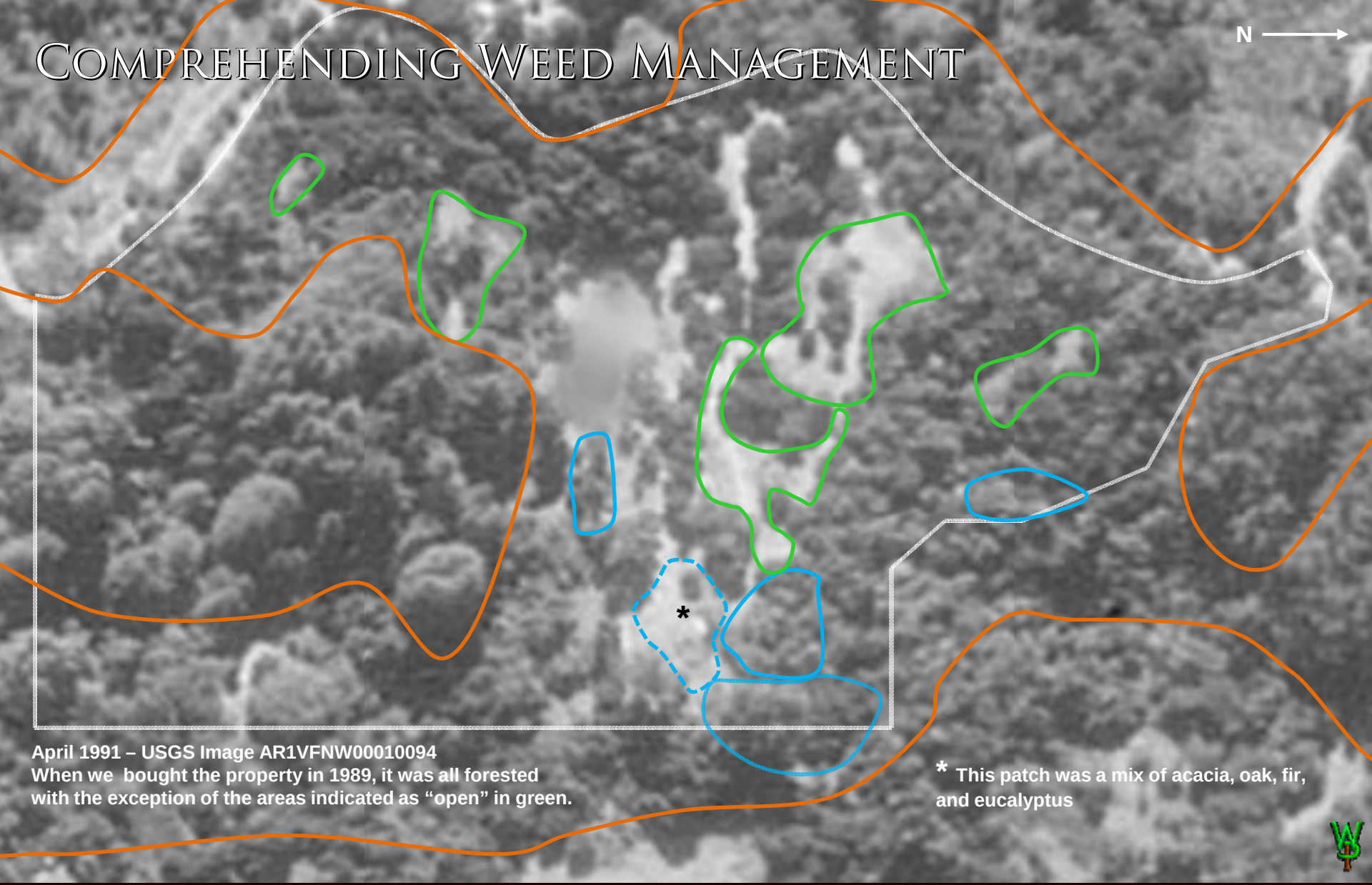
Comprehending Weed Management



April 1991 – USGS Image AR1VFNW00010094
When we bought the property in 1989, it was all forested with the exception of the areas indicated as "open" in green.

* This patch was a mix of acacia, oak, fir, and eucalyptus

To recap, this project began with impacted hardwood forests full of broom. Some of those stands were exotic trees. There were also more "open" areas covered with brush cut and sprouting broom one could only fantasize as "grasslands." Open areas and cleared exotic stands were combined and converted into either scrub/chaparral or grasslands, the latter of which were all I could handle once I started that process in 2004. Thence, for 8 years forestry was confined to minimal thinning for fire control and weed management. Once the grasslands were under control, I went back to forestry in 2012 and exposed significant area to the residual weed bank.

Wildergarten 5.2

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 5.2

Vande Pol, Mark Edward, 1954 –

Other writings by Mark Edward Vande Pol:

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

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

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

Wildergarten Press
P.O. Box 98
Redwood Estates, CA 95044-0098
www.wildergarten.com

Comprehensive Weed Management

Said “grasslands” management began with Management by Species (Part III, Chapter 1) starting in about 1990 with first a mechanical attack on 10 acres of broom in open areas and under forest cover. Chemical control began in 1991 but didn’t really get going until the next year. As the broom receded, up came the rip-gut brome grass (mostly in open areas) and hedge parsley in forests, virtual monocultures which also had to die. Then in came cat’s ear in 2000 and bedstraw a year later which focused on cat’s ear first because the books said bedstraw was native.

One prefers avoid spraying because it is so destructive to the natives one wants to breed but there was no other option and natives were few at that time. As the natives finally did start to return, I switched to Comprehensive Management stepwise by area, wherein one is addressing ***all*** the weeds within a particular area while continuing to sterilize others because comprehensive management is so much more time consuming that one is limited to weeding only the area one can handle.

Wishful thinking (the bane of the entrepreneur) usually has one attempting more area comprehensively than one ultimately can handle. That works earlier in the season when the weather is cooler and things are going more slowly. It might even reduce the need to broadcast spray down to a spot application in cases. Still, the possibility exists that one can tediously weed an area by hand, only to nuke it later with glyphosate; else the weeds will breed.

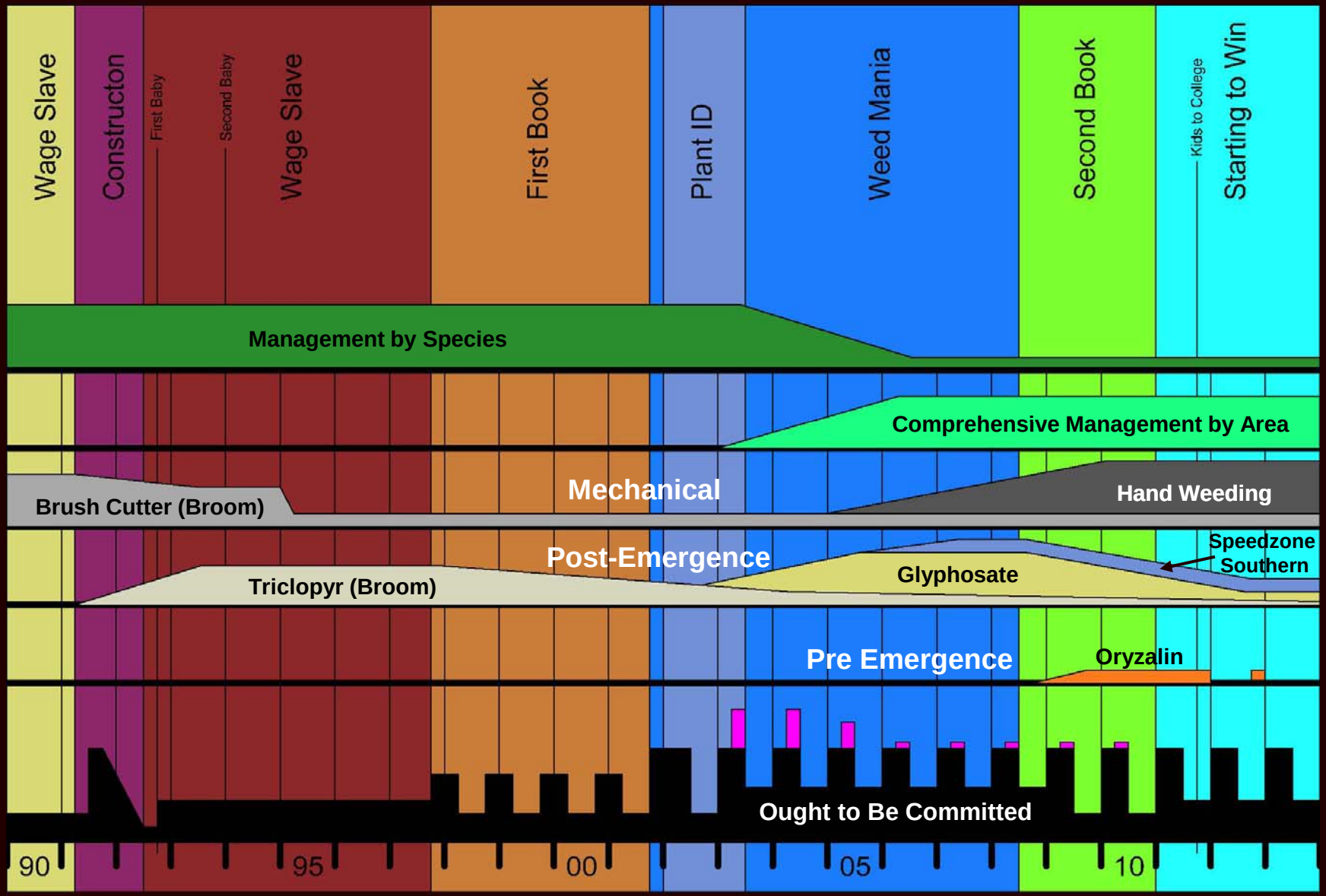
Hence, comprehensive management is a state of constant mental brinksmanship. It is very hard to imagine the brain drain of 120 target weeds maturing at various rates among 100 different patches. So for you deterministic bureaucrats out there reading this like you think I am going to provide a formula for success here that you can then dictate to your minions and contractors, fuggedaboutit. This teaching is about empowering your people to become independent, educated, and responsible actors; else, you will fail.

Things change fast in the field**:** the wind comes up preventing spraying, your run into a patch where the ground is softer than anticipated allowing for quick removals in an area where one wasn’t expecting it or drying out in another so that it is do it now or hope for more rain, the temperatures warm unexpectedly to allow spraying in a small area because of where the sun peeked through trees… It’s just too complicated for anyone to be able to provide enough instructions to “tell them what to do” and have them be sufficiently efficient, comprehensible, much less possible to execute, and even less than that, enforceable. Don’t even try.

This and the next chapter were to be the heart of this book. They are the least developed and will take the longest to complete simply because integrating that much multidisciplinary information into easily useful form is very challenging.

The top two lines of the graph (next page) depict the transition from Weed Management by Species (Part III, Chapter 1) to Comprehensive Weed Management (this chapter), the latter of which is far more complex because it is obviously more demanding to be selective among 350 species than it is simply to kill everything.

Weed Control Process Development Overview



Comprehensive Weed Management

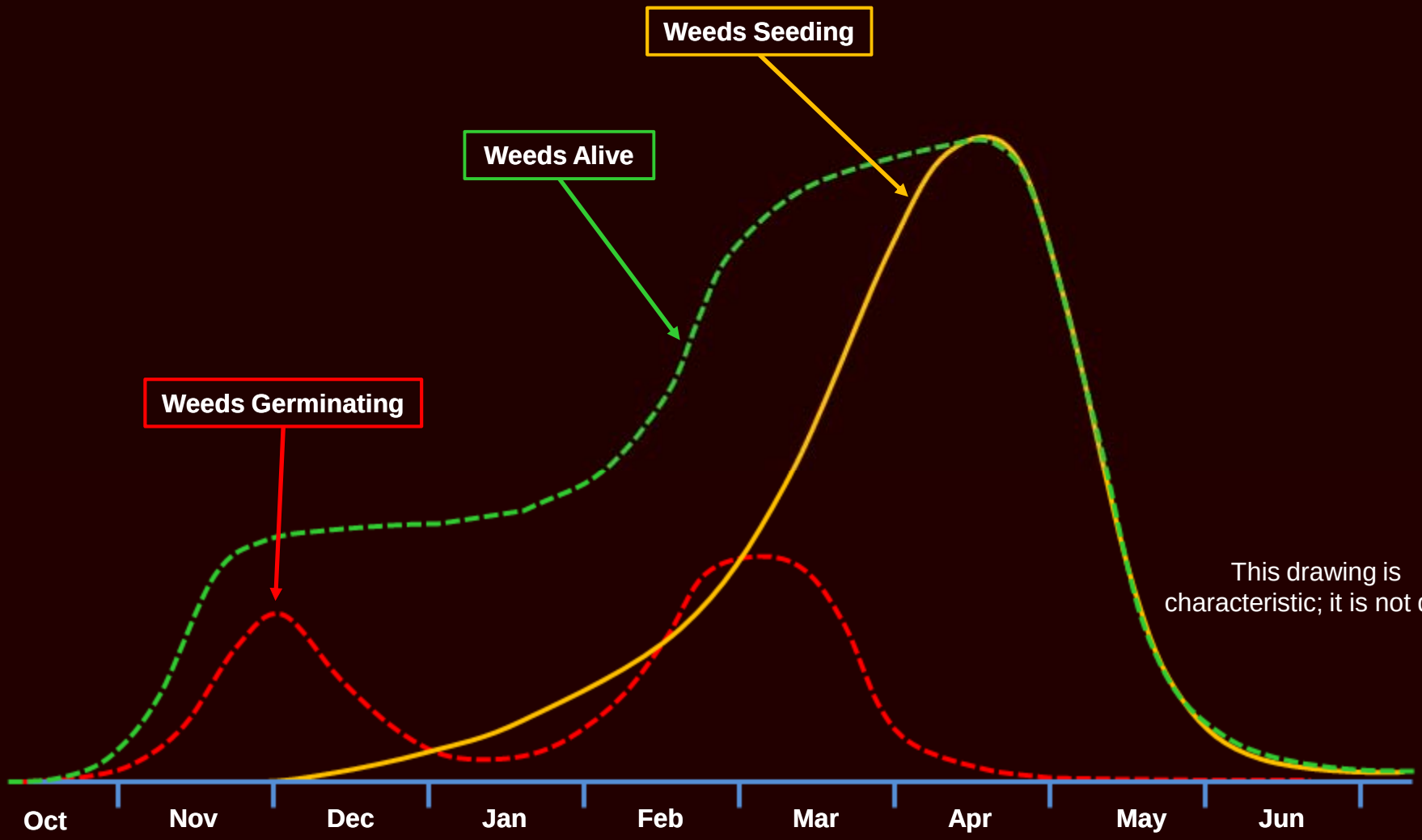
Comprehensive Weed Management involves the simultaneous application of every weed control process available as appropriate to a particular spot over time, that is the processes change with target species, natives present (both alive and in the seed bank), terrain, soil conditions, light, moisture, current and pending weather changes, and plant maturity. Many of those considerations and variables change through the seasons and from year to year, some even hourly.

So, if you think this kind of work involves detailed and extensive planning, you would be only partially correct. Experience has taught me to plan more for an array of possibilities and goals, and then be willing to select from among them on a moment's notice if conditions are other than as anticipated. Designing flexibility into my equipment and reducing transition time between processes has vastly improved my ability to respond, as there is truth to the Maslow's Law of the Instrument. At that point decisions become more art than science.

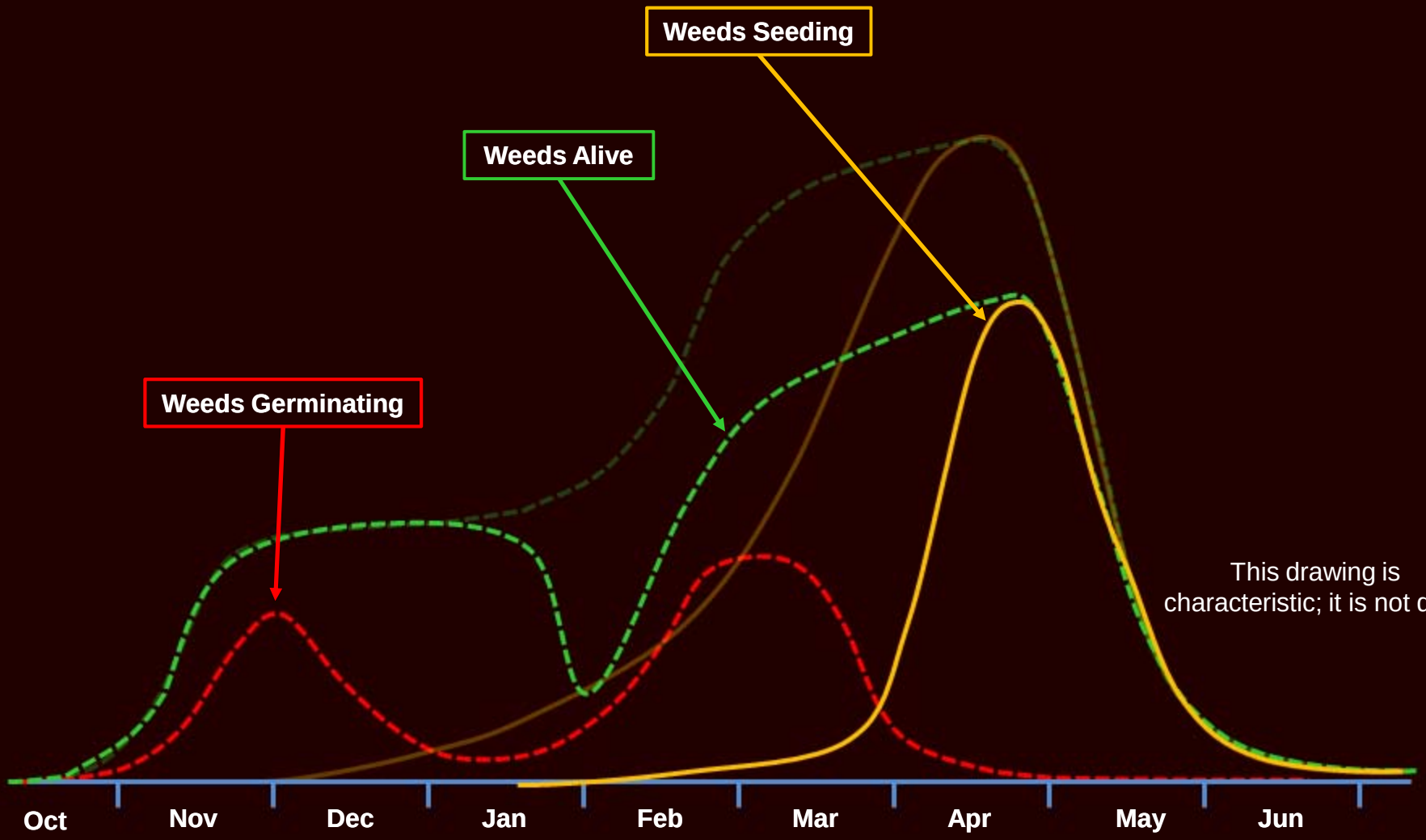
As the season progresses, as I have said before, speed is everything, particularly when conditions are advantageous. Soil moisture can change discernibly in just an hour, radically affecting weeding yield. Temperature or wind obviously affects spraying when it comes to harm to non-target species. Earlier in the year, when things are cold, there are fewer non-target annuals present. The "Speedzone Southern®" part of the "post emergence" tail against early germinating weeds such as bitter cress and chickweeds (both *Stellaria media* and *Cerastium glomeratum*). I use this product because it does not harm grasses and can be applied at 50°F. This process is beginning to recede as I gain control of the two latter species.

The glyphosate half of the Post Emergence chemical "tail" on the right represents the perimeter plus newly disturbed areas of two types. The first is when I take a stand of forest from Phases 1 or 2 to Phase 3, the usual response to which (besides broom) is herbaceous weeds such as hedge parsley *(Torilis arvensis),* catchfly *(Silene gallica)* or scarlet pimpernel *(Anagalis arvensis),* the latter of which is usually close to the bottom of the weed bank "onion." The second, although similar, is more distributed when I remove individual trees exposing spots that have never expressed their weed bank to light and warmth, then to lose their accumulated mulched leaf litter.

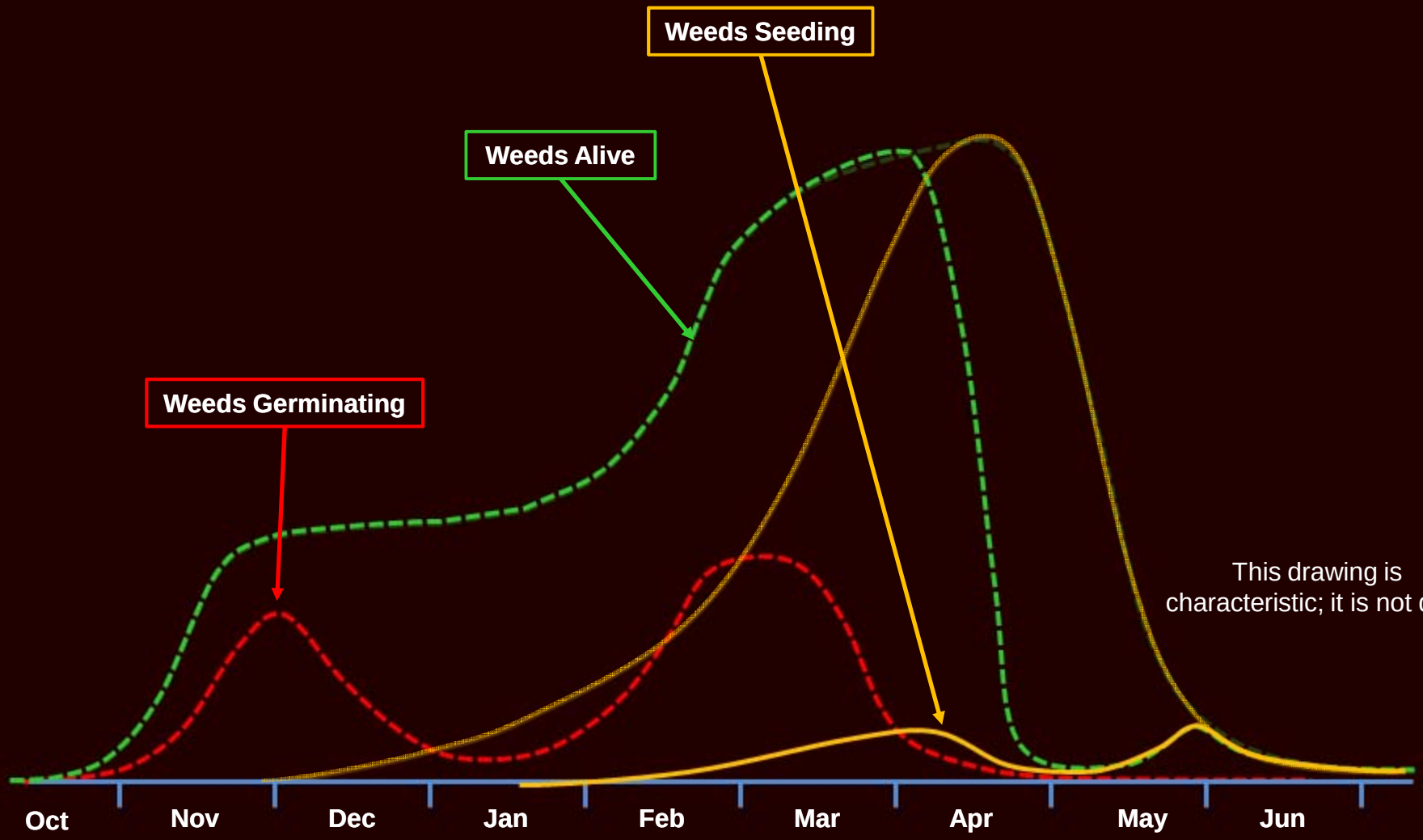
I am continuing my experiments with pre-emergence herbicides, gibberellic acid, karrakins, and nitrogen both to control bitter cress and as a caution against the day if the soils here become more fertile over time and germinate weeds in the seed bank I have not yet encountered in quantity. Fertility is a double edged sword. It supports more wildlife and or grazing animals yet it also germinates more weeds and undergoes succession more rapidly to chaparral and then forest. I am interested in more vitality, but I am not interested in generating needless work to deal with it. As you might expect, I have had quite enough of crawling around pulling acres of weeds and don't enjoy spraying any more than anybody else does. I much prefer searching for that one isolated pioneer among a rich variety of other native plants of increasing complexity. Most of the 24 eradications we have attained so far are instances in which I have controlled a new infestation before it could breed which requires detailed inspection of the entire property over a period of six months no matter how good it gets.



Untreated, most (not all) early season weeds here have a bimodal distribution of germination dates because of colder winter temperatures, but a single mode distribution of seeding dates skewed by increasing daylight hours and springtime temperatures with dropping soil moisture as the season progresses into summer.



If one sprays or weeds early, the total seeding potential drops and is shifted to later in the season because it is the earlier maturing weeds that have been removed. Critically, this allows more time when late season panic sets in. Accordingly, one is tempted to control later just before the weeds start to mature as it is what one does in management by species. Yet if one is trying to get to zero managing all species present, such that a real gain is made from year to year, that latter strategy can be a very bad idea. The early seeders will have done their thing and the practitioner has already assured things will get worse. Why?



It's a matter of mathematics. By the time our contractor arrives, some of the weeds have already bred. Let's say our contractor does a really good job and gets 99% of the weeds about to breed. Then not only does that 1% breed, usually producing more than 100 seeds per plant, but more late individuals mature and seed as well producing more seed because of both the disturbance induced by weeding and reduced competition.

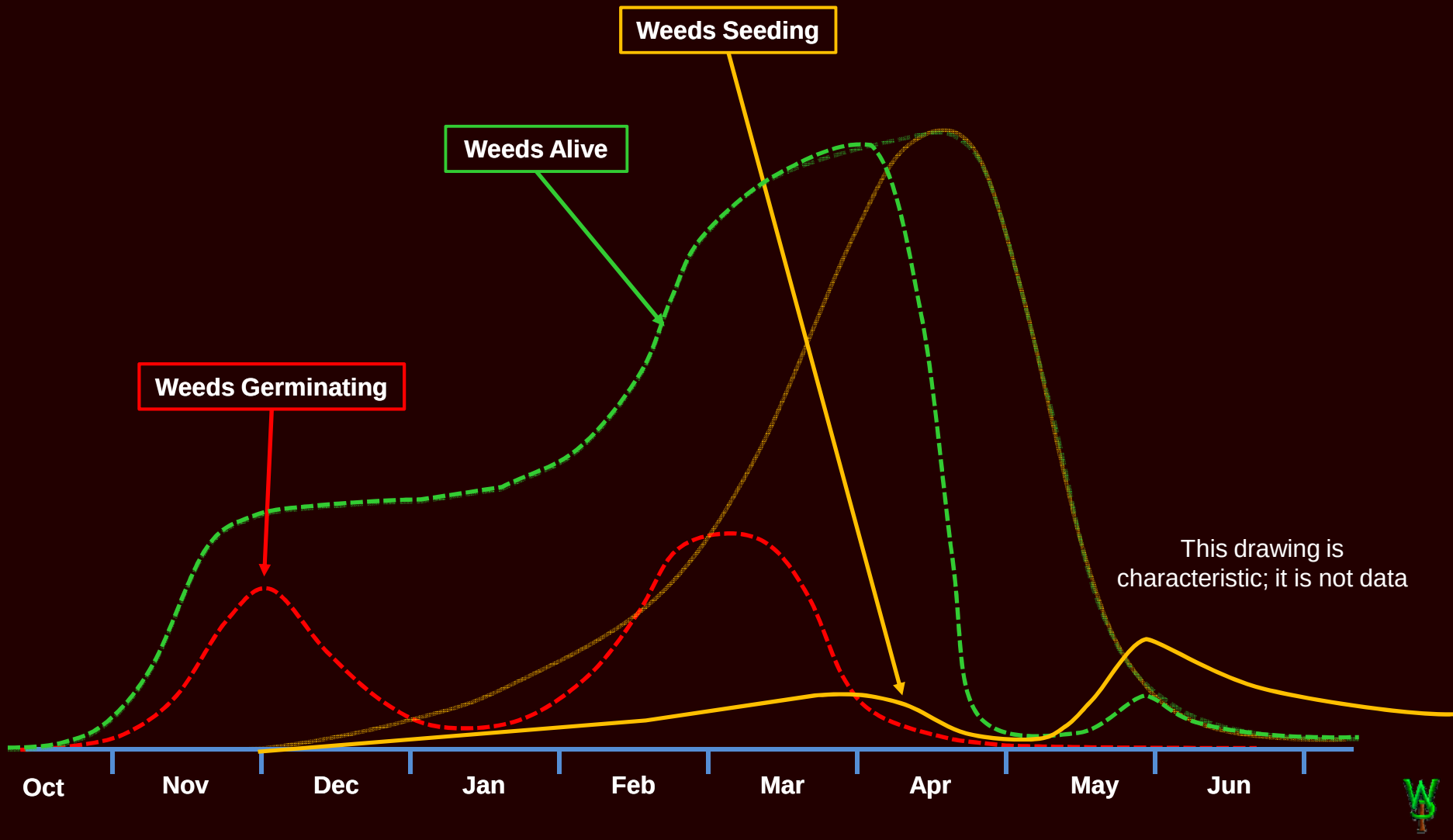
This is exactly what is done with public projects, as the method here at the Camden interchange with SR-17 does provide the most control for the dollar. It also assures that the job will be there again the next year…

…and it will be bigger. So, was that really the cheapest way to go? It depends upon the management goal.

The breadth of development and maturation dates is but one reason remote or absentee land management is doomed to failure. Another is the number of attempts it takes to find high fractions of weeds in a varied landscape. Then there is cumulative removal yield loss times seeds per plant. One stinkwort *(Dittrichia graveolens)* can make 30,000 seeds. Assuming conservatively given minimal competition due to prior weed removal that half of that seed will germinate the next year and that our contractor will remove 99% of those plants there will over 100 times more seed reproduction. And this was only one species with a single annual crop.

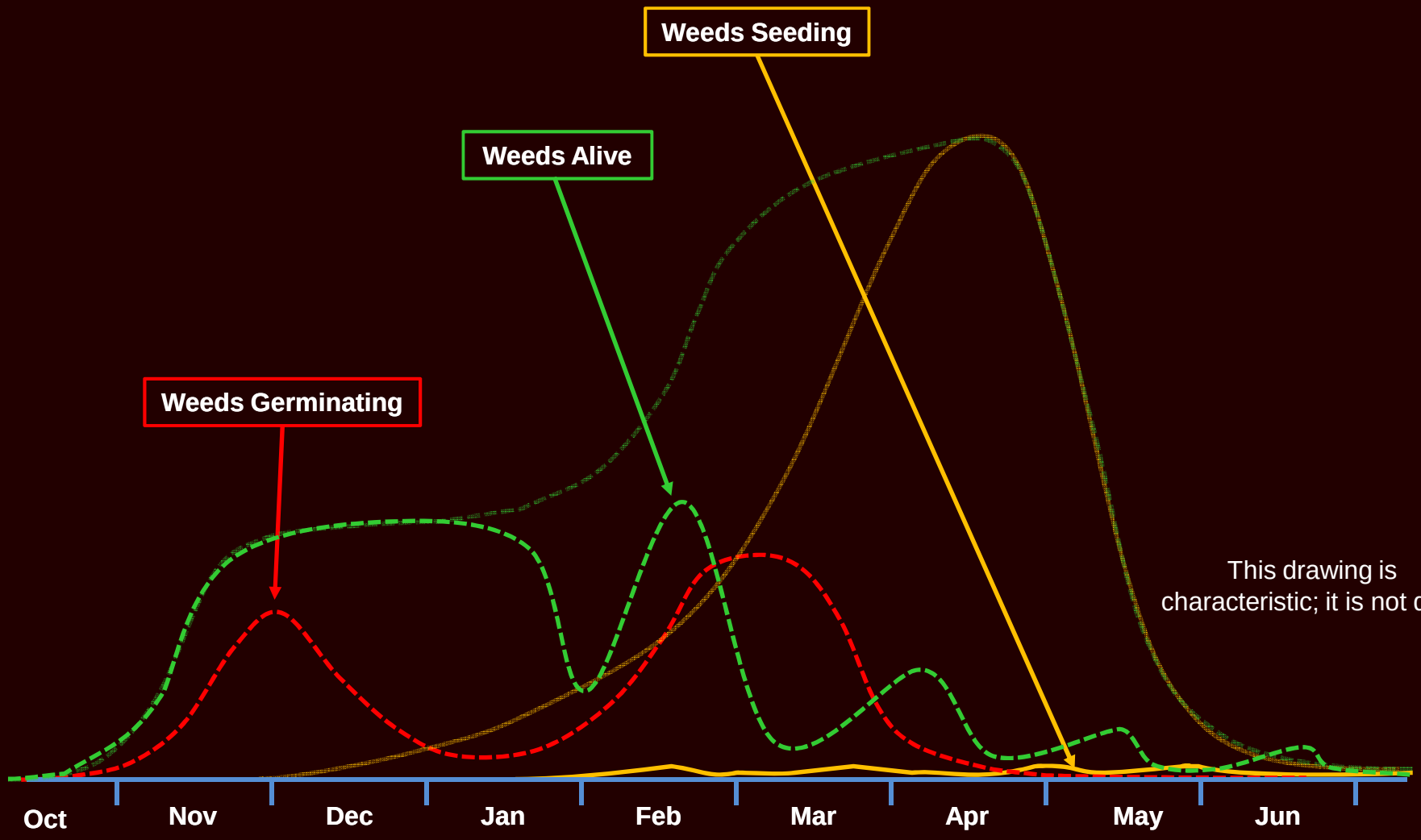
Bitter cress or annual bluegrass mature so rapidly they are effectively unimodal and continuous. To plot a graph of that reproductive potential requires a log scale! What this means is that a single plant seeding in November with but two pods with a total of 20 seeds per generation has similar reproductive potential to *Dittrichia* with its 30,000 seeds per plant!

There are some weeds that have later single-mode germinations, with maturation dates extending (maddeningly) into late summer, of which cudweed *(Pseudognaphalium luteo-album)* or horseweed *(Conyza spp.)* are most annoying. One might think they would be easy because they are so slow to develop, but they start underneath other plants and then quick-like-a-bunny shoot up multiple stalks with flowers that mature very quickly making tons of seed only after one is thoroughly convinced the season is done.



When one sums the maturation rates of all weeds present (which is what comprehensive management is all about) weeding once a year becomes a total waste of time and money, if for no other reason that the weeds drop seed both before and late season weeds (such as cudweeds, horse weeds, and stinkwort) then face less competition long after the treatment (…**except** that doing even this much reduces transmission potential to less infested sites!!). **The only way to make gains from year to year is to restrict weed reproduction to near zero**. But to make that many visits, you'd almost have to live there!

What makes weeds like bitter cress and annual blue grass so dangerous is that their seed can germinate early and when it is relatively cool, only hours after it hits the ground and can mature another plant within six weeks. That means they not only produce multiple generations per year, they are producing seed early and within the minimum return frequency I can attain at that time of year with a property this size. I must then divert attention from early detection of other weed species that take longer to develop. Bitter cress has the added threat that its seed travels very easily, popping 6-10 feet and sticking to passing animals. This tiny weed is a monster. What few can fully comprehend when I say that is that because this property is so free of weeds and because I must disturb parts , these few aggressive species are actually more of a threat because there is less exotic competition.

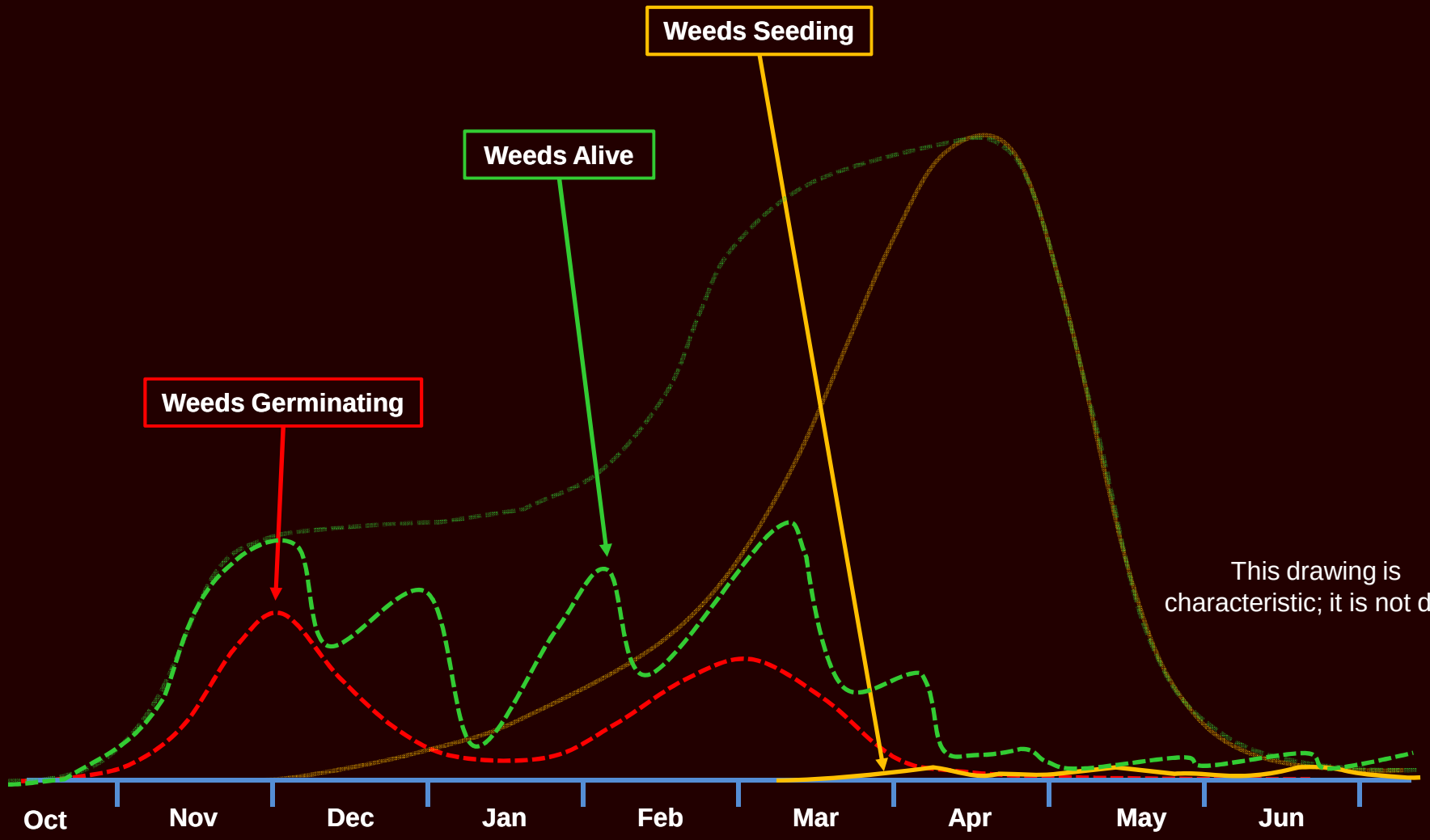


When one stacks these distributions, a picture of reality begins to appear. So let's continue with this single species analogy as if I was I spraying, weeding, and bagging my way through the season removing only 95% of the weed population each time. Let's assume I get 95% every two weeks and I start Feb 1. That's ten opportunities by the end of May, leaving $(0.05)^{10}$ or a number so close to zero as to be silly assuming no more germination. The point is that it is frequency of visitation that wipes out species for the same reason overgrazing does. Realize that because weeds are easier to detect with fruiting inflorescences on them and especially when their numbers are so depleted that they stand out from the background like sore thumbs, that the numbers are actually better than I am showing you because it is the early germinating and maturing weeds are much more likely to be detected.

Each of the spikelets on this small-seeded rattlesnake grass plant *(Briza minor)* has 3-8 eight seeds. There are well over 200 spikelets on this plant which is twice the height of this photo. One can weed a long time in one place and have but one plant like this ruin the whole effort somewhere else. So it takes a special effort for the kind of OCD person who makes a persistent weeder to pull up stakes from pulling juveniles to take a break to cruise for sore thumbs, but it does pay off over multiple years.

May 2015

Importantly, weeding frequently is MUCH faster because one spends MUCH less time looking for that last weed to drop the percentages to near zero. Hence, the secret to weed control is frequent sessions culling as many weeds as possible until things start to slow down. Then go somewhere else and don't waste any further time there. I had a hell of a time teaching my daughters this. The process not only works better biologically, it reduces fatigue and eyestrain while doing it because of the changes of scenery.



In weeds with fast maturation and high germination rates, starting early means that one gains fewer weeds from pass to pass, making for “95% removal ” from a much smaller residual rather than a larger population. It means less time spent in any one place, thus covering the property at higher frequency, which means higher yields against total seed production over the season because of fewer incidental errors, those individual plants I missed of failed to extract such that they regenerated and seeded. Over the summer, one merely walks about upon occasion nabbing those few remaining individuals of late maturing species. Sometimes one can spray those amid native annuals that are done for the year thus bringing weeding to an end. What happens to the few that drop seed?

These mouse-eared chickweed seedlings are likely symptomatic of what I call an “incidental error,” a weed from last year that seeded. The spot is too small for nitrate deposition from urine to have caused this and I would see more them than I do considering all the piles of deer pellets I find. So this is more likely simply a weed I missed last year, although there are two catchfly seedlings at the top edge. Yet that these are rare these days is a form of retrospective validation that the chickweed seed bank is on the way out.

June 2015 – Typical of our hilltop this June

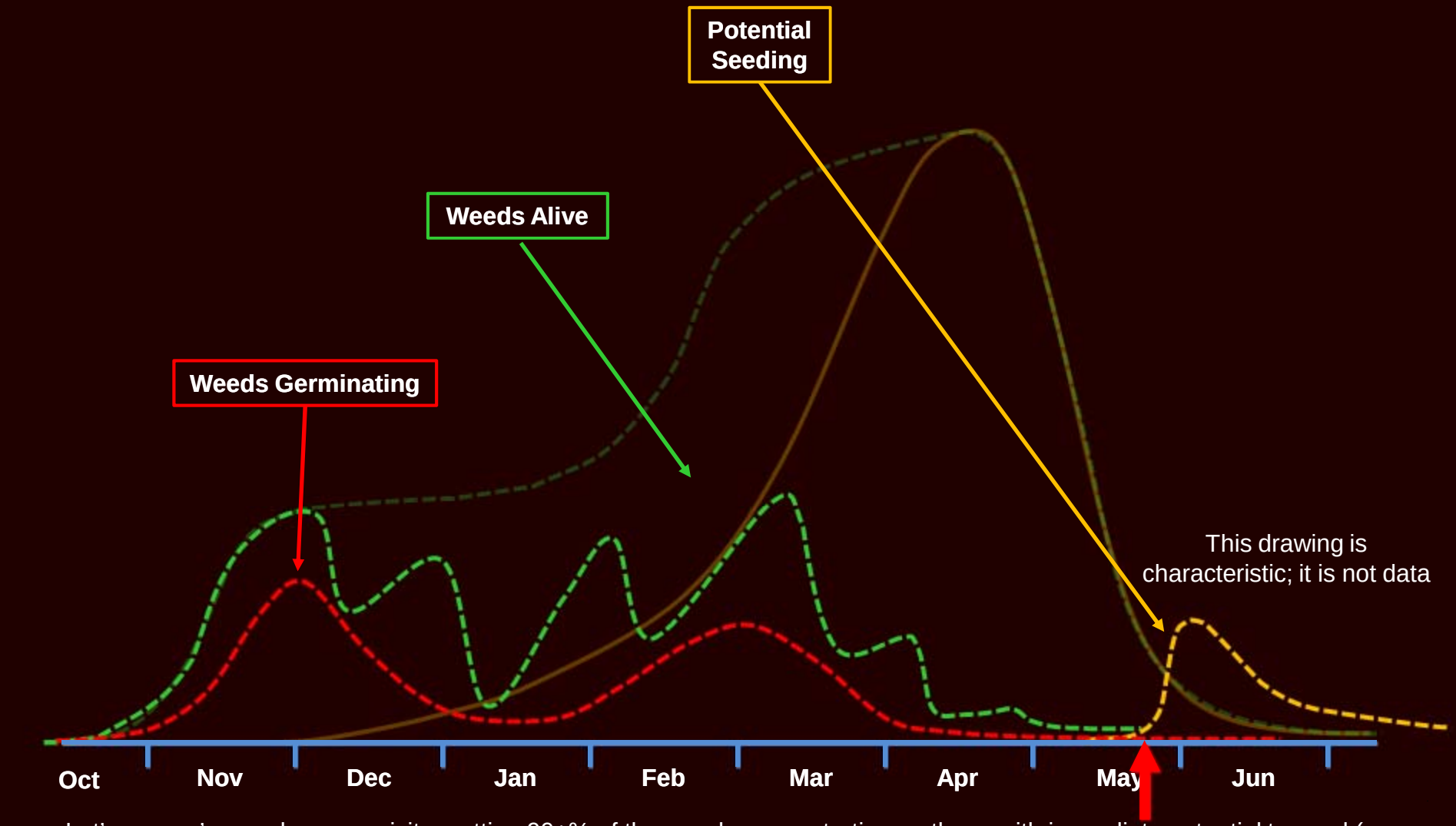
At this point, I wish to honor the memory of John Nash, the famous mathematician in the film, *A Beautiful Mind*. I have seen behavior in plants similar to as described in the film, where pioneer plants will appear to be great breeders, growing large and producing gobs of seed, yet these are normally the first to be consumed, whether by animals or the recalcitrant landowner. I suspect that the seeds of such plants are less likely to exhibit dormancy than seeds from smaller plants that are less likely to be entrained by a passing animal, wind, or other transmission media. I would hypothesize that "pioneer seed" would also exhibit more genetic variability to make them more adaptive as a total population as part of their colonization behavior. It is technically possible to assay both properties in seed. In a way, "normally" does not apply in this grassland as a system because herbivory is so constrained (no elk). So I get to deal with both levels of seed production in turn, because that is simply the temporal order of things. Like this text, it makes weeds very hard to see.

May 2015 – A “sore thumb” of annual exotic *Bromus hordeaceus* amid perennial *B. carinatus*

From a competitive and adaptive perspective for the species as a whole, by Nash’s model, “sore thumbs” would typically be pioneers, unusually large for its temporal cohort, ready to germinate immediately, and highly plastic. Smaller plants thereabout, each producing seed less likely to be entrained and transported, are therefore best dedicated to hold that spot and exhibit extended dormancy. These would be the squeefs that would do the bulk of the breeding, just as in Nash’s model. It would be interesting to assess the epigenetics of these groups, their relative seed coat thickness ,and abscisic acid content particularly with and without incidence of either fire or herbivory, to see if their distributions repeat.

May 2015 – A “sore thumb” of annual exotic *Bromus hordeaceus* amid perennial *B. carinatus*

From a competitive and adaptive perspective for the species as a whole, by Nash’s model, “sore thumbs” would typically be pioneers, unusually large for its temporal cohort, ready to germinate immediately, and highly plastic. Smaller plants thereabout, each producing seed less likely to be entrained and transported, are therefore best dedicated to hold that spot and exhibit extended dormancy. These would be the squeefs that would do the bulk of the breeding, just as in Nash’s model. It would be interesting to assess the epigenetics of these groups, their relative seed coat thickness ,and abscisic acid content particularly with and without incidence of either fire or herbivory, to see if their distributions repeat. As to how I consider this cluster such a standout, that will be covered in the next chapter.



Let's say we've made seven visits, getting 90+% of the weeds concentrating on those with immediate potential to seed (sore thumbs), thus holding those close to zero due to having had at least two opportunities to see and nab each one between the period from flowering to indehiscence. During the season, this technique pushes out the distribution of maturation dates, leaving very few of earlier germinating plants to develop toward maturity. These become "sore thumbs" as the year progresses. Because the total population is falling, one can make more frequent visits later in the season, thus increasing the chance of nabbing seed before it blows. Hence one is still weeding ever higher yields of material that would otherwise mature sooner. As the natives mature and get big, those few remaining late germinating weeds that did not have much time to develop before they need to seed because of drying conditions become harder to see, even when they mature. These become… the squeefs. Squeefs are mighty.

Early weed detection and removal is key to having enough time to nab sore thumbs while transiting between areas under intensive weed removal. Toward the end of he year, once one has pushed past the original date of peak maturation what, were “sore thumbs” are much smaller because they are maturing after only a few weeks of life. The photo above is of exactly that condition, with things cleaning up, yet despite the fact that this grass stand would easily pass for 99% native cover, the squeefs that still endure represent enough seed to set one back to *worse* than where one began the year. Don’t believe it? On this slide, amid *(Stipa lepida),* grand mountain dandelion *(Agoseris grandiflora),* and slender tarweed *(Madia gracilis)*, there are six exotics**:** four *Bromus hordeaceus* and two *Festuca myuros*. See if you can find them! Remember “Hidden Pictures” in Highlights Magazine?

Now wasn't that fun? Yet these six plants probably represent a total of fifty seeds! Squeefs are mighty, but one might not learn that right away, as some will lie dormant for years to come, waiting to start the great game again. So by now I am certain you understand why it is so important to cull weeds early so that one has time for looking when enemies are few. The key skill to early detection is to distinguish grasses by their vegetative attributes long before the seed emerges (next chapter).

Sorry to say it, but brome grasses are slow and big compared to these *Briza minor*…

…and Poa annua is much worse than that.
Six weeks from germination to seeding, and like all annual grasses, these tiny beasts are virtually born pregnant.

The more weeds one tries to get early, the more the time spent for the repetitive motion from the ground to a bag and back becomes problematic. It really adds up when repeated a million times per year. So, for how long in the developmental process of the weed can I drop it on the ground to die before it can breed? If I do drop a weed, can it root again and recover to breed if it rains soon thereafter? I learned both the hard way with *Briza minor*. I have come to treat virtually all annual grasses as if the seed is fertile before it appears (cleistogamous) and all small branch-rooted plants as if they will root again unless I know they will die before it rains. With very few exceptions and only under known weather conditions, all annual grasses and branch-rooted annual weeds go in a bag, especially "pseudo-cleistogamous" broadleaf weeds like the chickweeds. Grasses are why the weed piles are so big.

Mouse eared chickweed is pseudo-cleistogamous. This is how small it can get. We pulled literally acres of these, millions of plants this small, by hand (and by “we” I mean my two daughters here, who developed remarkable patience and tenacity in doing it). I am certain you are wondering why we bothered. One could easily overwhelm them with other larger plants, declare victory, and no one would be the wiser, here. Elsewhere it can grow to 24” tall and does a very good job of suppressing native annual groundcovers because it germinates in big numbers so early. Each flower “pod” this size has about five or six seeds. Squeefs are mighty.

Yet if one wants native forbs, until there is a more efficient process, this is what must be done**:** pull the weeds, one at a time until there is a more efficient process, with the faith that something might learned once they are gone. Guess what happens? The natives that came in on this spot after we got rid of the chickweed are “slender wooly-heads” *(Psilocarphus tenellis*). Since we got rid of most of the *Cerastium*, the wooly heads are spreading, as well as others.

Here are slender wooly heads moving into a grassland, on very poor soil. My purpose in bringing this up is that we don't know what role this plant plays in this system because it has been suppressed by weeds for so long. Like many native plants, *Psilocarphus* germinates rather late, making it easy for weeds to displace them from places in which it is less competitive. The Spanish grazed much of the State for over 100 years before Americans arrived in numbers, plenty of time for the landscape to change unrecognizably.

Nearby, here is another little native plantlet starting to make a resurgence. This is “dew cup” or “lady’s mantle” *(Aphanes occidentalis)*. The first individual appeared here in 2006 and it took quite a while for its presence to become noticeable.

April 2012

And here is dew cup taking it's place among lotuses and clovers in a stand of purple needle grass! Unlike slender wooly heads (which are of the Everlasting family), dew cup is a rose by another name. That means it may be a host to actinomycetes of the *Frankia* genus. In other words, it might be a nitrogen fixer. So in March 2015 I dug one up to look for nodules (inset).

September 2011

But why bother with tiny things like this? Well, I don't think anybody can responsibly answer that question yet, but we're getting an inkling here. I can tell you this: if you don't get rid of tiny chickweeds you don't get blue curls. No blue curls, way fewer native bees.

January 2015 – Yes, there were other weeds here, but none nearly so fast maturing

I hope by now you understand my bitterness about my failure to question seriously whether the State had botched the identification of a vicious weed like bitter cress *(Cardamine hirsuta)* for fifty years. After all that work, would you be looking forward to removing an aggressive weed that hides like this one? There simply must be a better way of managing and marketing this information.

Explanation of the Graph

The next graphic (two slides hence) is a little more complicated because of the transitions involved. For example, you will note that the area of "Contaminated" grasslands grows. That is because before that it was broom, which obviously is not a grassland. Much of the area that had been broom, became primarily small flowered needle grass *(S. lepida),* effectively it was going transitional. I thought I was a genius! In came rip gut brome (either from the seed bank or from contaminated "erosion control" grasses) and cat's ear. The effort to control them destroyed virtually all the native grasslands I had. They had to be maintained as "Sterile" for at least two years (rip gut longer than cat's ear) to use up the seed. Other areas were being cleared that had been exotic forest. For example, there was the acacia below the house with fir trees thereabout. Half of that became grassland (at first primarily rip gut) and the rest succeeded to native chaparral. The brome seed is probably still viable in that chaparral but the area (¼ acre) is so steep (150%+) that I must plan that attack very carefully.

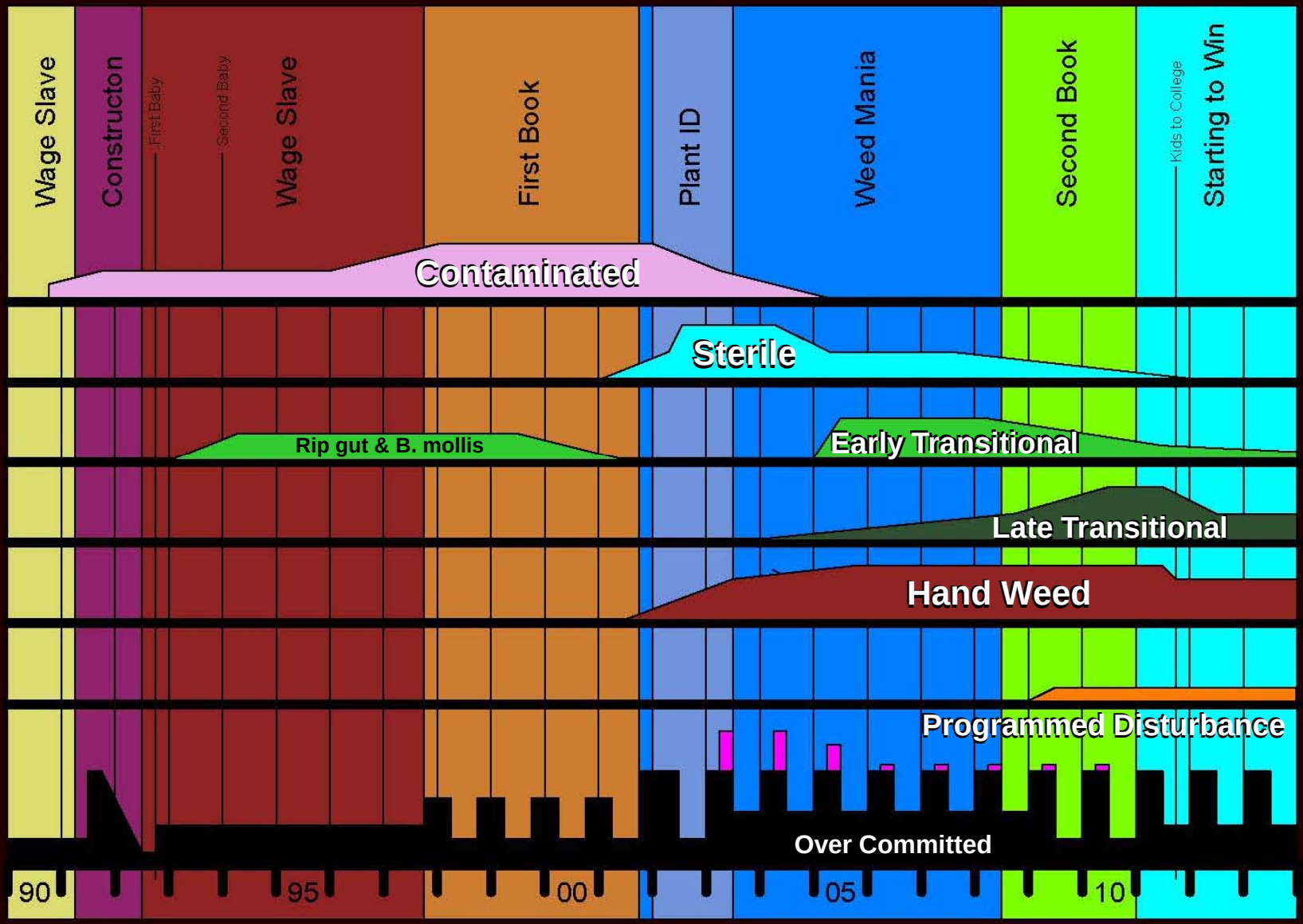
Once I got to the point where I had identified most of what I had in 2002-03, things became a bit more orderly. I had murdered most of my grasslands and sand hills. I started taking on meadows one-at-a-time in the order in which they appeared to have the highest content of native cover reappearing and starting at the top of the ridge.

I began with plugs of needle grass (both *S. lepida* and *pulchra*) in two patches of about 2-3,000 square feet, as they had both already showed up here (see previous chapter on grasslands rehabilitation). The goal was to raise seed. I bought some other seed, which was probably a mistake in the case of *B. carinatus* (contaminated) and *S. lepida* (not as well adapted) but not in the case of *S. pulchra*, which worked out quite well. I may do something about the *S. lepida* yet.

By the way (to fellow grass geeks)**:** I really do prefer the name *"Nassella"* to *"Sitpa."* After all, to euphony some heed must be given (if I had it to do over I might have named one of my daughters "Nassella"). Sigh, I know.

Why didn't I raise my own seed? First, because of cat's ear, it had been so long since I'd had seed to harvest I had not collected any back then (three years prior), an emphasis that was tactically correct in terms of the priority of killing cat's ear but strategically incorrect in terms of re-establishing needle grass. Second, back in 2004, I was quite well aware that I knew nothing of breaking seed dormancy and could not afford the delay to learn because… Third, I had major drainage problems to correct and planned to grade a number of areas that year. I needed a lot more coverage than I could get with plugs. In the areas I graded, I used some purchased California brome *(B. carinatus,* a perennial*),* because it appeared to be the most common-post disturbance/early-pioneer grass here. Unfortunately, buying *B. carinatus* as bag seed was a disaster, not because it did not do well, but because it was contaminated with an odd variety of the exotic annual, *B. hordeaceus,* that looked much more like *B. carinatus* than the "Blando Brome" (same species) with which I was already familiar (I had sown it in said obligatory erosion control mix). Unfortunately, it took about two years to figure out that distinction, and then I had a remedial weeding job on my hands which continues to a minor degree to this day.

Grasslands Status Overview



More Explanation…
…then again, Maybe Not

Most of the “early transitional” areas were handled by two means: masking and spot spraying, the latter of which required *much* more weeding after treatment. Yet early transitional areas are by no means as demanding as “late transitional” areas, those that require some spot spraying but mostly rely upon hand weeding. For example, the “entry ramp” you saw in the first slide of the chapter on meadows once required 14 “weeding visits” in one year, primarily for reasons based in the need for high yields while faced with a location so complex that weed detection was difficult.

I know that weeding in an area 14 times in a year sounds like an almost impossible level of intensity but there is a reason I had to get there so often**: I couldn’t do it all at once**. Mental fatigue and just the daunting nature of it would force me to leave and go somewhere else before I would otherwise make too many mistakes, burn out, or just go into despair, none of which could I afford to do. Remember**: this is about getting weeds in a bag.** I have over 100 different management areas on this property, each requiring its own combination of timing, duration, and treatment methods. In order to “get around” quickly enough to pick off the weeds that are about to breed in all of them, sometimes I had to do a fractional job in some places in order to cover them all in time, knowing that I would have to remember to get back to what was deferred in time for perhaps developmental reasons with regard to solar exposure, species, or moisture retention, and weather, or lighting conditions, depth of surface moisture to facilitate removal, or the likely depth of the root since I was last there...

Yes, it is that complicated. No, I haven’t reduced it to a formula. I set paths among these patches (for diagnostic reasons as much as weeding), respond to what I see, and go from there. I try to make every step useful. But when things get really complicated, when I find a spot that surprises me with the urgency of the situation, knowing where I have to be because the light is changing, the surface is drying, and what must be done along the way because I saw a developing head there two days ago… when technique and endurance seem to fail, and it all gets overwhelming… well, that’s when this gets spiritual. I pray, take instructions, and do. I know it makes no logical sense. I can’t explain it. I don’t know how else to explain that I can know there is a weed behind a particular shrub or grass bunch… It just works.

Finally, we get to programmatic disturbance, which for now consists of deciding where to put burn piles, pulling the coals off early, and distributing them before they cook the soil. The “coolest” part of this is that these burn spots are relatively easy to weed. I usually get a germination in the spring of the same year in which I burned. So far, I have seen a fairly weedy response the first time, with an almost clean patch the following year (this is an area where the weed “onion” had been largely handled). In those spots in which I am doing this for the second time, they come up almost clean. That does not mean the weed bank is gone, but for now, I’ll take it until I prod them with nitrate or something just to see what comes up. As a mechanic, I was always tweaking until I was sure it was right, then I tried tweaking it with something else...

Making It Bigger
Assaying the Onion
Spot-Cleaning the Weed Bank

Even if I do clear all the weeds where they have germinated, the seed still remains viable where they have not. For example, when one cuts down a tree, the weeds suppressed by leaf litter are then dosed with sun and warmth. The litter decays, leaving nitrate behind and up they come! Yep, it's broom, despite 25 years of control in this spot and a burn. Programmatic Disturbance is a means of attaining all of the above without having the time demand for the scope of work exceed the limits of maximum cycle time. By itself, a strategy of suppressing weed germination with other plants is not a successful long term option; it can help, but it is not sufficient.

The same thing happened here where catch-weed bedstraw *(Galium aparine)* responded to a tree removal. Typically this was close to the driveway where bedstraw first showed up. Broom and several other weeds are in here too.

I have repeated this process enough that I can usually predict what will come up if I initiate a disturbance in a particular area, such as thinning trees, a burn pile, or digging out the silt in a channel. Here it is hedge parsley *(Torilis arvensis*), which was both as predicted and very easy to deal with. Yet there is a reason this kind of knowledge may yet become unnecessary, and a hopeful reason at that, but before we get to that, we need one more example to show you how hard the hand work we did can be.

This is pretty typical these days of a shady spot that has just been exposed. French Broom, catchfly, pop-weed, mouse-eared chickweed, scarlet pimpernel, and what might be rip-gut brome. Usually, I hose a spot this bad these days, so this is part of that one quart or so of Roundup from a squirt bottle I use anymore. The good news is they are fewer.

When I get a great year for clover like 2010, that is the time to harvest. Because harvesting clover is such a messy and destructive business, I have no worry about depriving that spot of seed. Besides, we now have a seed bank with plenty of natives.
Is this really, “The onion is dead, long live the onion”? Are we really done???

Yes, 2010 was an awesome year for clover. In general, they tend to be more prevalent in wetter years.
Here it is growing amid poison oak and irises.

Table of Content

Each line in the TOC is a link that opens the corresponding chapter in a new file

These are LARGE files; they do take time to load

Please offer suggestions and comments **HERE**

References are **HERE**

Next