

# PART III: GRASSLANDS

Part II was about forestry, a priority dictated by the condition of the property when we bought it. Most of the place was overrun with an understory of exotic brush and had a few stands of very large exotic trees, requiring heavy equipment to remove. That made setting priorities and process design simple: Remove exotic trees, thin forests, and kill broom. That process took 10 years worth of spare time with thinning continuing to this day.

Worse, when we started, there were NO grasslands here. None. There were open areas one could *fantasize* had been or could be grasslands because they had few trees, but they were totally dominated by French Broom, much of which the seller had whacked in order to make them *look* like open grasslands. One need only to wait a couple of months to be disabused of that fantasy, as by then the broom was an absolute carpet two feet tall. Mow it and the carpet just got thicker, upwards of 200 plants per square yard. There was no other option than to spray. So to start, grasslands began with killing broom.

It was grasslands that eventually taught me the importance of annuals and the need to manage succession; else, there would be no grasslands at all. Interestingly, both grasslands and forests here each suffered from a transient invasion soon after I removed the broom: the forests were invaded with hedge parsley while the grasslands were blanketed with cat's ear. Similarly, both forests and grasslands also suffered from a predominantly exotic seed bank, forests with hedge parsley and grasslands with a series of weeds discussed later in Part III.

Open grasslands (as opposed to grass patches in forests) are much more complex and much more labor to manage than forests or chaparral, so I can only handle several acres of grassland without being overwhelmed. So I manage the two ecotypes in an attempt at harmony, also resembling the uniquely bifurcated landscape as maintained by aboriginal tribes in competition with grizzly bears. As time has passed and native species colonize and differentiate, they deepen in beauty, but they always remain a lot of work.

# WILDERGARTEN 5.4

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Revision History [1.0](#) [2.0](#) [3.0](#) [3.1](#) [3.2](#) [3.3](#) [3.4](#) [3.5](#) [4.0](#) [4.1](#) [4.7](#) [5.2](#) [5.3](#) [5.4](#)

Vande Pol, Mark Edward, 1954 –

Other writings by Mark Edward Vande Pol:

[Natural Process: That Environmental Laws May Serve the Laws of Nature](#): ©Wildergarten Press, 2001, 454pp, ISBN: 0-9711793-0-1, LOC Control #2001092201.

[Shemitta: For the Land is Mine](#): ©Wildergarten Press, 2009. Contains: 217pp text, 980pp overall, 14 picture books, 2 tables, 963 photographs, 9 maps, 2 drawings, 2 charts, 145 footnotes, 358 citations, and 216 other source references, not including external Internet links. ISBN 978-0-9711793-1-8

[Articles at Wildergarten Press](#): collected writings on Constitutional history and regulatory racketeering by tax-exempt “charitable” foundations

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In these mountains, fire-suppression has allowed forests to become overgrown. Grasslands ended up as very occasional openings, usually maintained by a bulldozer or as domestic grazing animals, while meadows dominated by native forbs are virtually non-existent. Today at the Wildergarten meadows are for the most part hand-weeded at least five times per year (weeds crop up after rain), more demanding than any other type of habitat. Larger plants hide tiny weeds, requiring time-consuming inspection and removal. In 2011, the patch at left got 14 visits. Meadow soils are also more tangled with roots, making effective removal more difficult.

This meadow is a mix of two lotus species, three clovers, three grasses, hedge nettle (*Stachys ajugoides*; they don't sting), two tarweeds, and about 20 others.

Interestingly, most of this one is succeeding to grasses, while patches of it are going the other way. In order to keep the grasses from getting out of hand, I try to burn them on at most a five-year rotation.

Note the three native shrubs, yerba santa (*Eriodictyon californica* - the leafy thing in the mid-ground), monkey-flower (*Diplacus aurantiacus* on the right), and deer weed (*Acmispon glaber*) behind my trusty dog. If I don't remove these natives too, this meadow (also a road) would succeed to chaparral in about five years. Now, that isn't a bad thing in terms of native plants, but it is a bad thing in terms of management if the goal is to maintain grasslands to learn about how each one of these systems works.

Although this site is cleaner than some other locations on our property, disturbance still brings up exotic bitter cress (*Cardamine hirsuta*), mouse eared chickweed (*Cerastium glomeratum*), and bur clover (*Medicago polymorpha*), even though the latter two have all been under control here for over 9 years before this photo was taken.



May 2010

Native meadows vary spatially and over time. Their management requires adapting to each individual system. This one is a mix of California brome (*B. carinatus*), blue wild rye (*Elymus glaucus*), and the usual lotuses, clovers, tarweeds, and cudweed.



April 2012

Besides being variable, meadows are intensely complicated. This one, in addition to the grasses, has strange perennials like cinquefoil (*Potentilla glandulosa*), blue witch (*Solanum umbelliferum*), strawberries (*Fragaria vesca*), blackberries (*Rubus ursinus*), and pink cudweed (*Gnaphalium ramosissimum*), an annual that can get five or six feet tall and as wide (if I let it). This is right in front of the house. I keep thinking from time to time that I should landscape it but maybe not just yet. I do mow it at the end of the year though.



May 2013

Meadows here also have their uses. Like the first image, this one is a road. Here are slender hair grass, (*Deschampsia elongata*), blue wild rye (*Elymus glaucus*), (*Bromus carinatus*), miner's lettuce (*Claytonia perfoliata*), monkey flower, Santa Barbara sedge (*Carex barbarae*), foothill sedge (*C. tumulicola*), and of course weeds, the worst of which is now chickweed (*Stellaria media*).



December 2014

A meadow is a lot more than grasses and forbs; it is the soil that makes things grow. Seventy percent of the world's agricultural soils are mollisols, in other words, former grasslands. We simply do not know what small native annual forbs did to make soils that work. If they cannot breed, we never will. So, while one might think weeds like chickweed are not a big deal with all these bodacious grasses around, they actually inhibit germination and growth of more productive plants like this miner's lettuce. What I am doing is simply cleaning out the weeds, learning what the natives do, perturbing the system repeatedly to see how it responds, weed it again...



February 1, 2009



Note the size of these grasses so early in the season! Perennials respond to early rains more quickly than do annuals. Productive forbs make a big difference in the forage value of this California brome (*B. carinatus*). More importantly, they exert a powerful influence upon the grasses. This miner's lettuce (*Claytonia perfoliata*) will drop seed and die back long before the grasses reach full maturity.





October 16, 2014

The grass season starts in late September or early October with perennial grasses greening up from the first rain. In this image, these grasses survived the terrible 2103-14 drought year with less than 20 inches of rain.



November 2014

Fall is when weeding begins. This is mostly clover, in particular *T. microdon*. If one knows the cotyledons, the weeds are easy to spot when separated like this. Getting early weeds is what makes it possible to keep up in mid-spring.



January 2015

In particular I inspect old burn piles closely to see what is coming up, while building new ones for burning in the rainy season.





January 2015

Winter is when most weeds grow slowly and are easy to distinguish, except for grasses for which I have developed special techniques. Unless I remove the bulk of the fall germination by the end of February, the spring germination can easily overwhelm any effort to remove them before all they can seed. The grasses are *Stipas lepida* and *pulchra*, the fabaceae are *A. americanus* and *T. ciliolatum v. ciliolatum*, and the dandelion is *Agoseris gradiflora* with *Uropappus lindleyi* on the way! As each new native invades the property, I have to develop new means to distinguish native from exotic juvenile forbs.



February 2015

December and January soil temperatures are too cold for efficient germination. When things start to warm up, we get a second crop.



February 2015

By late February, the weed war is on full. Here, I'm searching for bitter cress (*Cardamine hirsuta*, red arrows for a few...) hidden among various clovers (*Trifolium wildenovii*, *T. oliganthum*, *T. bifidum*, *T. midrodon*), lotus (*A. americanus*) and willowherb (*Epilobium minutum*). The grass weeds are rat tail fescue (*F. myuros*) and rip gut brome (*B. diandrus*). This is "Hidden Pictures" on steroids.



February 2015

February is also when the bulbs start to come up.





March 2015



March is simply frantic here. I don't get many pictures.





March 2017

This is a typical patch of mouse eared chickweed, **some only 1-2mm** . We do small here. It may not seem like such a small weed is a big deal, but they do suppress native germination to an impressive degree.



April 2015



April is typically our most photogenic month for meadows.



April 2015



The problem is that meadows are so varied here, that there is no such thing as a “representative” image.



April 2015 – *Stipa pulchra*



Particularly because, in order to really comprehend that incredible beauty, one often requires a closer view.



April 2016



Close-ups just doesn't lend themselves to thinking one has seen much of it all.



April 2016



There's just an awful lot of "all" on this mere 14 acres.



May 2016



In May, most of the forbs begin to drop seed and die.



May 2016



The color can just knock you down.





June 2015

The needle grasses typically drop seed in late May. After the harvest, the lotus and verbena are still in bloom until late July.



June 2015



The brome and rye grasses are ready in June. If I mow them now, they'll put up fresh growth. If I don't, they can die.



July 2015

This *Calamagrostis rubescens* in a forest grassland typically waits to drop seed until at least late July, but it so seldom seeds that one of its common names is “seven year” grass.



April 2015



By mid July, the second crop of forbs really gets going; these *Madia gracilis* are about three feet tall flowering from June to August. It is not hard to envision that a second crop like this over a large area would represent a great deal of seed or forage.



August 11, 2014

In August, one can see that this needle grass is still green. It would look better if I had mowed it after the harvest as it would have forced up fresh growth. I was busy you know.



September 2012



This California brome had been mowed. Everywhere else, all is dry and barely clinging to life until that first rain.



Cudweed

These trees  
were irrigated

Cudweed

Blue curls

September 2014



Over summer, blue curls and cudweed rule the day until wherever the soil had been bare enough for them to germinate in late February. I treated this flat with pre-emergence herbicides because I had moved these weed composting piles and was concerned about the seed I had surely dropped besides having the need to maintain it as a working area. Lacking competition after the oryzalin had petered out, the blue curls and cudweed came up in profusion, growing to four feet across without irrigation.



May 2010



When you get them right, native meadows can be immensely productive despite very poor parent material for making soil. This is almost all California brome (*B. carinatus*) about 4' tall with a bit of blue wild rye. We will now get to what you can't see that makes it go.





February 2015

As to nitrogen fixers here, there are at least three major types, two of which are represented above. In addition to the usual lotuses and clovers (*Trifolium microdon* here) that host rhizobial bacteria in root nodules, the leafy hedge nettle above (*Stachys rigida* v. *adjuroides*) produces root exudates that feed loose nitrogen fixing bacteria.





May 2013

But there are other nitrogen fixers here. Small annuals can have yet *another* understory of plants beneath them! Here are *Aphanes occidentalis* (red arrows), a member of the rose family which host nodules of actinomycetes on its roots to process nitrogenase. Yet there may be a result of the site history at work here that reduces the capacity of that nitrogen fixing to be discussed in these chapters.



May 2013

There is ongoing research here on other elements of the nitrogen cycle here that are not described in the scientific literature. Among them are members of the everlasting tribe (*Inuleae*), some of which store nitrates in their tissues. Here, fungi may play a key role in gathering those nutrients and conducting them into the cudweed. As annuals the cudweed dies each year, putting that nitrate back onto the surface. In a sandy soil, these plants may reduce loss of nitrates in soil due to leaching.



May 2015

Many plants here at the Wildergarten typically germinate in late February to early March. We have them in places that defy the botanical descriptions because virtually everywhere else not in their supposedly “usual” habitats they don’t get the chance because the weeds get there first. In this photo are “meager tarweed” (*Madia exigua* smells like cherry cough syrup when weeding) and “slender wooly heads” (*Psilochaupus tenellus*). Nobody really knows how these plants get along in a grassland because they have been so badly suppressed by weeds for over a century. They do interesting things here.



*M. exigua*



February 2015

This is how *Madia exigua* starts in and among tomcat clover (*Trifolium wildenovii*). They have quite the relationship.



May 2015



This is *Madia exigua* and tomcat clover (*T. wildenovii*), consummating that relationship.



February 2009



This is *Madia exigua* (yellow) growing in *Verbena*. Native grasslands can be so varied it's hard to call them "grasslands" in places (which is why I prefer "meadows"). The plants even take on different personalities in combination with their various cohorts.



**Land Trust of Santa Cruz property near Scotts Valley, CA, June 05 2015**

As to how to distinguish a truly native grassland from one that isn't, that difference is not as hard to recognize as one might think, seeing as you've probably never seen a truly native grassland, neither in parks, conservancies, wilderness, nor land trusts. What? They didn't tell you? The green stuff in the foreground is a pennyroyal, an exotic weed that is very difficult to control.





**Wildergarten, June 29 2015 – Lotus, Stipa, Madia, and Grand Mountain Dandelions**

As opposed to the Land Trust's flat bottomland in a marine climate at the beginning of June, you could try our sunny sandy hilltop in a much hotter inland climate at the *end* of June. It is often 10-15° hotter here than Scotts Valley the same day.



Wildergarten, June 13 2015

There really is a difference that anyone can see. Besides brome grasses (*B. carinatus*), needle grass (*Stipa pulchra*) blue wild rye (*Elymus glaucus*), and slender hair grass (*Deschampsia elongata*), this sward is populated with sedges (*Carex barbarae* & *C. tumulicola*), *Verbena lasiostachys*, tarweeds (*Madia gracilis* & *exigua*), *Camissonia contorta*, and silver puff dandelions (*Uropappus lindleyi*). Some of these perennials, such as the *Verbena* or the sedges, really increase the content of soil organic matter .



May 2010

There are 34 native species of grasses, rushes, and sedges in meadows here. This is (mostly) nodding Trisetum (*T. cernuum*), which is still spreading on the property. Where they first appear is not necessarily demonstrative of where they are best suited.



April 2009

Some meadows here have species characteristic of sand-hills present and vice versa, which is not surprising in a distribution of plants that is essentially representative of a successional transition.



April 2009

In fact, nailing down a sharp demarcation between grasslands, sand hills, chaparral, savannah, or even a forest can be a somewhat subjective exercise more determined by what stage of succession appears to be dominant. You know when you are in the middle of one, but at the edges or in pockets, not so much.



April 2015

When grassland species become so ubiquitous they start invading forests, one has to wonder what is going on. This is notch-leaf clover (*Trifolium bifidum*) building a patch on a road between oaks and redwood so dense one would be tempted to think it a weed. Nobody knows what is natural, because when the Indians had this landscape, **there were no forests up here**. This IS unprecedented.



July 2015

The transition between grassland and forest is not so clear-cut as one might think.





July 2015

Especially because we have grasslands deep in the forest. This one used to be about a quarter acre of French broom with bare soil. Now it is pine grass (*Calamagrostis rubescens*), and small-flowered needle grass (upper right) trimmed with roses, snowberry, hazelnuts, and ferns. But even as remote as it is, this meadow shares one thing in common with all the others: weeding every year.





May 2013



So, how did we end up with so many different meadows?  
Sometimes it was happenstance, simply because of varied topography. Most of the time it was a matter of site history.



April 2005



Sometimes they are by design. These are planted plugs.



April 2013

A few times it was easy. I did this with a loader and pre-emergence herbicides.





February 2009

Most of the time, it was war. This is wall bedstraw (*Galium parisiense*) from the weed bank infesting needle grass and Spanish lotus. This weed has taken forever to cleanse from the exotic seed bank, but we've done it in most places.



I want to say something important about weeding here. At times I talk about what “I” did or what “we” did. For the most part it was me, but this is “we” and it was important. For about three years, these two girls were coerced by their home-schooling daddy into weeding during the spring instead of getting a summer vacation. Neither one of them liked the work; it is tedious, repetitive, unrelenting, physically and visually exhausting, and seemingly endless and without benefit. Yet what they did, right here, has brought visiting botanists literally to their knees. Nobody knew what was going to happen or the contribution they had made. They just did what they were told, diligently, albeit occasionally begrudgingly and we all got to learn something important.

Most of the weeds here were either hedge parsley, mouse-eared chickweed (*Cerastium glomertum*), pimpernel (*Lysimachia arvensis*) or tiny grasses such as *Festuca myuros* and *Briza minor*. They were numerous. This patch took a couple of days, full time at least twice a year and then occasionally thereafter.

Weeding seasons ended for them when they started at a local junior college as soon as I thought it safe for them to be there. The one who hated this the most went on to be *summa cum laude* valedictorian of the College of Agriculture and Animal Sciences at Utah State University at barely 20. Imagine a kid with the discipline to take 21 units, run on the track team, be a teaching fellow, and go 4.0 (I can't). She has since entered a Master's program at Illinois Urbana-Champaign, one of five students in the program. The other went to Stanford, where the biologists simply could not believe that a 19 year-old kid could identify grasses. She became a resident advisor and an outstanding ballroom dancer. She is now in a PhD program at Michigan State University studying fungal microbiology, biosystematics, and biochemistry as applies to plant physiology.

I guess you can tell, I'm proud of them both academically, but in a way I'm more relieved than proud that the unrelenting toil I demanded did not make them totally dysfunctional.

So, what is it that happened here that was such a big deal?





April 2009

April 2015

As we got rid of hedge parsley, bedstraw, and exotic grasses in this forest opening, an amazing thing started to happen. The slender leaves on the left might seem to be grass, but they are blue dicks (*Dichelostemma capitatum*), one of the few species on our property whose seed survived, perhaps after hundreds of years. It can take a few years for them to get big enough to flower (right). Once weeds were removed the blue dicks started to express in patches extending over 70 feet. In fact, that breadth and density might be indication of historic Indian proto-agriculture on this site. Also present in the left photo is Pacific sanicle (*Sanicula crassicaulis*). We believe sanicle seed might make a nice cooking spice.



February 2013

The blue dicks came up as thick as grass, all the same size. Not a single native plant expert around here had ever seen such a thing. They got bigger every year thereafter, so it was clearly from seed. When I first realized what was happening, I broke into tears. Everybody doing this kind of work wants to have the land “come back,” but that wasn’t it. What got to me was not the land, but this little bit of contact with the **people** who for thousands of years had traveled along this Indian trail, digging up something to eat and perhaps a little moisture. It was an appreciation of the hardship of their lives that was what was coming back, something I wanted to share. Accordingly, I contacted the Environmental Studies group at UC Santa Cruz which teaches ethnobotany, asking them if they wanted to do a little experimentation with native farming in a truly native habitat. I received no reply, neither a polite decline nor a referral.



The prior  
photos were  
taken in this  
clearing

Blue Dicks  
on this side

Soap Lilies  
on this side

March 2012

Just down the slope from the patch of blue dicks are hundreds of soap lilies, another species Indians once grew for food. There is a well-defined boundary extending at least 70 feet between the two species. They are not intermixed, although the occasional stray shows that they clearly can tolerate each other. As I have since removed more trees, the pattern has extended. It simply has the look of a human arrangement. From what I can tell, this slope grew sanicle, soap lilies, blue dicks, and maybe clover for food, along with death camas, possibly for predator control. There are plenty of other herbs present, but they are farther down the slope. How is it that these plants started expressing simultaneously after all these years, over such a distance containing both meadow and redwood forest soils? I suspect that weeding removed the competition, the clovers came up, and their mycorrhizal symbiotes started functioning again. One symbiote of clover (*Glomus mosseae*) is known to exude gibberellic acid, a germination and growth promoting hormone.





May 2010



Once they are going, one need only weed and wait for the reward. Then start weeding natives. Sanicle can be a headache.



May 2010

Nativity doesn't always work out swimmingly. In one case a native grassland developed and then died almost totally, taken over by a perennial cudweed that at the time keyed out as a native *Gnaphalium purpureum*. In 2012, a new key from a new monograph was published. I pressed some samples and sent them to the author. He identified it as *Gamochoaeta ustulata* (same plant, new name). Yet the key itself led to *Gamochoaeta argyrinea*, an exotic. Until that time, *G. argyrinea* was unknown in this county and possibly the whole State. What to do? Where this meadow was going did *not* look promising; it was a pending monoculture. The plant sucks so much nitrate that it was killing other natives, even the nitrogen fixers. The soil read virtually zero nitrate at all. So I got rid of it here. I burned brush here and weeded "natives," confining them to a narrow ridge below. So, what happened?



February 2015

The blue dicks started coming up here too, like dark green spaghetti strewn all over the charcoal. The area of coverage is even larger than the earlier patch to the south. So, why did it happen here where there aren't many clovers? Smoke releases hormones that stimulate production of gibberellic acid in seed. So, we have two potential mechanisms. There are all sorts of surprises here.



April 2015

The area has now started to come back from the brink despite the multi-year drought. A few more years and I'll be back to kicking it around again to find out what can be made of it. Maybe I'll get lucky again, like this...



*Clarkia rubicunda*, June 2015

Beautiful, isn't it? Well, "this" is not "Natural." This was an enormous amount of work, and is emblematic of what this book is about.





"This" is here



In 1992, "this" started with a bulldozer, grading off a surface leaving almost bare rock. I sowed it with the agency-prescribed grass mix, one of which they claimed was native (a cultivated *Festuca rubra*), the others were exotic "Blando brome" (*B. hordeaceus*) and rose clover (*Trifolium hirtum*). Why does the government recommend exotics? Because they can compete with the other weeds.



May 2004



After twelve years of removing broom, “this” was hit with cat’s ear from a neighbor’s property (he had abandoned grazing and converted it to a vineyard). Suddenly, cat’s ear was everywhere. To get rid of it, I had to kill almost everything in my grasslands for three years. “This” took a lot of Roundup. I have since learned more effective means to be discussed in the chapters to come.



May 2010 – Wall Bedstraw in Lotus

After removing the cat's ear, up came other weeds from the seed bank, literally layers of weeds that together we call "the onion." Effectively, weeds suppress other weeds. Up came dwarf hop clover (*Trifolium dubium*), wall bedstraw (*Galium parisiense*, above), rat-tail fescue (*F. myuros*), and small-seeded rattlesnake grass. Each required years of control some of which continues to this day. In came native brush, such as yerba santa (*Eriodictyon californicum*) and monkey flower (*Diplacus aurantiacus*) along with a native brome grass (*Bromus laevipes*). Native forbs started to come back such as slender tarweed and clovers few-flowered (*T. oliganthum*) and tom cat (*T. wildenovii*). Then I found out that the supposedly native red fescue grass I'd planted here was actually a European variety. So I removed that too. What do you know that wherever there had been fescue, the onion was still lurking.





*Clarkia rubicunda*, June 2013

Yet even with all that, “this” was no accident. I sowed the clarkia seed here in 2012 after having played with it in various places to little avail for eight years. I only had a little seed I’d collected along the County road where they’d been “sown” by a roadside flail mower. They would come up, flower, and over a few years, slowly disappear. Then I tried it here, and they started to take and spread from year to year. Not that it was entirely on their own because I was tossing pods up the hill every summer.



January 2015 – Bitter Cress & Wall Bedstraw Before & After Weeding

Every winter they would come up, and I'd get up on this slope trying to keep the mouse-eared chickweed from taking over (*Cerastium glomeratum*). Then I got hit with bitter cress (*Cardamine hirsuta*), just after finding out that the biologists had been wrong about its identity for fifty years (errantly believing it was supposedly native *Cardamine oligosperma*). With that came the real possibility I could lose "this" forever after 25 years of work, weeding like crazy in January, with my fingers numb from the cold.





*Clarkia rubicunda* seedlings in strawberry, March 2015

In the fall of 2014, I hosed the area immediately above “this” with isoxaben to kill the bitter cress seed bank above so that I could save “this” by hand. I pulled all the monkey flower and poisoned the yerba santa that was taking over the area (both native).





*Clarkia rubicunda*, June 2014

Every year in June, as a sort of payback at the end of the weed season, "this" got a little better.





*Clarkia rubicunda*, June 2015



...and better.



*Clarkia rubicunda*, March 2017

So think of how that excitement and enthusiasm carries one through when searching for tiny weeds among seedlings of the most intense crop ever. At the very least, it makes crawling on hands and knees in the rain over and over, trying not to fall on a slope this steep, seems an acceptable (albeit not small) price to pay.



*Clarkia rubicunda*, June 2017

For this. “This” is a conquest. I felt that for you truly to comprehend this image, that a native grassland is worth it despite the pain and unpleasantness of dealing death for years on end without much to show for it, it is necessary to understand that this is what “this” takes. For me this was 20 years of work, with layers of unknowns, challenges, and digging out of mistakes, whether mine or others. In a way, we are all in “this” together. I am writing this book to help you bring your *Wildergarten* back to life more easily than I did.



May 2015



In any case, I have learned more from meadows than I have from any other type of habitat, simply because they do vary so much and change so greatly from year to year. So, now that you've made your introductions, it's time to get started with what was really involved.



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