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Saltcedar
Biology and Management

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. ORE THAN 500,000 ACRES IN Texas are infested with saltcedar, a small tree that poses major problems along rivers in the western half of the state.

Saltcedar reduces the diversity of plant and animal life, uses tremendous amounts of water, and causes flooding and fire hazards. It has choked out native vegetation, creating a monoculture in most locations along major rivers and their tributaries in western Texas. It is an increasing problem in central and coastal areas of the state as well.

A native of Europe and Asia, saltcedar was introduced in the United States as an ornamental in the early 1800s. It was sold by nurseries throughout the 1800s, and in the early 1900s many people began planting the trees along waterways and stream banks for erosion control.

Although the plant clearly excelled in its intended purpose of stabilizing stream banks, the negatives quickly outweighed the positives. By the 1920s, its potential problems were becoming increasingly clear, as it rapidly spread from one watershed to the next. Saltcedar is now found across the western half of Texas and throughout the U.S. Southwest. One of the major factors contributing to the spread of saltcedar has been the construction of dams and controlled river flows that have provided conditions conducive to its spread.

Saltcedar leaf excreting salty water.

Saitcedar seedling.

Saltcedar flower.

Saltcedar flowers.

Most saltcedar (or tamarisks) are deciduous shrubs or small trees typically growing 10 to 30 feet tall and forming dense thickets. A few species are evergreen. The plant has slender branches and dense gray-green foliage. Young twigs and stems have a smooth, reddish brown bark. The leaves are very small and scale-like, about 1/16 inch long. They often have a crust-like scale from salt secretions. As its name implies, saltcedar can tolerate salinities as high as 15,000 ppm, whereas natives such as cottonwoods and willows typically must have salinities below 2,500 ppm.

From March to September, the plant produces small white, pink or purple flowers in dense masses on its stem tips. It can produce up to 500,000 seeds per plant each year during April through October.

Biology and ecological impacts

Saltcedar can rapidly colonize riparian (stream bank) and sub-irrigated (shallow water table) areas. It can survive in a wide variety of environmental conditions. In the United States, it has no natural enemies to keep populations in check.

Many characteristics of the plant make it a threat to our natural environment:

- It produces hundreds of thousands of small, easily dispersed seeds throughout the growing season.
- It is cross-pollinated by wind.
- The seeds can be dispersed long- or short-range, mainly by wind or water.
- It vigorously reproduces from root buds as well as seeds.
- The leaves can excrete salt on the soil surface, which can kill more-desired vegetation nearby.
- The plant out-competes native vegetation for sunlight, moisture and nutrients.
- After a fire or mechanical disturbance, it sprouts vigorously from roots.
- Saltcedar can germinate, adapt and survive in a wide range of environmental conditions.
- Acting as a "well plant," it aggressively sends roots down to groundwater and uses large amounts of water through transpiration.
- Controlling the plant is expensive and difficult.

Saltcedar seedlings establish most often in areas where soils are seasonally saturated at the surface, such as where water has recently receded from flooding. Although the seeds remain viable for only a few weeks, they germinate rapidly - generally in less than 24 hours - when soils are saturated, even under highly saline conditions.

For the new seedlings to survive, the soil must remain saturated for several weeks after germination. Once established, the young plants can grow faster than most native plants.

At first, the aboveground growth of seedlings is slow, as the plant uses most of its energy to send down a tap root. The initial tap root grows downward rapidly, with little branching until it reaches the water table. Once it reaches the water table, the secondary branching of the root becomes profuse. One study documented a saltcedar root

Saitcedar dominating a riverbank in western Texas.

at 16 feet deep, where it was 3/16 inch diameter and still growing toward the water table 26 feet deep.

When mature, the roots generally occupy the capillary zone above the water table, with some later roots in the saturation zone. Mature plants can survive prolonged droughts or periodic flooding. Because it drips salt on the soil surface, the only plant species that can survive in its understory are xeric (requiring little water) or halophytic (salt-tolerant).

Saltcedar has been estimated to use from 14.4 to 115.2 inches of water (in rainfall equivalents) per year. On the upper portion of the Pecos River in Texas, an acre of dense saltcedar is estimated to use 5 to 7 acre-feet of water every year. With a conservative estimate of more than 6,500 acres of water-thirsty saltcedar infesting the river in this area, the annual water use by saltcedar exceeds 10 billion gallons. This is about the same amount of water that is consumed annually by a city with a population of 145,000.

Because of this high water use, the water table often declines in areas dominated by mature saltcedar. Two main factors affect the amount of water used by saltcedar:

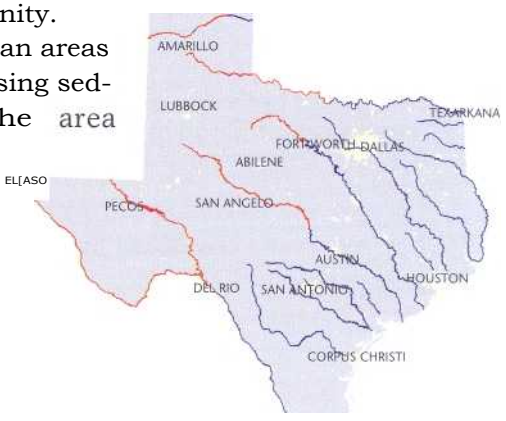
- The amount of leaf area. Trees with heavier, denser foliage use more water.
- The depth to the water table. Trees growing in areas with a shallow water table transpire more water than saltcedar in areas where the water table is deeper.

Other factors affecting water use include:

- Weather conditions.
- Tree density.
- Soil type.
- Water availability and salinity.

The plant also disrupts riparian areas by reducing streamflow, increasing sedimentation and increasing the area inundated during floods.

Few natural events affect saltcedar populations. It adapts extremely well to a wide range of environmental conditions, including highly saline water or soils, drought conditions and periodic flooding. However, saltcedar populations have been reduced naturally by changes in the depth of the water table or by



Red portions of the river indicate areas of saitcedar infestations.

flooding in which inundation lasts for more than 90 days.

Saltcedar control is not a one-time job. The plant is extremely hard to control because it will re-sprout after fire or mechanical removal of the aboveground parts of the plant. To manage infestations effectively, you must devise a long-term plan and use a combination of methods.

Mechanical control: Grubbing techniques can be somewhat successful if you take care to extract the entire crown and root portions from the ground. However, this treatment method is very expensive and can be limited by topography. Mechanical control methods to remove the standing debris following herbicidal control should wait a minimum of 2 years after initial treatment.

Biological control: Insects that attack the plant may soon be available to help maintain reduced populations.

Chemical control: Herbicides can be used for both individual plant treatment (IPT) and broadcast applications. Suggested chemical control recommendations are given for both in Table 1.

Individual plant treatment (IPT method for saltcedar.

For IPT leaf spray applications, you must be sure to treat all of the leaves, paying specific attention to covering the growing tips of the branches. Adding a blue dye to the herbicide mix can help you cover the plant completely and identify treated and untreated areas. Any part of a plant left untreated may survive. Table 2 gives mixing instructions for foliar individual plant treatments.

Another effective treatment for younger, smooth-bark plants is the basal stem spray method with Triclopyr (RemedyT"`). You can also use this mixture (Triclopyr + diesel or vegetable oil) to treat stumps immediately after cutting. This treatment works best when applied during the growing season when plants have mature leaves. For more detailed information on IPT procedures, see *How to Put a Halt to Saltcedar,* Texas Cooperative Extension publication L-5398.

For broadcast applications (see rates in Table 1), use at least 10 gallons per acre total spray volume with a surfactant. Tank mixing Imazapyr (ArsenaIT") and Glyphosate is a good choice for younger stands, with trees generally up

Mechanical control of saltcedar.

to 10 to 12 feet tall, and 2- to 3-inch trunk diameters. For stands with older, taller, and larger diameter trees at higher densities per acre, consider using Imazapyr alone.

Research on the Pecos River in Texas has shown that on winding river systems with narrow bands of saltcedar along the banks, better control can be achieved when the herbicide is sprayed from rotary-wing aircraft (helicopters) than with fixed-wing aircraft. Rotary-wing aircraft provided better control because of slower air speed and less spray pattern distortion during turns. Larger droplet size and higher total spray volume (15 gallons per acre) may be equally important.

High-volume aerial herbicide application on saltcedar.

Herbicide	**Broadcast Rate**	PT **Rate**	Spray Volume	Time to Apply
Imazapyr'	1 lb. a.i./acre	1 % (leaf spray)	Minimum 10 gallons/acre for aerial or ground broadcast sprays. Add 1 to 2 quarts surfactant' per 100 gallons water. Thoroughly wet foliage for individual plant treatment.	July through September, or until leaves begin to turn yellow.
Tank mix Imazapyr' with Glyphosate'	1/2 lb. a.i./acre Imazapyr + 112 lb. a.i./acre Glyphosate	1/12 % Imazapyr + 1/2 % Glyphosate (leaf spray)		
Triclopyr'		25 % in diesel fuel oil (stem spray or stump treatment)	Apply to lower 12 to 18 inches of trunk; do not spray to point of runoff. Apply completely around trunk.	Growing season when plants have mature leaves.

Current trade name for Imazapyr is ArsenalTM, and for Triclopyr is RemedyTM. Many trade names are available for Glyphosate including Roundup OriginalTM, Roundup UltraTM, GlyproTM, Touchdown TM and others. Read the label for amount of active ingredient for different trade names.

[2] When spray application may come in contact with water, use a surfactant with an appropriate aquatic label.

Ingredient	Percent	1 **gal**	**4 gal**	**15 gal**	**25 gal**	**50 gal**	**100 gal**
Imazapyr'	0.5	0.64	2.6	9.6	16.0	32.0	64.0
Glyphosate'	0.52	0.64	2.6	9.6	16.0	32.0	64.0
Surfactant'	0.25	0.32	1.3	4.8	8.0	16.0	32.0
Dye	0.25	0.32	1.3	4.8	8.0	16.0	32.0

Current trade name for Imazapyr is ArsenalTM. Many trade names are available for glyphosate including Roundup OriginalTM, Roundup Ultra TM, GlyproTM, Touchdown TM and others. Consult the label for product formulation.

[2] 0.5% based on 4 lb per gallon product.

Experiments have shown that fixed-wing aircraft can be effective on large-block acreages such as lake basins. Ground broadcast application may be feasible for limited areas with relatively new infestations of young trees.

Regardless of the type of herbicide treatment used, timing is critical.

Herbicide application along the Pecos River in Western Texas.

Research has shown that saltcedar is most susceptible to foliar applications of Imazapyr in late summer to early fall, generally from late July through September.

Because Imazapyr is a very slow-acting compound, you will not see results from applications until the next spring. Also, saltcedar in standing water is much harder to kill and control rates are reduced.

No matter what treatment choice is made, remember to plan for follow-up maintenance to control unwanted re-sprouts or seedling re-establishment.

Saltcedar infesting a lake in western Texas.

Texas Water
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