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WEED MANAGEMENT STRATEGIES – SALT CEDAR

BACKGROUND:

Salt Cedar or Tamarix *spec.* was initially introduced as a flowering ornamental for landscaping and further used in erosion control and bank stabilization along flood plains and river channels. This small deciduous tree can appear as a large shrub with multiple branches from the base, and reaches heights of 5 to 25 feet. In one growing season it is possible for Tamarisk to grow 9 to 12 feet, and can live a life span of 50 to 100 years. Young branches are reddish-brown in appearance and are smoothly barked, which with maturity becomes ridged and furrowed and turns a brownish-purple in color. As with the name sake (Cedars), Tamarisk the scale-like leaves overlap approximately 1/16 of an inch and form grayish green, feathery rachis of leaves approximately 1.6 centimeters long. The feathery branches of tamarisk with the bright flowers make this plant a desirable ornamental. The foliage blooms from March to September with catkin-like slender spikes of pink to purple to white flowers. The five petaled flowers are approximately 1.5 millimeters across and 2 inches long. Flowers produce a pinkish-red to greenish-yellow seedpod that when hits maturity breaks into 3 or 5 parts releasing thousands of seeds that are 1/25 inches in diameter. Seeds are tipped with a tuft of fine silky hair that helps the distribution. Seeds require extended saturation of soil for establishment. It is stated that a mature tamarisk can produce 600,000 viable seeds annually. With the seed source it provides, the most effective mode of reproduction is through its extensive lateral rhizome development. The deep taproot of Tamarisk will penetrate up to 30 foot to reach ground water, on average they are less than 15 foot due to growth location. When the tap root contacts water, the plant sends out rhizomes along the water source and the rhizomes branch profusely forming a dense mat of roots and large quantities of new tillers to form. Many times the leaves and stems of Tamarisk will be visibly coated in salt secretions from the root uptake of salts from the soils and water systems. The secretion can form crust of salt on the ground from needle shed and flushing of the plants.

Area of Adaptation

Tamarisk originates in Eurasia and Africa, following a distribution zone that stretches from the Mediterranean region through the Middle East and central Asia to northern China and Japan, with a few varieties in Africa. In the early 1800's Tamarisk was being introduced to the United States/North America as an ornamental in landscaping and also for erosion control on stream banks, naturalizing in many river systems from these points, severely infesting the Southwest by the 1850's. Populations could be found from Florida to California and north to Idaho by 1938 and into Montana by 1960. Today, extensive establishment of Salt Cedar can be located in the southwestern United States and Mexico, north to Massachusetts, Indiana, Missouri, Kansas, Colorado, Nebraska, and Oklahoma; with smaller stands in Oregon, Idaho, Montana, Wyoming and South Dakota. Deep taproots, extensive rhizomes and a variable tolerances to soil textures, conditions, salinity and salts allows Tamarisk to dominate upland and riparian sites, out-compete native species and inhabit sites that most natives can not. In many regions Tamarisk monopolizes the limited resources and alters the structure of the site to prevent natural succession back to native species. Tolerance of alkaline sites and saline soils containing up to 15,000 parts per million (ppm) soluble salts, and as much as 5% dissolved solids as found in Death Valley California. It has been found from sea level to above 7000 feet in elevation. As long as the seed can remain saturated for an extended period of time for establishment or rhizomes can follow the water table out of the riparian zone, the rapid growth

and ability to penetrate to the water table allows Tamarisk to survive and spread outward in the arid upland environment of the desert southwest.

Ecological Threat

The extensive rhizomatous root system of the Tamarisk plant provides much of the threat to the ecosystems that are being invaded. The aggressive lateral branching allows Tamarisk to dominate a site, reducing the diversity to a monoculture stand, stabilizes the channel reducing flow velocity changing the morphology and hydrology of the entire system. Native plants are reduced or crowded out of the areas by the increase in salt deposits in the soil profile and by reducing the water availability. A single large tree can consume 200 gallons of water a day, lowering the water table, reducing the availability of the smaller shallower root systems of the native plant communities. The salt content of the leaves of Tamarisk deposits salts on the surface while the roots leave salt crusts in the soil. The draw down or change in hydrology in the areas invaded reduces the flushing of the soil profile and thus increases the salt load of the area beyond the tolerances of the natives further pushing them out of the area. Severity and frequency of over-bank flooding is increased by the deposition and stabilization of sediments within the stream channel of invaded systems. The dense root masses can work to re-channel stream flow, reducing stream flow, widening the channel width and reducing the depth of flow, creating a shallower stream system with a lower water holding capacity. This also acts to reduce the gravel and stone base to the bottoms of the streams changing the morphology and habitat types within the system. Wildlife impacts are highly debated and several discrepancies exist in the literature on what the cause effect factors exist with the transition to a Tamarisk community. The dense stands of Tamarisk is thought to have a lower species density of both avian and arthropods, for example a dense monotypic stand of Tamarisk hosts 4 species of birds while a healthy native community will host 154 species of birds in a year. Reports say few insects will dwell in the Tamarisk canopy versus a native canopy. The seeds of Tamarisk are lower in protein than any other native species and the branches lack the structural cover of many willows and other natives. Debates are persisting on the efficient way to treat or manage the invasive Tamarisk plant. These debates are heightened by the facet of causal factors that have allowed Tamarisk to dominate these sites and continue to persist. Increasing disturbances or a shift in the dynamics of the historic disturbance regime must occur to allow Tamarisk to get a foot hold, so the eradication of Tamarisk alone will not break the regime shift to allow the native species to repopulate the area. As mentioned previously the flooding cycle is one of these regimes as well as the fire cycle. The dense branches create a large fine fuel load to drive fires, increasing the intensity and frequency of wildfires through the riparian zones. The fire tolerance of Tamarisk allows it to persist while the fire sensitive natives are weakened continually by the increased fires. Threatened and endangered species have brought a secondary concern of displaced habitat into the scenario. As Tamarisk replaces willow in many systems, a specific species of the Willow Flycatcher has been forced to adapt to the use of Tamarisk for nesting cover. The eradication or removal of Tamarisk with the steps to replace the natural regime to allow natives to persist may displace the Flycatcher permanently from the area, endangering the population status further and creating resistance in management of the invasive species.

Management

Control of Tamarisk is a two step process, to kill and remove the existing growth of the plant and the prevention of reinvasion. The best scenario to achieve this goal is EARLY detection and control by integration of mechanical, cultural, physical, biological, and chemical methods in a long term Integrated Pest Management Plan. Tamarisk is easiest to detect in spring and summer while in full flower. The stress applied to the Tamarisk plant during any control method will initiate an increase in flowering and seed production. Avoidance of inflaming the plant can be achieved by applying treatment in late fall and early winter when sap flow is towards the roots and seed dispersal is complete. Complete kill of the extensive root system is needed to gain control of the sprouting of the plant. Any above ground stems that are buried in damp/moist soils will allow for re-sprouting and rooting of the material and further infestation. Disturbance during treatment needs to be kept to a minimal, while removing the environmental

stressors, leaving native vegetation viable, if a native community is still present, and to prevent soil damage and compaction to avoid channel cutting, wind erosion, and to allow natives to reestablish. Thin stands of small diameter (1 inch saplings) may be treated by hand removal and stump treatment. In dense stands, root plowing is a means of effective mechanical treatment. The root plow must be set at 12 to 24 inches below the soil surface to effectively cut below the root crown to kill the plant, a fin added to the machine will pull the crown and roots to the surface to further prevent re-sprouting. A modified plow with a chemical injection system to spray the root cut with herbicide is the most effective method of root plowing. Hot dry weather is the best time to complete this task, and then debris must be piled and destroyed to prevent re-sprouting from stems. Mechanical techniques may achieve 90% effectiveness on Tamarisk alone, however they are labor intensive, costly and can disturb the site making re-vegetation difficult. Chemical combined with mechanical treatment increases cost, however helps to increase efficiency by reducing re-sprouting and other weed problems that may develop after mechanical treatment. Chemical alone will achieve 90-99% kill for one to three years after treatment, however re-treatment is generally necessary. The chemicals typically found to be effective are Dicamba (Banvel®), 2, 4-D, Tebuthium (Spike®), Imazapyr (Arsenal®), and Imazapyr + Glyphosate (Rodeo®). Spot treatment of cut stumps with Tebuthiuron or Glyphosate (Roundup®) and Triclopyr (Garlon 4®) diluted 1 to 1 with diesel oil or water has shown some success, when stumps are cut close to the ground surface and then immediately treated with herbicide. Arsenal and Rodeo both have achieved 90 – 99% efficiency for one time treatment for a treatment cost of $85/acre and $60/acre respectively. When using chemical it is imperative that you follow all label directions and choose the chemical that is appropriate for your site. Due to the water loving nature of the Tamarisk plant, and the relative connection to ground water, aquatic labeled herbicides must be used. Herbicides have proven to be the most effective and least invasive method for extensive infestations. The chemicals that are desired are systematic, transfer through plant to kill the root system. They can be applied as a foliar spray, cut stump, basal bark treatment or aerial spray. Grazing of the re-spouts or aftermath of any of these treatments can be a way to control or manage the infestations for a longer period of time. It has been documented that in a rare case cattle will graze the tender shoots and goats will browse on the leaves and flowers of older plants and especially like the tender shoots. Biological control is in the process of development, with two bugs approved for test release within the United States, the mealy bug (Trabutina mannipara) and the leaf beetle (Diorhabda elongata). Five other varieties of bugs are in controlled tests within the United States, and several 8 others in tests overseas. Debates on the use of biological control hinges on the impact to endangered species habitat, if the control takes all the Tamarisk, habitat and nesting grounds for listed species may not be available further hindering the prosperity of the species. It is also highly debated on to use the biological agents on large infestations or on the smaller areas as clean up after other control methods have been applied. One last method that was located in the literature was the flooding or droughting of the

Photo by Dana Larsen, USDA-NRCS, Nebraska, 2008

Cut stump treated with dyed herbicide, within minutes of cutting

Photo by Dana Larsen, USDA-NRCS, Nebraska, 2008

Tamarisk plant. Inundation of Tamarisk for a controlled period of time has achieved up to 99% kill for the first year after the treatment. The highest success for the longest period of time was achieved when a site was flooded with the basal growth of plants under water for 36 months (three entire growing seasons). It was found that 28 months (one growing season and then half of two consecutive seasons under water) achieved the same success however for a shorter period of time before new sprouts appeared, and a minimum of 24 months was needed to achieve the success for any period of time. Drought out the plant was not discussed in detail in literature, however it was said that by dropping the water table to prevent the rapid sprouting and rhizomatous spreading of the plant, and by reinitializing the flushing flows and natural or historic flow regimes of a particular stream channel, management and control of the spread of tamarisk could be achieved, to no discussed effectiveness. Either technique is difficult due to water rights, water law, lack or abundance of water in the particular system, and the realization that many of these systems have not had and are unable to have the natural or historic flow regime returned due to cultural and physical changes within the stream channel morphology and use. The best means of treatment is a combination of one or several of the methods mentioned. The key to success, however, is the long term commitment to treatment and the early detection fast response to treatment.

SUMMARY

Tamarisk, Salt Cedar, is an ecological threat to the many river systems throughout the United States, specifically the arid Southwest and Great Plains regions. An extensive root system allows the plant to colonize rapidly, out compete the natives and then acts to manipulate a natural or altered system beyond the tolerances of the native species. The treatment of the plant is hindered by its relation to the ground and surface water and its ability to re-sprout or retaliate back from most treatments. The best management practice is to detect the development of new infestations early and quickly, apply an integrated pest management plan and to give the plan a long term commitment. With the treatment of new areas, a long term plan of action needs to be developed and implemented for large established populations on a watershed scale. Cooperation with local weed authorities, weed management specialists and federal, state, and private landowners needs to occur to create the public awareness and drive to combat the invasive predator that has threatened our natural resources.

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