Noxious Range Weeds

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Saltcedar (Tamarisk): Classification, Distribution, Ecology, and Control

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Abstract

Saltcedar or tamarisk (*Tamarix* spp.) is a woody phreatophyte found along the drainage ways of many river systems in the United States, especially in the West. The shrubby tree was introduced into the United States as an ornamental in the early 1800s, but escaped cultivation in the mid to late 1800s and invaded many river systems, often replacing the native vegetation. In many, places the trees form dense stands which congest river channels, creating potential flood hazards. There have been claims that saltcedar evapotranspires considerably more ground water than the displaced native vegetation, thereby affecting the total flow of the river. Cited saltcedar benefits include nesting areas for doves and flowers which are a source of pollen and nectar for honey bees. Saltcedar has been classified as one of the 10 worst noxious weed in the United States. Its growth characteristics make it very difficult to control by either mechanical or chemical means. With a favorable supply of groundwater, there will probably not be a natural reversal in saltcedar stand compositions. Any type of saltcedar control must be part of a complete riparian habitat management program which evaluates merits of control, environmental effects, and public acceptance.

Introduction

Saltcedar or tamarisk (*Tamarix* spp.) is a woody phreatophyte, originally introduced into the United States from the Middle East as an ornamental shrub. Some benefits attributed to saltcedar are possible nesting sites for doves and a source of pollen and nectar for honey bees. It escaped from cultivation and is now found along the riparian drainageways of many river systems, especially in the western U.S. In places, trees have become so dense that they congest the river channels, creating potential flood hazards. There have been claims that the plant evapotranspires considerably more ground water than the displaced native vegetation which may affect the total flow of the river. Saltcedar's growth characteristics and persistence makes it difficult to control by either mechanical or chemical means. Robinson (1) stated: "...saltcedar is without doubt the outstanding problem phreatophyte of the Southwest because of its aggressive nature and thirst for water." He listed it as one of the 10 worst noxious weeds in the United States.

Description and Classification

Saltcedar is a phreatophytic shrub or small tree that may grow up to 10 m tall. Its slender upright or spreading branches covered with a smooth reddish-brown bark that becomes furrowed and ridged with age. The branches reach the ground and form a narrow or rounded crown. The small, scalelike, appressed leaves are deciduous. The flowers are crowded into numerous clusters 2 to 5 cm long on the ends of the twigs and are present throughout the growing season (2). The leaves secrete salt as a white bloom and may be covered with a salty fluid during periods of high humidity (3). The seed capsule is reddish brown which splits into three to five parts with many tiny hairy seeds (4).

The taxonomy of saltcedar is uncertain. It is a deciduous plant in the genus *Tamarix*, one of four genera in the Tamaricaceae, the tamarisk family (5). Four species have been commonly referred to as saltcedar: *Tamarix gallica* (4,6); *T. pentandra* (7-9); *T. ramosissima* (10,11); and *T. chinensis* (12). Most land managers use the common names of saltcedar or tamarisk for all of these indistinct species. The name "saltcedar" is believed to come from the small scale-like leaves that resemble cedars and the salty residue that collects on the foliage (13). The common name "tamarisk" is often confused with "tamarack," a coniferous tree.

Distribution

Saltcedar is believed to be a native to southern Europe, northern Africa, and eastern Asia (5) and is reported to have grown for centuries in the Jordan River Valley (13). The specific time when the plant was introduced into the United States is not firmly known. Horton (14) reported that saltcedar was introduced in the eastern United States in the 1820s. Seed and nursery catalogs listed the species for distribution as a landscape ornamental plant as early as 1856. It is believed that the plant escaped from these early plantings into the river basin areas where it has become a noxious weed problem (9). A saltcedar herbarium record was made in 1884 on the San Jacinto River in Texas and a specimen was collected in Fairmont Park, Philadelphia, in 1887. Other records of collections were infrequent until 1915, when the name saltcedar came into popular usage.

The extent of saltcedar infestations was not considered a major problem in the period prior to 1915. Turner (15) referenced reports of saltcedar spread in the Canadian River flood plain of Oklahoma from 1920 to 1935, along rivers in Utah from 1935 to 1955, and along the Arkansas River in Colorado from 1936 to 1957. The invasion of saltcedar was most noticeable in the valleys of central New Mexico (Figure 37.1) (16).

Similar results were documented for the upper Gila River in Arizona (15). It now grows along the lower elevation drainageways of many major rivers throughout the lower half of the United States and, at present, is found across the midsection of the United States from the central valleys of California to the southeastern coastal plains (17) (Figure 37.2). Saltcedar is found in nearly every watercourse in the southwestern states at elevations below 1830 m. It is rapidly spreading into drainageways in Oregon, Wyoming, western Nebraska, and Kansas, and is becoming a serious problem along the tributaries of the Missouri River and perhaps in the entire Missouri River system (18). Robinson (19) estimated that a total of 364,000 ha in the United States were infested by saltcedar in 1960 and the area was expected to expand to 526,000 ha by 1970.

Ecology

Saltcedar is a rapid-spreading phreatophyte on moist riparian areas along river channels and is dependent upon groundwater for growth and survival. In 1957, it was considered one of the 10 worst unwanted water-using plants, with an annual rate of water consumption greater than any other phreatophyte (1). It was believed to be the main reason for low

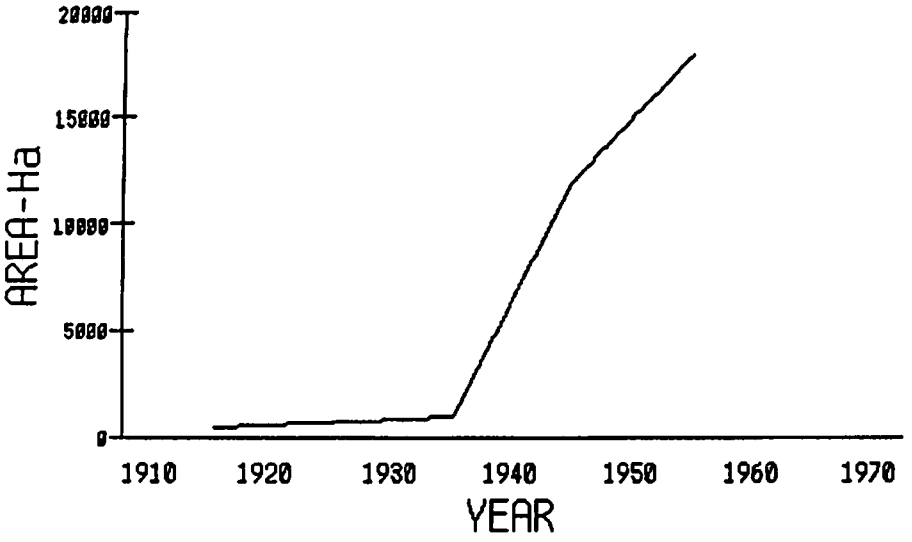

FIGURE 37.1 Increase in the extent of saltcedar in the Rio Grande river valley of New Mexico from Bernardo to San Macial (16).

water deliveries in the Rio Grande River to the Elephant Butte Reservoir in southern New Mexico as required by the Rio Grande Compact (20). Water use by saltcedar has received much research attention with extensive studies incorporating sophisticated techniques such as energy budgets and lysimeters (21-23) but it is still not certain if saltcedar uses more water than the vegetation it replaces (24).

Saltcedar spreads by seeds and resprouts vigorously from roots if the top growth is damaged or removed. The seeds are shed throughout the growing season (2) and usually germinate within 24 hr after moistening. Seeds have been known to germinate while floating on the water during May and June in Arizona. The germinated seeds float to the shore and become established on the saturated soil as the water recedes.

Saltcedar seedlings are capable of surviving long periods (several weeks) of submergence (25) and are tolerant to saline soils (26). Early seedling growth is slow, with plants reaching only 10 cm after 60 days. During the early seedling stage, the soil must be kept moist as most young seedlings can be killed by one day of drought. Older plants grow rapidly and are alkali-tolerant and drought-resistant (4). After the plants become established, saltcedars can withstand severe droughts of several months or more. Saltcedar can also be readily established from cuttings if planted in moist soil (9).

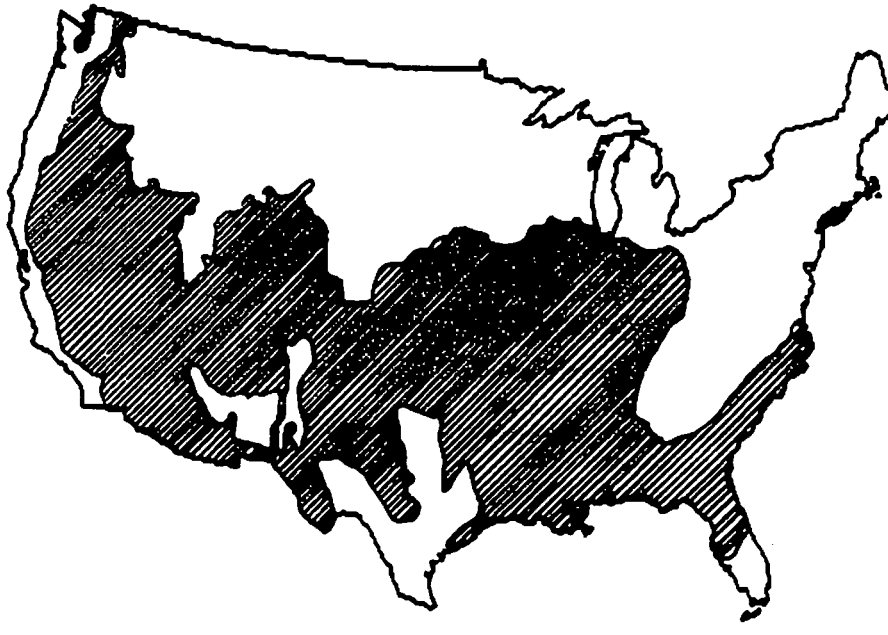

FIGURE 37.2 Extent of saltcedar invasion in the United States by 1938 (17).

The saltcedar will invade a well-lit bare, moist seedbed, often invading an area as a few scattered seedlings. It then rapidly spreads into other adjacent, favorable areas. Saltcedar may grow in association with mesquite, willows, and cottonwoods. However, after the saltcedar has become firmly established in large numbers, the native plants are almost completely excluded due to shading and salt accumulation under the plant canopy. Everitt (27) indicated that river peak discharges in the spring favored cottonwoods but peak discharges in the summer favored saltcedar.

Saltcedar has changed the plant successional stages in some areas and will ultimately dominate many riparian communities (28). Once saltcedar becomes established, even large changes in soil moisture will not completely eliminate it (15). As long as there is an abundance of available ground water, there will probably not be a reversal in saltcedar stand composition.

A dense cover of saltcedars can have a major impact on the hydrologic balance of an area. Saltcedar stands can increase hazard of floods in an area by choking or reducing the width of the normal channel, obstructing flood waters, and impeding river flow. Along the Brazos River flood plain in Texas, saltcedar dominated about 37% of the area (7000 ha) and

was estimated to be using over 93 million cubic meters of water annually (29).

While it is commonly believed that saltcedar is an important habitat component for nesting white-wing and mourning dove, dense stands of saltcedar along the lower Colorado river were also found to have a low value for other avian populations (30) and other animals. Some saltcedar stands are used extensively by bee keepers. This is frequently done to avoid pesticides sprayed on crops and to maintain the hives when other plants are not producing pollen or nectar. The honey produced from saltcedar is generally sold to the baking industry (31).

Replacement of native plants and changing habitats for animals are the main effects of saltcedar invasion into riparian habitats. This invasion is a result of many factors including (1) overgrazing, (2) land clearing, (3) changing seasonal river flows, (4) lower water tables, and (5) factors such as woodcutting and recreational uses.

Control

The sprouting characteristics of saltcedar, its aggressive invasion of open areas, ease of establishment, and its dense stands make it very difficult to control. During the past 40-50 yr, many control methods have been investigated with variable degrees of success. Control methods investigated include burning, mowing, chopping, disking, root plowing, herbicides, and combinations of the methods (32-37). Usually only temporary suppression of plant growth was obtained, even with repeated treatments. The most successful control was a combination of root plowing followed by burning the debris and repeated spraying of herbicides on the regrowth. Root plowing 35 to 60 cm deep with a cutting blade equipped with fins to pull roots and buried stems out of the ground was generally effective but destroyed the grass and other vegetation in the area. Root plowing must be done while the soil is dry and conditions are such that the plant material will rapidly dry. This leaves the soil in an unprotected state subject to wind and water erosion.

There are few herbicides available for use on saltcedar. Tebuthiuron is effective and currently labeled for spot treating saltcedar as a soil application (38). Some newer herbicides, hexazinone and imazapyr, show promise but need further testing on saltcedar (39,40). Herbicide spraying of saltcedar during the growing season is restricted by potential drift onto sensitive crops adjacent to treatment areas. Most chemical treatments have to be repeated to maintain plant suppression. Injecting long residual life herbicides at 35 to 60 cm in the soil with a finless root plow killed 90% or more of the saltcedar with one treatment without

destroying the cover of grasses and other shallow-rooted plants (41). Long-lived herbicide residues can possibly contaminate ground water in areas with shallow water tables and may affect the water quality for downstream water users. Individual trees and small stands of trees may be most suited to herbicidal control. However, currently available, effective herbicides are not selective for saltcedar alone, but kill other plant species as well. Before any herbicides are used, current registrations and limitations should be determined.

Changing the ground water level may kill the saltcedar as well as other riparian vegetation. While the trees are considered drought resistant, a dropping water table along the Gila River in Arizona reduced saltcedar stands (42). Extended inundation of one or two years will also kill the trees (43).

Grazing by livestock of seedlings and fresh sprouts can, in some places, repress saltcedar regrowth and seedlings (44). The use of insects and diseases has been suggested as possible control measures for saltcedar, but these techniques have not been fully tested (45). A leafhopper reduced saltcedar growth by 76% in limited tests in New Mexico (46). There are several species of insects from the eastern Mediterranean and Pakistan areas which attack saltcedar and may have potential in some area as biological control agents (47). The advantages of introducing biological control agents are that the method is usually self-perpetuating and achieves most objectives of multiple use of riparian sites (47).

Controlling saltcedar is a controversial subject (48-50). Those favoring saltcedar control cite: (1) removal of barren disclimax saltcedar stands to restore the original riparian flora and fauna, (2) increasing channel flow by reducing excessive evapotranspirations losses, (3) reducing flooding hazards from vegetative restricted channels, and (4) reduction of salt build-up in soils. Those opposing control cite: (1) saltcedar thickets used for nesting areas of white-wing and mourning doves in Arizona, (2) saltcedar as a source of pollen and nectar for honey bees, (3) potential hazards of increased soil erosion following saltcedar removal, and (4) potential damage to ornamental *Tamarix*. Even the proposed forms of biological control will face many of the same environmental objections used against other saltcedar control methods. There are also potential problems of restricting biological agents to the applied sites and eliminating them if they become established outside the control areas. Several proposed saltcedar control projects have been halted or delayed by court orders on challenges by opponents to vegetation control.

After saltcedars are killed, other vegetation must be established to protect the soil resource and to prevent or retard saltcedar re-invasion. Establishing a canopy cover on treated areas with seeded grasses and

planted cottonwood cuttings could reduce the chances of saltcedar successfully re-invading an area but this is costly. Saltcedar control must be part of a complete riparian habitat management program. All factors, such as merits of control, environmental effects, and public acceptance, must be considered.

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