Yellow Starthistle Management Guide

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CHAPTER 1: Introduction and Spread

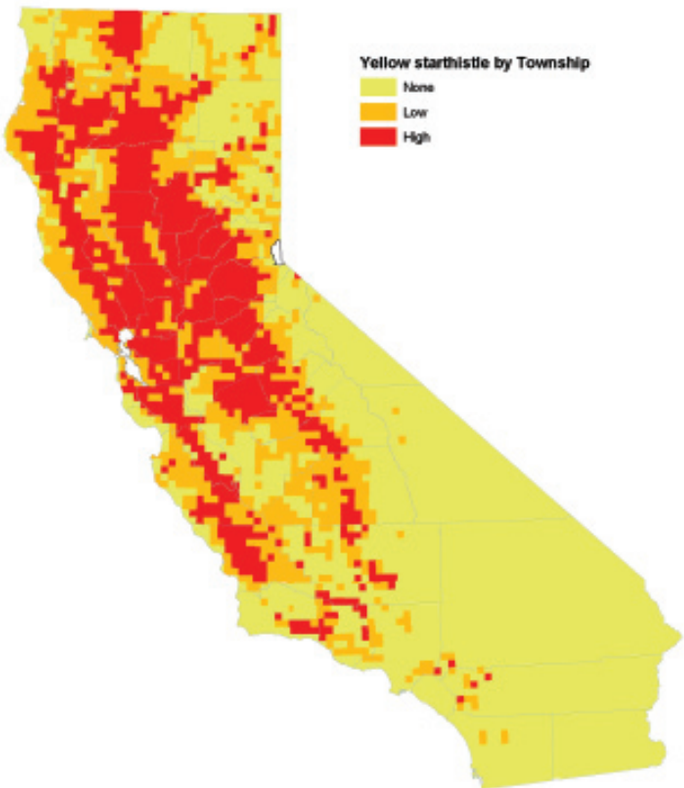
Introduction to North America

The center of origin of yellow starthistle (*Centaurea solstitialis* L.) is believed to be Eurasia, where it is native to Balkan-Asia Minor, the Middle East, and south-central Europe (Maddox 1981). Its introduction into North America probably occurred in California after 1849 as a seed contaminant in Chilean-grown alfalfa seed, known then as Chilean clover (Gerlach *et al*. 1998). Historical records indicate that alfalfa was first introduced to Chile from Spain in the 1600s and from Chile to California at the time of the gold rush. Despite its Spanish origins, alfalfa came to California only from Chile before 1903. After 1903, it is likely that alfalfa was also introduced from Spain, France, Italy, and perhaps Turkestan.

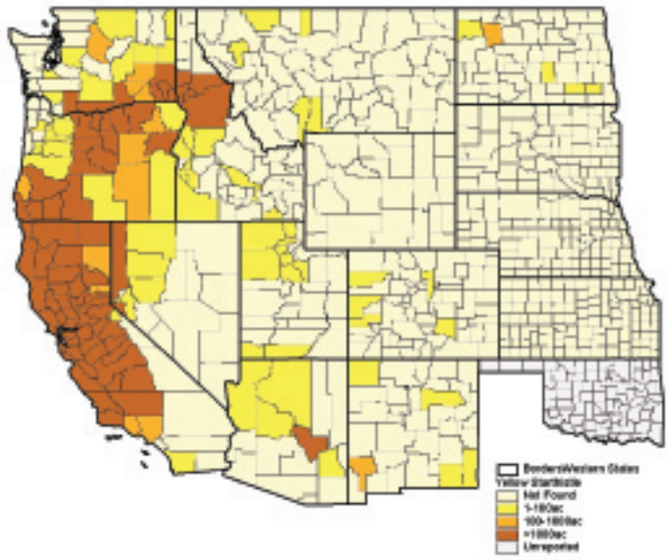
Worldwide distribution of yellow starthistle. *Maddox et al. 1985.*

Spread and Distribution in California

It has been speculated that the introduction of yellow starthistle into California occurred in multiple steps (Gerlach 1997a, b). The first report of alfalfa cultivation was near Marysville, California, in 1851. Before the 1870s alfalfa was grown primarily along river levees near Sacramento, Marysville and San Francisco. These areas were characterized by deep, well-drained soils and easy access to drinking and irrigation water. Both animal and alfalfa forage were distributed only short distances. As a result, yellow starthistle infestations that accompanied alfalfa stands were fairly localized. From 1870 to about 1905 much of the surrounding areas previously consisting of dry-farmed wheat and barley fields were converted to both dryland and irrigated alfalfa fields. During this period, yellow starthistle established as dense local populations in these areas and along adjacent roadsides. The use of tractors and other equipment spread starthistle seed to other locations, including grain fields. Gerlach (1997a) indicates that yellow starthistle in California probably decreased between 1920 and 1940, most likely due to changes in crop production techniques and the widespread use of inorganic herbicides, such as



Distribution of yellow starthistle in California. *This 2002 map, based on survey data by township, illustrates how widespread the plant is in the state. At 14 million acres, it is California's most widespread weed. Data collected by the California Department of Food and Agriculture. (Pitcairn, Schoenig, Yacoub and Gendron 2006)*



Distribution of yellow starthistle in western states. *While plains states have many grassland weeds that threaten California, yellow starthistle is one grassland weed spreading from California. Data provided in 2001 by state weed coordinators and compiled by Eric Lane, Colorado Weed Coordinator.*

Spread to Other States

Introduction of yellow starthistle from California to other western states occurred in the 1870s and 1880s (Gerlach 1997a, Roché 1965). The first report outside of California was in Bingen, Washington (Sheley *et al*. 1999b). These first introductions were also likely through contamination

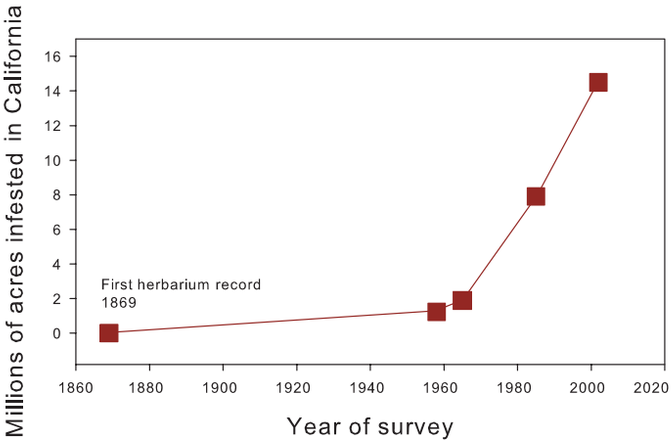


Fig. 1. Expansion in California. *A comparison of estimated infestation area in California shows a rapid expansion over the last 50 years (Pitcairn* et al. *2006).*

sodium arsenite and sodium chlorate, along roadsides. However, around the 1930s or 1940s yellow starthistle began to invade foothill grasslands on both sides of the Central Valley. In this way, yellow starthistle became an integral part of the grazing/weed dynamic of the rangeland system, in which wildlife and livestock participated in the spread of the plant. By 1958, the weed was estimated to have invaded over one million acres in California (Maddox and Mayfield 1985).

Since the 1960s, three factors have contributed greatly to the further spread of yellow starthistle: an extensive road building program, increased suburban development, and expansion in the ranching industry. These factors all contributed to the rapid and long-range dispersal of seed and the establishment of new satellite populations (Gerlach *et al*. 1998). Over the past 40 years, yellow starthistle has spread into rangeland, native grasslands, orchards, vineyards, pastures, roadsides, and wasteland areas. The infestation area reached nearly eight million acres in California by 1985 (Maddox and Mayfield 1985). Today, it is thought to have spread to over 15 million acres, and can be found in 56 of the 58 counties in California (Pitcairn *et al*. 1998b).

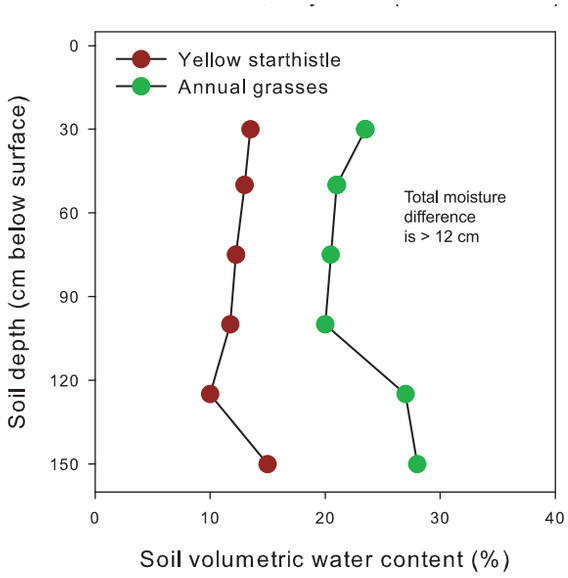
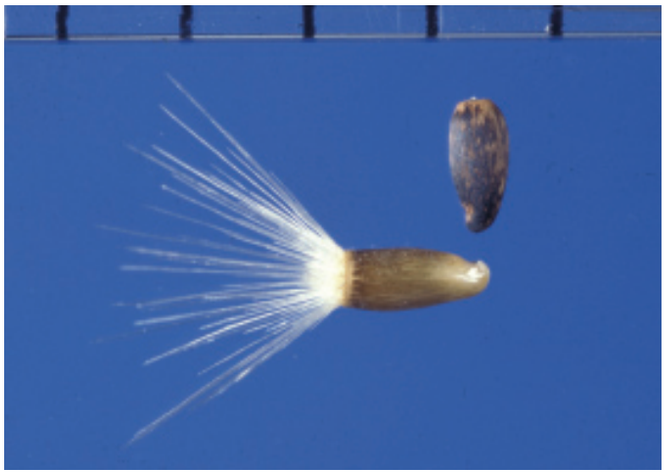


Fig. 2. Soil moisture under yellow starthistle compared to annual grasses. *The volumetric water content of soil under yellow starthistle is reduced compared to soil under annual grasses near UC Davis, July 1996 (Gerlach 2003).*



Seed dispersal. *Yellow starthistle seeds have stiff bristles that attach to fur or clothing, facilitating dispersal. (Photo: J. Clark)*

Contaminated hay. *If hay contaminated with yellow starthistle is moved offsite, it can become a source of new infestations. (Photo: J. McHenry)*

of alfalfa seed (Gerlach 1997a). During the 1920s, yellow starthistle expanded rapidly in grasslands in the Pacific Northwest states. By the mid-1980s it was estimated to occupy 280,000 acres in Idaho, 135,000 acres in Oregon, and 148,000 in Washington (Sheley *et al*. 1999b). In 1989, the rate of spread of yellow starthistle was determined to be 7,000 to 20,000 acres of rangeland per year in the west (Callihan *et al*. 1989) and by 1994 it was estimated to be spreading at twice that rate (15,000 to 50,000 acres per year) (Sheley and Larson 1994).

Today, yellow starthistle can be found in 23 of the 48 contiguous states, extending as far east as New York (Maddox *et al*. 1985). It has also extended into Canada from British Columbia to Ontario. Beyond this continent, yellow starthistle is now found in nearly all Mediterranean climates and most temperate areas of the world (Maddox *et al*. 1985).

Mechanisms of Spread

Human activities are the primary mechanisms for the long distance movement of *C. solstitialis* seed. Seed is transported in large amounts by road maintenance equipment and on the undercarriage of vehicles. The movement of contaminated hay and uncertified seed are also important long distance transportation mechanisms. Locally, seed is transported in lesser amounts and over short to medium distances by animals and humans. The short, stiff, pappus bristles are covered with microscopic, stiff, appressed, hair-like barbs that readily adhere to clothing and to hair and fur. The pappus is not an effective long distance wind dispersal mechanism as wind dispersal moves seeds only a few feet (Roché 1992).