



Dalmatian toadflax, *Linaria dalmatica*, and the Dalmatian toadflax weevil, *Mecinus janthiniformis*, at Hungry Valley SVRA

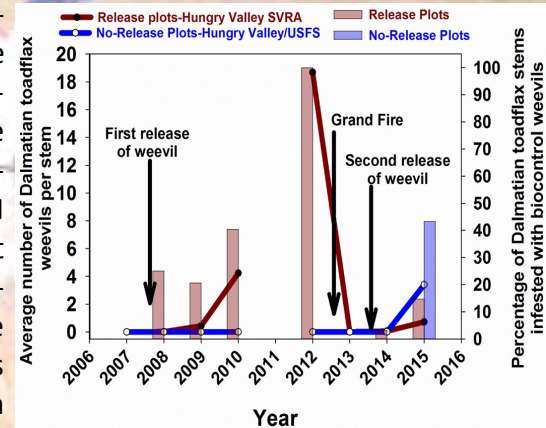
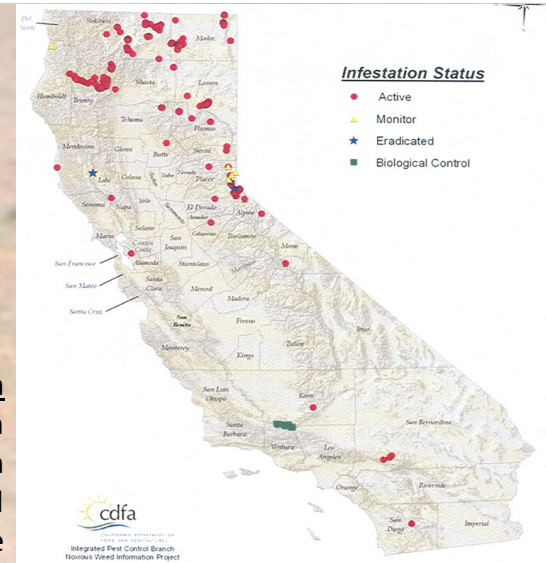
Dalmatian toadflax (*Linaria dalmatica* subsp. dalmatica (Scrophulariaceae) from southern Europe and the eastern Mediterranean, is a widespread invasive perennial weed in rangelands and natural habitats in the western U.S. This weed is toxic to livestock and some wild grazers and displaces native plants. California State Parks-Hungry Valley State Vehicle Recreation Area, LA, Kern, and Ventura Counties, has one of the southernmost invasions of Dalmatian toadflax in the U.S. Dalmatian toadflax was discovered during a wildflower tour in the North Grassland Management Area of the park. Annual chemical control with Round Up Pro Concentrate and Milestone VM Plus (Capstone) is effective with repeated treatments, but is not feasible for this large invaded area (over 100 acres). This treatment has kept Dalmatian toadflax under control, but not able to eliminate it from the park. CDFA approached State Parks about a biocontrol release of *Mecinus janthiniformis*, starting a partnership and study to eliminate this invasive species. USDA took over the study in 2014 monitoring establishment, dispersal, and impact of these two species.

The Dalmatian toadflax weevil (*Mecinus janthiniformis*, Coleoptera: Cucurionidae) was released in the USA and Canada in the late 1980s through the 1990s. At sites in cold temperate areas, this weevil completes one generation per year on Dalmatian toadflax. Adults emerge from old stems in the spring, feed on leaf tissue, mate, and females then deposit eggs onto spring stems. Larvae hatch and burrow into stems, completing their development in about 2 months. Larvae pupate and pupae overwinter inside stems.

The weevil was released in many western U.S. states, but not California. The weevil dispersed into northern California on its own in the mid-2000s and has become established at several sites in Shasta and Trinity Counties.

Establishment and dispersal are being examined by collecting (each spring) the preceding years' stems and dissecting them for evidence of feeding and development by the larvae. At the Hungry Valley SVRA site, the relatively mild conditions may alter the life cycle and survival of the weevil during either the summer or winter compared to sites in the Northern Plains and Pacific Northwest. To examine this possibility, an overwintering study is being conducted in 2016-2017. Stems containing the pupae and adults are being collected monthly.

Impact is being measured annually during the spring growth season in terms of Dalmatian toadflax stem height and density along 50-m transects, and the diversity and abundance of other plant species are being measured (15 other plant species seen in 2016 surveys).



Description of Figure: Plot of average number of Dalmatian toadflax weevils over time per plant inside stems collected each year from three release locations (red line) and three non-release locations within 1 km (blue line) near the Condor Trail at Hungry Valley SVRA (left axis); and % infested stems (right axis) at release (red bars) and non-release (blue bars) locations. In June 2008, 1400 Dalmatian toadflax weevils were released at this site. The abundance of weevils remained low in 2008-2009, then increased several fold in 2010, and no data were collected in 2011. Weevil infestation increased by over 15-fold by 2012, and 100% of stems collected that year were infested with weevils, suggesting exponential population growth. The Grand Fire (May 2013) destroyed both the live stems and weevils developing inside them that spring. Dalmatian toadflax populations quickly recovered, and 3000 more weevils were released in May-June 2014. Weevil populations have recovered from zero in 2014 to 2 to 4 weevils per plant in the release locations in 2015. In 2015, for the first time, weevils were found in the non-release plots, indicating dispersal of weevils on their own to these areas. Overwintering of the beetle is being studied in 2016-2017 to determine the ability of the weevil to exponentially increase its populations in 2017.

