A Literature Review of Management Practices For Multiflora Rose *(Rosa multiflora)*

James E. Evans
The Nature Conservancy, Minneapolis, Minnesota 55414

INTRODUCTION

Multiflora rose (*Rosa multiflora*) is a common pasture weed in the northeastern and midwestern United States. It was originally introduced to the east coast from Japan in 1866 as an understock for ornamental roses (Wyman, 1949). A hardy plant, it is widely used among horticulturalists and still commercially available from nurseries (Morse, 1974). Multiflora rose attracted little attention from conservationists during the period that its use was confined to horticultural purposes (Schery, 1977).

The situation changed dramatically beginning in the 1930s when the U.S. Soil Conservation Service advocated the use of multiflora rose for soil erosion projects and as a "living fence" to confine livestock (Albaugh *et al.*, 1977). Experimental plantings of multiflora rose were conducted in a number of states (Steavenson, 1946), and as recently as the late 1960s many state conservation departments were giving away rooted cuttings to property owners (Schery, 1977). Multiflora rose hedges were valued as wildlife cover for pheasant (*Phasianus colchicus*), bobwhite (*Colinus virginianus*), and cottontail rabbit (*Sylvilagus floridanus*) (Labisky and Anderson, 1965) as well as a source of food for song birds (Scott, 1965). More recently, hedges of multiflora rose have been used as crash barriers and to reduce headlight glare in the medians of highways (Schery, 1977; Coartney, 1977; Hipkins *et al.*, 1980.

The uncontrolled spread of multiflora rose in pastures and other unplowed land was soon recognized (Dambach, 1948). In some areas large acreages of pasture land have been completely taken over by multiflora rose (Barbour and Meade, 1980). Cattle are often reluctant to enter fields dominated by multiflora rose (Fawcett, 1980). It has also been shown that multiflora rose hedges lower the crop yields in adjacent fields by competition for nutrients (Labisky and Anderson, 1965).

The controversy over classification of multiflora rose as a noxious weed continues to this day and hunters, horticulturalists, and farmers who earn their

living from row crops value multiflora rose as wildlife habitat and for its aesthetic value. Dairy farmers, ranchers, conservationists, and others are more concerned with its uncontrolled spread. This dichotomy has lead to a noxious weed classification in New Jersey (Barbour and Meade, 1980) and Iowa (Fawcett, 1980) on a county-by-county basis, while in some other states, such as Ohio and West Virginia (Sherrick and Holt, 1977), it has resulted in a statewide noxious weed classification.

The purpose of this paper is to review the biology of multiflora rose and to examine the relative success of the control practices that have been attempted for it.

BIOLOGY

The present range of multiflora rose is throughout the United States, with the exception of the Rocky Mountain area, Southeastern Coastal Plains, and the Nevada and California desert areas (Fawcett, 1980). The plant does less well in the northern tier of states (Fawcett, 1980).

Multiflora rose is a perennial shrub that reproduces by seeds and by rooting at the tips of its drooping canes (Albaugh *et al.*, 1977). The stems of a typical plant are 3 to 4 meters long, with the first 2 meters being erect and the tips drooping close to the ground (Albaugh *et al.*, 1977; Fawcett, 1980). The leaves are pinnately compound, with between five and eleven leaflets per leaf, each leaflet broadly oval and generally less than 4 centimeters long (Fawcett, 1980). The flowers of multiflora rose are white to pinkish-white, one to two centimeters in diameter, with numerous stamens. Between 25 and 100 or more are generally found in a long or pointed panicle (Fawcett, 1980). Flowering begins in June and the fruits develop in late summer (Fawcett, 1980). The fruits, or rose hips, are bright red, globular to ovoid, and fleshy (Albaugh *et al.*, 1977; Fawcett, 1980). The rose hips do not split apart to release the seed but dry gradually to form a leathery capsule too dense to be wind carried. These fruits are highly sought after by birds, especially the cedar waxwing (*Bombycilla cedrorum*) and American robin (*Turdus migratorius*) (Scott, 1965; Albaugh *et al.*, 1977; Barbour and Meade, 1980). Wyman (1949) showed that better germination success results from the scarification seeds receive passing through the digestive tract of birds. Birds are responsible for spreading the seeds, and as Schery (1977) noted, rose seedlings are often found under bird perch sites. Uneaten rose hips remain on the plant until the following spring (Fawcett, 1980). The seeds remain viable for a number of years (Wyman, 1949). As a result of seed dispersal by birds, the volunteer stands are generally a short distance (less than a mile) from their source (Scott, 1965).

The seeds germinate readily following deposition in the soil. Steavenson (1946) recommended cold stratification from February 1 to April 1 for people planting multiflora rose. He did not, however, indicate moisture conditions or recommend scarification. Seedlings appear within 60 days at soil temperatures above freezing (Steavenson, 1946). Seedlings are generally inconspicuous the first one or two years due to their low growth habit and the way the trailing stems intermingle with the ground vegetation (Schery, 1977).

Multiflora rose is capable of enduring a wide range of soil and environmental conditions (Wyman, 1949). Steavenson (1946) reports successful plantings even in the eroded claypans of central Missouri and southern Illinois. Multiflora rose grows less well in wet soils, and Schery (1977) reports loss of vigor

after two successive growing seasons with high precipitation.

MANAGEMENT

Cultural Control. Multiflora rose is not generally found in areas where the ground is frequently plowed. (Scott, 1965; Fawcett, 1980). In other areas, such as in fields and pastures, mowing, cutting, and burning are possible control practices.

Repeated mowing will control the spread of multiflora rose, particularly where the grass cover is dense (Scott, 1965; Fawcett, 1980). Fawcett (1980) recommends that mowing once or more will prevent multiflora rose seedlings from becoming established. At the Woodborne Sanctuary (PA), annual mowing in July has helped control the spread of multiflora rose in meadows and pastures but not eradicated it (J. Stone, pers. comm.). Mowing can be difficult due to terrain when multiflora rose becomes established in brush or hedgerows (Barbour and Meade, 1980). It is also difficult to mow when the individual rose clumps reach maturity, due to their size.

Hand-cutting of established clumps is difficult and time-consuming (Schery, 1977). Fawcett (1980) recommends use of heavy machinery to knock down large rose clumps but cautions that further control will be necessary both due to resprouting and because seeds will be spread and germinate readily in the area in which the machinery was used. At Woodborne, a large hedge cutter was used to top cut 3 meter high rose clumps. Following this, annual mowing has prevented the establishment of large rose bushes and kept the field open (J. Stone, pers. comm.).

Burning. Apparently, burning has not been tried for multiflora rose; however, it has been tested as a management practice for Mccartney rose (*Rosa bracteata*), another exotic pasture species in the southern United States. Gordon and Scifres (1977) used head fires on plots in southeastern Texas at two to three month intervals starting in February, 1975. Fire intensity and fuel components varied seasonally; however, in all cases top-growth removal of Mccartney rose was greater than 90%. Regardless of the date of burning, regrowth was initiated within two weeks. The average cane elongation was about 4 cm. per month, and canopy cover replacement averaged 10 to 15% per month following burning. Burning in winter effectively reduced the rose canopy for short-term gains in brush control and allowed native grasses to take advantage of the entire spring growing period. There were higher grass yields following winter burns than other seasons. Scifres (pers. comm.) believes that multiflora rose response to burning would be similar.

Prescribed burning in combination with herbicides has also been evaluated for Mccartney rose in southeastern Texas. Scifres (1975) found that mechanical methods such as raking and stacking are effective for initial removal of mature, dense and ungrazed stands of the rose, allowing access for subsequent treatment. The most effective herbicide treatment was 2,4,5-T plus picloram at 2 lb. per 100 gallons of water and a surfactant (0.5% volume/volume or v/v) applied to thoroughly cover the plant. The best time of treatment was in the fall, when Mccartney rose is actively growing, and resulted in 90% top kill rates. A prescribed burn eighteen months later resulted in a high degree of control. This system (mechanical-chemical-burning) is most efficient when an adequate period of time for canopy replacement separates each phase, allowing for complete action of the herbicide. Prescribed burning removes the debris that remained after spraying and should reduce live Mccartney rose top growth by 75%.

Periodic burning or respraying is probably necessary to prevent re-invasion of the rose (Scifres, 1975).

Biological Control. There is controversy over the value of grazing to inhibit the spread of multiflora rose. Scott (1965) reports that frequent grazing by cattle can help prevent the establishment of large bushes. Others point to the effect cattle have in disseminating or dispersing rose seed (J. Stone, pers. comm.). Fawcett (1980) cautions that the soil disturbance that accompanies overgrazing favors the establishment of multiflora rose.

There is a potential biological control species for multiflora rose. The European rose chalcid (*Megastigmus aculeatus* Swederus, Hymenoptera: Torymidae) was first reported in this country by rose growers who complained about poor germination success in multiflora rose seed imported from Japan. An investigation showed that nearly every shipment into New Jersey from Japan was infested with *M. aculeatus* (Weiss, 1917).

M. aculeatus is a phytophagous wasp. The life cycle and distribution in North America has been summarized by Milliron (1949) and Balduf (1959). The adults are minute, weak flyers of limited lifespan. In May and June the long terebras of the female ovipositor pierces the still soft achene and deposits one egg in the soft, pulpy seed. The larvae subsequently develop during June and July, and consume the entire contents of the seed. After full growth in mid to late summer, the larvae undergo a long diapause and remain inside the now seedless achene. Pupation occurs in late-April to June, and the adult emerges from the rose hip in early summer to renew the cycle. Populations are heavily female in number, suggesting that the majority of reproduction is parthenogenetic (Milliron, 1949; Balduf, 1959).

The degree of host specificity is not completely understood at this point (see Table 1). Milliron (1949) recognized two varieties of *M. aculeatus*, a "light form" (*M. aculeatus aculeatus*) and a "dark form" (*M. aculeatus nigroflavus*). Milliron believed that *M. aculeatus nigroflavus* was host-specific on multiflora rose. Balduf (1959), however, recovered dark forms of *M. aculeatus* from *Rosa eglanteria* and *R. virginiana*, both native roses. Further work is necessary to determine if a biological control program using *M. aculeatus* would represent a threat to the ornamental rose industry and also to native roses.

It is important to note that *M. aculeatus* adults are limited flyers and do not appear to disseminate even locally through their own powers of flight (Balduf, 1959). Their spread is dependent upon the use of rose seed, which explains the presence of these insects in nurseries on the east coast where imported rose seed was used to start root stocks. Subsequent plantings, however, were done vegetatively, far from nurseries where the plants were grown. It is possible that some of the large-scale plantings of multiflora rose throughout the midwest are isolated from their chalcid limiting agent (Scott, 1965). If true, this suggests that local introductions of *M. aculeatus* could be an effective control method for multiflora rose.

M. aculeatus has been collected from Jamaica Plain, Massachusetts, and Ithaca, New York (Milliron, 1949); a number of locations near Urbana, Illinois; Ash County, North Carolina; Columbiana and Coshocton Counties, Ohio; Geneva, New York (Balduf, 1959); Kingston, Rhode Island; Rockville, Maryland; and Seattle, Washington (U.S. National Museum, reported in Balduf, 1959). Further

evidence could be sought from the entomology collections at universities in each state.

Chemical Control. Plant growth regulators have been used to control multiflora rose in southwestern Virginia where it has been used as a safety barrier along highways. Of the four regulators tested in spring, 1977, chorflurenol, maleic hydrazine, and MBR-18337 effectively prevented fruit set and subsequent spread. The fourth regulator, glyoxime, did not give adequate control but did show some activity in causing fruit abscission after fruit set had occurred (Hipkins *et al.*, 1980).

Numerous herbicides have been tested on multiflora rose (see Table 2). Though a discussion of the effects of treatments on non-target plant species is beyond the scope of this paper, a few comments may be made regarding the nature of some of the herbicides reported to control multiflora rose. Certain of these herbicides are more selective and thus better for use in natural areas. Dicamba and picloram are both very mobile and should not be used near desirable plants or in areas where runoff or soil water movement will bring the chemical in contact with the roots of desirable plants (Chappell, 1980). Glyphosate (Roundup) is also non-selective, but it is non-volatile and has no soil activity. It is routinely used near desirable vegetation with no harmful effects (Fawcett, pers. comm.). Fosamine (Krenite) controls woody species, is non-volatile, and may be suitable in some situations where the concern is with protecting herbaceous plants (Fawcett, pers. comm.).

Albaugh *et al.* (1977) applied four rates of glyphosate on June 4, 1976, in a field in southeastern Pennsylvania. The use of 1% volume/volume (v/v) solution proved an adequate control, and the use of a surfactant allowed adequate control with a 0.5% v/v solution.

Sherrick and Holt (1977) applied 22 different treatments of various herbicides in the Purdue Wildlife Area in northwestern Indiana in mid-June and mid-

TABLE I: ROSE HOSTS FOR *Megastigmus aculeatus*

Host Species for *Megastigmus aculeatus* var. *aculeatus* (light form)	Host Species for *Megastigmus aculeatus* var. *nigroflavus* (dark form)
From Milliron (1949)	
Rosa alpina	*Rosa gallica*
R. cinnamomea	*R. multiflora*
R. davurica	
R. jundzillii	
R. kamtschatica	
R. medwedweii	
R. mollis	
R. sempevirens	
From Balduf (1959)	
R. eglanteria	*R. eglanteria*
R. canina	*R. virginiana*
R. palustris	

Table 2. Summary of Chemical Control Practices for Multiflora Rose

Chemical	Rate	Location	Date	Effectiveness (% Defoliation)	Reference
Glyphosate	1% volume/volume	S.W. Pennsylv.	June	"adequate"	Albaugh *et al.*, 1977
	0.5% "	N.W. Indiana	June-July	89	Sherrick and Holt, 1977
	1.0% "	" "	" "	98	" " " "
	1.5 lb/100 gal	Iowa	May-June	94-97	Fawcett *et al.*, 1977
	3.0 "	"	" "	99-100	" " "
	1.5 "	Connecticut	June	96-99	Ahrens, 1979
	3.0 "	"	"	95-98	" "
	1.5 "	Georgia	May	50-75 stem kill	Reed and Fitzgerald, 1979
	2.3 "	"	"	25-50 " "	" " " "
	1.0% V/V	New Jersey	June	100	Barbour and Meade, 1980
	2.0% "	" "	"	95-100	" " " "
Triclopyr	1.5 lb/100 gal	Georgia	May	75-99 stem kill	Reed and Fitzgerald, 1979
	2.0 "	"	"	100 " "	" " " "
	0.8 "	Connecticut	June	79-96	Ahrens, 1979
	1.5 "	"	"	93-94	" "
	1.5 lb/acre	New Jersey	"	100	Barbour and Meade, 1980
	3.0 "	" "	"	100	" " " "
2,4,5-T	0.5% volume/volume	N.W. Indiana	June-July	99	Sherrick and Holt, 1977
	1.0 "	" "	" "	100	" " " "
	4.0 lb/100 gal	Iowa	May-June	100	Fawcett *et al.*, 1977
	6.0 "	Connecticut	June	89-100	Ahrens, 1977
	2.0 "	Georgia	June	75-99 stem kill	Reed and Fitzgerald, 1979
Fosamine	6.0 lb/100 gal	Connecticut	June	25-65	Ahrens, 1979
	12.0 "	"	"	25-73	" "
	6.0 "	"	August	33-48	" "
	9.0 "	"	"	99	" "
	12.0 "	"	"	95-100	" "

Table 2, continued

Chemical	Rate	Location	Date	Effectiveness (% Defoliation)	Reference
Tebuthuron					
20% P pellets	4.0 kg/ha	N.W. Indiana	June-July	93	Sherrick and Holt, 1977
	6.0 "	" "	" "	92	" " " "
	2.0 lb/acre	Ohio	fall,spring	100	Lynn *et al.*, 1978
	4.0 "	"	" "	98-100	" " "
	6.0 "	"	" "	100	" " "
	2.2 kg/ha	not indicated	March	67-73	Link *et al.*, 1981
	3.4 "	" "	"	77-90	" " "
	6.7 "	" "	"	80-100	" " "
Dicamba foliar	2.0% volume/volume	N.W. Indiana	June-July	87	Sherrick and Holt, 1977
	3.0% "	" "	" "	100	" " " "
soil,10% Pellet	8.0 kg/ha	" "	" "	96	" " " "
" "	16.0 "	" "	" "	87	" " " "
5% Granule	8.0 "	" "	" "	58	" " " "
" "	16.0 "	" "	" "	67	" " " "
5% Granule	8.0 lb/acre	Iowa	June	82	Fawcett *et al.*, 1977
10% "	8.0 "	"	"	73	" " "
10% Pellet	4.0 "	Connecticut	June	24-32	Ahrens, 1979
" "	8.0 "	"	"	33-55	" "
5% Granule	4.0 "	"	"	22-34	" "
" "	8.0 "	"	"	60-84	" "
5% Granule	2.0 "	New Jersey	May-June	0-15	Barbour and Meade, 1980
" "	4.0 "	" "	" "	0-83	" " " "
" "	10.0 "	" "	" "	27-60	" " " "
10% "	2.0 "	" "	" "	0-15	" " " "
" "	4.0 "	" "	" "	0-45	" " " "
" "	6.0 "	" "	" "	0	" " " "
" "	8.0 "	" "	" "	0-15	" " " "
Picloram foliar	1.0% V/V	N.W. Indiana	June-July	100	Sherrick and Holt, 1977
soil, 10% P	4.0 lb/acre	Iowa	May-June	96-99	Fawcett *et al.*, 1977
" "	8.0 "	"	" "	99	" " "
" "	2.0 "	Connecticut	June	71-82	Ahrens, 1979
" "	4.0 "	"	"	72-90	" "
" 5% P	2.0 "	"	"	72-90	" "
" "	4.0 "	"	"	80-91	" "
" n.a.	2.0 "	New Jersey	June	83-90	Barbour and Meade, 1980
" "	4.0 "	" "	"	97-100	" " " "
" "	6.0 "	" "	"	100	" " " "
" 10% P	4.0 "	not indicated	March	93-100	Link *et al.*, 1981

July, 1977. All treatments except dicamba granules at 8 kg/ha and Velpar at 1% v/v were relatively effective. The best results were with 2,4,5-T at all rates, picloram triclopyr ester, and glyphosate at 1% v/v, (all foliar sprays), and with dicamba pellets. The more residual properties of the granular and pelleted formulations appeared to be more effective in reducing resprouting.

Kmetz (1977, 1978) applied fosamine (Krenite) at 1.5 to 3 gallons per 50 to 300 gallons sprayed per acre. The dates and locality were not reported; however, he noted that a fall application is absorbed by leaves, stems, and buds with little or no apparent effect until the following spring, when bud development is entirely prevented or limited to small, spindly leaves.

Fawcett *et al.*, (1977) applied fifteen different treatments of various herbicides in two pastures in Iowa in May, June, and early July, 1977. Most foliar applications provided excellent control, especially 2,4,5-T, glyphosate and dicamba. Soil applications with picloram 10% granules (10G) and 5% granules (5G) provided adequate control.

Coartney (1977) tested foliar sprays of 2,4,5-T, silvex, and glyphosate at 0.5 to 1.0 gallons per gallon rate, and picloram 10K pellets in Floyd County, Virginia. The picloram pellets, applied in March, 1976, were extremely efficient, with rates as low as one-half teaspoon killing a rose clump up to 1.8 meters high and 2 meters across.

Lynn *et al.* (1978) applied tebuthiuron 20% pellets (20%P) of two size ranges (1/16" and 3/4"), each with 5 g. active ingredient, to hedgerows and scattered plants in Ohio and Maryland. Rates of 2 lb/A or greater provided excellent control when applied in either fall or spring. The smaller pellets were broken down more rapidly, causing faster kill rates. Broadcast applications of tebuthiuron at 2 lb/A resulted in a 40% kill of adjacent ground cover, including *Andropogon virginicus* (broomsedge), *Solidago spp.* (golden rod), and *Trifolium repens* (white clover).

Reed and Fitzgerald (1979) tested a number of herbicides on an overgrown pine plantation in Elbert County, Georgia in spring of 1978. Triclopyr, 2,4,5-T, and picloram provided adequate control, although the results with picloram were erratic, with stem kills ranging from 25 to 100%. Foliar sprays with glyphosate were the least effective, with stem kills ranging from 25 to 75%. They concluded that a single treatment will not eradicate multiflora rose, and that a more effective control than repeated spraying might be a combination of prescribed burning and herbicides, as discussed earlier.

Ahrens (1979) applied 42 treatments of a number of herbicides to two study plots in Connecticut in 1977 and 1978. He found that treatments of 2,4,5-T, dichlorprop, and dicamba were more effective in June, while fosamine and triclopyr were more effective in August. The effects of fall spraying were not observed until the following spring. The use of foliar sprays of glyphosate did not affect perennial grasses growing under the rose bushes. Soil application of dicamba did not give adequate control.

Lynn *et al.* (1979) examined long-term (300-day) effects of applying 1-2% v/v solutions of glyphosate in spring or fall to multiflora rose. The fall treatments did not show results until the following spring, when effective control was observed. The spring treatments showed increasing control over the growing season to complete control the following spring.

Paterson *et al.* (1980) were concerned with controlling grasses and broadleaf weeds in cultivated multiflora rose production for nurseries. Glyphosate at 3 - 6 lb/A damaged the roses as well as adjacent "weeds."

Barbour and Meade (1980) tested five herbicides over a three year period in Sussex County, New Jersey. Glyphosate at 1-2% v/v and picloram at 2,4, or 6 lb/A rates were effective in controlling multiflora rose. Glyphosate had the unique side effect of making the over-wintering rose canes very brittle so that grazing cattle would break up the brush. Triclopyr was effective at 3 lb/A, but allowed almost complete regrowth at lesser rates. Dicamba was generally ineffective at all rates.

Mann *et al.* (1980) studied the uptake of tracer-marked fosamine by multiflora rose. In a 32 day study, 2.5% fosamine and 0.5% non-ionic surfactant v/v solution was applied to leaves, stems and buds. The greatest absorption was by buds followed by leaves and stems. There is evidence that fosamine absorbed by leaves translocated to buds. The concentration of fosamine absorbed in leaves and buds rather than the stems illustrates the problem of long-term control versus temporary top-kills of multiflora rose.

Link *et al.* (1981) applied thirteen treatments of granular and pelleted herbicides to plots in March, 1979 (location unreported). The results were evaluated over a period of two years. Tebuthiuron and hexazinone provided adequate control that increased with time, while dicamba was not an adequate control.

SUMMARY

Multiflora rose management includes a number of options, including cutting and mowing, burning, grazing, and the use of plant growth regulators and herbicides. An effective method for control of Mccartney rose *Rosa bracteata* includes cutting to remove mature, dense stands; application of an herbicide in the fall to cause root and stem kill; and prescribed burning twelve to eighteen months later to rejuvenate grasses and remove subsequent rose top-growth. This combination of practices might profitably be applied to multiflora rose. A biological control species, *Megastigmus aculeatus*, was introduced to North America before 1917 but may be isolated from large-scale plantings of multiflora rose due to the insect's weak powers of flight. Further investigations into a biological control program could prove very useful.

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