5.6 WEEDS

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Introduction

For the purposes of this report, weeds are defined as plant species that were introduced to this area within historic times, have become naturalized, and are invasive. A naturalized plant species is a non-native one that reproduces regularly, either by seed or vegetatively, within its new range. An invasive plant is one that aggressively colonizes unoccupied habitat and/or existing plant communities. Invasive species usually outcompete or otherwise exclude native vegetation but vary in this characteristic to some degree. For example, some weedy species colonize disturbed soil but gradually disappear and are replaced by native species as the soil of the site stabilizes and compacts.

A major portion of the present flora and vegetation of California is composed of weeds. Approximately 20 percent of the total number of plant species that presently grow in the state are non-native, and the great majority of these are invasive. Some vegetation types, such as nearly all of the grasslands of the Great Valley, are composed almost entirely of weeds. Even within vernal pools, which constitute the only remaining vegetation "islands" within the Valley that are composed primarily of native species, non-native species may be common or even co-dominant.

The biological values of weedy plant species are generally lower than those offered by native vegetation, because our native wildlife has adapted over millions of years to take best advantage of the habitats and species that were present over that time. Vegetation composed of only one or a few species is always of lower overall biological values than vegetation that is composed of many plant species. Species-poor vegetation is usually less able to accommodate changes in the physical environment, and supports fewer wildlife species. On a site-specific basis, though, any vegetation provides more habitat value than none at all, thus, areas that are not colonized by native vegetation will obtain higher short-term habitat values if invaded by weeds than if no vegetation grew at all. Over the long term, however, presence of dense weedy vegetation on such sites may prevent colonization by native species if the physical environment subsequently becomes more suitable. For example, a recently deposited bar composed of cobbles may be rapidly revegetated by weeds; later, as fines are deposited on top or in the spaces between the cobbles and the bar becomes more suitable for native species, the habitat patch may be unavailable due to shading by the weedy vegetation.

Many non-native species occur within riparian habitats in the study region. This section focuses on two of these, which are of concern with respect to the present habitat conditions and restoration opportunities within the study area: tamarisk and giant reed.

Tamarisk *Tamarix ramossissima (T. pentandra)*

General Background

Tamarisk, more precisely known as five-stamened tamarisk and also called salt cedar, was introduced from Southern Europe into the eastern U.S.[1] in the early 1800s and planted along the Colorado River along the California-Arizona border to control erosion along the riverbanks. By the early 1900s, tamarisk had escaped cultivation and had become widespread throughout the southwestern U. S. along riparian areas and springs.[2] It was also planted as an ornamental[3] and a windbreak.[4] Beekeepers highly regard the pollen for the production of honey.[5] Tamarisk adapted readily to the California environment and has proven to be a formidable invader which is difficult to eradicate both because well-established plants are difficult to remove or kill and because it produces seeds prolifically, giving rise to large numbers of seedlings annually.[6]

Tamarisk will grow in saline soils, is fire retardant, and has deep taproots and a highly competitive root system.[7] *T. ramossissima* is found in more saline habitats, and is more common in standing water, than other *Tamarix* species. It has a wide range of tolerance to saline or alkali soil and water. Although it has been found growing where groundwater contains as much as 5 percent (50,000 ppm) dissolved solids, it grows best where the groundwater is little to moderately mineralized. It prefers moist sand along a river's margin where it occupies the niche usually associated with willow and cottonwood. Where tamarisk grows with willow, willows usually occupy the muddier parts, and tamarisk the sandy areas. Without competition, either one alone might spread into both habitats.[8]

In a single season, a tamarisk plant may produce many thousand seeds over a long period (April to October), which are dispersed by the wind. Seeds remain viable for only a few weeks, especially at high temperatures. Fresh seed germinates rapidly, generally in less than 24 hours. Germination is dependent upon saturated soils. Receding spring and summer flows are ideal for germination and seedling establishment.[9] Tamarisk seeds are spread easily by water as well.[10]

Seedlings grow slowly and are sensitive to drying. Survival is dependent upon saturated soils during the first two to four weeks of growth, and seedlings can be submerged several weeks or more. When small, they can be detached from the soil and float away if there is appreciable current. Light has no effect on germination.[11]

Early growth is very slow. At 30 days, average top height is one inch; at 60 days seedlings average four inches tall. At this time roots are about six inches long. After seedlings become established, they can withstand severe drought. When mature, roots occupy the capillary zone above the water table, with some roots in the zone of saturation. Seedlings mature rapidly and often flower by the end of the first year. Tamarisk grows up to one foot per month, and so densely that native trees are crowded and shaded from direct sunlight and cannot thrive. Desert riparian areas have been converted to impenetrable thickets in less than a decade.[12]

Tamarisk stem tissue (including root crown material) will sprout vigorously and form new plants if buried or partially buried in warm moist soil. The drying of cuttings reduces sprouting ability. Sprouts do not form from severed root tips.[13]

Tamarisk has an extremely high rate of evapotranspiration.[14] It saps local water supplies and may degrade topsoil with salt crystals that exude from its leaves. Native riparian plants such as cottonwoods and black willow cannot tolerate high salinity. As a consequence of tamarisk invasion, plant diversity diminishes and, with it, the diversity of animal life.[15]

Invasion of a floodplain by tamarisk usually leads to depletion of streamflow, an increase in the area inundated by floods, and an increase in sediment deposition. During a flood, the restriction and increased channel roughness cause inundation of areas that are not normally flooded. The damming and ponding effects reduces stream velocity and causes acceleration of sedimentation. Fewer species of birds nest in tamarisk than in native riparian vegetation.[16]

Status Along Cache Creek

Tamarisk severely competes with native flora throughout Cache Creek, except for the reaches having permanent surface flow. In 1992, tamarisk was dominant in the first half-mile below the Capay Bridge, from below Esparto to one mile downstream of I-505. It was the dominant woody species observed in the low flow channel and on deposition berms along most of the reach from below Stevens Bridge to Road 96-B, and dense stands were dominant in the active channel downstream of Road 96-B to Yolo. Tamarisk shrubs were observed on portions of the mid-channel deposition sand bar islands from Capay Dam to Capay Bridge, and at the borders of the channel from below Stevens Bridge to Road 96-B. Tamarisk saplings were observed in small areas where agricultural tailwater occasionally drains onto the channel floodplain from below Capay Bridge to 1 mile below Esparto Bridge (Road 87). Tamarisk occurred, but was not dominant, from below I-505 to Moore Dam and from Moore Dam to one-half mile downstream of Stevens Bridge.[17]

Tamarisk occurs in the California Department of Fish and Game wildlife area in the vicinity of Grizzly Creek and Highway 20.

Despite the well documented adverse effects that tamarisk has had in southwestern riparian systems, it does provide some positive habitat values, even though native woody vegetation provides more values and supports more species. Tamarisk is reported to provide cover for native species such as quail and deer along lower Cache Creek.

Control

Cultural Control

Construction of levees to reduce the area flooded during high flows, and regulation of releases from reservoirs to avoid slowly decreasing flow during the seed production season may prevent tamarisk invasion.[18]

Tamarisk appears to outcompete native trees in the transition zone if tree saplings do not grow above the tamarisk canopy before canopy closure occurs a few years after disturbance. Therefore, tamarisk weed control and riparian revegetation efforts should begin within the first year following ground disturbance to ensure success.[19]

Quailbush (*Atriplex lentiformis*), seeded after bulldozing and clearing, germinates in winter when tamarisk is dormant and provides competition for any tamarisk which might redevelop. Treatment should be continued for consecutive winters.[20]

Chemical Control

Chemical control is superior to mechanical destruction which results in bare disturbed subject to erosion and colonization by more tamarisk or by other weeds. Dying trees keep soil in place and retain moisture, providing a good environment for growth of new grasses and seedlings.[21]

Best results are obtained from late spring to summer applications, timed close to flowering.[22]

In New Mexico, ninety-five percent of tamarisk subjected to aerial and ground spray application of a tank mix including Rodeo were dead two growing seasons after application. Rodeo or Roundup may be applied at full strength to freshly cut stumps and must cover the entire cambium layer. Rodeo is not persistent in soil and Arsenal has some persistence. Rodeo is labeled for aquatic use and is low in toxicity.[23] Application of Garlon *immediately* (within minutes) of cutting is effective.[24]

Treatments should be repeated to control shoots growing from root systems, and for control of new seedlings. A management control program should include spot treatments in succeeding years to maintain desired results.[25]

Resulting small dead seedling trees or brush may be removed manually or mechanically, or left to decompose naturally. Large trees may be left to decompose naturally, or may be burned.[26]

Mechanical Control

Tamarisk can be suppressed on flood plains and reservoir deltas by periodic mowing. Cattle browse on the succulent new growth. Tamarisk may be killed by frequent foliage removal. Mortality increased when plants were completely defoliated at frequent intervals. Plants were not killed by one season of mowing. Mowing can decrease evapotranspiration by approximately 50 percent. Total hydrolyzable carbohydrate root contents decreased with severity of treatments, an important factor when considering herbicide application.[27]

Use of a root plow to cut shrubs below the surface of the ground during the growing period, when the soil is dry, is an effective, but costly, method of causing stems and branches to die before new plants develop from sprouting. Stems should be left on the surface of the ground and never buried in moist soil.[28]

In marshy areas, where chemical treatments are prohibited, tamarisk stands may be uprooted with a backhoe or tractor. This is best performed when plants are flowering, and more visible.[29]

In combination with other means of control, removal of saplings by hand is suggested. Tamarisk plants up to a stem diameter of three cm can be pulled up with relative ease when the soil is moist.[30]

Biological Control

An unpublished report on biocontrol found a significant reduction in *Tamarix* growth by a natural field population of the leafhopper *Opsius stactagallus*. This insect is stated to be host-specific, that is, it feeds only on tamarisk and not on other species. A list of insect species that feed on tamarisk and an evaluation of their damaging potential was published in the proceedings of the IV International Symposium on Biological Control of Weeds, 1976.[31]

Giant Reed *Arundo donax*

General Background

Giant reed was introduced from the Mediterranean region of Europe into tropical America for horticultural (landscaping) use. It needs a rich, moist soil. Roots need mulch in cold winter areas. It has been used in erosion control and is extremely invasive.[32]

Giant reed has spread uncontrollably and is now found in virtually every stream system along the coast from Sacramento into Baja California.[33]

Flowering occurs only at intervals of several years, therefore propagation is primarily vegetative. Open colonies or groves are established as shoot-producing rhizomes are spread extensively underground. New growth can be established by division of the colony; as older stems fall to the earth or are torn from the ground, stem segments can reestablish themselves and produce a new colony.[34] Clumps of giant reed apparently established by this means can be found in various locations along lower Cache Creek.

Giant reed grows rapidly at the onset of colony establishment, especially if this resulted from previously established rhizomes. Growth rates have been recorded which are two to five times faster than those for black willow and red willow.[35] Growth rates of more than two inches per day have been recorded.[36] At least four or five years are required for the clumps to reach their maximum average heights of 20 to 30 feet.[37]

Giant reed was found to be dominant only in vicinities adjacent to the riverbank.[38] Disturbance from earth-moving activity, including flooding, scouring, and debris sedimentation promote expansion of Giant Reed along the zone of frequent inundation.[39]

Giant reed lacks natural predators and competitors in North America and is unsuitable as food or habitat for native wildlife[40] and creates a zone devoid of wildlife.[41] In areas where it completely dominates a stream course, giant reed causes the water table to drop and thereby reduces habitat for native fish.[42] For these reasons, giant reed is considered to be one of the primary threats to native riparian habitats in the southwestern United States.[43]

History

Giant reed was plentiful in the Los Angeles area in the 1820s.[44] It is reported to have escaped along irrigating ditches from Texas to central and southern California.[45]

In 1951, the only California specimen in the National Herbarium was from the "Alameda marshes".[46]

Other Sites

Giant reed has invaded riparian habitat in Orange County, California, where it interferes with flood control, crowds out native plants, and presents a high fire potential.[47]

Studies were made of colonies ranging in age from 40 days to 35 years at three locations on the San Luis Rey River and the San Diego River in San Diego County.[48] Giant Reed has been observed to inhibit the establishment of native and exotic species, and form pure stands along all the major river drainages in San Diego County.[49]

Status Along Cache Creek

In contrast to the large-scale and very severe adverse impact that giant reed has had in some other areas, especially in southern California, the plant is only of scattered occurrence along Cache Creek. Although some very large clumps have developed and these exclude both native vegetation and wildlife, on the scale of the riparian system as a whole, this effect is relatively localized. However, the heavily mined losing reaches of the creek (Subreaches 3 and 5-7) have hydrology and potential substrate (following cessation of mining) more similar to that of the southern California rivers, where giant reed has such adverse habitat effects. Consequently, it could become a major problem in the effective reclamation or restoration of these subreaches. Also, large clumps may have an important role in affecting the path of high flows and thereby causing channel migration.

Control

Cultural Control

Giant reed sprouts vigorously after fire,[50] and burning only encourages further growth.[51] The plant is capable of surviving several years of drought, but probably would not survive prolonged submergence in 3 to 4 feet of water.[52] The dependence of giant reed upon flooding and vegetative propagules has acted as a limiting factor for its invasion into new habitat.[53]

Chemical Control

Rodeo is a very effective control. Treatment should occur from late spring through summer or early fall. It may be used as both foliar and cut stump treatments. Total spray coverage is essential for optimum results. For cut stump treatments, canes should be cut as close to the ground as practicable and Rodeo should be sprayed or painted at full strength onto the cut surface.[54]

Follow-up includes treatment of resprouts and escapes in successive years. After complete brownout, stands may be mowed or burnt or left to decay naturally. Native species may be seeded or transplanted into treated areas.[55]

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