

Sophia Lin

Countering Yellow Starthistle

Imagine playing on the fields at school as a young child and looking out at the wide expanse of grass dotted with flowers here and there; but everyone has seen flowers before, so why pay attention now? What damage can they possibly do to the environment? A lot, it turns out. I was one of those people who would absentmindedly pick at the grass and flowers around me whenever I was out in the fields. I never knew there existed plants that could negatively affect the environment. But there are, and yellow starthistle is one of the most detrimental invasive weeds of California. My name is Sophia. I'm from Saratoga, representing the Cal-Pac section, and this presentation will focus on the basic what, why, and how of yellow starthistle.

So what is yellow starthistle? Yellow starthistle is a grayish-green plant that grows between six inches to five feet. It is characterized by its bright yellow flowers and sharp spines that surround the base of the flower. The stem has a winged appearance and a cottony wool covers the stems and leaves. It is a facultative winter annual, facultative meaning that it is able to survive in more than one set of environmental conditions. It typically germinates in the fall and occasionally in the spring. After germinating, its roots grow rapidly, allowing it to take in more resources to survive longer into the summer. Plants bolt in the spring and flowering occurs from June to October.

Yellow starthistle originated in Eurasia and was introduced to North America in the mid 19th century as a seed contaminant of alfalfa seed. At first it only infested locally in California, but later when dry-farmed wheat and barley fields were changed to alfalfa fields and when road building and ranching development occurred, a rapid expansion of yellow

starthistle took place. Yellow starthistle now spreads between 15,000 to 50,000 acres per year. It is found in over 15 million acres of California, 23 of the 48 states, as well as almost all Mediterranean climates and most temperate areas of the world.

This global plant is diverse not only in geographic reach, but also in the types of seeds it bears. About 25% of achenes are non-pappus-bearing; these are retained in the seed head for a sizable amount of time and have no wind dispersal mechanism, usually falling immediately below the parent plant. 75% of achenes are pappus-bearing; these disperse soon after flowers drop petals, but are not an effective long distance wind dispersal mechanism. Birds like pheasants, house finches, and goldfinches feed heavily on seeds and are capable of long distance dispersal. Vehicles and road maintenance equipment, as well as contaminated seed or soil also contribute to long distance dispersal of yellow starthistle. The plant's stiff pappus bristles covered with hair-like barbs readily stick to clothing, hair, and fur, allowing it to transport locally by animal and people.

Why should you care about this plant? Well, it is one of the most threatening rangeland weeds in the northwestern United States, requiring regional and statewide control on public lands. It is a major consumer of groundwater and outcompetes native plants, reducing forage for livestock. If not controlled, yellow starthistle may spread to neighboring lands. Its toxicity to horses also causes an incurable neurological disorder called "chewing disease." In just California, around 0.5 million acres of yellow starthistle are managed at approximately \$12.5 million annually.

How is yellow starthistle controlled? There are actually four ways: mechanical, cultural, biological, and chemical. Mechanical control includes hand pulling, tilling, and mowing. Manual removal is effective with small infestations and on uneven land where

mechanical tools are impossible to use. Tillage is often used in agricultural lands and is effective with annual weeds, but can damage important desirable species and expose the soil for rapid re-infestation if subsequent rainfall occurs. Mowing is used for lightly infested areas and has less impact on the environment than tillage.

Cultural control includes grazing, revegetation, and burning. Grazing helps reduce yellow starthistle seed production and growth, limiting damage inflicted on desirable plants. Revegetation with native or high forage non-native perennial grasses is used to prevent establishment in liable areas and can be the best long-term sustainable method of suppressing weed invasions while providing high forage production. Burning is used to remove the soil seed bank to reduce the amount of yellow starthistle infestation.

Prescribed burning in favor of fire-adapted native species can increase plant diversity and control harmful weeds.

Biological control of yellow starthistle encompasses six insects: the bud weevil, flower weevil, hairy weevil, seed-head fly, peacock fly, and false peacock fly. These insects reproduce within the seed head, lessening the amount of seed production by about 50%. They not only target yellow starthistle specifically but also require no assistance in spreading and are most effective during the summer. The pathogen Mediterranean rust fungus has also been proven to restrict yellow starthistle seed production by attacking the leaves, stems, and bolts of the plant.

Chemical control, or use of herbicides, is considered the most practical and efficient method of yellow starthistle control. It is used on large infestations, around the perimeter of infestations, and for spot treatments. The most effective season-long control is with the use of preemergence control of seedlings and rosettes, which inhibits yellow starthistle

growth and provides soil residual activity for a couple of months until spring rainfall is completed. Postemergence herbicides are typically used on seedlings at latter stages of long-term management, but do not provide soil residual activity.

Although yellow starthistle may look just like any other harmless plant, it is one of the most severe rangeland weeds, capable of infecting millions of acres of land, and requiring long-term treatment using integrated approaches. Control methods include mechanical control, manual or machine use; cultural control, animal, plant, or fire use; biological control, insect or plant pathogen use; and chemical control, herbicidal use. The goal of yellow starthistle management is to control and prevent yellow starthistle spread while maintaining a good ecosystem. Awareness of yellow starthistle and identifying and understanding its damaging effects can lead to early detection and response to infestations. With further study and efforts to employ strategic integrated approaches, it is possible to successfully control the spread of yellow starthistle. Now that you know that there are plants that can cause so much damage to the environment, consider the flowers and weeds you come across the next time you pass through a field and how *you* can help manage it with just your awareness. Thank you.