Perennial Pepperweed: Research and Control with the Drizzle Method

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Introduction/Background: Perennial pepperweed, known by the scientific name *Lepidium latifolium*, is a noxious weed in many western states that continues to expand its range. Why is pepperweed a problem you may ask? For numerous reasons, first and foremost that it has the ability to grow in a wide range of environments creating monocultures and displacing more desirable plants. It grows in agronomic fields, on ditch banks, in riparian areas, pastures, wildland areas and more. On range it provides poor forage for livestock and wildlife, but does support pollinators with its showy white flowers. It can easily take over and has an impact both on agriculture and the ecology of our natural systems.

What makes perennial pepperweed so difficult to control is its biology. As many perennial plants do, it has a deep creeping root system. The roots are thick and tuberous, full of sugar reserves, allowing the plant to withstand many treatment methods. It is a prolific seed producing species, with studies indicating a dense population can produce 65 billion seeds per acre. While the soil seed life is thought to be short (2 years) these seeds are small and readily move around the environment by people, animals and water. Once a plant establishes a root system, is when pepperweed becomes really difficult to control. Root spread allows a patch to grow from the edges 3-6 ft. per year, eating through uninvaded areas quickly as the patches grow. While pepperweed grows throughout the state, it is particularly problematic in the intermountain region of California. There are vast acreages and watersheds overtaken by this plant. The Honey Lake valley is a key example where at one point tens of thousands of acres were documented to be infested. Other adjacent valleys have seen this as a warning and now have more vigilant management plans. A recent dive around the Klamath basin showed that pepperweed is rapidly expanding in this valley.

How can pepperweed be controlled? This is a difficult question and often is very site dependent. Generally, systemic herbicides that move to the root of the plant are needed to control pepperweed. However, their effectiveness can benefit from a combination of physical and chemcial techniques. Pepperweed patches create a thick thatch layer that can intercept herbicides. Previous research has shown that using physical techniques such as mowing, discing, or grazing to break up the thatch layer in combination with herbicide applications can be more effective than herbicides alone. Even so multiple years of herbicide treatments are needed to target the thick tuberous roots.

While perennial pepperweed control has been the focus of numerous research efforts throughout the decades, there is no silver bullet. One challenge is for federal land managers, who control pepperweed in the riparian areas next to water. This research project focused on experimenting with the drizzle method of herbicide application for pepperweed control with aquatically labeled herbicides. The drizzle method involves using a hand gun to apply herbicides at low carrier volumes, anywhere form 2-5 gal/acre. Coverage is not the goal, but instead getting a little bit of highly concentrated herbicide drops onto the foliage. Typically backpack application uses anywhere from 20-100 gallons/acre of carrier volume for treatment. This technique was developed in Hawaii and has been replicated with success here in California on other species such as yellow flag iris and oblong spurge.

Methods: Two field trials were implemented at the Honey Lake wildlife area to test the drizzle method for pepperweed control, one in the summer of 2017 and one in 2018. The drizzle method was compared to traditional broadcast applications of standard herbicides. Treatments were applied at the bud stage of growth in each year. Four replications of each treatment were made in a randomized complete block design to 10*20 ft. plots. Broadcast applications were made with a Co2 pressurized backpack sprayer applied with 11002 flat fan nozzles at 20 gal/acre, with either 1%mso v/v or 0.25%NIS v/v depending on herbicide. The drizzle treatments were made by handgun pressured at 30 PSI with a 0.5mm orifice nozzle at 3.5 gal/ace with a 10% v/v concentration of the aquatically formulated oil based adjuvant Competitor. Treatments were evaluated for burndown control that growing season and reevaluated for control 12 months and 24 months after application.

Results: The 2017 broadcast applications of Rodeo (glyphosate) 2qt/acre, and Telar (Chlorsulfuron) 1oz/acre provided greater than 80% control 12 months after treatment (Figure one). Only one of the drizzle treatments tested, Rodeo 1.5 qt.+2,4-D 1.3pt./acre provided similar control. Twenty-four months after treatment, no drizzle treatments had comparable control to the broadcast applications of Telar. Milestone (aminopyralid) and Method (Aminocyclopyrachlor) applications did not provide adequate pepperweed control in the trial. In the 2018 trial, only broadcast applications of Telar 2oz/acre provided better than 80% control 12 months after treatment. Six of the drizzle treatments tested (combinations or 2,4-D and Rodeo) provided better than 80% control 12 months after treatment (figure 2). Similar control

to the broadcast application of Telar 2oz/acre was observed 24 months after applications with five of the drizzle treatments tested.

Discussion: None of the treatment tested provided 100 percent perennial pepperweed control 12 or 24 months after applications. Broadcast applications appeared to be more effective than the drizzle applications in the 2017 trial, however in the 2018 trial, many of the drizzle applications offered comparable control of perennial pepperweed to the best broadcast treatments. There was a small learning curve with the drizzle application techniques and this could have affected the lower control values in the first year of the trial. It appears there is promise for the drizzle technique to be effective at controlling perennial pepperweed with aquatically labeled herbicides in riparian areas. Furthermore, this may give landowners and managers a viable tool for spot treatments wherever pepperweed grows. One benefit of the drizzle method is that with the ultra-low volume application, less water is needed and more acres could be covered by crews using backpack applicators. This would result in less time needed for crews to control weeds in remote areas with limited access to water. More work to demonstrate the effectiveness of the drizzle method on perennial pepperweed is needed.

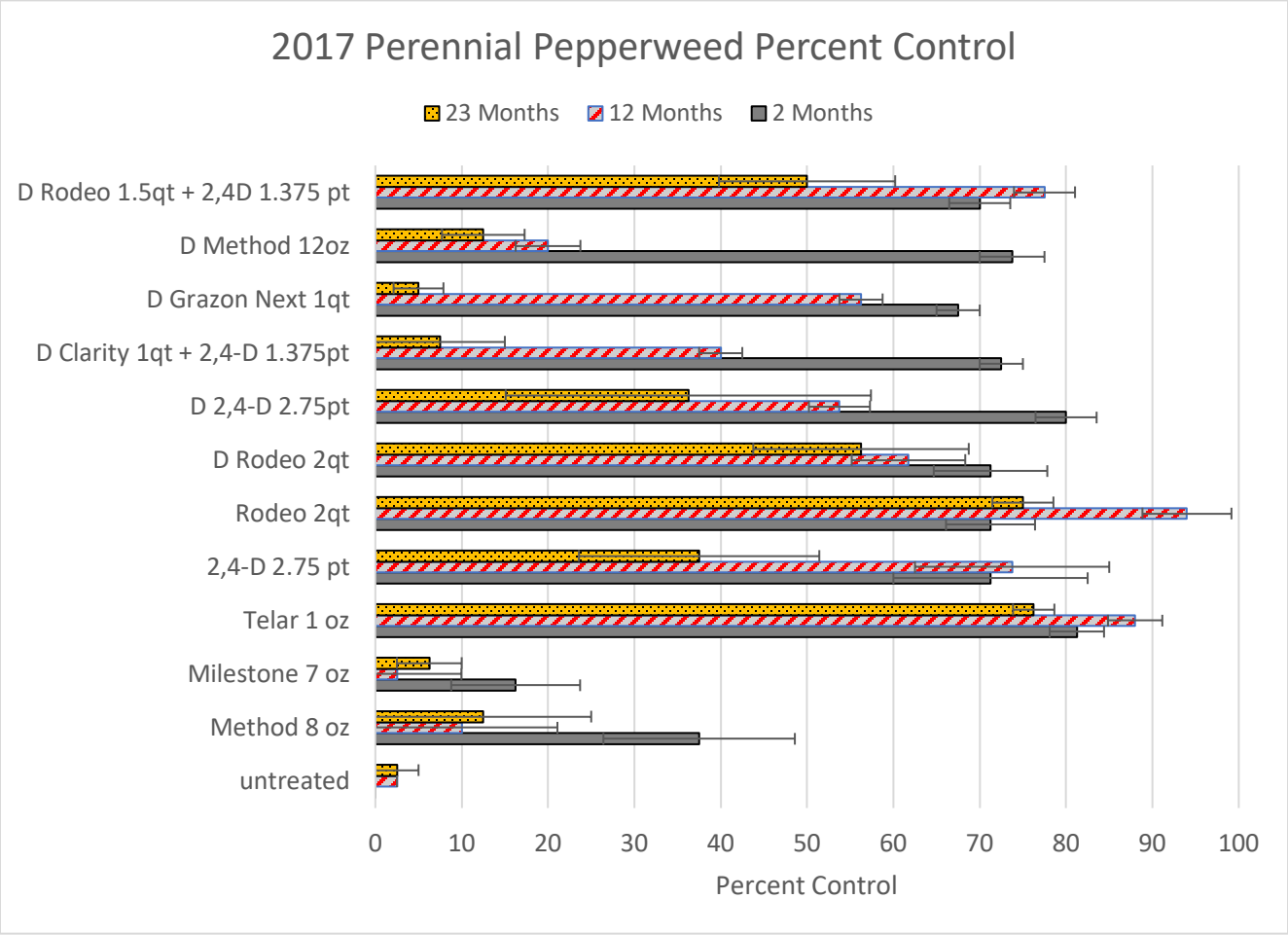

Figure one: Percent Pepperweed control for the 2017 Trial. All treatments with a “D” in front of them were made with the drizzle application, where all others were made with a broadcast application. Application rates are listed as the amount of product per acre. Dark grey bars indicate control 2 months after treatment, red striped bars indicate control 12 months after treatment and yellow dot bars indicate control 24 months after treatment. Error bars indicate standard error of the mean.

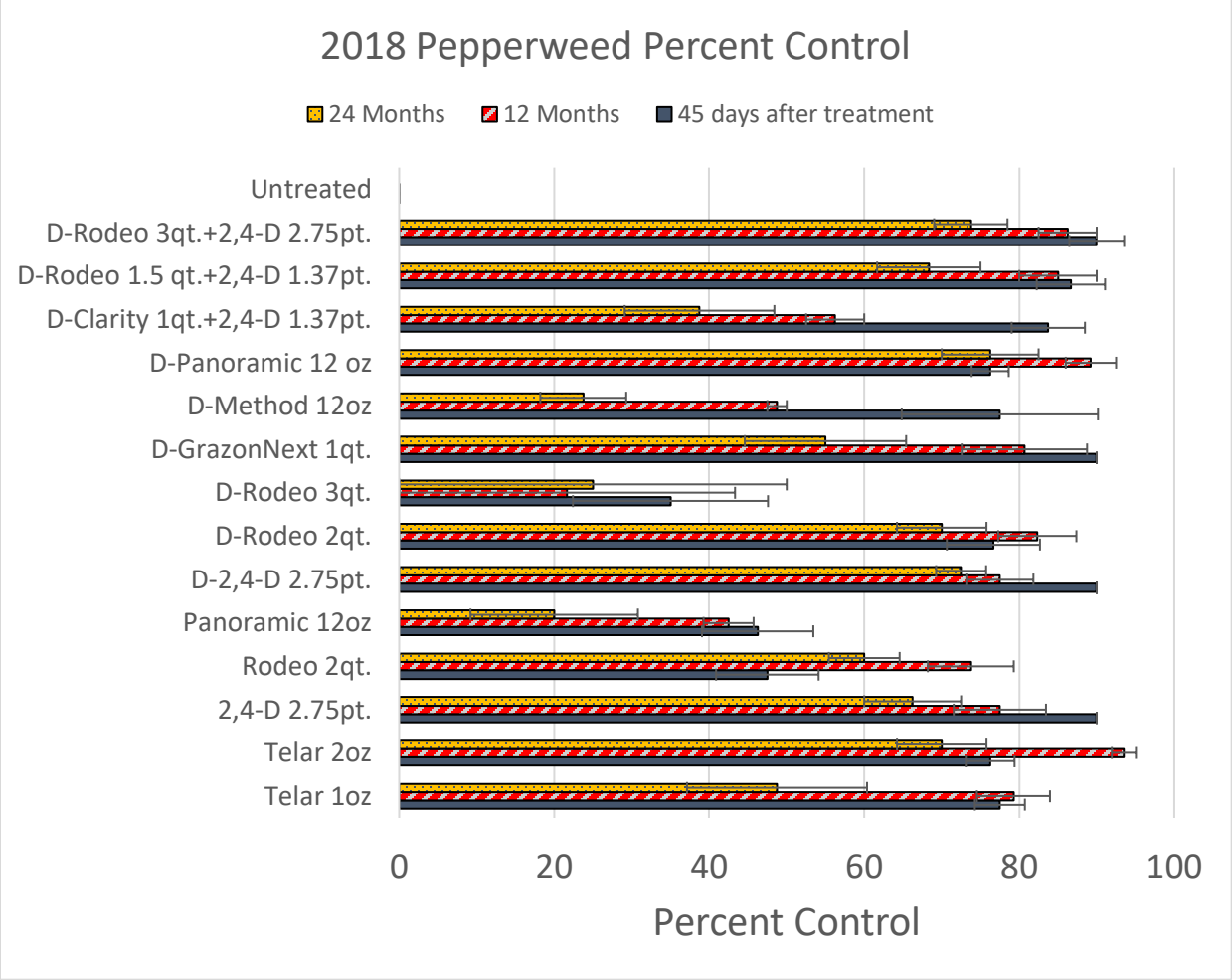

Figure Two: Percent Pepperweed control for the 2018 Trial. All treatments with a “D” in front of them were made with the drizzle application, where all others were made with a broadcast application. Application rates are listed as the amount of product per acre. Dark grey bars indicate control 2 months after treatment, red striped bars indicate control 12 months after treatment and yellow dot bars indicate control 24 months after treatment. Error bars indicate standard error of the mean.

Photo One: Picture of untreated check in perennial pepperweed monoculture at the Honey Lake Valley in the 2017 trial thirteen months after study implementation.

Photo Two: Picture of 2.75 pt. 2,4-D/acre applied with the drizzle method 13 months after application in the 2017 trial. Pepperweed was mostly controlled. The majority of the green plants in the plot are prickly lettuce coming back into the site.