

MORE ON THE "GARTEN" PART



Most anybody crazy enough to build a house is also sufficiently masochistic to want a vegetable garden. Call it "white picket fence" disease, whatever, I simply prefer to eat vegetables picked only minutes before. While there are solid nutritional reasons for this preference, growing food is a small part of what this section is about, because I was just curious enough to design this particular garden with a whole host of other purposes long torturing the back of my mind, a list that (needless to say) has grown with said insatiable curiosity. The result was a big investment of time and trouble with limitations that I'll just have to tolerate because undoing them at this point is simply beyond the pale. Had I the funds... sigh, engineers.

WILDERGARTEN 4.1

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

Revision History [1.0](#) [2.0](#) [3.0](#) [3.1](#) [3.2](#) [3.3](#) [3.4](#) [3.5](#) [4.0](#) [4.1](#)

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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This chapter is a new addition to the book, just like this book was originally a chapter to another. Similar to that first prior effort, it's a bit sketchy in its content and organization until I gather more images and get the presentation worked out, not to mention do more work in this area once the writing demands elsewhere drop off significantly.

As of now, it includes the following topics:

1. Wood grow box construction and the incorporation and effects of charcoal as a soil amendment.
2. The vegetable garden as a soil diagnostic and amendment process development tool as applies to the rest of the land.
3. Observations of native plant behavior when given optimal conditions in a garden setting.
4. Companion planting, both with natives and crop cultivars.
5. To come: Native plants as foods, herbs, and spices.

In other words, this garden is meant to be an integral part of the restoration of the whole property toward the purpose of restoring people in the land for its own good. The garden sustains the people doing the work. It exposes aspects of the local weed history. It is a way of learning about the soils and the native plants found here. It suggests how to develop potential plant benefits for human and animal health.

This garden was built as a permanent architectural feature of our home. It is therefore a fixed thing of fairly standard construction. In addition to growing yummy food, the intention is to use it as a developmental tool with which to identify desirable grow box design features and process attributes for self-contained *portable* growing systems as are advocated in the new edition of *Shemitta*. In that respect, the goal of the development project would be to maximize the independence of mobile users, requiring minimal regular supplies with which to sustain life, thus extending residence time in the wild with minimal need for expensive deliveries. As portable equipment, one must improve adaptability to variations in terrain, solar exposure, soil and air temperatures, pests, and moisture conditions. Some of these needs demand contradictory features. Yet finding the way among trade-offs is what development work is all about. The subject deserves attention to facilitate wildland restoration.

As a garden, the soil must maintain good drainage, efficient "soil water" infiltration and retention, yet with a low leaching rate of both mineral and organic nutrients, particularly because soil depth adds weight. One might also use the garden as a sink for weedy organic matter, with which to contain seed and prevent unwanted dispersion of cultivars into the surroundings. It would process human wastes from composting toilets, use gray water from a sink, all of which has been done by others better than I. Thinking toward portability on the other hand or integrating native plants... not so much.

None of this will be cheap to develop from an engineering perspective, but bits of the knowledge toward those ends are within our capability here at the Wildergarten, some of which are design related, but more of which are process related (making new machinery costs bigger money than I have). So in the mean time, I'll learn what I can so that the machinery might go through fewer iterations. That is how things get done in the real world anyway.



The requirements for building such systems are many and are part of what makes this such an interesting engineering challenge. So I'll list a few to help you keep them in mind as you read this.

Yield per unit weight (including soil) and area

Moisture infiltration and retention. i.e., easy in, but not so easy out (with charcoal, perlite, and mycorrhizae it's doable)

Minimize nutrient leaching, vibratory packing, and external temperature sensitivity

Minimize setup and take-down time for moving

Pest Resistance while retaining attraction to pollinators

Ergonomic access and low total labor input

Cost

Beauty (beauty inspires work)

Serve as testing bed to develop processes with which to rehabilitate native soils

A sink for weeds as organic matter

Develop native plant companion planting within that area to learn which native plants function to augment productivity of food crop plants

Develop native plant attributes as cultivars

Learn which native plants are edible, what their health benefits and or risks might be, and how to cook with them to produce tasty and nutritious food. Part of this goal is to reduce allergic responses of people new to an area by homeopathic means.

Low shear tilling and mixing (the two are not the same thing)

Sampling, analyzing, and characterizing local soil microflora

Simple flexible and efficient irrigation, preferably modular

Integrated with germination systems, including soil temperature control (a likely need in a mobile system).

Anybody who thinks that this combined list of demands is not a serious engineering problem should ask for a refund on their degree! Integrating biology into engineering is one of the most entertaining set of design constraints I've ever encountered, partly because one is constantly challenged with the inspiring genius of life systems. To do it for a price is even harder.



BOX CONSTRUCTION & SOIL PREPARATION



The slope was cut and backfilled with sand, no need for compaction, equal pressure, therefore sheet steel. It worked.

Counter-bored in digging zone to protect liner

Slender hot-dipped bolts with oversized washers

Staggered lap joints

The box walls were built of redwood I had felled in 1994 and milled here years later. These timbers are full 3X8 heartwood bolted to 4X4 pressure-treated posts. Although it was overkill, I couldn't sell the redwood so what the heck. The wood was coated with copper naphthanate. All joints were bedded with tar. This image was after ten years of use when I dug out the boxes to mix in charcoal for a soil experiment, so I had an opportunity to document their construction and to reveal the durability of the design. Redwood is corrosive to metals. These boxes are assembled with 3/8" hot-dipped galvanized bolts with oversized washers because redwood is soft and subject to cracking. The bolts are coated with "wet-surface" tar so they did not corrode at all. There are gaps between timbers to inhibit rot.





The surface was graded so that it drains the rock to a flush 4" pipe day-lighting just outside the box for a cleanout, its opening covered by $\frac{1}{4}$ " hardware cloth. The bottom of the box is protected from gophers with $\frac{1}{2}$ " hardware cloth sheets wired together on bare soil at pH7 protected from corrosion due to soil salts by a sheet of 6 mil polyethylene on top. The wire bottom is "sewn" to a sheet of 16ga galvanized steel at right. A second sheet of wire closes the lower outside opening (left) and folds underneath. On top of the polyethylene is $\frac{3}{4}$ " drain rock. The outside walkway is pea gravel to drain rainfall, inhibit weeds, and clean up with a rake.



Filter fabric was put on the rock (I would use MiraDrain® today and gain a couple of inches of depth). Then the side walls were lined with doubled 6 mil black polyethylene. This retains moisture in the soil and protects the wood from rot. Sand was put over the filter fabric so that it won't clog. I later protected the top edge with a 1/8" polyethylene "bender board" screwed to the wall with oversized washers.



Organic

Soil



The soil mix in the beds has three major components: The top two were 40% (by volume) soil from the land (left), 35% composted wood chips (right) and 25% charcoal, while the bottom bed was 50% soil, 35% organic, and 15% charcoal. Results (TBD) suggest the lower charcoal number may be more productive, easier to till, and has better structure, but the higher charcoal percentage does conduct and retain irrigation water more efficiently. On the other hand, the higher charcoal concentration tends to pack up, despite what seems to be plenty of worm activity. I may dig out the middle bed this spring, dilute it, and try, try it again. This is how we learn.



Organic

Soil

The bed was filled in two “lifts” of mixing. The first lift of soil, organic matter, and charcoal was mixed with a rototiller.



**Mixed
First Lift**

The effect of adding charcoal should be obvious (right). Here I am adding the second lift of rotted chips on the left, then I will add the charcoal, and the rest native soil. Then I mixed it again along with a 40# bag of a volcanic trace mineral clay, trade name Azomite®.



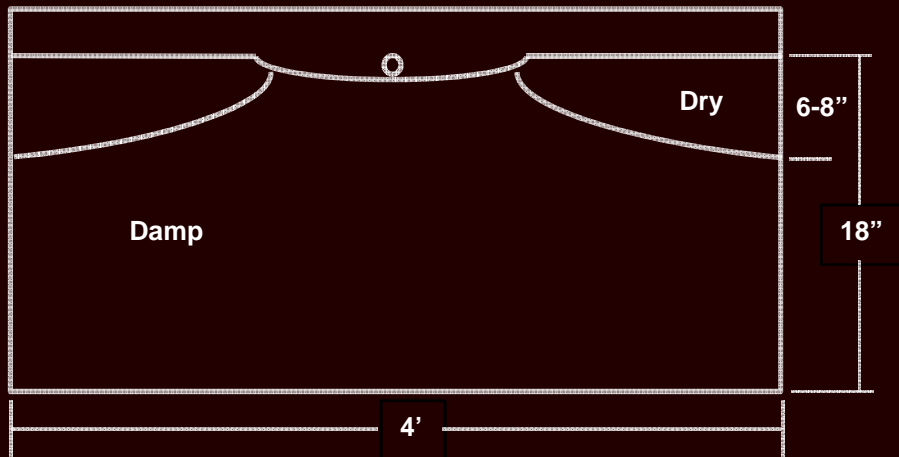


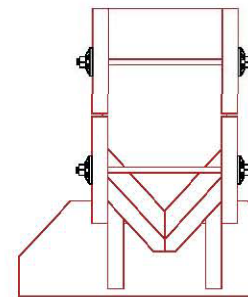
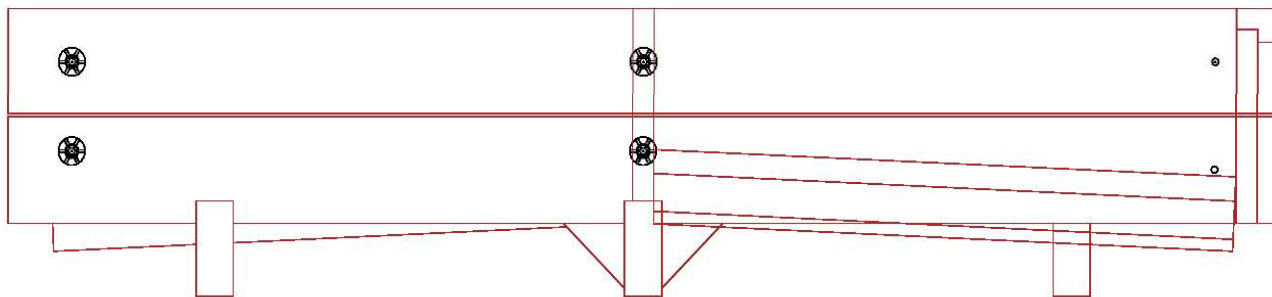
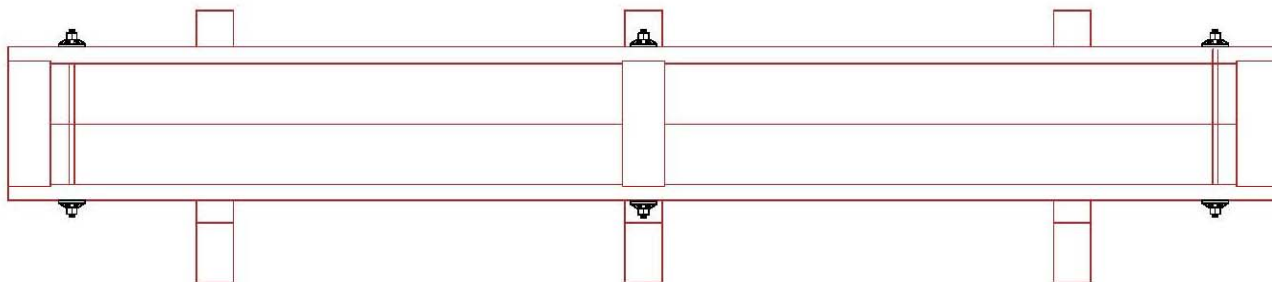
When it's done, it looks like this. Along the top edge I screwed on a polyethylene "bender board" to protect the exposed edge of the inside polyethylene sheet from both sunlight and physical damage. I sowed bell beans as a cover crop for the winter. They grew to 4-5' and made good greens but did not produce nitrogen fixing nodules at all (this was before I knew about our molybdenum deficiency).

I first added charcoal the year after Charles Mann published his seminal 2002 article in the Atlantic Monthly: [1491](#). In it, he reported that newly deforested areas in the Amazon jungle revealed huge rectangular plots of agricultural soils, “dark earths” dug six feet deep with charcoal, six-to-nine times more productive than the “native soils” thereabout. Effectively, aboriginal peoples had *made* much of the Amazon “jungle,” actually an abandoned permaculture forest grown on modified soils. Making charcoal for soil finally provided a use for the excess vegetation choking these mountains. I just had to try it.

Our soil is sand, in an area with typically 35-50” of rain in the winter and very hot summers. When I read 1491, I was in the process of building these beds, so I put in all the charcoal I had from burn piles into the bottom layer (which wasn’t much), hoping to retain nutrients before they washed out. It didn’t work; I had not crushed the coals thus not deriving much surface area for adsorption. Every year I would till in organic matter, and every year the soil level would drop four or more inches as the soil compacted and the organic matter leached or oxidized (you should see the growth on the slope below the main drain outlet from the garden). So the soil degraded very rapidly, in part because managing a garden was secondary to me compared to getting rid of weeds on the land. Still, there had to be a better way.

In winter 2011, I crushed bags of mesquite charcoal at about 15% by volume (the “lower bed” mentioned above). The results were so encouraging that I got ambitious. The next year, I put four yards of charcoal through a ¼” screen and mixed it into the soil as above. I have since been growing crops in the box continuously, including cover crops in the winter. I added half the mulch I once did and only a ½” layer of kitchen compost. There has been no other physical amendment. The difference is considerable. In sand, water usually drops almost straight down. This year, I was growing squashes in a trench down the middle of the bed with a single line of drip emitters. At the end of the summer, I pulled the plants, turned off the water, waited two weeks, and checked for moisture. What I found was the pattern you see below. This isn’t sand any more, this is a sponge. It is even starting to look like one when you break it. So, one problem has abated, but the soil in the upper two beds went at least part way back to packing up again. It wasn’t until I repeated that experiment that I got the message.





The patio needed a planter box along the retaining wall. Given that my elder daughter was interested in soil science and I had an interest in charcoal, I applied the technology learned in building the vegetable beds to this box with a sloping bottom to capture and drain all the leachate from two chambers, one with charcoal and one without. Again they are lined with plastic, but this time with the filter fabric over a layer of drain rock atop a perforated pipe set in silicone-coated mortar to collect all of the leachate to a convenient outlet without sedimentation, pooling, or contamination. I hypothesized that the ability to measure rainfall and transient response characteristics would make it possible to generate a transfer function describing the difference between the two soil systems in terms of both moisture and nutrient retention as a “unit pulse response” (for the engineers among you), thereby characterizing both infiltration and discharge responses to charcoal amendment! Accordingly, Daddy coerced his teenager (then in junior college) into mixing the soil, filling it, and keeping retains for “her” (my) experiment. I never took the data because we didn’t have the money for the lab work, but it was a cool idea. I might still do it if I can find a way to afford the lab work, because a few *really* interesting things did happen.



"Charcoal"
side



March 2012

Knowing that whole nuclear reactors have been built backwards because somebody put a drawing upside down on a light table, I asked her several times... "Charcoal on the left?" "Yes, Daddy (exasperated sigh)..." She had homework to do and a crushing commute schedule... I popped in blue dick bulbs and skullcap tubers (*Scutellaria tuberosa*) on both sides both because I was curious about the food potential of these plants under cultivation and I like pretty flowers. When it rained the first response was obvious: both grew 5-20 times the size one sees in the wild (see the chapter on [meadows](#)). As far as food is concerned, the bulbs do not get much bigger, they just divide, none being much more than a centimeter at its largest dimension. Both would make nice yard plants though.



March 2014



"No Charcoal" side

"Charcoal" side



April 2013



What was particularly fascinating about this experiment was at first I thought that the "charcoal side" (top) did not grow plants as well as without! Obviously not what I had expected. The surface also sank almost 2" more than the "no charcoal" side with more organic matter, which if anything **rose** in height over time, similar to what happened in the lowest of our three vegetable beds when we added charcoal there. There were all sorts of possible attributions, from excess salts in the charcoal to the preference nematodes might show for the additional organic matter, but it bothered me.

Aside from the analytical and aesthetic purposes for the box, its horticultural purpose has been met very nicely, which is to test how various native plants might do when grown in better soil. I also wanted to make more of them for reintroduction elsewhere on the property (which is why I chose plants with bulbs). In fall 2012, I planted the blue dick bulbs and the lesser fêted skullcap tubers (*Scutellaria tuberosa*).

Yet when I dug the blue dicks out to plant in early March 2014, I found out that "food" value was not the whole picture! One of the roots had swollen into this "bag" 6 inches long mostly consisting of safe drinking water (inset). I had seen irises do something similar, but not on a scale even close to this! NONE of the ethnobotanists or archaeologists I have contacted had ever seen this, nor is it to be found in the literature about this plant, yet it may be historically important.

We now may know another reason why blue dicks were such an important "food" for Indians working their way along a hot dry ridge on a trading excursion: they may have been storing safe drinking water in these roots. The borderline starving white guys who often contracted dysentery drinking from the local streams just called them "diggers" without really looking at what they were doing, much less why.

Interestingly, the soil in the "no charcoal" side was also considerably softer, and I was really starting to wonder what was going on.



"Charcoal" side

M. villosa ssp. *franciscana*

M. villosa



End of September 2014

The horticulture experiments continued in 2013-14 with two varieties of coyote mint (*Monardella villosa* and *M. villosa* ssp. *franciscana*), to learn how they would respond to container planting in full sun and what their water requirements might be. Clearly, both varieties could take the sun and survive in the box, although the *v. franciscana* having denser hair apparently tolerates sun better. This is simply a wonderful plant with a magnificent mint aroma and gorgeous flowers (inset). The ssp. *franciscana* is more of a shrub than regular coyote mint and are unusual around here. Neither tolerated over-watering. Note the continued settling on the "charcoal: side.



Was "No Charcoal"
Actually IS the Charcoal Side
50% Soil, 25% Charcoal, 25% Compost

Was "Charcoal"
Actually is "No Charcoal"
50% Soil 50% Compost



July 2015

Then in June the next year (2015), something fascinating happened. A gopher found this box, climbed up the wall almost two feet, and entered the "no charcoal" side. We have never seen a gopher in *any* other bed or planter. I didn't have time to deal with it. It tore things up to the point that it went through the filter fabric and brought up gravel from the bottom. The coyote mint died. It stayed there feasting on blue dick bulbs and skullcap tubers **for two weeks without touching the other side!** Then it went to the other side, rooted around a bit, and LEFT without finishing it off? I don't know how it got in there at all, much less why. Finally, I dutifully dug out the soil to repair the filter fabric and the plastic liner. I suppose by now you realize just from the soil color that I had the soil types BACKWARDS, effectively a double-blind experiment (not so obvious when wet). It had been the charcoal side that had grown better, sunk less (just like the first vegetable bed), and had attracted the gopher. Even more amazing, I found lots of *Dichelostemma* bulbs, but **only in the NON charcoal side** the gopher had left behind. But if it wasn't food the gopher wanted, what was it?



March 2014



Could it be the gopher knew from scent that there would be water? What with the charcoal's propensity to store water, this would be reasonable. Yet despite how tenuous this all may seem to be, there may be good reason to pursue what has been learned here.

SOIL REHABILITATION & FOLIAR APPLICATION



Back in the veggie beds, at first this squash grew rapidly, but look at the leaves, especially in shade (red arrows). Most of the leaves once looked as bad or worse, some frying completely in the sun. My daughter at Utah State had checked this soil for N-P-K, pH, conductivity, and salt. All were fine. Multiple assays of the soil parent material indicated adequate magnesium, iron, cobalt, and manganese, but low zinc, boron, and no molybdenum. There had been two years without squash in this bed so viruses were unlikely. Visual diagnostics suggested molybdenum deficiency, with the lack of boron possibly accounting for the leaf miners (blue arrows).



February 2015

As discussed in the chapter on grassland restoration, I have noted both vegetative symptoms indicating molybdenum deficiency and have confirming test data from elsewhere on the property. I have reason to suspect that aboriginal burning over millennia left residual charcoal that retained atmospheric deposition of trace minerals in the soils and that those minerals were then lost when the place was terraced and tilled annually for apples. The base mineral soil, being sand, is likely to leach out those minerals.



October 2012

I want those minerals to get into the soil but not to leach out. I suspect the charcoal can hold them but cannot be tilling steep slopes, nor do I wish to see an expensive charcoal or clay amendment washed off by rain or minerals leached out before I learn whether it works. The problem is that incorporating charcoal or clay by mixing it would bury non-native seed, then to be brought to the surface later on. Tilling would also be costly. I have worked too hard to risk making that situation worse. So the question is: Is there an inexpensive way to get the charcoal or clay into the soil *without* tilling and keep it there?



End of September 2014

Would mulching stimulate an increase in moles, voles, and gophers to do it? It's a thought, so I gave it a try two years ago when I put down this pile of straw left over from harvesting. It clearly works to a degree. What may inhibit that method is that *Stipa* grass straw is supposedly allelopathic, but that is only temporary. I would suspect bromes would be also.



End of September 2014



In 2014 I tried a larger area and not quite so thick. Thicker straw retains more moisture which keeps more insects (mole food) going. One does not get the results until the next spring when the critters are active. This is effectively a transition from an extreme vertex design (straw v. no straw) to graduated design (thicker v. thinner straw) with which to characterize how long it might take for me to do a substantial area with the annual mass of grass this place produces and whether I might need to harvest more straw elsewhere to bring to this nitrogen deficient ridge in the attempt to get the microflora here to produce more of it. Still, the bugs need the Mo and this is slow.



February 2015



We may just have a savior with which to get the critters to doing some more aggressive mixing. The blue dicks are coming back to this ridge. It would mean I'd best get to purging this seed bank before the gophers mix in the charcoal. Stay tuned, this could be interesting.

Foliar Only (lower bed)

Soil Only (middle bed)

Foliar Plus Soil (upper bed)

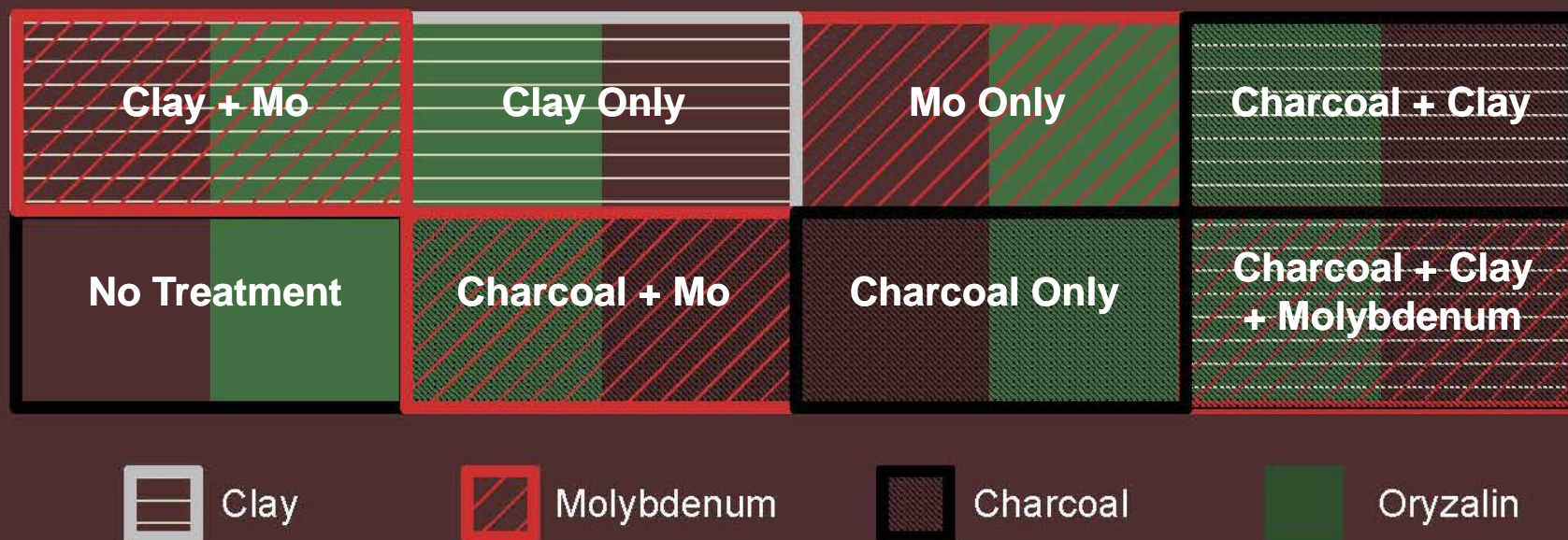
Notes on foliar absorption in vegetable beds:

1. Target molybdenum concentration was to achieve 1ppm for the top 1' of soil depth
2. Target boron concentration was to achieve 3ppm for the top 1' of soil depth
3. Both sodium molybdate dihydrate and boric acid were mixed at 2gm/gallon
4. The applications were sprayed uniformly until the material was gone
5. The beds are 64, 96, 128 square feet.



One popular *agricultural* means to apply trace minerals is to spray a dilute solution as a foliar application. One can then use the plants to translocate the needed minerals *into* the soil which would retain it longer in an available form in decayed organic matter until I can get the critters to mix in charcoal or clay. So I am using the garden to test both translocation efficiency and retention of molybdenum by charcoal. I dutifully researched the concentrations of elemental salts these plants might tolerate as a foliar spray. During the process, I learned that one must know the assimilation rate into the foliage of each respective mineral so that each application is absorbed *before* adding the next; else they can just wash off. Growing squash was probably ideal, both because of high growth rates and large leaf surface area. I applied nitrate first; that goes in within a few hours, the process washes off surface dust, and stimulates growth activity. Then it was 2gm/gallon boric acid because that goes in quickly too. Zinc takes 1-2 days, while sodium molybdate can take **10-40 days**. So foliar translocation of molybdenum is *very* slow and it leaches from soils. Sometimes, the choices we have are sub-optimal. I might have put this observation in the chapter on grassland restoration, but I thought a few nuggets basically showing the connections between the garden (a lab) and the field relate here, partly as a reward to those who dig this deep. If you did, thank you.

2014-15 Charcoal, Molybdenum, Clay, & Oryzalin Array



1. This is a different location than the prior bone meal, blood meal, burn, and (charcoal + Azomite®) array.
2. There is also a 50% overlay of oryzalin pre-emergence herbicide.
3. Again, each cell is 240 square feet.
4. Four cells were amended with charcoal at a rate of 1 cubic yard of charcoal / 960 ft²
5. Four cells were amended with used kitty litter (no feces) at a rate of # / 960 ft²
6. Four cells will be amended with molybdenum by foliar spray at a rate of XX gm sodium molybdate dihydrate / 960 ft²
7. "XX" means I don't know yet.



If the data from the garden show reasonable assimilation of Mo by foliar application, that changes the time at which I will apply it for the experiment above. I may include nitrates in the fields with oryzalin pre-emergence to stimulate the germination of the remaining weed seeds until they are gone. Now, obviously this is all being done in full parallel on the basis of reasoned estimation and a few screening experiments. It does seem like a lot to hang on so few established facts, doesn't it?

So, is this science? No university would condone doing things this way! No, we'd have transects with minute measurements, and control plots, complete with massive statistical analyses, pretty colored scatter plots (that few can read)... Can I do that? Sure. Do I have the time? No. Should I then not ask the questions? Is there no value at all to what is learned here? This is where we get to a very serious and fundamental philosophical question about "science" the way it is practiced today:

University and agency environmental sciences today function in sum respects as a self-perpetuating grant application system. That means the scientist must produce data that reflects the standards of practice as set by the people who bestow the grants, usually Federal bureaucrats as advised by prestigious, appointed, and generously-compensated academics. Unfortunately, this is where group-think enters in, and where procedure begins to trump, if not obscure, the applicability of the results.

The larger is the area to which the results of a study are to be applied and the more subtle are the distinctions being examined, the more important becomes the need for precision in sample measurement. Yet with precision comes a much higher cost, which then constrains both the area of study and the term over which it is conducted. Yet the larger the area of application, the more obvious it becomes that the magnitude of background variation over time will exceed the tolerances in the measurements! That argues for bigger scale and more replicates over longer periods with less analytical precision (effectively the choice I have made), except that such is not allowed and is certainly not useful in court (which is where much of government sponsored science is actually used). Said another way, the more detailed and precise is our study, the less applicable the findings become in application because everything is subject to external variation. So, what good is all that expensive precision at that point?

This is why in manufacturing we did our factorial arrays with considerable sample sizes but also with very coarse measurement gradients, because applicability was a requirement. That does not mean we did not take precise measurements where they were warranted (I worked with high-frequency microwave circuits at one time) as 'coarse gradients' might involve differences in a very small component. Yet pursuant to those observations, I would argue that what is needed in ecology is to increase the number of trials and the rate and types of disturbance repeated over long periods, by which to characterize system responses to discontinuities. This is not what I usually see in the practice of academic studies in ecology.

So I keep building equipment and trying things with which to identify control levers on the system. Certainly the relationships between aboriginal burning, charcoal, hydrology, trace minerals, and use of mulch to stimulate mixing go that far, don't they? So, if I plop a pile of straw down and maybe measuring how thick it was might mean something? Not as much as one might think. The variations in how much precipitation there is in any one year, what the temperature profile of the summer might have been, what bugs were there and what animals might have done would blow away much more analytical precision than to say, '4-6 inches of straw in the first pile and a couple in the second.' Although the causes of variation are many, the experiments are big enough that I expect to see something.

So yes, there really is a place in science for this kind of opportunistic happenstance and observation. It is to say, 'Is it worth detailed quantitative study? What might be the range for within each variable under test and how much precision is necessary? How long is it going to take before one learns anything definitive?' At least this way, I get to ask more questions and make more observations for both less time and money while identifying procedural risks and possibly synergistic opportunities.





End of September 2014

I did learn from those boxes that coyote mint does not at all appreciate excess water. The charcoal conducted so well that although I plugged the drip line to it this plant is still too wet and has barely survived. Now that I have compared the two varieties side by side I will probably pull the plants from this second box this year to add more soil and prepare for some new horticultural tests.



July 2014

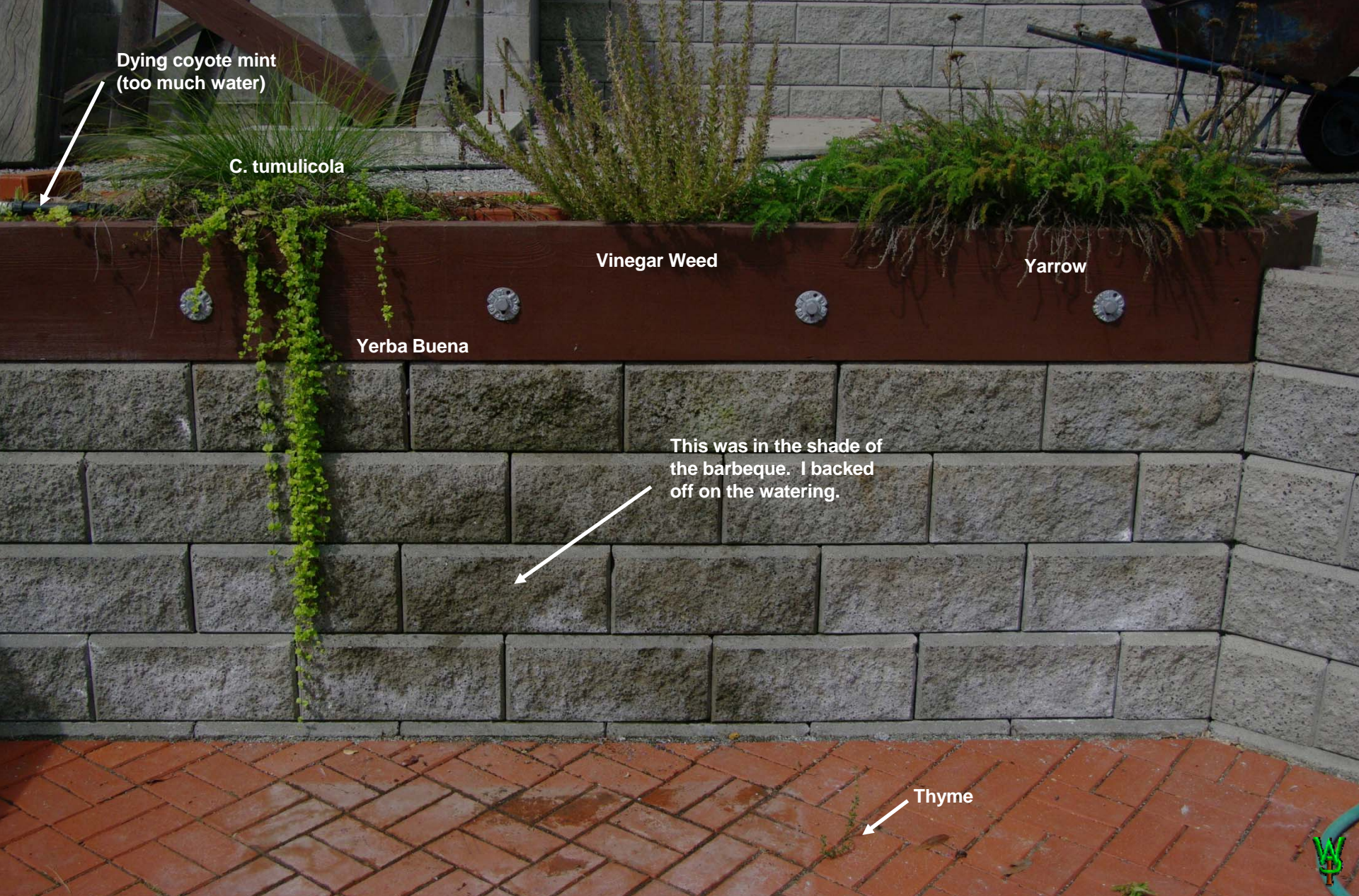


There is a relatively common buckwheat (*Eriogonum nudum*) found on my neighbor's property (above) that I am trying to germinate here. There is also another buckwheat species found within three miles of here that I would like to collect, *Eriogonum fasciculatum*. The latter is said to be endemic to Santa Barbara. It is lower growing, more productive, and prettier compared to more common local flavor. Indians probably brought it to nearby Aptos and Scotts Valley, as those places did host tribal villages. Such issues get back to "what is native" versus what is not. People clearly played a part in plant distributions even thousands of years ago.



May 2009, this is a very large specimen by wildland standards here

I have also been playing around with *Camissonia* spp., of which there is a coastal variety known to produce a root that once was a native food. That made me suspect that the two species we have here might also be edible (gophers love them). In the wild they grow as a flat rosette usually about 3-5" across with a short stem, unless it is a wet year and they're in the shade and they put out branches (the one above is 12-16"). In my vegetable bed on the other hand, a *C. contorta* grew to FIVE FEET across and 2 feet tall without irrigation. I tried munching on it and it was pretty bitter and the texture unpleasant. I'll give this *C. micrantha* a taste sometime.



There are happenstance “experiments” here too. In this bed I planted yarrow and yerba buena (*S. douglasiana*). The *Carex tumulicola*. and vinegar weed (*Trichostema lanceolatum*) are volunteers. Vinegar weed is an amazing dry land annual forb and is *very* attractive to bees (next chapter). Unlike the coyote mint, everything else loved regular watering. There used to be thyme here, which I have decided to discontinue here because it appears likely to be invasive (below). We learn more by doing than by observation alone.

COMPANION PLANTING



September 2014



This winter we are beginning experiments in “companion planting,” including both crop plants (such as carrots or beets with cabbage) and a couple of native groundcovers. This will include in particular yerba buena (*Satureja douglasiana*), a type of mint, and hedge nettle (*Stachys rigida*), a non-stinging low-growing relative of stinging nettles. Yerba buena (prior slide) starts from cuttings, so it’s slow and iffy. *Stachys* is known to augment nitrogen fixing-bacteria in the rhizosphere and does start from seed. Deer do make things difficult.



September 2014



The deer fence is only half done, the main reason we have grown a lot of squash and haven't taken vegetable production terribly seriously. We did try hiding some green beans and beets under the squash and that worked surprisingly well considering the neglect they got. After feeding the deer this well, it does have one contemplating Bambi Burgers though. Maybe the capsaicin that didn't work will spice them up. The ground was too dry for grading and drilling posts last winter. I can do that this winter if it rains.



Given that our garden is made of materials obtained locally, it serves an important diagnostic purpose to identify our weed history: **Gardens bring up weeds early under ideal and controlled conditions.** Hence, what I learn here applies everywhere else. In this bed, I was planting carrots and beets, along with *Stachys bullata* to see how well it serves as a nitrogen fixer. There are several exotics here: shepherd's purse, pop-weed, henbit, and chick-weed. There are also *Verbena* seedlings, a big native perennial I do not want here. The henbit and *Verbena* have leaf shapes and textures very similar to *Stachys*. So I MUST distinguish them as early as possible to get an acceptable weeding yield and to minimize the damage of removing them, particularly before the garden hides them. I have never before bothered to study *Stachys* closely as a juvenile. Fortunately for purposes of early identification, the henbit and the shepherd's purse are very fast maturing weeds so they are easy to watch in a garden bed in early October when nothing is starting outside it. Shepherd's purse is easy to identify early by the stripe down the middle of a smooth edged pointed leaf. For the henbit, the aspect ratio of the leaf, its "spade" shape, became the visual key. *Stachys* leaves (none here) are more triangular than the *Verbena* and curl upward. Yes, the weeds win, even here. So if we are ever to take advantage of these plants, processes like we are developing here may become important beyond the mere goal of keeping the native system from dying outright.

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