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Low-Impact, Selective Herbicide Application for Control of Exotic Trees in Riparian Areas: Saltcedar, Russian-Olive and Siberian Elm

A Preliminary Field Guide by Doug Parker and Max Williamson

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Low-Impact, Selective Herbicide Application for Control of Exotic Species in Riparian Areas

Background

Riparian areas (the vegetation zone on the banks of streams and rivers or bodies of water, including flood plains and wetlands) are of particular concern to resource managers in the Southwest. These areas comprise less than 2 percent of the land in New Mexico and Arizona, but they are the most biologically diverse and productive ecosystems in the arid Southwest. Over 65 percent of Southwestern animals depend on riparian habitats during all or part of their life cycles, and many threatened or endangered species also depend on these sites.

The "original" vegetation along rivers, etc., was comprised of gallery forests of native cottonwoods (*Populus spp*.) and willows (*Salix spp*.), thickets of smaller trees and shrubs, and numerous grasses and other plants. After many decades of fire exclusion, intensive grazing and browsing by domestic livestock and wildlife, dam building, recreation use, removal of water for agriculture and communities, etc., the vegetation in many riparian areas has been drastically altered. It has been estimated that more than half of the riparian areas in the Southwest fail to meet the desired goals for physical and" biological conditions.

The spread of saltcedar (*Tamarix ramosissima* and closely related species), Russian-olive (*Elaeagnus angustifolia*), and Siberian elm (*Ulmus pumila*) has contributed to the continued degradation of riparian ecosystems. These exotic species are highly invasive and will continue to spread, not only along riparian habitats, but also into abandoned croplands and other sites. All of these species strongly modify their environment by displacing native plant species, using great amounts of ground water, increasing the risk of fire, blocking stream channels, etc. They also reduce the abundance and diversity of wildlife species.

Saltcedar is a large shrub or small tree that is a Eurasia native. It was initially sold as a landscape plant in the early 1800’s and it escaped cultivation by the late 1800’s. Resource managers intentionally planted saltcedar in several river systems in the Southwest in the 1920’s and 1930’s to stabilize eroding soil surfaces. This contributed to its rapid spread. It is abundant in many low-elevation, hot desert rivers in the southern portion of the region, and is invading higher elevation river systems to the north. The longer a plant community is occupied by saltcedar, the more xeric

(dry) it becomes. As the name suggests, saltcedars increase the salt content in soil and they are physiologically adapted to salt levels that stress or kill native plants. Also, fire disturbance has increased with the increase in saltcedar, which has led to its domination of extensive sections of some rivers.

Russian-olive is a small Eurasian tree that escaped cultivation in the late 1800's in the Southwest. Like saltcedar, it was planted for soil stabilization on some river systems and it has proven to be highly invasive. For example, in Canyon De Chelly in northeastern Arizona, it was planted in 1964 and 10 years later it was one of the dominant trees of the canyon bottom. Russian-olive is now common along several rivers at higher elevations in the northern portions of the Southwest, and it is spreading southward. Russian-olive often forms a mid canopy layer under cottonwoods, but it dominates the canopy on some sites. Relative to cottonwoods and willows, Russian-olive is drought tolerant at both the seedling and adult stages. It is regarded as a prolific sprouting tree, and cut branches that are covered with soil will form adventitious roots and shoots. Although not as salt tolerant as saltcedar, it is more tolerant than native species. Russian-olive has been observed to move into some drainages with monotypic stands of saltcedar, grow above the smaller saltcedar trees, and take over dominance of the site.

Siberian elm is a small to medium size tree from Asia that is the hardiest of all elms. It does well even on sites with cold winters and long periods of summer droughts. It was introduced to the United States in the 1860's as an ornamental for shade and a shelterbelt species, and it was planted in the Southwest some years later. It is often erroneously called Chinese elm, an autumn-flowering species. Siberian elm flowers in the spring. It grows rapidly and sprouts after being cut. Siberian elm has naturalized and become a serious problem replacing native trees and shrubs. It is becoming the dominant tree in some riparian areas, especially along mountain streams in the southern portions of New Mexico.

Purpose

These invasive trees have proven to be difficult to control. Fire and mechanical treatments have provided temporary control in some areas. In other areas, the use of these techniques has resulted in dense stands of regrowth due to sprouting and dispersal of seeds from nearby infestations, especially where soils were disturbed. Efforts are underway to release biological control agents for saltcedar, but no efforts are being attempted for Russian-olive or Siberian elm. It must be realized that the removal of saltcedar alone will allow the other exotic species to spread into open spaces. Effective biological control of these woody species is probably one or more decades away. It appears the use of herbicides provides the best opportunity for control of these exotics under current circumstances. In some instances, a combination of techniques, such as mechanical and

herbicide treatment will be appropriate. Without some form of intervention, these exotics will continue to increase causing unacceptable damage to riparian ecosystems.

The purpose of this field guide is to describe low-impact, selective herbicide application techniques that have been developed for control of these three invasive tree species. Selectivity is achieved by using herbicides, like triclopyr, that will control woody plants and not grasses. Selectivity also can be achieved by application techniques where target plants are sprayed and nearby desirable plants are not sprayed. Based on field trials, we have determined that satisfactory control results (70 percent or higher) can be achieved if the described techniques, herbicide mixtures, and application methods are followed. It must be emphasized that the recommendations in this field guide are preliminary and further evaluation is needed throughout the extensive ranges of these exotic species in the Southwest and elsewhere. We may find that slightly less herbicide may be effective where the trees occupy high elevation sites or occur at the northern edge of its range, and slightly higher concentrations may be needed to achieve control at the lower elevations or at the southern end of the range. A combination of two herbicides may be needed on some sites to achieve satisfactory control. Nevertheless, any substantial deviations from the described approaches in the field guide could reduce control effectiveness.

Management Options

Protection of Southwestern riparian ecosystems from exotic plants and restoration of damaged riparian sites are a concern and emphasis of work for the Forest Service, other Federal and state resource agencies, and private landowners. Successful managers and landowners choose a variety of vegetation management options, often called Integrated Vegetation Management, that have been shown to be effective, economical, and environmentally compatible. There are several fundamental questions that need to be addressed before control is attempted. What species warrant management action? Are there underlying causes that facilitate the spread of the undesirable exotics? Can the exotics including terrestrial species, be controlled or suppressed to allow native plant species to proliferate? How many treatments will be needed and what will be the cost? Will native trees, shrubs, and grasses need to be planted on some sites? Also, because the spread of exotics in riparian systems can be a drainage-wide issue, coordination among multiple landowners with diverse interests and management goals is necessary. Control efforts can be enhanced if these questions and coordination aspects are adequately addressed.

Control of exotic trees must be a part of a complete riparian management program, and establishment of desired cover with seeded grasses, planted cottonwood cuttings, and introduction of willows may be required. Importantly, it must be realized that sustained control efforts, including follow-up treatments, will be necessary to prevent reinvasion. Maintenance treatments usually will require less effort.

Application Techniques

Low- Volume, Oil Basal Method

Use. This method is more effective in controlling relatively small plants (an inch or two in diameter or smaller at ground level) that have smooth bark. Thick, furrowed bark on larger trees inhibits movement of the herbicide into the water conducting tissue and control success can be reduced. Treatment can be done at any time of the year with comparable results, but application is easier from late fall to early spring when there is little foliage to intercept the spray. Another

advantage to treatment at this time of year is that many desirable plants are dormant, and selectivity can be improved.

Equipment. A backpack sprayer is the most efficient equipment to use for this method, and we recommend that only those sprayers with a diaphragm pump be used. Sprayers with a piston pump are not recommended because of their tendency to leak. A Swissmex SP1 and Solo Model 475 are commonly used units that are relatively inexpensive. A trigger jet gun with a 15-inch extension wand is recommended. CCI Chemical Containers, Inc., is a company that provides completely assembled backpack units. A spray gun with a TP 1502 or TP 2503 flat fan spray tip or an adjustable conejet nozzle can be used depending on the size and number of stems to be treated. The TP 1502 is best where the density of small stems is low, and the TP 2503 will be more efficient when there are more and larger stems.

Mixing. Remedy*, Garlon 4*, or other ester formulations of triclopyr are the recommended herbicide products to use, depending on the site to be treated. Remedy is registered for use on rangelands, pastures, and non-irrigation ditch banks, and Garlon 4 is registered for use on rights-of-ways, industrial sites, non-irrigation ditch banks, forests, and wildlife openings. Both formulations contain triclopyr and they are soluble in oil. A 25 percent mixture of the selected triclopyr formulation in oil is necessary to achieve satisfactory control. We recommend that a vegetable based oil carrier like Improved JLB Oil Plus (Brewer International) be used. This product is a 100 percent blend of natural vegetable oils plus limonene penetrants. Other oil products may be substituted, but they have not been evaluated. The mixture can be obtained by adding one quart or parts of the herbicide formulation plus three quarts or parts of Improved JLB Oil Plus.

How to obtain a 25 percent mixture for the oil basal method: Add one part of Remedy or Garlon 4 formulation to three parts vegetable oil.

Spraying. Spray the herbicide/oil mixture evenly but lightly from the base of the stem up to 12 inches above the ground for relatively larger stems that still have smooth bark. Smaller stems require only a few inches of spray; however, if the stems are sprouts from a large root system, spraying should not be done until the sprouts are at least 5 feet tall to get enough herbicide into the root system. It is important to cover the entire stem circumference, but not to cause runoff or puddling. The oil helps the spray mixture to "wrap" around the stem as it flows downward with gravity. Where there are many stems in a clump, it usually is necessary to spray from two or three sides of the clump to ensure that all stems are sufficiently covered. Do not conduct treatments when stems are wet from rain or snow. Water and oil do not mix, and the results will be ineffective. Treated plants are easy to observe when a vegetable based carrier is used, even months after spraying; thus, it is not necessary to add a dye to the spray mixture to mark treated plants.

* Trademark of Dow AgroSciences

Low- Volume, Cut Stump Method

Use. This method involves a combination of mechanical and herbicide treatments to achieve "root kill" for large saltcedar, Russian-olive, and Siberian elm trees that have thick, furrowed bark. The first step is to use a chain saw to cut the trees just above the ground. It is important to have well trained personnel do the cutting, because chain saw use is inherently dangerous. Also, experienced chain saw operators are much more efficient. Large machines are occasionally used to mow or cut large trees, but they are costly to use and are not as selective in avoiding damage to native vegetation. Cut surfaces should be horizontal to the ground to allow the herbicide to soak into the cut surface and not run off. Also, all sawdust needs to be removed from the cut surface before herbicide application. A mixture of 50 percent Garlon 3A* and 50 percent water yields adequate control results at the least cost. This product is a triethylamine salt of triclopyr that mixes with water. Some resource managers have tried a 50/50 percent mixture of Garlon 4 in JLB Oil Plus for treating the cut surface and the remaining bark surface. This approach does not appear to provide any better control than the water mixture, but it is more costly.

Mixing. In limited field tests, a 50 percent mixture of Garlon 3A added to an equal amount of water provided acceptable control results. If it is found that this mixture is not providing adequate results, the percent of Garlon 3A can be increased, including a straight (100 percent) application of the product. To make a quart (32 ounces) of the recommended spray mix, add one pint (16 ounces) of Garlon 3A to one pint of water.

How to obtain a 50 percent mixture for the cut stump method: Add one part of Gar/on 3A to an equal part of water.

Spraying. Immediately following the cutting of trees (within a few minutes), sawdust and wood chips must be cleaned off the cut surfaces and the entire perimeter if the stump (the sapwood) has to be thoroughly sprayed with the herbicide mixture. The treatment area is about the outer inch of the stump from the inner bark to the sapwood. This will allow the herbicide to move into the water conducting tissue of the tree and be translocated to the roots. A delay of more than 2 hours between cutting and spraying can significantly reduce effectiveness.

Additional Herbicide. There may be some sites where the cut stump method using Garlon 3A in a 50 percent mixture with water will not yield acceptable results. This has not been documented to date, but the possibility exists. When this occurs, managers or landowners may chose to add 3 ounces of Arsenal[**] (imazapyr) per gallon of the Garlon 3A mixture. The two herbicides applied together should increase control with a minimal increase in cost. This approach, however, is not recommended unless there is no other alternative. Arsenal is a broad spectrum and soil active herbicide that will kill desired vegetation unless it is applied properly and with caution.

Hack and Squirt Method. There may be instances when managers or landowners do not choose to use a chain saw to cut trees and then treat the stumps with herbicides. An alternative technique is to use a hatchet to cut downward into the water conducting tissue (xylem) of standing trees and then use a quart spray bottle, with either a 50 percent mixture of Garlon 3A in water or with the addition of 3 ounces of imazapyr, to squirt the herbicide(s) into the cut. When the hack and squirt method is used on larger trees, it will be necessary to make two or more cuts on larger stems to get the herbicides around the circumference of each stem. The cuts should be made at about 4 to 5

[**] Trademark of BASF Corporation

feet above the ground. This is a difficult technique to use in dense stands of saltcedar and with Russian-olive which has thorny branches. Siberian elm is much easier to treat with this approach.

Precautionary Statement

Care needs to be taken to avoid contamination of water when treating saltcedar, Russian-olive, and Siberian elm trees with either the Garlon 4 and oil mixture or the Garlon 3A and water mixture in accorda1nce with label requirements.

Assistance

Contact Doug Parker by calling (505) 842-3280 or by email at dlparker0l@fs.fed.us, if you have questions or need assistance.

The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

Pesticides used improperly can be injurious to human, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key — out of the reach of children and animals — and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first-aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.