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Managing Saltcedar

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Saltcedars (*Tamarix chinensis, T. ramosissima,* and *T. parvifolia*) are invasive, shrubby trees that are rapidly colonizing riparian areas in Nevada. *Tamarix ramosissima* is the principle invader. They were introduced into the United States in the early 1800's as ornamentals and to prevent soil erosion along streams. These trees have escaped cultivation and are spreading rapidly throughout the desert southwest, Rocky Mountains and Great Basin. A fourth species, Athel (*T. aphylla*) is a very tall single-trunked, evergreen that is invasive in Southern Nevada. Less hardy than the others, it grows in Clark and southern Nye Counties.

In Nevada, saltcedar occupies Baltic rush meadows along the Walker River, saltgrass communities or former croplands at Stillwater and the Humboldt Sink, and arroyos in the upper pinyon/juniper zone of the Stillwater Range at Fence Maker Pass. The Colorado, Muddy and Virgin Rivers are heavily infested in southern Nevada. Native plant communities surrounding springs, seeps, streams and lakes are also threatened. Even isolated arroyos are being occupied by saltcedar throughout Nevada.

DESCRIPTION AND HABITAT

Saltcedar (*T. ramosissima*) is a deciduous shrub or small tree that grows 20 to 25 feet tall. Its gray-green leaves and wispy limbs give it a feathery appearance. The striking, small, pink to white flowers cover the upper branches in spring with occasional sparse flowering over the season (Fig. 1). It profusely produces tiny seeds each year that are spread by wind, water and animals.

Unlike native willows and cottonwoods that produce seeds for a short period in the spring, saltcedar

Figure 1. Wispy saltcedar limbs in bloom.

produces seeds over the entire summer as long as soil moisture is available. Spring-produced saltcedar seed has near 100 percent germination over a wide range of constant or alternating temperatures. Seed produced later has less viability. Each plant can produce 500,000 or more seeds. One hundred seeds per square inch have been produced within a saltcedar forest. Once wetted, embedded in soil or not, saltcedar seeds germinate in 24 hours. If the soil dries rapidly, the seedlings die. For establishment, the soil must dry slowly enough for the roots to grow into moisture deeper in the soil profile.

Saltcedar also reproduces vegetatively from the stems, crown and roots. New growth occurs readily when young plants are grazed or mowed, or the trunk or shoots are removed or killed by fire or severe drought.

Saltcedar uses more water than native cottonwoods, poplars and willows. It grows best in riparian sites such as stream banks, saline meadows, seasonally saturated washes, and lands that have seasonally high

water tables. It is classified as a phreatophyte, meaning it uses very large amounts of groundwater. Therefore, it lowers the water table that supplies springs and shallow wells. Dried up springs in Nevada have recovered after the surrounding saltcedar has been removed.

Saltcedar is able to use salty water. It does this by absorbing the salts through cell membranes. It avoids the toxic effects by using special glands to excrete the salts and by dropping salt-filled leaves. The leaves dropped each fall accumulate to a considerable depth under the canopy. Through this process, saltcedar acts as a salt pump concentrating salts from deep in the ground onto the soil surface. Over time, salts in the mulch layer kill existing plants and prevent others, especially desirable forage species, from becoming established. As a result, the ground under a saltcedar or within a saltcedar boscage is void of plants except, on occasion, another salt tolerant species.

SALTCEDAR ASSOCIATED PROBLEMS

Studies in New Mexico and Utah show saltcedar uses four to thirteen acre-feet of water a year; much more water than native trees and shrubs. It has an extensive, deep root system that absorbs water from the surrounding soil lowering the water table and killing most native plants. Competition for water resources in the west is growing yearly, especially where large saltcedar communities exist.

A normally functioning, healthy river (Fig. 2) has a

Figure 2. A variety of plants contribute to a healthy, functioning, beautiful river or stream.

narrow, deep, meandering flow. Saltcedar reduces a river's flow of water. It uses soil moisture that would usually contribute to the stream and traps sediment along the banks and in the river. This increases the size of the flood plain spreading water over a larger area, which increases evaporation and water use by plants (often extensive saltcedar woods). When infested with saltcedar, a healthy river becomes an impenetrable, unproductive saltcedar forest that may use one third more water from the river than a similar stand of native trees (Fig. 3). A saltcedar-dominated stream functions poorly, is unattractive, changes native habitats, supports less wildlife, spoils recreational uses and affects water quality.

Cattle, sheep and goats will graze saltcedar but it is nutritionally poor forage for both livestock and wildlife. They prefer not to eat it and only do so when little else is available. Cattle eat only the young sprouts early in the year. Aggressive grazing by sheep may provide some control, but overgrazing stimulates suckering and speeds the area's conversion to a pure saltcedar stand.

Saltcedar provides cover for wildlife, but animal and plant diversity is reduced. The impenetrable stands make recreational access almost impossible on foot, horse or vehicle. Hunting and fishing are greatly restricted. Rounding up livestock hiding in a thicket is a chore.

CONTROL STRATEGIES

Effective management requires determination and a

Figure 3. Saltcedar stands along the Muddy River at Glendale, NV prevent fishing.

multi-year commitment. Efforts should be taken to prevent site disturbances by fire, overgrazing, and mechanical damage, that leave the site open for saltcedar invasion. Elimination of upstream infestations is required to effectively control saltcedar in a watershed. Eradication of the plant immediately after discovery is best before saltcedar becomes well established. After saltcedar is removed, it is requisite that a competitive stand of desirable plants be established to prevent reinvasion of the area by saltcedar.

BIOLOGICAL CONTROL

Biological control applies natural enemies to weeds. Insects, disease causing organisms, and livestock have all been used in successful biological control efforts on a variety of invasive weeds.

Two insects, a mealy bug (*Trabutina mannipara*) and leaf beetle (*Diorhabda elongata*), have been released in the United States to attack saltcedar. The

mealy bug is not adapted to colder, drier environments and was released outside Nevada. The leaf beetle was released at Schurz, Stillwater, and Lovelock, Nevada after it was established that it eats only saltcedar and not valuable natives, ornamentals or crops. Research continues on its adaptability, reproductive ecology and predation of saltcedar in Nevada.

MECHANICAL CONTROL

Plowing, cutting, mowing, chaining and burning have been attempted to control saltcedar. All have failed on large-scale projects because saltcedar resprouts profusely following mechanical treatments. Success has been achieved after a fire when the root crowns are removed before the next growing season and all new growth is removed as it occurs.

Flooding saltcedar for one or two years is effective. Small plants, if completely covered, easily succumb. The root crown and most of the shoots must be covered completely for months to successfully kill larger plants.

CHEMICAL CONTROL

Only two herbicides effectively control saltcedar, triclopyr (Garlon 4) and imazapyr (Arsenal). After applying either product, do not disturb the saltcedar for two years. This allows the herbicide time to move throughout the entire plant, especially the root system, and kill it. Applying 2,4-D, picloram, or glyphosate to saltcedar does not control it.

Saltcedar usually produces a multi-stemmed shrubby tree. In the Walker River Delta, there are 60,000 stems per acre, many of them less than one inch in diameter. This makes navigating the area and applying chemicals difficult, even hazardous. Exercise care in handling herbicides while moving among the stems to avoid spilling it on yourself, others, or contaminating the area.

Cut saltcedar stems off at ground level and immediately paint the cut surface with full strength Garlon 4, the ester formulation of triclopyr. (Specific instructions limit the use of triclopyr near water and in wetlands.) Apply the herbicide with a brush within ten minutes, sooner is better. Triclopyr can also be applied as a basal stem treatment mixed with metylated seed oil as a carrier (see the label for directions on mixing the two). Stems must be treated all the way around, which can be difficult in heavy stands. Stem treatments can be used on stems up to three inches in diameter. This requires less labor than painting the cut surface of stems. Both applications use large amounts of herbicide per acre, are labor intensive, and time consuming.

The only effective foliar-applied herbicide for saltcedar is imazapyr. Follow the label instructions regarding application rates, use of an oil carrier, and the types of application equipment to use. Again, do not disturb saltcedar treated with imazapyr for two years or burn the treated stand after it has dried. For additional insights see Table 1.

When applying herbicides, always follow the directions on the label. Failure to do so violates the law. Following the instructions protects the applicator, other workers, non-target plants and animals, and our environment. It also reduces liability for any damages incurred.

SUSTAINABLE MANAGEMENT

Treated areas should be revegetated and properly managed. Successful saltcedar control and revegetation is difficult for these reasons:

- The accumulation of salt on the soil's surface hinders the establishment of desirable plants.
- The understory species in many saltcedar infestations is desert saltgrass, which is damaged or killed by imazapyr. The area has to be tilled to break up the saltgrass sod and turn the salts under before seed of other species can be broadcast or drilled.
- Removal of the limbs and roots of saltcedar is difficult and expensive. If the trees are large, chainsaws and a caterpillar are used to remove the biomass and deep rip the roots.
- Burning the treated area results in sprouting from the roots. Two growing seasons must elapse for the herbicide to kill the roots so that the saltcedar will not regrow when the shots are removed or burned.

Other aspects must be considered when controlling and removing saltcedar. The plant plays an important part in bank stabilization on Nevada's desert river systems. Loss of stabilization must be compensated for in any control program. Control of saltcedar in the Walker River Delta and the Virgin River Valley may result in additional erosion of highly salt-affected soils, increasing the salt content of nearby waters.

Along the Carson, Humboldt, Muddy, Truckee, Walker and Virgin Rivers or other riparian communities where saltcedar is established, selective control is necessary. Reestablishment of native woody vegetation may prove difficult requiring changes in management of the riparian woodlands to prevent pollution of nearby waters and re-establishment of saltcedar.

Table 1. Considerations for effective chemical treatments to control saltcedar.

Considerations	Treatment Methods		
	Cut-stump Surface	**Basal Bark**	**Foliar Spray**
Plant Stage	All stages, triclopyr in summer and fall.	All stages, but most effective applied to stems less than 3" in diameter treated when dormant compared to spring or summer applications.	Best results occur with an aerial application of imazapyr in the late summer to early fall (August – September). Stop when fall dormancy begins.
Treatment Process	Paint the cut stumps immediately with triclopyr; within 10 minutes, sooner is better. Use a water-soluble dye to track the treated plants.	Spray the lower uncut 15" of the plant with triclopyr in an oil carrier. Be sure to spray the entire bark surface of the stem.	Herbicide and wetting agent are applied via spray devices. Ground based sprayers (ATV's or trucks) and aircraft are effective.
Herbicide Application	Thoroughly treat each stump, especially the cambium layer just inside the bark. Stumps must be wetted completely for good control.	Low-volume application: mix 25 to 30 gallons Garlon 4* with oil to make a 100-gallon mixture. Apply to plants with stems less than 3" in diameter. Inconsistent results.	Apply Arsenal* (Imazapyr) with the proper surfactant until the saltcedar is wet, but not dripping. Do not disturb the crown and roots of large trees for 2 years to allow imazapyr to move throughout the tree to prevent re-sprouting from the roots.
Effectiveness	Most popular and effective in areas unsuitable for aerial or ground rig applications. Use near water to avoid drift and contamination of water.	Retreatment of the stems that were not killed is difficult compared with the cut stump treatment. Use where it is very rocky or labor is not available for treating cut stumps.	Effective on large stands with few non-target plants growing among the saltcedar. The shoots normally die within one year, the roots within two years.
Retreatment	Is necessary to clean up missed stumps.	May need to retreat the following year.	If necessary.

*Trade or common names have been used to simplify information; no endorsement by the University of Nevada Cooperative Extension is intended nor implied. Likewise criticism of products not listed is neither implied nor intended.

Be cautious when using chemicals. Be careful not to treat irrigation ditches, non-target plants, or surface waters. For more information contact your local University of Nevada Cooperative Extension office.

BENEFITS OF SALTCEDAR CONTROL

Controlling saltcedar and revegetating the land improves riparian habitats and increases biodiversity. Using the woody biomasss of saltcedar for value added manufacturing in rural Nevada may be a viable option. Conversion of saltcedar woodlands to more water efficient plants allows water in a watershed to be utilized for more beneficial uses. Until alternative vegetation becomes established on the infested land, actual measurements cannot be taken to determine whether or not water is conserved and available. Control of saltcedar also improves grazing, wildlife habitat, and recreational uses along waterways.

ADDITIONAL RESOURCES

1) Ball, D., P.J.S. Hutchinson, T.L. Miller, D.W. Morishita, R. Parker, R.D. William and J.P. Yenish. 2001 Pacific Northwest Weed Management Handbook. Oregon State University. Corvallis, OR. pp. 184-203.
2) Bussan, A.J., S.A. Dewey, W.E. Dyer, M.A. Ferrell, S.D. Miller, J. Mickelson, B. Mullin, R. Sheley, R. Stougaard, M.A. Trainor, T.D. Whitson and D. Wichman. 2001-2002 Weed Management Book. Montana, Utah and Wyoming Cooperative Extension Services. pp. 222, 224, 273.