



The Efficacy of Various Methods for Treating Invasive Oxalis

Prepared for San Mateo County Parks by Go Native Inc.
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Plot 1: Tarping, and Plot 2: Soil Removal

The area of Plot 1 had been tarped with multiple layers of heavy-duty UV resistant Poly tarp, and tacked down on the edges and center with metal ground staples. Tarp was applied to the area as-is, with no prep.

The area of Plot 2 has had its top 3” inches of soil removed and stockpiled under a tarp to the side. The plot has been covered with a fine mesh window screen to minimize any introduction of wind-blown seed from other plants.



Plot 1, tarped, March, 2019



Plot 2, 3” soil removal, March 2019



Plots 1 (top) and 2, February 2020

As expected, corms in the soil in Plot 1 (and in the tarp-wrapped removed soil from Plot 2) attempted to grow, extending radicles to the surface but, blocked by the tarp and with no sunlight, development of cotyledon was inhibited. Tarp was replaced to maintain barrier and see if new corms develop in the following year.

Plot 2 exhibited a full density of new oxalis plants – excavation seemed to indicate that these corms were below the 3” removal level, indicating this is an insufficient depth for removal of the corms from the soil. Measurement of roots from developed plants indicated corm formation as much as 6” below the soil surface.

Plot 3: Flaming

The Oxalis in Plot 3 was treated with a propane torch to heat the plants to the point of wilting and browning, but not fully burning. A metal shield was used to keep the wood frame and other nearby plants from being affected.



Plot 3 after flaming, March 2019



Plot 3, February 2020

This procedure is typically applied at an earlier stage of the plant's development, when it has first sprouted from the ground, the root structure has not developed, corms have not formed and it's more susceptible to damage from the intense heat. As expected, there was significant new sprouting this year.

But again, unexpected warm and dry weather created unfavorable conditions for use of a propane torch in an open grassland area, and the plot could not retreated until March of 2020. With corms already developed, significant new growth is expected for next year.



Plot 3, retreated, March 2020

If the treated vegetation dries up and dissolves completely, this plot will be screened over to limit any new growth to only the corms remaining in the ground.

Plot 4: Hand Weeding

This plot was weeded by hand, using hand picks and cultivators to remove as much of the plant, root and corms as reasonably possible in about 10 minutes time. This is a labor-intensive approach, and difficult to really clean out all the plant materials short of sifting the soil, but will give a guide to the effectiveness of this approach. As a side note, at that rate of work, it would take approx. 806 person-hours (100+ 8-hour days) to clear an acre of heavy oxalis infestation.



Plot 4 after hand weeding, March 2019



Plot 4, February 2020

As expected, Plot 4 exhibited heavy regrowth of Oxalis in 2020. With the determination from Plot 2 that corms reside at depths 6” below the soil surface indicates that this approach is unlikely to yield any positive results.

Plot 5: Burying and Compaction

In Plot 5, the Oxalis was covered with 4+ inches of a mix of soil and gravel base-rock, and then compacted down to 3” thick. The vegetation was stomped down flat first to eliminate any stems from protruding into the cover material. The plot was covered with fine screening to prevent any outside weed seed from blowing in and limit the regrowth to the corms remaining in the ground.



Plot 5 after burying/compaction, March 2019



Plot 5, February 2020

Although 2019's growth was halted by the compacted covering, the treatment seems to have had no effect on corm development, germination or sprouting. The Oxalis easily pushed through the extra 3" of compacted cover, creating root runs 9-12" in length.

Plot 6: Herbicide (triclopyr)

Plot 6 was treated in 2019 with the same herbicide formulation that is being used for the treatment of the larger Oxalis population throughout the Hillside/Juncus management unit: Garlon 4 Ultra @ 4 quarts per acre with a non-ionic surfactant (Competitor) @ 0.5% concentration.



Plot 6 five days after 2019 treatment



Plot 6 in February of 2020



Plot 6 March 2020 re-treatment



Plot 6 10 days after re-treatment

Initial suppression of further growth of Oxalis after 2019 treatment was noted (top left), and the plot showed almost no new growth in 2020. The few Oxalis sprouts that did appear were stunted and significantly smaller than the immediately adjacent untreated areas. The application of triclopyr appears to have significantly suppressed new growth this year. It is not clear whether this is because the 2019 application damaged or killed the corms as they developed, or inhibited their germination in 2020. It is worth noting that no other plant species germinated in the exposed soil, despite being surrounded by aggressively seeding native and non-native species.

Plot 7: Control

The Control plot is meant to provide a basis for comparison to “no treatment”. This area was left undisturbed, and monitored through the year to document the uninterrupted life cycle of Oxalis and other plants within this habitat. No change in density or cover of Oxalis was noted in the plot.



Plot 7, March 2019



Plot 7, February 2020

Plot 8: Herbicide (Weed Slayer Organic)

Plot 8 was added in March of 2020 to test out the product Weed Slayer, a “natural” herbicidal 2-part formulation. The active ingredient of the first part is Clove oil (Eugenol) in a molasses & water syrup. Eugenol is a known acidic defoliator, and often used in other natural herbicide formulations. The second part is a “proprietary biological amendment”, which is a specific strain of bacteria starter (*Bacillus megatherium*) that promotes growth of the target plant in a way that optimizes its absorption of the clove oil. It is certified as organic, non-toxic, and does not require EPA registration. The SDS for both parts claim no toxicity to anything. The species of bacteria is very common in just about everything, including us. The bacterial formulation is often used as a plant growth supplement in commercial greenhouses. Labels and SDS sheets are here at:

<http://www.andaman-ag.com/products/weed-slayer-organic-herbicide/>



Plot 8 before treatment



Plot 8, ten days after Weed Slayer application

Initial application of Weed Slayer in Plot 8 resulted in complete mortality of the Oxalis within 10 days. The plot should be monitored next year (2021) to observe what effects the application has on corm development and germination.

The biological amendment to the Weed Slayer Organic herbicide formulation was found to have trace amounts of the active ingredients glyphosate and diquat upon inspection. As such the amendment has been banned from use by the County of San Mateo as of December 2020. This additive may or may not have been present in the formulation used to treat the oxalis. If the undisclosed ingredients were present in the formulation, those ingredients likely would have a higher control rate than an organic-only formulation may have achieved.

Summary and Observational Analysis:

Plot 1: Tarping has had an initial positive effect on controlling Oxalis growth and development – the tarp should be kept in place and the plot checked to see if the blocked growth develops new corms.

Plot 2: The 3” of soil removal had little if no effect on germination of new Oxalis at a density equal to what was there before. Examination revealed that the corms are situated much deeper in the soil and depths of 6” or more would be needed before any effect might be possible.

Plot 3: Flaming is an effective and quick method for killing above ground vegetation, but seems to have little effect on corm development of mature plants. Circumstance in both years prevented the process from happening at an earlier stage of the Oxalis development when there may be a better effect in stopping corm development. It should be planned for 2021 to apply the treatment earlier in the winter (January/February) when the plants first begin to sprout above ground.

Plot 4: Hand weeding is a very labor intensive and low-success-yield process that, to be effective, would need to be done multiple times during the growing season over multiple years until the existing seed/corm bank is exhausted. This might be effective on small isolated patches, but not on any large-scale efforts.

Plot 5: Burying and Compaction looks to be a technique with limited promise. At some point, there could be enough material covering an Oxalis population, and compacted to a certain density, to stop it from growing. But even this simple form of the experiment would indicate that would take a lot of material and some very hard compaction, both factors that would make this technique impractical and undesirable in a natural areas setting.

Plot 6: Application of known, effective herbicide compounds had the best results, although the resultant barren area can be cause for concern. Further study is needed to determine whether the application is destroying the corm’s viability or if the residue effect is stopping the germination process (and affecting the germination of desirable vegetation.)

Plot 7: Control.

Plot 8: As noted above, long-term efficacy of the application of Weed Slayer will need to be studied next year when it’s effect on germination can be determined.