

## Use of Less-Toxic Herbicides and Sheet Mulching in Landscapes

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### Abstract:

Sheet Mulching and the use of less-toxic herbicides reduce the need for stronger herbicides on commercial landscapes. The way landscapes are commonly designed, built, and maintained favors the growth of weeds. Compaction, the removal of organic matter, excessive turf areas, and salty fertilizers all create an environment that stresses plants and requires many pesticides to maintain. These pesticides, including herbicides, cause collateral damage and help create conditions that require repeat applications. This cycle should be broken by reducing turf areas, building soil through the addition of organic matter, and using less-toxic herbicides. Sheet mulching smothers existing weeds, inhibits new weed growth, helps build soils, and composts existing turf in place. Less-toxic herbicides are continually improving and landscape managers must stay abreast of new and improved products and methods to maximize efficiency. Transitioning turf areas through sheet mulching and the strategic use of less toxic herbicides can help improve return on investment while reducing pollution, improving ecological stability, and naturally inhibiting weed growth.

Commercial landscapes in California are at a huge disadvantage when it comes to weeds. If one were to design and maintain the perfect environment to promote weed growth, it would look much like your typical commercial landscape. Organisms seek out and prefer certain niches in which to establish themselves. The perfect niche habitat for weed growth is one that mimics early trophic level disturbed soils, soils that have had their structure destroyed through compaction or inundation, or those that have had their supporting organisms wiped out by toxins. Weeds are nature's "first responders". They have evolved to be able to quickly establish themselves in disturbed or "injured" habitat situations, heal the soil, and provide an organic cover layer. They quickly establish themselves to inhibit erosion and build up organic matter that provides food for fungal organisms, thus reducing the pH of the soil. This prepares the way for woody perennials to move in and bump the ecology of the niche habitat into the next successional trophic level. Different weeds serve different roles in the process. Leguminous weeds fix nitrogen and deep tap-rooted weeds help to break up compacted soils and bring up mineral nutrients from lower soil horizons. Other weeds are adept at sequestering and/or breaking down toxins. Weeds have a purpose in the landscape ecology.

Weeds put all their efforts into fast, efficient growth and seed production. When they have done their work, and the niche habitat has been "healed", the weed population naturally declines as a healthy, diverse "O" soil horizon is established and woody perennials take over. In doing their important work, weeds actually go against what one would think best in terms of

natural selection: they create and promote an environment that decidedly favors against their well-being. If they have done their job well, their seeds may not even be able to germinate in the environment they have created. One has to take a much greater holistic viewpoint to see the genius in their work, and see how their work fits into the scheme of ecological succession. Their purpose is to fix, repair, and heal land that has been abused and then move on to the next crisis, their seeds being able to travel far and wide and/or to remain dormant for long periods of time until their services are needed again.

The abuse of land reaches an apogee in commercial landscapes. To paint a picture of the archetypical situation, we start at the beginning: Whether it is a new development for a subdivision, a shopping center, an office complex, a new HOA, or an apartment complex, the same procedure usually ensues:

First, the land is surveyed and any vegetation or topsoil is removed. More and more, this topsoil is saved for future use, but many times, and certainly historically, it is simply pushed aside or used as non-structural fill. Secondly, the sub soil is compacted, sometimes limed, and “engineered” soils are generated that are fantastic for roads, foundations, and light pole footings.

Thirdly, after the built structures are in place, the landscape installation is awarded to the low bidding landscape contractor. The low-bidding contractor, having likely underbid the project, moves forward using the least amount of effort to decompact the landscape areas, if at all, depending on the specifications. The least amount of top soil is then put in to achieve the target grade. Minimum-sized holes are then dug for the proposed plant material, a thin layer of topsoil is laid under proposed sod areas, and the minimum amount of mulch is applied, and only if specified. To maintain appearance through the establishment period, chemicals such as Oxadiazon (Ronstar) and Oryzalin (Surflan) or perhaps Pendimethalin (Pendulum) are applied. –Or maybe a mix of Trifluralin (Treflan for grasses) and Isoxaben (Gallery for broadleaves) is used, such as the mixture in Snapshot. Then surviving weeds are hit with Glyphosate and maybe Diquat as in the concoction in QuickPro.

To make matters worse, the plants generally proposed are those that evolved in woodland environments or bred in European gardens. They are better adapted to different soils and climates. The other problem is that many of them will get much larger than the spaces allotted to them on the plans due to the desire to have a quick mature appearance to entice would be tenants into the new development.

Enter the landscape maintenance contractor. After the establishment period, the maintenance contractor adds insult to injury by flooding the phyllosphere of the roots of the plants with a toxic mix of salty urea-based fertilizers blended with chelated minerals to make up for the deficiencies shown in the plant material’s leaves, usually iron due to the high pH. The plants respond like they’re on plant growth drugs and put on fast succulent growth that is immediately attacked by fungal pathogens, mollusks, and insects. The experienced maintenance contractor, however, is already a step ahead of the game and has injected the trees and sprayed the shrubs with Imidicloprid (Merit) and applied the fungicide Mefenoxam (Subdue) to the color

beds. The planting areas have been spread with Metaldahyde and any mammalian pests have gotten a dose of Strychnine or several of Diphacinone. The Landscape now looks “Clean & Green”, a masterpiece of sterility and order.

Over time, along with a good deal of fossil fuel use and noise pollution, the maintenance contractor then endeavors to blow, rake, vacuum, and remove any and all organic matter from the site. New mulch, since it’s not in the maintenance specs and can be expensive to spread, or might be seen as messy or collecting debris, is often not used, or if it is, only “colored bark” is applied at the minimum amounts necessary to cover the ground. Those plants that are outgrowing their allotted space are routinely hedged into neat little boxes and/or spheres, and many times coated with a PGR, or Plant Growth Regular. It might have an exciting name like Methylchlorohydroxyfluorene. These practices can go on for YEARS.

When the plants eventually (or quickly) give in and decline and weeds amazingly get through the onslaught of chemical herbicides, a new, low bidding landscape contractor is selected to “fix the problem” (... something the weeds could have done if allowed the chance and a decade or so). The “revolving doors” of landscape service providers then begins. Any let down in herbicide defenses invites an onslaught of weeds desperate to heal the habitat niches that are so wildly out of balance.

On a side note, but one that is pertinent to this topic is the overuse of turf in commercial landscapes. Here we have a monoculture of a plant that necessitates roughly 75% more water to be happy than the area in which it is grown generally receives. To maintain this water hungry monoculture, we provide roughly 5% of our air pollution by constant mowing, edging, and blowing. The EPA estimates that roughly 18 MILLION gallons of fuel are SPILLED each year in the process of keeping these monocultures of climate inappropriate plants looking “Clean & Green”. The “Clean” part of commercial turf involves more than mowing and edging. Weeds are constantly trying to fix the problem presented by the unnatural monoculture. 2,4-D, Dicamba, and Mecoprop are the chemicals of choice to keep these ecowarriors at bay. While very little of these turf areas is used for actual recreation, many commercial landscapes contain many acres of turf for purely ornamental reasons. It is such an obvious target for water conservation that the state of California is actively promoting the removal of turf through incentive programs identified in the WELO or the Water Efficient Landscape Ordinance (AB1881), and many “cash for grass” conservation programs throughout the State.

When you add up the initial soil destruction, the inappropriate plant selection, the systematic removal of organic matter, the compaction, the regular application of salt based fertilizers, and the unintended collateral damage caused by a mix of chemical herbicides, fungicides, insecticides, and even mammalian toxins used on these commercial landscape sites, there is little wonder why nature has sent in the early responders, the weeds, to fix the problem. That’s their job! These soils need help and we keep killing the organisms that are there to take care of it. Unfortunately, the process of natural pedogenesis, that of building soil structure, takes time and our culture has developed an aversion to seeing weeds doing their job.

While it is easy to show a Return on Investment in water savings to promote the transition of wasteful turf monocultures to more climate-appropriate plants on efficient in-line drip systems controlled by ET/Weather-based controllers, the process needed a sustainable procedure that would help the soil and new plants. It had to be quick, efficient, and not involve the use of weeds. Sheet mulching is the answer. Many people have used sheet mulching for permaculture projects and home garden areas, and it has been around as a “fringe” landscape tool for generations but the last five years or so have seen a huge increase in the number of large, commercial-scale sheet mulching projects that have been very successful. It is now taught in UC approved Master Gardener Classes, Bay- and River-Friendly Landscaper Qualification courses, and promoted by many preeminent professional landscapers.

Sheet Mulching is a process that can be used to not only transition turf areas, but also ivy and other monoculture perennial beds such as Hypericum. It is also effective to control weeds in other areas. The beauty of the process is that it minimizes the use of chemical herbicides, completes the cycle of the use of post consumer waste paper products, keeps old sod out of the land fills, and composts the old turf in place. With a little grading around hardscape elements, layers of compost, recycled cardboard, and organic wood chip mulch feeds the soil, inoculates it with microorganisms, smoothers the weeds, and provides a chemical-free, biologically diverse environment to promote water conservation, nutrient cycling, and healthy plant growth. It also inhibits weeds because it does the same work as weeds: It quickly covers the area to mitigate erosion, it builds up the organic content of soils, thus promoting fungal populations, the creation of humus, humic and fulvic acids, and thus lowering the soil pH and making nitrogen available as ammonium. It also establishes a healthy, diverse “O” soil horizon.

There are many different ways to Sheet Mulch. Depending on the existing weeds (which could be turf!) that involve a number of variations on the “lasagna” approach to layering compost, cardboard, and mulch. Blackberry, Poison Oak, and even Eucalyptus can be sheet mulched with enough layers of cardboard and a deep enough layer of organic wood chips. Bindweed, Yellow NutSedge, and Bermuda can all be successfully composted in place using this technique –without the use of herbicides, and while building healthy, biologically diverse soils and promoting the healthy growth of perennial woody plants.

The ones that get away, the weeds that still try to do their work on the dirt, can be addressed with less-toxic herbicides. These are natural oils and acids. Over the last decade, many products have tried to fill the niche market for those who want to avoid the common synthetic herbicides such as 2,4-D, or make a stand against Monsanto and their plans to dominate the food production of the planet. The landscape market is based on customer needs and desires. More and more the landscape maintenance contractor is hearing the customer plead “Please don’t use pesticides on my landscape anymore.” -and many of them are prepared to pay the difference. Municipalities, school districts, parks and rec; they are all getting pressure to reduce or eliminate the use of pesticides. In Canada, where 2,4-D is now not allowed, for example, a strong market has been created for alternative, selective broadleaf weed control.

While some less-toxic herbicide products have done all right, and some have required surfactants to get the job done, several are proving very efficacious. The methods to improve

their efficacy are being developed and the landscape maintenance professional who is catering to the desires of the new eco-literate customer are formulating best management practices to implement true IPM that first goes to the cause of the weeds, but also uses multiple control strategies to hit the weeds with a strategic approach using the least toxic controls in effective and cost effective programs. This is a moving target. New products and new methods are being developed while the customers push for cost effectiveness.

There are no organic trans located herbicides. Corn gluten does not work very well on the West coast. No OMRI listed material will kill Bermuda in fescue. There are certainly limits as to what these burn-down products can offer. They are, however, the leading edge in landscape weed management for the customer who increasingly, care. While an intelligent discussion about the aesthetic threshold level can be good for the site manager-landscape service provider relationship, the bottom line is that as our potable water and oil-based fertilizers and maintenance practices get more expensive and huge expanses of turf are looked at more as wasteful instead of bucolic, the trend towards a sustainable, ecologically responsible way to transition them to more climate-appropriate plants on drip with mulch will intensify. The use of less-toxic herbicides as an adjunct to the process as well as to address weeds in recreational turf and shrub beds will continue to be a growing profit center for those landscape service providers who are prepared to meet the challenge.