# CONTROL OF RUSSIAN OLIVE BY AERIAL APPLICATION OF HERBICIDES[1]

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## Highlight

**Russian olive trees in Nebraska were controlled with aerial application of 1:1 mixture of PGBE esters of 2,4-D and 2,4,5-T. Repeat application after one or two years was needed for best control of large trees.**

Russian olive trees *(Elaeagnus angustifolia* L.) have become a pasture weed problem in the North Platte River Valley of Nebraska. Russian olive grows rapidly and spreads by seeds and underground rootstalks, crowding out desirable forage species (Figure 1). The tree was reported by Pool (1951) to grow well in practically all parts of Nebraska. Herbicidal control with ground equipment was not practical because of the tall vegetation, large infested areas, and wet soil conditions near the Platte River. Therefore, airplane applications of herbicides were investigated to develop effective and economical control methods for Russian olive trees.

No previous studies have been reported on Russian olive control since this species is usually a desirable ornamental. Numerous studies have been conducted utilizing aircraft for the control of other woody plant species. Arend (1959) stated that the use of aircraft to control brush in pastures was established prior to 1950. Darrow (1960) listed recommendations for the control of mesquite and other brush species in Texas using aerial application techniques. Leonard and Carlson (1960) reported studies on the control of blue oak and poison oak in California by aerial application of phenoxy herbicides. Considerable research has been conducted using aircraft for the control of hardwoods in conifers using phenoxy herbicides (Arend 1959, Kirch 1961, and Peevy and Burns 1959).

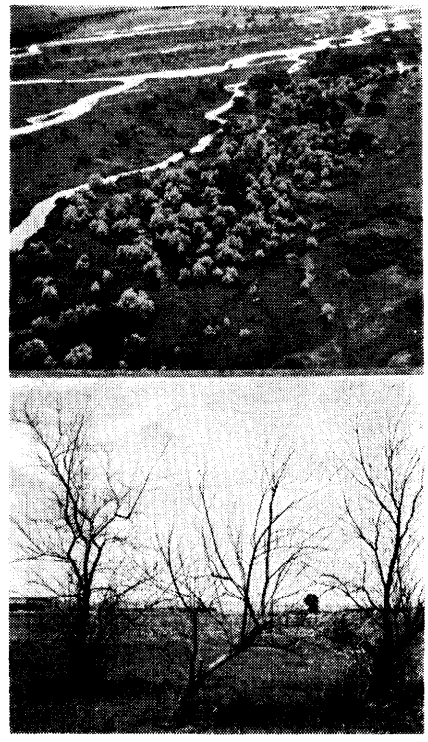

FIGURE 1. *Top*—Aerial view of silvery-green Russian olive trees encroaching on pasture lands along the North Platte River near Bridgeport, Nebraska. *Bottom*—Tree kill from application of a 1:1 mixture of 2,4-D and 2,4,5-T at 2 lb/A, treated June, 1961; retreated June, 1962; photographed June, 1963.

These references emphasize the advantages of using aircraft on rough terrain, wet soil, and tall vegetation for timely treatment of large areas, particularly where effective aerial application methods have been developed.

### Materials and Methods

Russian olive control studies were located at Bridgeport, Nebraska on a Laurel very fine sandy loam soil adjacent to the North Platte River. The average annual temperature is 49.4° F; average annual precipitation is 14.8 inches. The predominate pasture species was Kentucky bluegrass *(Poa pratensis* L.) with scattered plants of strawberry clover *(Trifolium fragiferum* L.) under the Russian olive overstory.

Herbicides applied were the propylene glycol butyl ether esters (PGBE) of 2,4-D; 2,4,5-T; silvex; and a 1:1 mixture of 2,4-D plus 2,4,5-T.

Three experiments were conducted, the first established on June 13, 1958. All herbicides were applied by a Piper Super Cub on plots 99 feet wide and 440 feet long. Silvex was applied at 1 and 2 lb/A; 2,4-D at 2 lb/A; a 1:1 mixture of 2,4-D and silvex at 2 lb/A; and a 1:1 mixture of 2,4-D and 2,4,5-T at 2 and 4 lb/A. All herbicides were applied in a 2:3 oil:water emulsion at 5 gpa. Retreatments were made on June 18, 1960, on the original plots using the same herbicides and rates as applied in June, 1958, except the 1:1 mixture of 2,4-D and silvex was retreated with 2 lb/A 2,4,5-T. Number 2 diesel oil was used as the herbicide carrier at 5 gpa.

In a second experiment on June 18, 1960, silvex; 2,4-D; and a 1:1 mixture of 2,4-D and 2,4,5-T each at 2 lb/A were used, since they showed promise in the first experiment. Number 2 diesel oil was used as the herbicide carrier at 5 gpa. Retreatments were made in June, 1961 on the 1960 plots, using the same herbicides and rates as original treatments.

In the third experiment, aerial treatments were sprayed June 18, 1961. The plots were retreated June 19, 1962, using the same treatments as in 1961. A 1:1 mixture of the PGBE esters of 2,4-D and 2,4,5-T at 2 lb/A was used with number 2 diesel oil, water, and water plus a surfactant (Multifilm X-77) carriers at 5 and 10 gpa. Plot size was 66 feet wide and 330 feet long. A randomized block design was used with two replications per treatment.

In the first experiment top kill evaluations of Russian olive trees were made 3 months, 1, 2, and 3 years after one treatment and 1 and 2 years after two (repeat) treatments. In the second experiment, top kill evaluations were made 1 year after a single application and 1 and 2 years after two treatments. In the third experiment top kill readings were taken 1 year after both single and repeat applications. Ten trees were randomly selected and evaluated in each plot at each evaluation

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date. Top kill was based on visual estimates of leaf and stem kill. If any regrowth was present the tree was considered alive.

### Results and Discussion

In the first experiment, all treatments gave extensive top kill, however, considerable resprouting occurred from the crowns of the plants during the first year after treatment. Evaluations in June, 1960, (two years after treatment) revealed that the 2,4-D and 2,4,5-T mixture at 2 and 4 lb/A and silvex at 2 lb/A were most effective in controlling Russian olive.

The 2,4-D and 2,4,5-T mixture at 2 and 4 lb/A also gave most effective control 1, 2, and 3 years after two treatments. Retreatments of silvex at 1 lb/A appeared more effective in killing regrowth than silvex at 2 lb/A. Retreatment with 2,4-D gave good initial top kill but failed to control regrowth. Retreatment with 2,4,5-T at 2 lb/A was comparable to silvex at 2 lb/A (Table 1).

**Table 1. Percentage top kill of Russian olive (15 to 30 feet high) after two applications of herbicides at Bridgeport, Nebraska. Original treatments June, 1958; retreatments June 1960.**

| Herbicide | Rate[1] lb/A | Top kill after two applications 3 mo. | 1 yr. | 2 yr. | 3 yr. |
|---|---|---|---|---|---|
| 2,4-D | 2 | 81 | 46 | 20 | 20 |
| 2,4-D + 2,4,5-T | 1+1 | 95 | 98 | 100 | 100 |
| 2,4-D + 2,4,5-T | 2+2 | 95 | 100 | 100 | 100 |
| Silvex | 1 | 69 | 74 | 90 | 100 |
| Silvex | 2 | 97 | 100 | 70 | 70 |
| 2,4-D + silvex | 1+1[2] | 84 | 91 | 60 | 70 |

[1] Rates shown are for original treatments June 1958; retreatments in June 1960 used identical rates.

[2] Repeat treatment with 2 lb/A 2,4,5-T only.

In the second trial, 2,4-D, silvex, and the 2,4-D plus 2,4,5-T mixture was applied at 2 lb/A each, (Table 2). The three herbicides produced similar top kill during the first year after application. After retreatment, the 2,4-D plus 2,4,5-T mixture gave excellent control, whereas 2,4-D and silvex declined in effectiveness.

In the third experiment the 2,4-D plus 2,4,5-T mixture was used in combination with three herbicide carriers and two spray volumes (Table 3). Small trees were sprayed (8 to 12 feet high) and appeared easier to kill than larger trees of previous experiments. All treatments showed better than 90 percent control from a single application one year after treatment. Retreatment gave 100 percent control when the herbicide was applied in the 5 gpa water, water plus surfactant, and 10 gpa number 2 diesel oil carriers. The remaining three treatments showed some regrowth but top kill was generally complete. There were no differences between the 5 and 10 gpa spray volume applications or between herbicide carriers in increasing herbicide effectiveness.

### Summary and Conclusions

Control of Russian olive trees, rapidly encroaching on pasture land in the North Platte River valley, was studied by aerial application of herbicides. A 1:1 mixture of the PGBE esters of 2,4-D plus 2,4,5-T gave excellent control at 2 and 4 lb/A. Repeat application one or two years after initial treatment was necessary for the best results on large trees.

The 1:1 mixture of 2,4-D and 2,4,5-T at 2 lb/A was applied at 5 and 10 gpa in carriers of number 2 diesel oil, water, and water plus a surfactant. The treatments were applied on small Russian olive trees (8 to 12 feet high). All treatments gave better than 90 percent control from one or two applications except one treatment. There were no differences in Russian olive control between spray volumes and herbicides carriers used in this study.

**Table 2. Percentage top kill of Russian olive (15 to 30 feet high) after aerial applications of three herbicides at Bridgeport, Nebraska. Original treatments June, 1960; retreatments June, 1961.**

| Herbicide | Rate lb/A | Top kill after One Applic. 3 mo. | 1 yr. | Two Applic. 1 yr. | 2 yr. |
|---|---|---|---|---|---|
| 2,4-D | 2 | 87 | 68 | 50 | 70 |
| 2,4-D + 2,4,5-T | 1+1 | 90 | 71 | 90 | 100 |
| Silvex | 2 | 82 | 71 | 30 | 20 |

**Table 3. Percentage top kill of Russian olive (8 to 12 feet high) from a 1:1 mixture of 2,4-D and 2,4,5-T at 2 lb/A applied in three carriers at 5 and 10 gpa at Bridgeport, Nebraska. Original treatments June, 1961; retreatments June, 1962.**

| Herbicide carrier | Top kill after One Applic. 1 year | Two Applic. 1 year |
|---|---|---|
| 5 gpa water | 99 | 100 |
| 5 gpa water + surfactant[1] | 97 | 100 |
| 5 gpa no. 2 diesel oil | 93 | 95 |
| 10 gpa water | 96 | 85 |
| 10 gpa water + surfactant[1] | 95 | 95 |
| 10 gpa no. 2 diesel oil | 99 | 100 |

[1] Alkylaryl polyoxyethelene glycols (Multifilm X-77 at 0.1%).

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