are now no areas left on our land that require broadcast spray.

This is an experimental portable shade-house for growing grass plugs. It has an irrigation line under the ridge. It works great as long as the rabbits don't find it.

Once the meadow is fairly clean, we install plugs on about 12-18" centers. This is heresy among restoration people because they want the grass to suppress the weed seeds they are leaving in the soil. They'll just accept the fact that the plot will have non-native plants in the grass understory. Some restoration contractors plant a 6" spacing, but they can only hope that native plants other than grasses will come back on their own or that the remaining ruderal weeds don't eventually crowd out their new grasses. We hold the patches sterile for several years. As the natives come in, we mask, thus acquiring fresh seed and building a foundation of native annual forbs. Then we plant grass sparsely enough to see how it will behave among its friends. Sometimes, it reverts to the forbs.

Same spot, two years later. How they grew depended almost totally upon the soil. The grasses are dense here and about 3 feet tall. In other places, they remain distributed exactly as they had been planted at half that size. This patch is less complex than it was, but is cleaner than ever of weeds. We have been harvesting the seed from here for similar projects elsewhere and mow it to mulch the surface, reduce thatching, and make early weeds more visible. This year, we did not harvest grass seed per the Shemitta year.

Interestingly, the native stuff is now colonizing the sterile area where I stood for this photo. In other words, it is going transitional before I was really ready. This hill is a place where I burn piles of tree tops and stock piles of tree chips.
This grass is about three feet in height. So, are we done? By now you understand that this process does not have an “end.”

Here they are today (opposite side of the same hill top), almost five feet tall and with a dense ground cover of Spanish Lotus *(L. purshianus)* in the grass understory. We had a long damp winter with some warm spells and what do you know but we got an unexpected blast of Wall bedstraw and scarlet pimpernel *(Aganalis arvensis)* from the "weed bank" covering much of the property. It was war, but we're winning it. How? We harvested almost 30# of seed by hand. That way we could see the smaller weeds.

I burned this patch and most of the bunch grass *(Nassella lepida)* died. So I replanted it with plugs. After the fire, the filaree went nuts. The plugs have not spread in three years but have shown themselves incredibly hardy, surviving without rain from the end of February to October with over 40 100°+ days and most of the rest in the 90s. However, the lupine, purple spoon-leaf cudweed, various clovers and three lotuses have increased in density considerably with deer weed *(lotus scoparius)* and monkeyflower trying to cut in, but I'm not thrilled with the idea of a chaparral here. The latter two would take over quickly, so I pull them in order to keep the weeds coming up to remove them from the seed bank. I try to keep the brush in transverse belts for fire management reasons. This is a very sandy soil within 100' of my sand hill. **The point is:** if we burned this spot regularly as the Indians did, there might not be grass at all. A confirming indication is ookow *(Dichelostema capitata,* a sort of mini-tulip*)* coming up in very dense patches, definitely from surviving seed. I am pretty sure this phenomenon has not been seen in these mountains in a long time. I have not seen ookow germinate where there is anything else growing, but once the bulb is established, it seems to tolerate native interlopers. There are a couple of Clarkias in the area too. So, was this spot another place where the Indians "farmed" ookow and clarkia?

So, what is ”Natural” in this spot? The most common understanding of the early Spanish journals suggests that these ridges were usually verdant meadows comprised of annual forbs and perennial grasses. Unfortunately, our understanding of the 17th Century Castilian Spanish of a very amateur botanist is somewhat limited. More recent readings of Juan Crespi’s record of the 1769-70 expedition, along with lab analysis of pollen and bricks from Spanish missions along with an understanding of the aboriginal diet suggest fields of annual wildflowers, especially buckwheats, and roots, with patches of grasses where there was more water. Guaranteed, there were more people where there was summer water.

Nobody knows for certain how these systems worked. From what I can tell, nobody is *going* to know unless they develop areas nearly devoid of exotic plants and run trials over a wide range of soil and micro-climate conditions over a considerable period of time under a variety of management styles. I can tell you for certain it would be totally unaffordable, due to the bureaucratic overhead we have now. Our project is an exploratory exercise in developing restoration methods and tools while stirring things up and observing how these systems work. Simply learning what it takes to create native plant habitat is useful knowledge. The other goal is to provide a refuge for producing native seed, which is critical. The amount of viable native seed left in the ground is severely depleted.

My own experiments suggest that the way land that was not under cultivation might have worked might be patches of various cohorts of plant species moving among each other with patterns of disturbance, usually fire set intentionally by Indians. If the patch was something the Indians liked, they’d tend and extend as appropriate to what they were growing. After that disturbance, whatever colonized first successfully held that patch until the next disturbance. Unless I miss my guess, fires probably were also patchy.

Generally speaking, meadows were more common on ridges and wet bottomland, with chaparral on the top slopes succeeding to oak woodland and then redwood in the gullies (or wherever there was a spring, of which these mountains have many, even on ridge tops). The meadows and chaparral were probably patchy too because they’d burn off together when a sufficient fuel load met a hot enough fire. It’s almost impossible to kill a mature redwood except by hard freezing.

As to animals, there probably weren’t very many (with the exception of gophers and squirrels). With the exception of grizzlies mostly in the Santa Barbara area, Crespi’s journal does not mention much wildlife. The Indians would have hunted them mercilessly.

Even if we did know how things once were, there is still a more important question as regards “sustainability”**:** Is what the Indians did the best that could have been done? I doubt it, at least around here. The tribes didn’t have good animals with which to build deep organic soils. They burned so often that on steep ground like this, the nutrients would wash off in the first heavy rain. The plants they used for food are VERY time and energy intensive. Having extirpated so many megafauna after the end of the Pleistocene, the tribes had a very limited array of options compared to an industrialized society.

That doesn’t mean Europeans have done such a hot job, as we have yet to deal with the legacy of our processes and subsequent neglect over the last two centuries. We just have better tools. Indians would have killed for a chainsaw or a good shovel, never mind herds of cows and horses. Human vegetation management played a significant role in shaping these mountains and should do so consciously once again instead of pretending it will fix itself. So here follows an example.

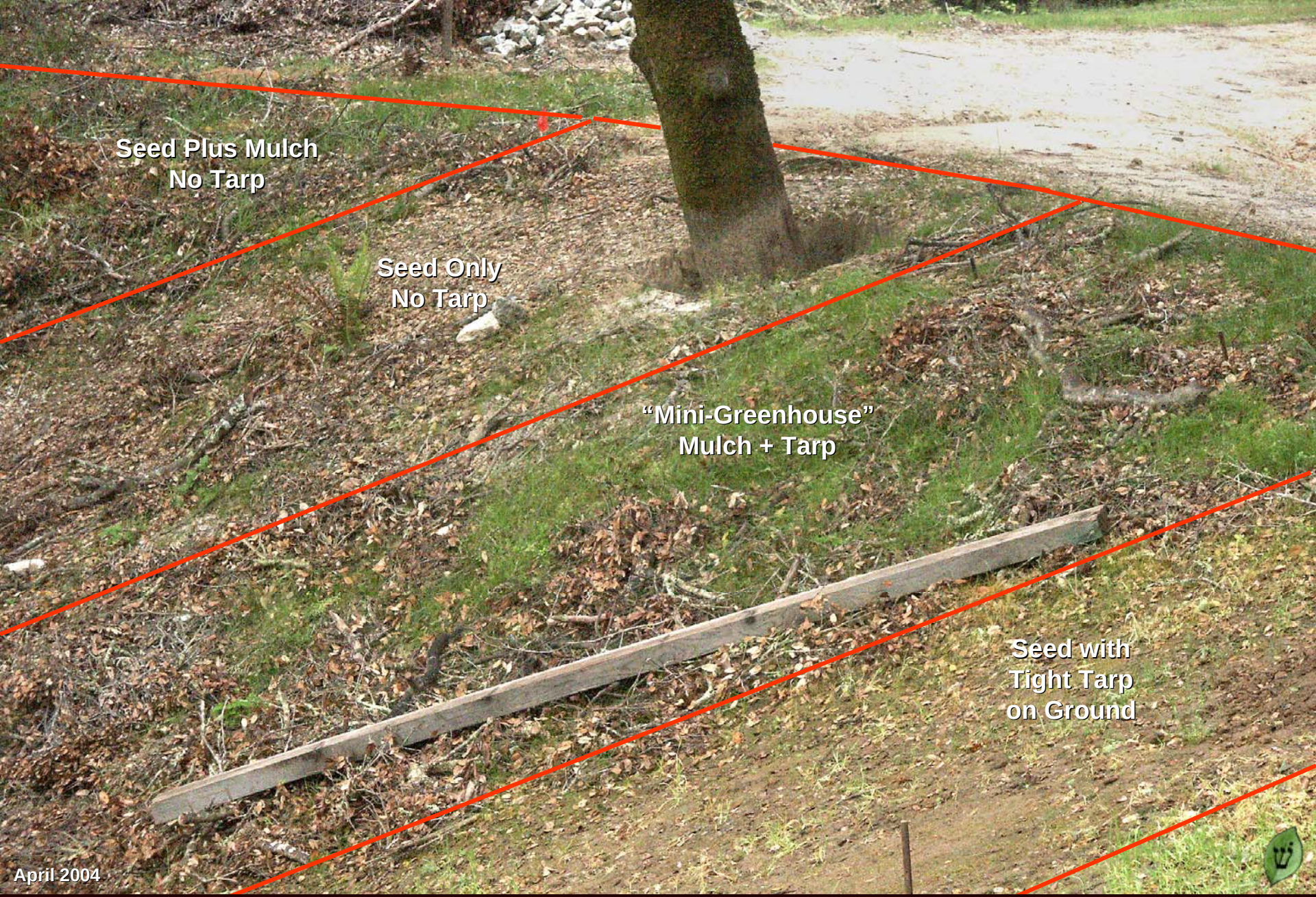
February 2004

In steep sand-”stone” mountains like these, reversing the damage from poor drainage control is a high priority. The slope up the hill had originally been cleared and terraced for an orchard that was eventually abandoned. The resulting down-cutting required repair, else the slope below our house would have been destabilized.

Drainage usually involves expensive and protracted projects, especially because bureaucrats, engineers, and contractors have colluded on permit requirements that make reversing historic damage very expensive (and the local sellers of drainage products very rich). So the usual mode is to do nothing while the consequences grow. That mechanism has been used to wreck havoc with the Timber Harvest Permit process.

In this project we collect the water *into* the stream to preclude surface rills, typical of civil engineering designs over the last 100 years. However, this slope was shaped like a watershed, with alternating side channels. It works, although it does require monitoring for damage from gophers and ground squirrels just as “natural” slopes also do. So far, no problem.

The plastic was stapled and wrapped around battens then screwed to timbers that were in turn screwed to steel stakes. The system has survived 50mph winds undamaged, a design that could allow work to be done in the dead of winter between deluges when the soil is damp enough for good compaction.

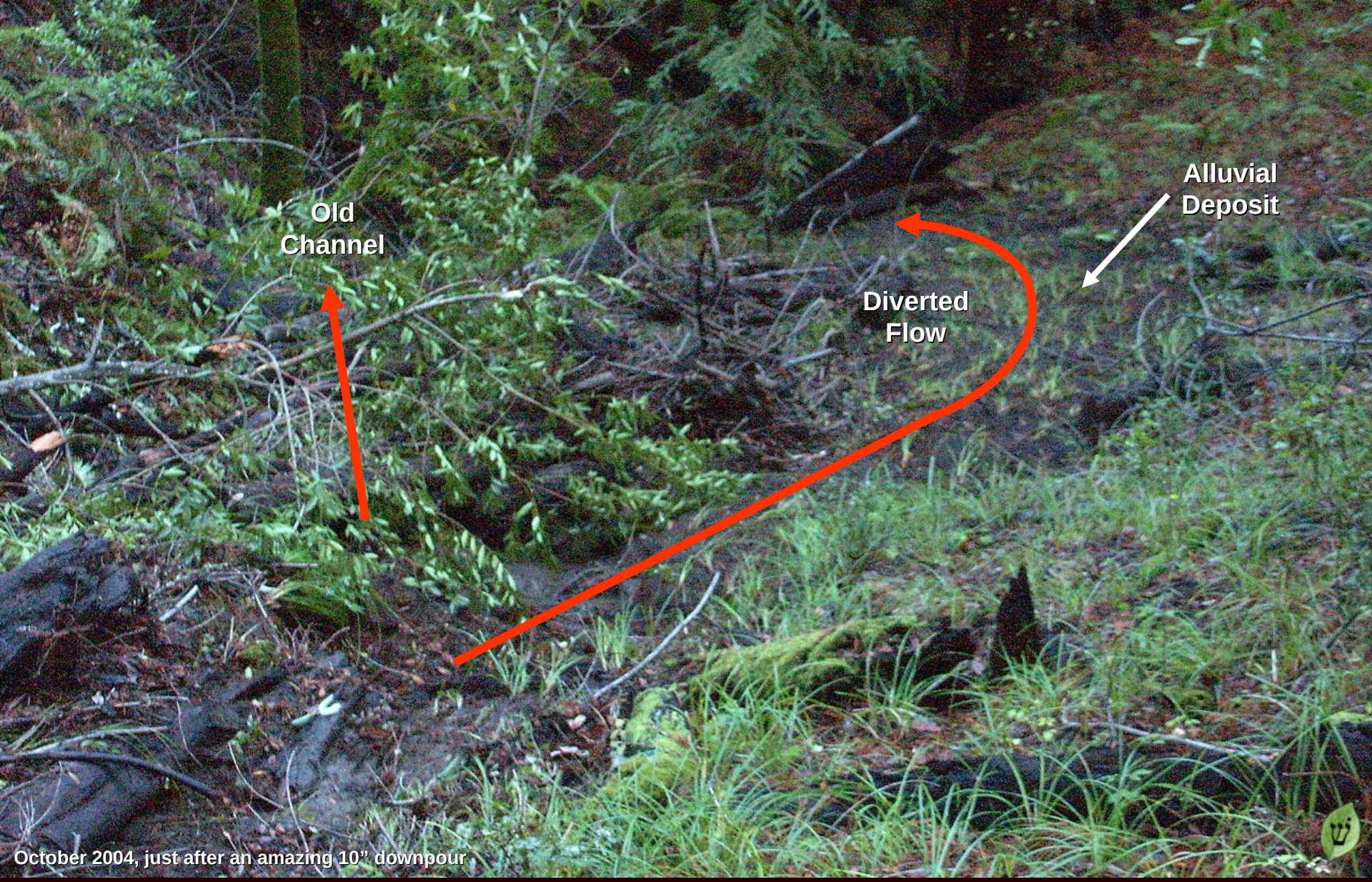


The plastic was part of an experimental array for revegetation. It was either tight on the surface or held aloft by a “mulch” of chopped tree branches forming mini greenhouses to improve the establishment of the grasses. As long as one doesn’t use too much mulch and there is enough moisture getting under the plastic to keep the grasses going, these tarp-houses at least **triple** grass growth.

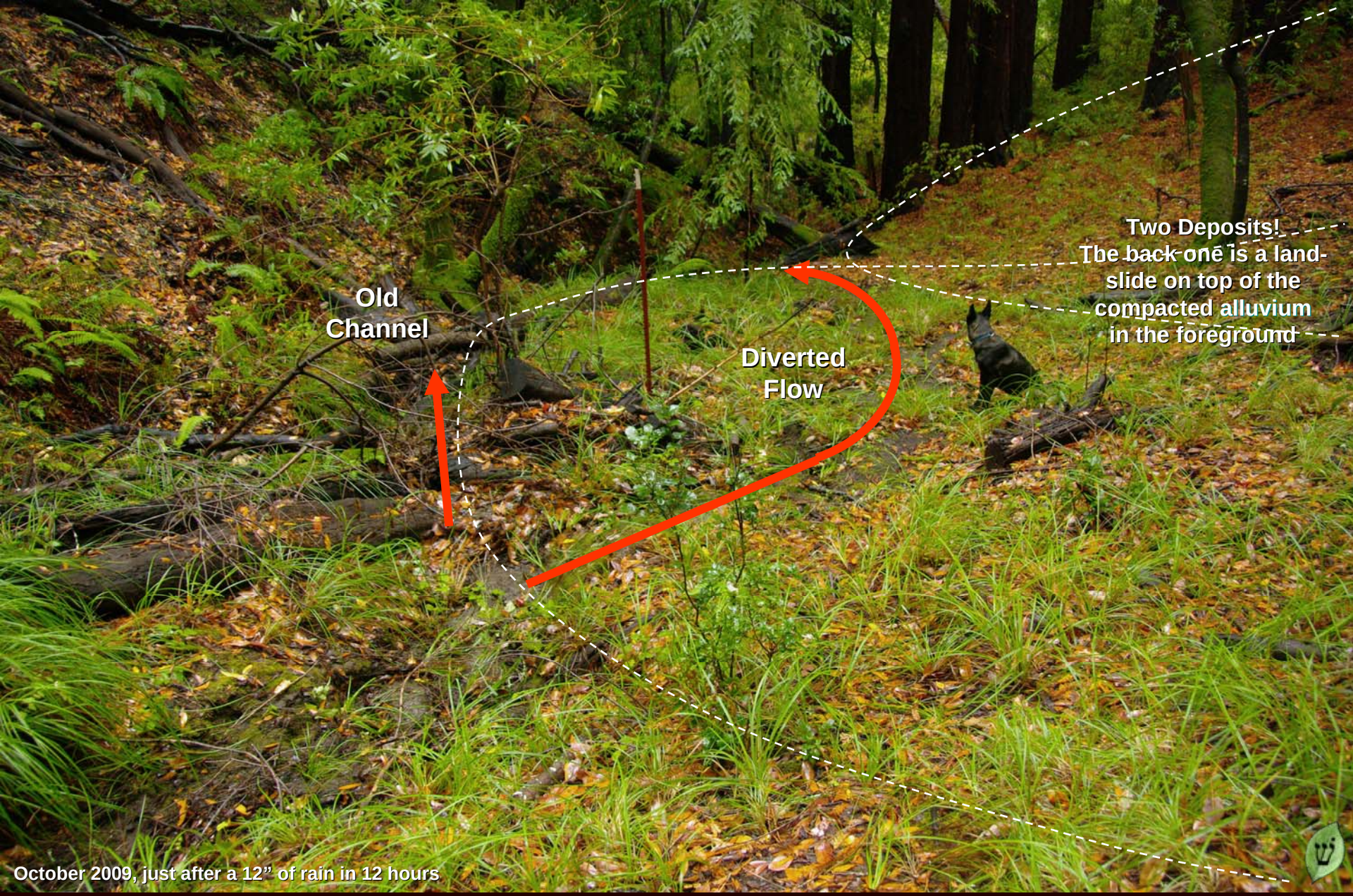
That runoff has to go somewhere, so now I'm going to show how logging can REVERSE channel erosion that would progress without it, perhaps catastrophically. On the left is a cluster of redwood I somehow discerned needed thinning. The stream from the prior slide ran right in front of them and was starting to undercut their support. You will soon see what happens should that process progress. This was once a pair of trees that had sprouted from a log buried under an old landslide at the bottom of the ridge behind them. Then white guys cut them and "left it alone" for 90 years until the sprouts grew into this tight clump at left. I whacked it and, (because of "the rules") gave away probably $10,000 worth of logs, ten grand that should have been spent on our land.

Here is the same cluster from above (the second photo was taken from about 75 feet farther down the ridge to the right). Where there were 31 trees from that double stump, there are now six, which is still a dense spacing of 8-10 feet. The stream now runs through the middle of the clump with no apparent effect. There isn't much groundcover because below these trees because it was too dark to support vegetation. The important thing in this comparison as regards logging and erosion is **the change in canopy density**. Huh? How does the density of treetops effect erosion??? Simple**:** it's all about getting light on the ground.

Here is the same cluster looking up. I had said in *Natural Process* that these trees would sprout branches and straighten, but I could hardly believe the change! They even realigned themselves to a degree in their race for light. In another decade or so, it should be thinned down to three. Then it can probably go for another hundred. Slow growth makes better lumber.



One of the ways in which the environmental industry had driven the timber industry into ruin has been claims that logging releases fine sediments into streams, thus harming **"endangered' fish."** A logging job surely does release sediment, just as not logging can do also. Remember in an earlier picture book how I said Santa Barbara Sedge *(Carex barbarae)* was an amazingly erosion resistant plant? Thinning bay trees on the ridge to the left was what got the sedges growing on the bottom of this drainage. The runoff was diverted to the right by a fallen madrone log and the biggest rain event in decades went right over the top of this alluvial deposit.



The activists tell everybody that “we need monitoring,” so here it is after five years of winter rains. So, NO erosion because I had logged out the bay to get light on the bottom of the channel, but there is much more to this story. If you look carefully, you’ll see deposited sediment in the foreground at the tails of the two red arrows. That material is from all over the property: From the my neighbors across the road, various stumps from fallen trees, etc, but probably the biggest source is gophers and moles.

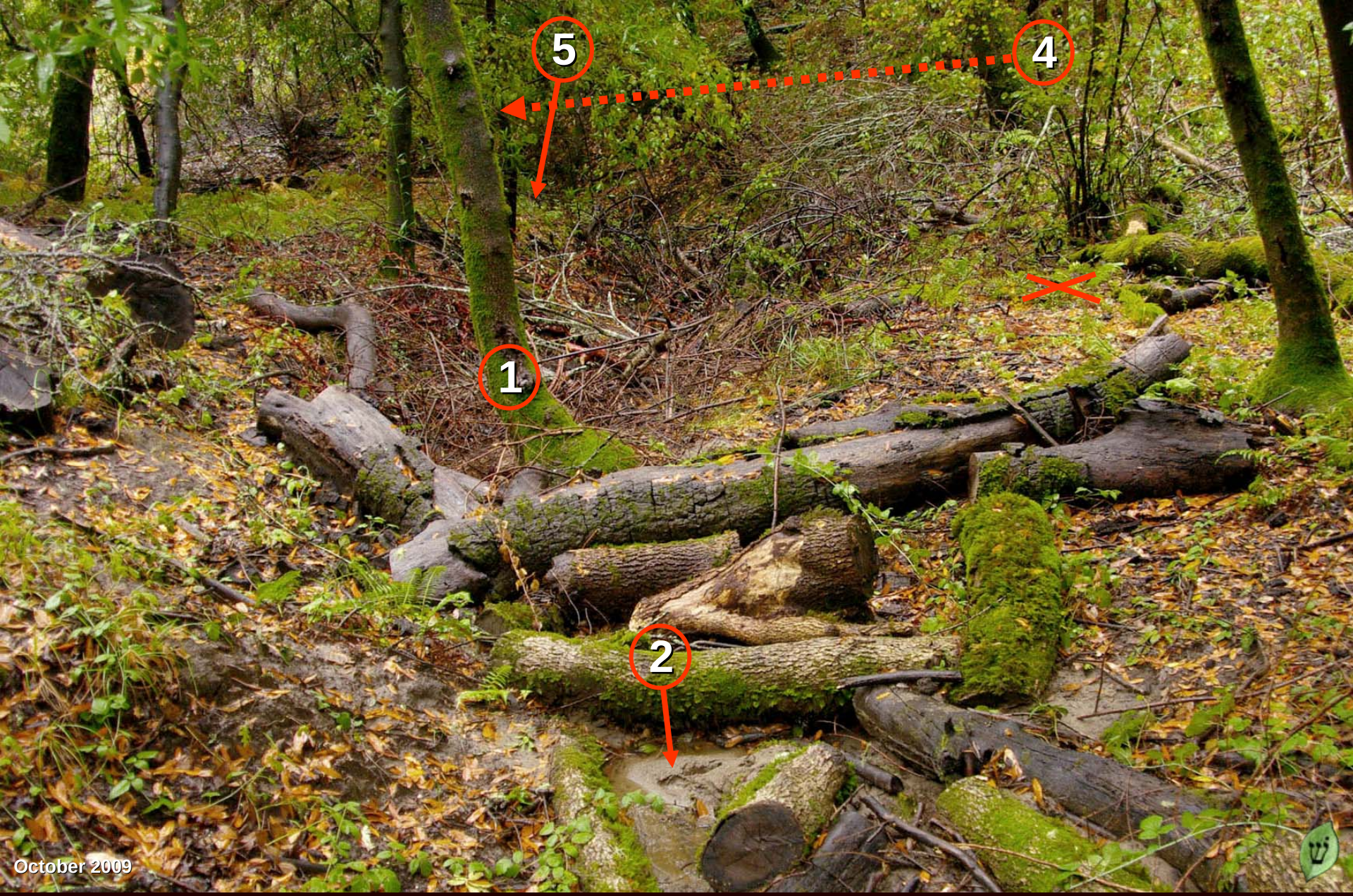
All those tiny sources add up to a fair bit of material lost off the property every year. So, I decided to solve a problem with it. This photo was taken six years after my original redwood logging job in 2000. These interlocked structures of left-over logs form stepped weirs with vertical drops and slow runs to trap that sediment, and raised edges to contain the flow. The sediment has started filling in a stream that was 6-8 feet wide and 2-4 feet deep. Note the circled structure above for reference from slide to slide.

This is the same channel today from a little wider view. Logging made the material to line the bed and collect the annual deposition (and could have financed the labor). Logging thinned the slopes so that light could reach the canyon bottom to stimulate the vegetation. It's working (slowly), but more thinning is needed for the sedges to really take. More sediment will help too.

Another view, L+6, same channel. I thinned bay trees above the left background that year and put more into the stream along the dashed line down to the circled tree (1).

Here it is last spring from a spot just to the right (vegetation was in the way). Thinning the hillside on the left allowed in a lot more light. The stream bed is still filling in and more plants are taking root.

Here it is just downstream on the way to that (1) tree, immediately after a 12” deluge in as many hours. The logs are chocked to make “mini-meanders” which fling material to make the banks. The stream bed is still filling in and that allows the water to carry the sediment down to the next trap. The trees anchor the system but they make it dark, so I may cut the tops off to get the sedges going.



The tree (1) is circled on the prior slide. Note deposition beneath the log in the foreground (2); this photo was taken the same day after that 12” downpour. Just beyond the logs, the channel is 4+ feet deep (about what it was when we started) by about 10 ft wide. I just lost a dying black oak to the left, so that will make material to continue the project downstream.
The next photo was taken from the “X” with the camera at (4) looking over the mini-promontory below (5).

The channel now averages fifteen feet wide and 6-8 ft deep, with a secondary embankment two thirds of the way down upon which the tree (5) is sitting. The cross section stabilizes from here at about 20-30 ft wide and 10-15 ft deep. What you can't see is a pocket to the left. This spot has probably lost about 60 cubic yards of soil. No thinning, no groundcovers. Without treatment, the down-cutting here will only get worse. But what if I hadn't done anything? You have only to wait; that experiment is easy to find.

So, let's take a look at the "Natural" method of erosion control and drainage management in a local redwood grove. I did not have to go looking for this mess in order to make people look bad; it's just down the road from our place.

This is called "recruitment of large woody debris." The belief is that the flow will cause logs to fall into the channel and do things similar to what I did artificially on our place. The activists' goal is to ban all logging near seasonal streams 'to prevent release of silt and maintain shade to keep the water cold for endangered salmon' (actually introduced). One has to wonder why shade matters so much where there is no summer water.

The culvert in this photo is 24" in diameter, so this represents a fairly small flow in these mountains. There hasn't been logging here for at least fifty years. So this channel represents how an average seasonal drainage might look if the activists get the "riparian buffers" they are demanding along seasonal streams.

As you can see, it's very shaded here, so they've got their canopy, thus, there is no vegetation in this channel. See how the root mass on the left is undercut? When the erosion causes the walls to collapse under the weight of the trees, they fall and hit the opposite bank, thus **bridging** the channel. Then the water runs underneath them and the stream keeps cutting. The fallen trees do virtually nothing to halt the flow or armor the channel.

The channel here is 30-40 feet wide and well over 20 feet deep. That it is cut this deeply with roads across top and bottom means that the average slope has decreased with no apparent reduction in scouring collapsing the banks. This particular spot has unusually gentile slopes for this area, so it is an ideal location for such a trial. Were this channel at the bottom of a canyon, there would be significant risk of undercutting the slopes above the channel, thus destabilizing an entire hillside.

Despite the culvert modifying the "natural flow, if this method worked, the water would eventually slow down and the "Natural" method would start to take effect. It doesn't.

This is about 100’ below the culvert outlet, looking downstream. Again, there are no effective groundcovers because it is way too dark. The logs bridge the channel so the stream is still down-cutting underneath them. **Nothing** was done here to cause this channel, including logging. In fact, the flow was diverted away from its old location into this one long after this area was logged. This is “preservation,” “recruitment,” and “canopy protection” in action. What you see is what you will get.

This drainage channel is only about 75 yards long. There isn't ANY part of it where "recruitment" or dark canopy are working. These regulations are just as dumb as was fire suppression and for the same reasons. Suppress fire and you get fuel. Suppress surface erosion and what you get is hillsides collapsing into excised channels. At right is the bottom of the channel at the lower county road, which effectively limits the cutting by making a hard bottom. Here you see a root wad spanning the bottom of the channel. If "recruitment" was going to work, you would see it here. It did not.

This is “sour-grass” (*Oxalis pes-caprea* from South Africa), for which there is no known mechanical control method. It re-sprouts from bulblets deep in the soil. Oxalis makes dandy monocultures and is unbelievably invasive. A cubic meter of soil has been known to produce a five gallon bucket of bulblets. Nothing eats oxalis willingly as it is mildly toxic. An infestation like this one produced bulblets that floated on runoff through the eucalyptus stand on the north end of our place and infested a couple of acres nearby. Although I’ve rid the downstream areas of almost all the oxalis, it isn’t easy to find them all on ground like you are about to see.

This is the area where the Oxalis came in to our place (I'm pulling rip-gut in this photo). It's just a tad steep here for a backpack sprayer, although a squirt bottle works for an infestation currently this sparse.

But, if I did not spritz them, this slope would be lousy with Oxalis in about three or four years. Guaranteed. There would be no stopping it, similar to other weeds.

There would be no saving it without bombing the whole thing with chemicals repeatedly. So, what else should I do? Write it off? Let it spread farther into the wild? Let my land die? These are the choices we face over much of California.

So, if I'm willing to take these risks, why is the public making it even more expensive, difficult, and even dangerous? Who is going to do this with mountain lions, bears, wild boar, or wolves running around, overpopulated and hungry because nobody is allowed to hunt them (you can shoot the boar but it takes a permit that has to be renewed annually subsequent to a "site inspection")? A unionized bureaucracy on full pensions now kills more lions than the voluntary hunt ever did, but with one difference, the State used to make a profit selling the hunting tags that funded wildlife management.

It's one thing to risk death because of my own mistakes; it is quite another to risk being eaten because ignorant urbanites want to use my land in a manner that pleases them without any accountability for the outcome. Until we have technologies that are species specific, weeding *must* be done. Without it, we can expect extirpation of plant species with their seed rotting in the soil because of witless policies that abet continued infestation.

Why make it worse? Why harass, disarm, threaten, and punish the people who do the work city people will not? Who else is going to do it? Can you imagine the OSHA rules if unionized bureaucrats were doing this? It would be unaffordable even if California wasn't virtually bankrupt.

There is just no containing a problem that replicates itself unattended, and there is no option other than to do something about it. Farther from home, this hillside on the coast is covered with poison hemlock *(Conium maculatum)*. This photo is to show you the potential for this weed to colonize former grasslands. The pollen is known to be toxic to people and animals. Wilder Ranch State Park is now seriously infested with it. To give you the prognosis, the history of the infestation went something like this…

These headlands probably once looked much like this…
although when the Indians had it, they burned it bare every year.

Then came first the Spanish, who grazed intensively with cattle that brought annual grasses. Then came farmers, who used poison hemlock as fences to keep neighboring cattle out of their vegetable patches, just like they had in the old world where they came from. It worked; as long as there were plows on one side and cattle on the other.

June 2002

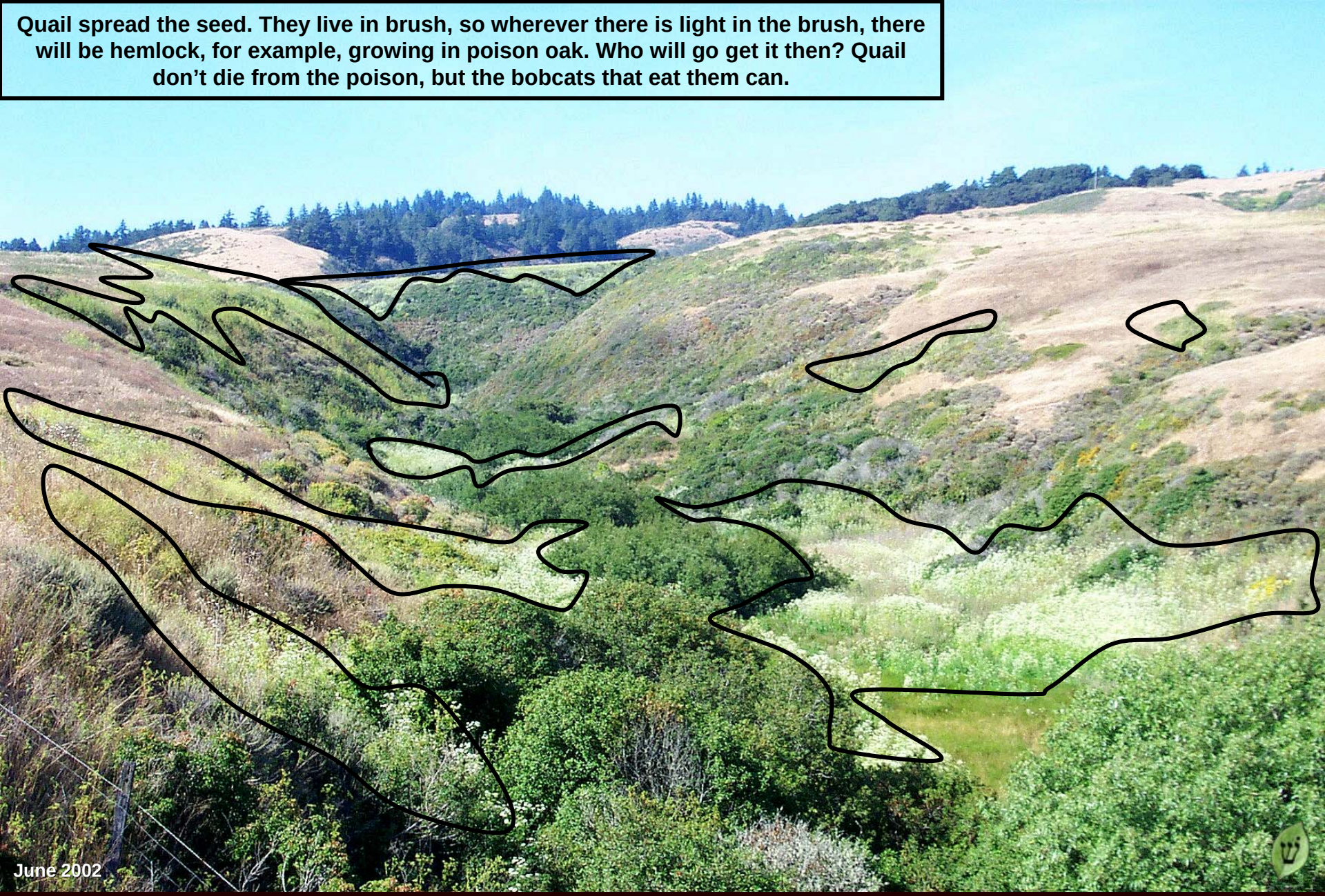
The California State Parks and various land trusts took over local farms and the Coast Dairies property with the promise that they would keep it as a working ranch. The weeds took off on the ranch just as soon as they stopped grazing, which was hardly before the ink was dry. The lime colored landscaping for their pretty sign is poison hemlock.

There is a lot of it, and has been spreading, although it is somewhat better this year because the Coastal Conservancy actually put more cows on it!!! **(So, what was so bad about the dairy?)**

You can see where it was still grazed when I took this picture seven years ago. I am told the hemlock is now reaching the farthest hilltop. Frankly, it's hard to make myself go back to look. I get terribly angry.

Well, this abandoned field isn't all hemlock… it has thistles too!
Who is going to weed it when it goes over the cliff?

Quail spread the seed. They live in brush, so wherever there is light in the brush, there will be hemlock, for example, growing in poison oak. Who will go get it then? Quail don't die from the poison, but the bobcats that eat them can.



I can't blame activists for wanting to save these headlands, but when they take control of the land by means of an ideology that holds human activity as inherently destructive, they are bound to manage it by the same rationale. The result is to abet the spread of a massive and self-replicating source of poison. This philosophy is killing the land.

“Preserving Nature” without people while socializing the business of enjoying the natural world replaces local food with factory food. It replaces local resources and jobs with foreign resources and jobs (often destroying foreign habitat). It degrades biodiversity. It ruins soil productivity. It places our lives and our freedom at peril. It impoverishes our treasury. It blinds science with ideology. It breeds hatred, arrogance, ignorance, and bureaucracy. It alienates urban people from the land. It is time for this to stop.

This story was about my “back yard,” so it is subjective. Still, I have no doubt things here bear a certain similarity to yours because… this is a moral problem.

If we cannot afford to tolerate these results on “public lands,” why are we collectivizing ever more of them? The wealthy socialists who fund the environmental movement want control of markets and people as a way to make money and secure power. They clearly do not care what happens as a consequence; all the pompous wailing we see in mass-media notwithstanding. The results will be “Natural,” no matter what the outcome.

Unless people, by their actions, demonstrably take the moral high ground out from under the witless agents of these self-righteous crooks, too many plants and animals will be gone forever. They are for us to care for, to make fruitful and to multiply, to fill the earth with life, not to let them kill each other off or let their seed rot in the ground unseen. At least now you know better, and hopefully, after reading this book, you know what that means:

You are accountable... to care for the life in the land that provides us life itself, with your own hands if you are able, to make it ever more productive and beautiful.

Welcome to a worthy struggle, one that will take all our might to accomplish! People must take care of the land to save it from arrogance, ignorance, apathy, greed, and fear. We have a responsibility to learn how to turn the knobs and we’d better get started.

Cain, meet Abel. Seek out your brothers and sisters in your back yard. We need each other more than we know.