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Best Management Practices for Montana
Biology, Ecology, and Management of Russian Olive (*Elaeagnus angustifolia* L.) and Saltcedar (*Tamarix ramosissima, T. chinensis,* and their hybrids)

By

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I. Introduction: History/Identification/Threat for Russian Olive

A. Russian Olive History: Russian olive (*Elaeagnus angustifolia* L.) is a member of the Oleaster family. Russian olive originated on the European Continent and ranged from southern Europe to western and central Asia (Little 1961). Russian olive was introduced to the United States in the early 1900's. Tolerant to diverse site conditions, Russian olive has been planted as an ornamental (Little 1961), and used extensively in shelterbelts in the drier regions of the Great Plains and Rocky Mountains (Read 1958). In Montana, east of the Continental Divide, Russian olive trees have been used in shelterbelts, windbreaks, wildlife habitat, ornamentals and for wildlife habitat. Plants that have naturalized thrive along riparian corridors, irrigation delivery systems, pastures, saline affected areas and some wetland sites.

B. Russian Olive Identification: Russian olive is a large, thorny, perennial deciduous shrub or small tree (up to 40 feet). The leaves are alternate and simple, elliptical to lanceolate in shape, 1 to 3 inches long and ½-inch in width, scaly on the top and silvery and scaly on the bottom, dull green to gray in color. Stems may be thorny. The bark appears smooth and reddish brown to gray in younger trees and becomes unevenly rigid, wrinkled and graying in color as it matures. The fruit is berry-like, approximately ½-inch in length, dry, mealy, sweet, and edible.

C. Russian Olive Threat: Russian olive infestations threaten native plant communities in riparian areas and grasslands, as well as irrigated pastures and hay land. Russian olives have been identified along all of the watersheds in eastern Montana. Along riverine areas native cottonwood and willow species are being replaced by Russian olive through competition and succession. Russian olive grows relatively quickly and develops a dense canopy; preventing shade-intolerant native vegetation from establishing. Katz and Shafroth (2003) report that Russian olive constitutes a new functional guild; it can establish beneath the canopy of native riparian trees and can form self-replacing stands. In addition, there are selective pressures from mammals. Lesica and Miles (1999) observed that beavers select cottonwood and willow over Russian olive to forage on; providing Russian olive plants an additional competitive edge over native woody riparian vegetation.

II. Introduction: History/Identification/Threat for Saltcedar

A. Saltcedar History: Saltcedar (*Tamarix ramosissima* Ledeb, *T. chinensis*, Lour., and their hybrids) are members of the Tamarix family. Saltcedars are invasive deciduous shrubs or treelike shrubs. Native to eastern Turkey and Korea (Jacobs and Sing 2007), these species and their hybrids have evolved in conditions where winters are severe and frost-free growing seasons range from 60 to 120 days. Saltcedar populations were first reported in 1960 in Montana and now can be found along nearly all of eastern Montana's rivers, lakes and reservoirs (Pearce and Smith 2003; and Jacobs and Sing 2007). Since the introduction of saltcedar in 1960, saltcedar has spread to Musselshell, Yellowstone (and its tributaries), Clark Fork, and the mid- to lower portions of the Missouri watersheds. Pearce and Smith (2003) also identified individual locations of saltcedar along the Milk River, Marias River, Canyon Ferry Reservoir and Flathead Lake.

B. Saltcedar Identification: Saltcedar stems are arching with the young bark a distinctly smooth, reddish-brown with light-colored leaf scars. Mature branches and stems become brownish-purple, ridged and furrowed (Jacobs and Sing 2007). The plants can grow up to 20 feet in height, with stems dying back to the growth collar during winter. Leaves are scale-like, small and overlapping; similar in appearance to cedar or juniper leaves. They are grey-green in the spring and turn a golden brown in the fall. The flowers are pink to white and small. They are clustered in showy compound catkin-like racemes. Flowers will bloom from May through September and infrequently into October.

A mature saltcedar (i.e., 3-5 years old) will produce capsules containing thousands of very small seeds. Seeds are reported to be viable from 45 to 130 days depending on the seasonal and site-specific conditions. The seeds have a tuft of hair at the tip of the seed coat, which aids in dispersal. The principle dispersal mechanisms are wind and water, but seeds may also be spread by wildlife.

C. Saltcedar Threat: Saltcedar and their hybrids are listed in the State of Montana as Priority 2B Noxious Weeds (Montana Noxious Weed List, January 2010). The various species of saltcedar are a significant threat to Montana's riparian and sub-irrigated lands. Mature saltcedar plants will produce nearly half a million seeds during the growing season. Exposed riverbanks, shorelines, sandbars, receding wetlands leave bare, moist soil conditions that are ideal for saltcedar germination. These areas can have up to 800 seedlings per square meter. However, many of these seedlings do not survive their first year. Saltcedar seedlings can have a mortality rate as high as 90%. Seedlings that establish above the line of disturbance along riverbanks and shorelines typically mature into seed-producing plants.

Saltcedar has the ability to alter the soil chemistry and therefore affects the plant species that will grow in those areas. Saltcedar is deep-rooted and tolerant of saline soil conditions. Saltcedar uptakes salt from the soil and secrete these salts from glands located on the undersides of their leaves. The secreted salts can accumulate in the upper soil layer; changing the soil chemistry around the plants. This can create a saline condition in soil that can prevent some native plant species from establishing.

III. Integrated Pest Management (IPM) Control Method: Integrated Pest Management is the application of multiple management acts that are mutually supportive, and should include actions that cultivate competitive desirable plants and actions that suppress undesirable plant populations (i.e., weeds). The goals of IPM go beyond weed control including the reduction of weed management expense, and reducing herbicide applications. The key to successful IPM includes understanding the biology of the weed, understanding the ecology of the system, and careful and thorough planning. The general principles of IPM are prevention, early detection and small-scale population reduction, containment, and large-scale population reduction. Being diligent and persistent is necessary to successful treat and control Russian olive and saltcedar.

A. Prevention is guided on how Russian olive and saltcedar spread and their requirements for establishment:

1. Understand their life cycle requirements.
2. Understand their dispersal mechanisms and establishment requirements.
3. Maintain competitive plant communities.

B. Early Detection and Small-Scale Population Reduction:

1. Persistent field surveys of likely risk areas such as receding shorelines and river banks, irrigation delivery infra-structure, and saline areas.
2. Spot herbicide treatments.

C. Containment:

1. Diligent monitoring.
2. Use herbicide/mechanical control on all known seed dispersing shrubs.
3. Reducing ground disturbance activities.

D. Large-Scale Population Reduction is accomplished through the diligent implementation of the first three described above, and:

Use bio-controls for saltcedar when permitted. Previously authorized bio-control permits for saltcedar have been terminated (APHIS 2010) pending restoration review/activities.

IV. Russian Olive – Saltcedar Treatments:

A. Basal Bark Application (Terrestrial Application): Most appropriate for plants with multiple small-diameter (i.e., less than 3" basal diameter) stems.

1. Chemical to be used:
a. Triclopyr amine (Garlon 3A®; for use in areas with surface water present or near aquatic environments)
b. Triclopyr ester (Remedy®, Garlon 4®, consult your local County Weed Control Supervisor and Extension Agent for other triclopyr ester products, follow label recommendations for low-volume basal bark treatment).
2. Application rate: 25% to 33% solution.

3. **Acceptable dates of application:** Any time of year except when the bark is wet, frozen, or frost is on the stem. Fall is optimum because there is less foliage to intercept spray and non-target plants are dormant. Avoid application during rapid growth in the spring.
4. **Carrier used:** Basal oil (preferred), diesel, kerosene, or methylated seed oil (MSO). An oil carrier must be used for the basal bark treatment to be effective.
5. **Special application techniques:** Read and follow label instructions for mixing herbicide in oil and for low-volume basal bark treatment. Add herbicide product to the required amount of oil in the spray tank or mixing tank and mix thoroughly. If mixture stands over four hours, re-agitation is necessary. Adjust nozzle for narrow cone-shaped spray, spray solution lightly but evenly from the root collar (ground) up to 18 inches thoroughly wetting all sides of every stem but not to the point of runoff. Old or rough bark requires more spray than smooth, young bark. Do not apply to wet, frosted, or frozen stems, or when snow or water prevents spraying to the ground line.

B. Cut Stump Application (Terrestrial Application): Most appropriate for plants with large (i.e., greater than 3" basal diameter) stems and thick rough bark.

1. **Mechanical/physical removal:** Use mowers, loppers, chainsaws, timber axe, bobcats fitted with cutting shears or sawing attachments. Use the appropriate-sized equipment based on the density and size of the Russian olive or saltcedar being treated.
2. **Chemicals to be used**:
   - **a.** Triclopyr amine (Garlon 3A®; for use in areas with surface water present or near aquatic environments),
   - **b.** Triclopyr ester (Garlon 4®, Remedy®, consult your County Weed Control Supervisors and Extension Agent for other products, follow label recommendations for cut stump treatment).
3. **Application rates**:
   - **a.** Triclopyr amine – 50% solution,
   - **b.** Triclopyr ester – 25-30% solution (preferred).
4. **Acceptable dates of application:** Any time of year as long as the herbicide does not freeze when applied and the tree is not frozen.
5. **Carrier used:**
   - **a.** Triclopyr amine – water,
   - **b.** Triclopyr ester – basal oil (preferred), diesel, kerosene, methylated seed oil (MSO).
6. **Special application techniques:** Read and follow label instructions for mixing herbicide in carrier and for cut stump treatment. Cut stump close to ground level but leaving enough stump to be able to locate them and apply herbicide. However, in hay and pasture fields where driving wheeled vehicles is necessary consider cutting the stumps closer to the ground. Apply herbicide with a backpack sprayer using low pressure and a solid cone or flat-fan nozzle. Spray the root collar area, sides of the stump, and the outer portion of the cut surface including the cambium until thoroughly wet but not to the point of runoff. Spray as soon as possible after cutting stem. Stumps cut longer than one hour before herbicide application is made should be treated using the triclopyr ester in an oil carrier. Apply anytime except when snow or water prevents spraying to the ground line.

C. Burning, Cultivation, Grazing, Mowing and Hand Pulling: These treatments when used independently have not proven to be effective for controlling Russian olive or saltcedar. The plants have extensive root systems and ability to regenerate and develop new plant material from roots remaining in the soil material. This can be problematic since re-sprouts develop multiple stems resulting in a dense, thick plant that is difficult to treat with the chemical/mechanical treatments mentioned previously. However, when used in combination with herbicide treatments described previously, these methods may be incorporated into an Integrated Pest Management Plan for Russian olive and saltcedar.

D. Biological Controls: Effective biological controls have been found for all species of saltcedar occurring in Montana. The leaf beetle, *Dirhabda elengata* Brulle, is originally from China and Kazakhstan and has been successfully field tested in the southwestern states and federally permitted in 13 western States. Currently, the USDA (as of the date of the technical note) Animal and Plant Health Inspection Service (APHIS) has terminated previously issued permits and discontinued issuing new permits for *Dirhabda* biological control releases. The reason for this decision was based on concerns regarding critical habitat of the federally-listed endangered southwestern willow flycatcher (*Empidonax trailii extimus*) and the biological control agent *D. elengata* (including all species, subspecies, or ecotypes in the *Dirhabda elengata* complex). USDA APHIS will continue to survey and evaluate the biological control program, and assess the impact on saltcedar density and the re-establishment of native vegetation.

Currently, there are no biological controls available to treat Russian olive or saltcedar (including saltcedar hybrids).

V. Woody Debris Removal:

A. Pile stems and burn: Stems and debris should be collected in piles and burned. This may take a year or more before the piles will be dry enough to burn.

B. Chip the stems: Run stems through a shredder at the time of harvest and disperse the material across the treatment site.

C. Pellet the stems: Have the stems chipped and manufactured into pellets for wood burning heating units.

VI. Noxious Weed Control Treatments:

Noxious weed treatment in some areas will be as important as the treatment of Russian olive or saltcedar. Noxious weeds may establish, deposit seed and basically remain in a state of dormancy around and under Russian olive and saltcedar. Weedy species such as Canada thistle, houndstongue, kochia, leafy spurge, spotted knapweed, Russian knapweed, and toadflax may lie dormant for years in the shade of Russian olive and or saltcedar canopies. Once the canopy is removed these species may flourish, especially in the case of Russian olive. Russian olive fixes nitrogen in the soil. Annual and perennial weeds thrive in nitrogen rich soils, so when the Russian olive canopy is removed, weeds may become a significant management issue on these sites.

It is essential to evaluate the site and determine if noxious weeds need to be treated during and likely after the control treatments are initiated for Russian olive and saltcedar.

VII. Monitoring: Monitoring should be conducted frequently and diligently throughout the subsequent growing seasons. Below are several suggestions for consideration:

A. Thoroughly inspect field borders, exposed river banks, lake, pond or wetland shorelines, fence lines, areas of ground disturbance, irrigation infrastructure (i.e., irrigation delivery ditches, seeps, etc.), livestock trails, access roads, etc for signs of new growth and/or re-sprouts.

B. New growth and re-sprouts can be hidden under previous years vegetation cover.

C. Ensure that treated sites are inspected no later than two years following a completed control treatment.

D. Evaluate the existing vegetation community.
1. Is the targeted plant community/composition desirable?
2. Is there an abundance of weeds that will need treatment?

E. Diligently treat all re-sprouts and/or new growth.

VIII. Post Treatment Vegetation Establishment:

A. See the attached Russian olive – saltcedar Post-Control Treatment Re-Vegetation Species List and Recommended Practice Standards Document.

IX. Summary:

A. Successful invasive species management and long-term control of Russian olive and saltcedar depends on early identification/detection, treatment, monitoring, and commitment for the project. With technical and financial assistance from local, state, tribal, and federal agencies; landowners can make a significant contribution to the control of these invasive species.

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