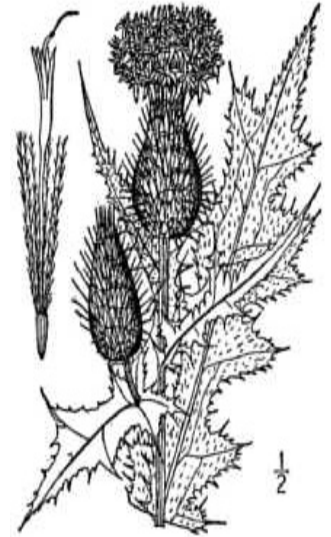


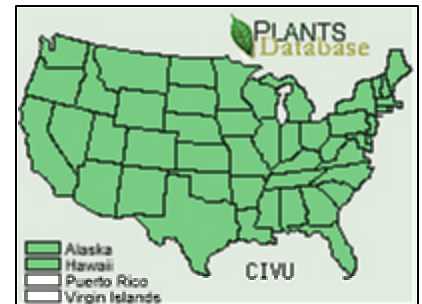
BULL THISTLE

Cirsium vulgare

Botanical Description: Bull thistle is a biennial, and sometimes annual or monocarpic perennial, forb. In the juvenile phase, individual bull thistle plants form a single rosette with a taproot up to 28 inches (70 cm) long. Rosettes may develop up to 3.3 feet (1 m) in diameter. The taproot does not spread, but develops several smaller lateral roots. Stems have spiny wings and grow 1 to 6.6 feet (0.3 to 2 m) tall, with many spreading branches, and sometimes a single stem. Bull thistle stem leaves are more or less lance-shaped and 3 to 12 inches (7.6-30 cm) long, prickly hairy on the top and very hairy underneath. Lobes on leaves are tipped with stout spines. Bull thistle flowerheads are 1.5 to 2 inches (3.8 to 5 cm) in diameter, 1 to 2 inches (2.5-5 cm) long, usually solitary, and more or less clustered at the ends of shoots and branches. Flowers are subtended by narrow, spine-tipped bracts. Bull thistle fruits are achenes, 1/16th-inch (0.15 cm) long, with a long, hairy plume that is easily detached.



Habitat: Bull thistle is a very widespread weed that can grow in a wide range of environments but is most troublesome in recently or repeatedly disturbed areas such as pastures, overgrazed rangelands, recently burned forests and forest clearcuts, and along roads, ditches, and fences. Bull thistle is found on dry and wet soils, but is most common on soils with intermediate moisture.



Geographical Distribution: *Cirsium vulgare* is a native of Europe, western Asia, and North Africa. It is found in the US in the states shaded green on the map.

Ecological Damage: Although bull thistle is a problem predominantly in disturbed areas, it also can be found in natural areas. The basal rosette may grow to nearly 1 m in diameter before bolting, and, once established, bull thistle out-competes native plant species for space, water, and nutrients.

Control and Management:

Biological: The seed-feeding fly, *Urophora stylata* Fabricius, has been selected and released for biological control of bull thistle.



Mechanical: Mow to prevent seeding.

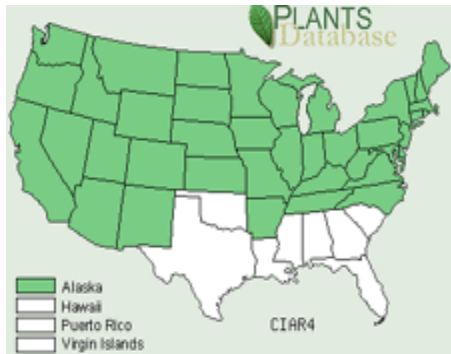
Chemical: Pre-emerge with Aatrex 4L, Oust, Princep Liquid. Post-emerge with 2,4-D + dicamba, Garlon 3A, Garlon 4, Roundup/Accord, and Stinger

Reference: <http://plants.usda.gov>, www.fs.fed.us/database,
<http://tncweeds.ucdavis.edu/esadocs/cirsvulg.html>, www.invasive.org,
www.riparianbuffers.umd.edu/manuals/pannil.html

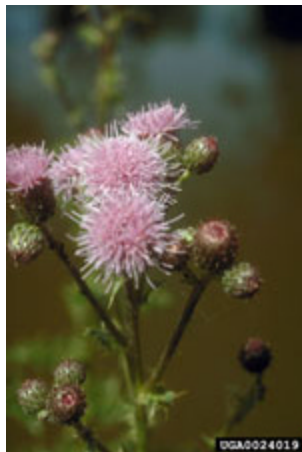
Canada Thistle

Cirsium arvense (L.) Scop.

Distribution Map Canada thistle is distributed throughout the northern U.S., from northern California to Maine and southward to Virginia.



DESCRIPTION: Canada thistle is an herbaceous perennial in the aster family with erect stems 1½-4 feet tall, prickly leaves and an extensive creeping rootstock. Stems are branched, often slightly hairy, and ridged. Leaves are lance-shaped, irregularly lobed with spiny, toothed margins and are borne singly and alternately along the stem. Rose-purple, lavender, or sometimes white flower heads appear from June through October, generally, and occur in rounded, umbrella-shaped clusters.



ECOLOGICAL THREAT: Natural communities that are threatened by Canada thistle include non-forested plant communities such as prairies, barrens, savannas, glades, sand dunes, fields and meadows that have been impacted by disturbance. This highly invasive thistle prevents the coexistence of other plant species through shading, competition for soil resources and possibly through the release of chemical toxins poisonous to other plants.

HABITAT IN THE U S: Canada thistle grows in barrens, glades, meadows, prairies, fields, pastures, and waste places. It does best in disturbed upland areas but also invades wet areas with fluctuating water levels such as stream bank sedge meadows and wet prairies.



CURRENT MANAGEMENT APPROACHES: Management of Canada thistle can be achieved through hand-cutting, mowing, controlled burning, and chemical means, depending on the level of infestation and the type of area being managed. Due to its perennial nature, entire plants must be killed in order to prevent regrowth from rootstock.

References: <http://www.nps.gov> www.invasive.org

Japanese Knotweed

Taxonomic Hierarchy: *Polygonum cuspidatum* Sieb. & Zucc

| | |
|---------------|---|
| Kingdom | Plantae – Plants |
| Subkingdom | Tracheobionta – Vascular plants |
| Superdivision | Spermatophyta – Seed plants |
| Division | Magnoliophyta – Flowering plants |
| Class | Magnoliopsida – Dicotyledons |
| Subclass | Caryophyllidae – |
| Order | Polygonales – |
| Family | Polygonaceae – Buckwheat family |
| Genus | <i>Polygonum</i> L. – knotweed |
| Species | <i>Polygonum cuspidatum</i> Sieb. & Zucc. – Japanese knotweed |



NATIVE RANGE: Eastern Asia

DESCRIPTION:

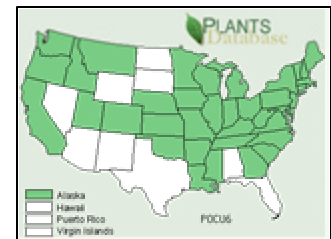
Japanese knotweed, a member of the buckwheat family (Polygonaceae), is an upright, shrublike, herbaceous perennial that can grow to over 10 feet in height. As with all members of this family, the base of the stem above each joint is surrounded by a membranous sheath. Stems of Japanese knotweed are smooth, stout and swollen at joints where the leaf meets the stem. Although leaf size may vary, they are normally about 6 inches long by 3 to 4 inches wide, broadly oval to somewhat triangular and pointed at the tip. The minute greenish-white flowers occur in attractive, branched sprays in summer and are followed soon after by small winged fruits. Seeds are triangular, shiny, and very small, about 1/10 inch long.

ECOLOGICAL THREAT: Japanese knotweed spreads quickly to form dense thickets that exclude native vegetation and greatly alter natural ecosystems. It poses a significant threat to riparian areas, where it can survive severe floods and is able to rapidly colonize scoured shores and islands. Once established, populations are extremely persistent.

DISTRIBUTION IN THE UNITED STATES: Distribution includes 36 states in the lower 48 from Maine to Wisconsin south to Louisiana, and scattered midwest and western states. See **Green** map area----->

HABITAT IN THE UNITED STATES: Japanese knotweed can tolerate a variety of adverse conditions including full shade, high temperatures, high salinity, and drought. It is found near water sources, such as along streams and rivers, in low-lying areas, waste places, utility rights-of-way, and around old homesites. It can quickly become an invasive pest in natural areas after escaping from cultivated gardens.

CURRENT MANAGEMENT APPROACHES: Grubbing, cut stem treatment, and herbicide spray treatment to control large populations





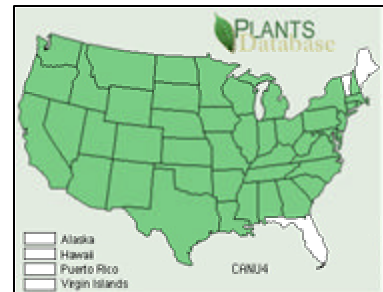
Musk Thistle - *Carduus nutans* L.

DESCRIPTION: Musk, or nodding thistle, a member of the aster family (Asteraceae), is an aggressive, biennial herb with showy red-purple flowers and painful spiny stems and leaves. Mature plants range in height from 1½ to 6 feet tall, and have multi-branched stems.

Leaves are dark green, coarsely lobed, with a smooth waxy surface and a yellowish to white spine at the tip. The large disk-shaped flower heads, containing hundreds of tiny individual flowers, are 1½ to 3½ inches in length and occur at the tips of stems. Flower heads will droop to a 90-degree angle from the stem when mature, hence its alternate name, nodding thistle. Each plant may produce thousands of straw-colored seeds adorned with plume-like bristles.

DISTRIBUTION IN THE UNITED STATES: Musk thistle is found in every state except Maine, Vermont, Florida, Alaska and Hawaii.

HABITAT IN THE UNITED STATES: Musk thistle grows from sea level to about 8,000 ft elevation, in neutral to acidic soils. It invades open natural areas such as meadows, prairies, and grassy balds. It spreads rapidly in areas subjected to frequent natural disturbance events such as landslides and flooding but does not grow well in excessively wet, dry or shady conditions.



BIOLOGY & SPREAD: Musk thistle is usually a biennial, requiring 2 years to complete a reproductive cycle, but may germinate and flower in a single year in warmer climates. Seedlings emerge in mid to late July and develop into a rosette where plants can reach 4 feet in diameter. Flowers emerge in early May to August and seed dissemination occurs approximately one month after the flowers form. A single flower head may produce 1,200 seeds and a single plant up to 120,000 seeds, which may be wind blown for miles. Seed may remain viable in the soil for over ten years, making it a difficult plant to control.

CURRENT MANAGEMENT APPROACHES:

Mechanical Methods- Hand pulling is most effective on small populations and can be done throughout the year, but is most effective prior to the development of seeds. Flowers and seedheads should be bagged and disposed of in a landfill to prevent or minimize seed dispersal. Minimizing disturbance to the soil during removal activities will help reduce the chance of germination of seeds stored in the soil.

Biological Control- Two weevils have been introduced from Europe and released in the United States, the thistlehead-feeding weevil (*Rhinocyllus conicus*) and the rosette weevil (*Trichosirocalus horridus*). Have had some notable success, but may impact native thistles.

Chemical Methods- Foliar spraying is effective on established populations of musk thistle. Treatments should be applied during the rosette stage or prior to flowering. Glyphosate is a non-selective systemic (i.e., moves through the plant) herbicide that can kill non-target plants that are only partially contacted by spray. Triclopyr is selective to broadleaf species and is a better choice if native grasses are present.

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Russian Olive *Elaeagnus angustifolia* L.



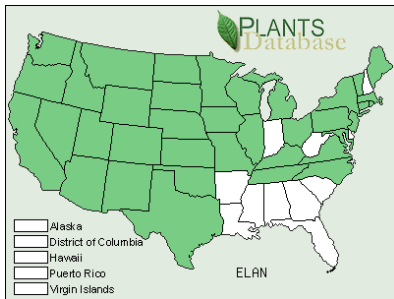
Common Names:
Russian-olive, oleaster

Native Origin:
Southern Europe and western Asia;
planted in landscapes, along roadsides
because of salt tolerance, for
windbreaks, wildlife habitat, and surface
mine reclamation



UGA1213001

Description: Russian-olive is a small deciduous tree or large thorny shrub in the oleaster family (*Elaeagnaceae*) that can grow 15 to 30 feet in height. It is generally rounded in shape with loose arrangement of branches. Its stems, buds, and leaves have a dense covering of silvery to rusty scales. Twigs have silvery scales and thorns on the ends. Leaves are simple, alternate, 1-3 inches long, lance-shaped and silvery on both sides. Flowers appear in June and July. They are bell-shaped, single or clustered in the leaf axils, fragrant, yellowish on the inside and silver outside. Olive like fruits are dupe-like, .5 inches long, light green to yellow with silvery scales, hard and fleshy. Plants begin to flower and fruit at three years of age. Reproduction is by seed, sprouting from buds on the root crown and suckering.



Habitat: It is found along fields, open areas, grasslands, stream banks, lakeshores, roadsides, and urban areas, sandy and bare mineral soils. Seedlings are tolerant of shade and it thrives in a variety of soil and moisture conditions, including bare mineral substrates.

Distribution: This species is reported from states shaded on Plants Database map. It is reported invasive in AZ, CA, CO, CT, DE, IA, ID, IL, IN, KS, MD, MI, MN, MT, NC, NE, NJ, NM, NV, NY, OK, OR, PA, SD, TN, TX, UT, VA, VT, WA, and WI .

Ecological Impacts: This invasive plant can interfere with natural plant succession, nutrient cycling, and tax water reserves. Because Russian-olive is capable of fixing nitrogen in its roots, it can grow on bare, mineral substrates and dominate riparian vegetation where over-story cottonwoods have died. Although Russian-olive provides a plentiful source of edible fruits for birds, ecologists have found that bird species richness is actually higher in riparian areas dominated by native vegetation.

Control and Management:



- **Manual-** Mowing hedges with a brush type mower, followed by removal of cut material are an effective method for eradication.
- **Chemical-** It can be effectively controlled using any of several readily available general use herbicides such as triclopyr or imazapyr. Metasulfuron-methyl with a surfactant is also reported to be highly effective in controlling this plant. Follow label and state requirements.

References: www.forestimages.org, <http://plants.usda.gov>, www.nps.gov/plants/alien, Czarapata, Elizabeth J. Invasive Plants of the Upper Midwest, An Illustrated Guide to their Identification and Control, 2005 p. 90, Miller, James H. Nonnative Invasive Plants of Southern Forests, A Field Guide for Identification and Control, USDA FS SRS-62, p. 13, 72-73



Siberian Elm

Ulmus pumila L.

NATIVE RANGE: Northern China, eastern Siberia, Manchuria and Korea

DESCRIPTION: Siberian elm is a fast-growing tree in the elm family (Ulmaceae). Mature trees reach a height of 50-70 ft. (16-22 m.), with a round crown of slender, spreading branches. The small, smooth, dark green toothed **leaves** are about 1-2½ inches (3-7 cm) long wide, and pointed at the tip. The **bark** is rough, gray or



brown, and shallowly furrowed at maturity. **Twigs** are nearly hairless with small, blunt buds. Small green spring **flowers** lack petals and occur in drooping clusters of 2 to 5. After flowering, a single **seed** forms in the center of each smooth, flattened, circular, ½ in (10-15 mm) wide fruit.

ECOLOGICAL THREAT: Dry to mesic prairies and stream banks are vulnerable to Siberian elm invasion. Thickets of seedlings soon form around seed-producing trees, bare ground areas, animal and insect mounds, and other disturbed areas. Wind carries seed to distant areas where new colonies can form. This tough exotic survives under conditions not easily tolerated by other species, allowing it to take advantage of open ground and resources otherwise used by native plants. Fast growing seedlings of Siberian elm quickly overtake native vegetation, especially shade-intolerant species. This often leads to invasion by additional weedy species, compounding the problem.

DISTRIBUTION IN THE UNITED STATES: Siberian elm is known to occur in 43 states and reported to be invasive in natural areas in 25 states (AZ, IA, ID, IL, IN, KS, KY, MA, MD, MI, MN, MO, NE, NM, NV, OH, OK, OR, PA, TX, UT, VA, WA, WI, WV).



HABITAT IN THE UNITED STATES: Dry and mesic prairies and areas along stream banks in Minnesota and forested areas and high elevations in Arizona.

MANAGEMENT OPTIONS: For long term management of Siberian elm, reduction of seed sources is essential. **Manual-** During the growing season, seedlings can be hand pulled and girdled. On sites with few seed sources, the large trees can be cut down and resprouts trimmed. **Chemical-** To avoid resprouts after cutting or girdling, cut stumps may be treated with systemic herbicides such as glyphosate (e.g., Roundup) and triclopyr (e.g., Garlon). **Other-** A regular regime of prescribed burning in fire-adapted communities will kill seedlings.

REFERENCES: <http://plants.usda.gov>, www.nps.gov/plants/alien



Spotted Knapweed

NATIVE RANGE: Central Europe, central Russia, Caucasia, and western Siberia.

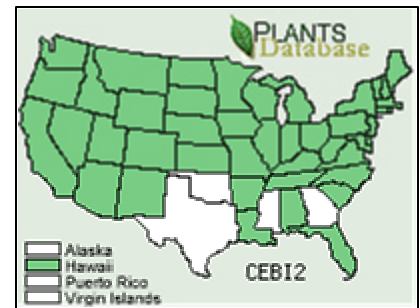
DESCRIPTION: Spotted knapweed, *Centaurea biebersteinii* DC. is a biennial or short-lived perennial member of the Sunflower (Asteraceae) family. Spotted knapweed typically forms a basal rosette of leaves in its first year and flowers in subsequent years. Rosette leaves are approximately 8 inches long by 2 inches wide, borne on short stalks, and deeply lobed once or twice on both sides of the center vein, with lobes oblong and wider toward the tip. The taproot is stout and deep. Flowering

stems are erect, 8 to 50 inches tall, branched above the middle, and sparsely to densely hairy. Stem leaves alternate along the stem, are unstalked, and may be slightly lobed, or linear and unlobed. Leaf size decreases towards the tip of the stem. Flowers are purple to pink, rarely white, with 25 to 35 flowers per head. Plants bloom from June to October, and flower heads usually remain on the plant. Flower heads are oblong or oval shaped, ¼ inch wide and ½ inch across, and are single or borne in clusters of two or three at the branch ends. Leaf like bracts surrounding the base of the flower head are oval and yellow green, becoming brown near the base. The margins of these bracts have a soft spine like fringe, with the center spine being shorter than the lateral spines. The brown, oval seeds are 1/16 to 1/8 inch long, with pale longitudinal lines and a short fringe on one end.

ECOLOGICAL THREAT: Spotted knapweed infests barrens, fields, forests, prairies, meadows, pastures, and rangelands. It out-competes native plant species, reduces native plant and animal biodiversity, and decreases forage production for livestock and wildlife. Spotted knapweed may degrade soil and water resources by increasing erosion, surface runoff, and stream sedimentation.

DISTRIBUTION IN THE UNITED STATES: (see green areas on map)

HABITAT IN THE UNITED STATES: Spotted knapweed is found at elevations up to and over 10,000 feet and in precipitation zones receiving 8 to 80 inches of rain annually. Spotted knapweed prefers well-drained, light-textured soils that receive summer rainfall, including open forests dominated by ponderosa pine and Douglas fir, and prairie habitats dominated by Idaho fescue, bluebunch wheatgrass, and needle-and-thread grass. Disturbance allows for rapid establishment and spread; however, spotted knapweed is capable of invading well managed rangelands.



MANAGEMENT & CONTROL:

Manual and Mechanical: Small infestations of spotted knapweed can be controlled by persistent hand-pulling done prior to seed set. Gloves should be worn because of the possibility of skin irritation. Because spotted knapweed can regrow from the base, care must be taken to remove the entire crown and taproot.

Biological control: Two species of seed head flies, *Urophora affinis* and *U. quadrifasciata*, are well-established on spotted knapweed. The larvae of these species reduce seed production by as much as 50% by feeding on spotted knapweed seed heads and causing the plant to form galls. Three moth species (*Agapeta zoegana*, *Pelochrista medullana*, and *Pterolonche inspersa*) and a weevil (*Cyphocleonus achates*) that feed on spotted knapweed roots have also been released. Biological control agents may be more effective when combined with other control methods such as herbicides, grazing, and revegetation with desirable, competitive plants.

Chemical: Picloram is a persistent herbicide used to control knapweed for three to five years when applied at 0.25 lb/acre at any stage of plant growth; or with clopyralid (0.24 lb/acre) or clopyralid (0.2 lb/acre) plus 2,4-D (1 lb./acre) applied during bolt or bud growth stage. In the absence of desirable native grasses, longevity of control may be increased by revegetating with competitive grasses and forbs.

Other methods: Long-term grazing by sheep and goats has been found to control spotted knapweed. Burning, cultivation, and fertilization typically are not effective on spotted knapweed unless combined with other methods of control.

References: www.invasivespecies, www.nps.gov

Tree-Of-Heaven

Ailanthus altissima (Mill.) Swingle



DESCRIPTION: Tree-of-heaven, also known as ailanthus, Chinese sumac, and stinking sumac, is a rapidly growing, deciduous tree in the mostly tropical quassia family (Simaroubaceae). Mature trees can reach 80 feet or more in height. It has smooth stems with pale gray bark, twigs which are light chestnut brown and large compound leaves. All parts of the tree, especially the flowers, have a strong, offensive odor, which some have likened to peanuts or cashews.



ECOLOGICAL THREAT: Tree-of-heaven is a prolific seed producer, grows rapidly, and can overrun native vegetation. Once established, it can quickly take over a site and form an impenetrable thicket. Ailanthus trees produce toxins that prevent the establishment of other plant species.

DISTRIBUTION IN THE UNITED STATES: Tree-of-heaven is widely distributed across the United States, occurring in forty-two states, from Maine to Florida and west to California.



HABITAT IN THE UNITED STATES: Fields, roadsides, fencerows, woodland edges and forest openings.

CURRENT MANAGEMENT APPROACHES:

- Young seedlings may be pulled or dug up, preferably when soil is moist. Care must be taken to remove the entire plant including all roots and fragments. Cutting large seed producing female trees would at least temporarily reduce spread by this method.
- The most effective method of ailanthus control seems to be through the use of herbicides, which may be applied as a foliar (to the leaves), basal bark, cut stump, or hack and squirt treatment.
- Basal bark application is one of the easiest methods and does not require any cutting. It works best during late winter/early spring and in summer.
- The hack-and-squirt or injection method is very effective and minimizes sprouting and suckering when applied during the summer.
- The cut stump method is useful in areas where the trees need to be removed from the site and will be cut as part of the process.
- A potential biological control for ailanthus may lie in several fungal pathogens, (*Verticillium dahliae* and *Fusarium oxysporum*) that have been isolated from dead and dying ailanthus trees in New York and in southern and western Virginia.

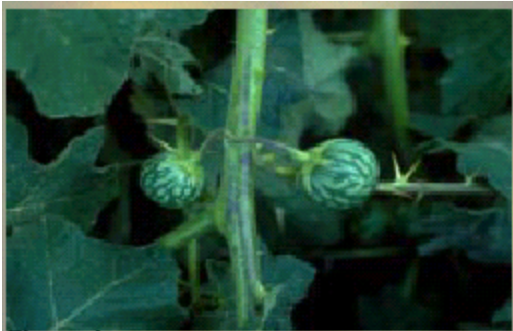
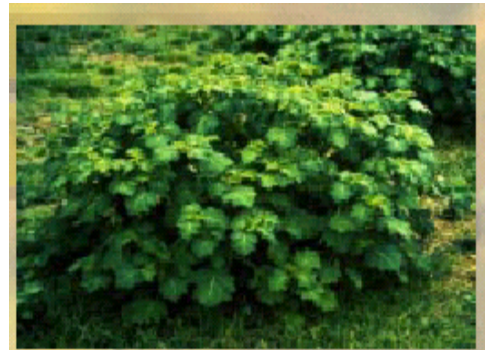
References: <http://www.nps.gov/plants/alien/fact/aial1.htm>
<http://www.nps.gov/plants/alien/fact/aial1.htm>

Tropical Soda Apple

Solanum viarum Dunal

CONCERNS: Tropical Soda Apple (TSA) is a Federal Noxious Weed. TSA can over take pastures, roadsides and recreational areas making them nearly impenetrable to domestic animals, large wildlife and man.

DESCRIPTION: TSA plants can reach several feet in height and width. Fig-shaped leaves, stems, petioles and pedicles are armed with thorn-like, straight prickles up to 3/4 inch long.

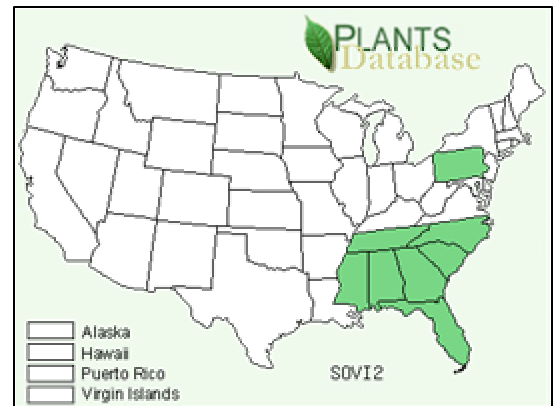


Flowers have white curved petals. Immature fruit are green with a watermelon-like mottled appearance; mature fruit are yellow and are 1-to-1 1/2 inches in diameter.



DISTRIBUTION: This exotic weed has been in Florida for several years and has recently moved into Georgia, Alabama, Mississippi, Pennsylvania, and South Carolina.

SPREAD: Mature fruit are eaten by livestock and wildlife. Viable seed pass through the animal and are defecated. Seed can also be spread as contaminants of hay, sod, seed, composted manure and potting media.



HABITAT: Pastureland, roadsides, cattle yards and other areas frequented by animals or that have received mulches, sod or seed from areas infested by TSA.

CONTROL: Control programs are available.



*Biological control field plots showing control 2 months post treatment in 1998. The bacterial pathogen **Ralstonia solanacearum**.*

Yabuuchi was applied using the Burch Wet Blade Mower to plots on left side that were previously infested with tropical soda apple.

Reference: www.invasive.org, <http://plants.usda.gov>

YELLOW STARTHISTLE

Centaurea solstitialis L.

DESCRIPTION: Yellow starthistle is an annual herbaceous plant in the aster family (Asteraceae). Plants are gray-green to blue-green, grow from 6 in. to 5 ft. (15 cm to 15 dm) in height, and have deep taproots. Flowers are bright yellow with sharp spines surrounding the base, giving the plant a particularly menacing appearance and a painful response if touched. Stems and leaves are covered with cottony wool. Basal leaves are 2 to 3 in. (6 – 7 cm.) long and deeply lobed. Upper leaves are short (0.5 to 1.0 in.; 1 to 2.5 cm) and narrow, with few lobes.



DISTRIBUTION IN THE UNITED STATES: Yellow starthistle is a strong invader that occurs in forty-one of the United States. Yellow starthistle is most concentrated in California, where the plant infests nearly 12 million acres of rangeland and wildland. It is also reported to be invasive in natural areas of Idaho, Oregon, New Jersey, Utah, and Washington, and five western national parks - Death Valley National Park, Glen Canyon National Recreation Area, Redwood National Park, Sequoia and Kings Canyon National Parks, and Yosemite National Park.

HABITAT: Plants typically thrive in full sunlight and deep, well-drained soils, where annual rainfall is between 10-60 inches, and is especially common in disturbed areas such as roadsides. It chokes out the native plants, reducing biodiversity, and wildlife habitat and forage.

BIOLOGY & SPREAD: Spread of yellow starthistle is by seed and each seed head can produce from 35 to approximately 80 seeds. However, the seeds have no wind-dispersal mechanisms so few seeds move more than two feet from the parent plant without assistance.

CURRENT MANAGEMENT APPROACHES: When driving, walking, or moving livestock through infested areas, clothing, vehicles, and animals should be inspected and cleaned to remove any seeds before continuing on into uninfested areas.

>**Biological Control:** Six biological control insects have been released in the United States for yellow starthistle control: *Bangasternus orientalis*, *Eustenopus villosus*, *Urophora jaculata*, *Urophora sirunaseva*, *Larinus curtus*, and *Chaetorellia australis*. Of these, five became established and three (*B. orientalis*, *U. sirunaseva* and *E. villosus*) are widespread.

Also, the accidentally introduced fly, *Chaetorellia succinea* has a strong affinity to yellow starthistle and is found almost everywhere yellow starthistle occurs. All of these insects attack the seed head of yellow starthistle, effectively limiting the number of seeds the plants are able to produce. Current research indicates that the insects have reduced seed yield by at least 50%. The rust fungus, *Puccinia juncea* var. *solstitialis* was released in California in 2003. It is too early to know if this rust will establish and eventually cause high mortality of yellow starthistle in the wild. Several more fungi and insects are currently being tested for introduction into the United States.

>**Chemical Control:** Application of the systemic herbicides clopyralid or picloram between December and April seems to be the most effective. Application during the winter encourages the growth of other, more desirable, plants.

>**Mechanical Control:** Mowing is effective during the early flowering stage or when most buds have produced spines. However, it is only successful when no leaves are present below the level of the cut.

>**Grazing:** Sheep, goats, and cattle graze on yellow starthistle in early spring, before the flower's spines develop. Goats also graze plants in the spiny or flowering stages. Grazing reduces biomass and seed production.



REFERENCES: www.nps.gov, www.invasive.org

