1-1-1960

Multiflora rose in West Virginia

R. Franklin Dugan

MULTIFLORA ROSE in WEST VIRGINIA

BULLETIN 447
NOVEMBER 1960

WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

THE AUTHOR

Author of *Multiflora Rose in West Virginia* is R. Franklin Dugan, formerly Assistant Professor of Wildlife Management in the Division of Forestry and Assistant Forester in the Agricultural Experiment Station, and now Biologist, United States Department of Agriculture, Soil Conservation Service, Roanoke, Virginia.

West Virginia University
Agricultural Experiment Station
College of Agriculture, Forestry, and Home Economics
A. H. VanLandingham, Director
Morgantown

MULTIFLORA ROSE IN WEST VIRGINIA

R. FRANKLIN DUGAN

WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION

ACKNOWLEDGMENTS

A survey with the scope of the one on which this bulletin is based could never have been accomplished in the space of two summers without the cooperation of the two agencies most closely connected with Multiflora rose plantings in West Virginia—the U. S. Soil Conservation Service, and the Conservation Commission of West Virginia. Soil Conservation Service technicians working on West Virginia Soil Conservation Districts and Farm Game Managers of the Conservation Commission gave freely of their time in helping with the field work of this project. The office records made available by both agencies also were invaluable in locating and classifying the rose plantings examined. The author wishes to express his sincere gratitude to all the individuals, too numerous to mention by name, who participated in this survey.

Thanks are due also to some 170 farm operators who furnished the established plantings used in this study, and gave information on the history of the hedges.

The statistical analyses of the data were conducted under the direction of the Station Statistician, Dr. R. S. Dunbar, Jr.

Multiflora Rose in West Virginia

R. FRANKLIN DUGAN

Introduction

MULTIFLORA rose, first brought to America from Asia about 100 years ago, has been used in conservation plantings since the 1930s. It was first tested in the Northeast and Midwest, but has since been widely used in most of the United States. Its chief values are as a living fence and for wildlife cover and food.

Formerly, Osage orange was widely planted throughout the Midwest as a hedge fence. After several years, however, it became apparent that the disadvantages of this plant so outweighed its advantages in the minds of farmers, that not only was its planting discontinued, but existing hedges were destroyed in a large majority of cases. Osage orange was not suited to use as a fence adjacent to cropland because it grew to tree size and hindered the growth of crops through shading and root competition. At the same time, as the plants grew taller, the lower branches died and eventually broke off, lessening or destroying the effectiveness of the planting as a fence. The only way to avoid this condition was to prune the hedge severely at least once a year, a rather disagreeable and costly job. It was also discovered that the long, woody thorns of Osage orange were strong enough to puncture the pneumatic tires which are now almost universally used on farm tractors.

Multiflora rose does not possess these undesirable qualities. After it reaches a height of eight or ten feet, the branches fall over of their own weight, and subsequent growth serves only to increase the density of the hedge, without adding to either the height or the width. Therefore, it does not hinder the growth of agricultural crops, and its effectiveness as a fence increases with age. The thorns, although sufficiently sharp and numerous to act as a real deterrent to livestock, are too short and weak to damage tractor tires.

Multiflora rose has long been recognized as one of the finest plants available for furnishing cover to wildlife. Not only game species, but a wide variety of songbirds and small mammals use it for nesting and escape cover. Research has shown that the birds,

FOR MAXIMUM wildlife benefits, plant Multiflora rose around a plantation of wildlife food shrubs, such as the Autumn Olive in the background.

mammals, and insects found in shrubby or woody fence rows are predominantly those beneficial to agriculture. On the other hand, the majority of the animals living in grass and weed fence rows are injurious to farm crops (7).

The fruits of Multiflora rose, known as hips, are large and red, and persist on the bushes throughout most of the winter. Thus, they form a source of wildlife food at the time when most of the native plants have little or nothing to offer. Until recently, biologists considered rose hips to be more or less emergency food, without very much nutritional value. Recent studies, however, have demonstrated that pheasants can live for several weeks on this diet alone, without loss in weight or health (13).

From the viewpoint of the average farmer, the most important value of a rose hedge is the economy with which it can provide a fence. A study made in Illinois indicated on the average, a mile of Multiflora rose fence cost $26.81 per year as compared to an average cost of $66.40 per year for the same length of woven wire fence (24).

However, during the past few years, two serious objections to the use of Multiflora rose in this area have been raised. The first

concerns the possibility of its spreading so as to become a troublesome weed. The late J. B. R. Dickey presented a paper at the 1952 Northeast Fish and Wildlife Conference entitled "The Multiflora Rose as a Troublesome Weed in Pastures and on Idle Land." A series of magazine articles, most of them by the same author, also appeared about the same time. As a result of this unfavorable publicity, many farmers, and some conservation technicians became reluctant to make plantings of this species.

Another question raised mainly by technicians was: "Does Multiflora rose in this area actually develop into a hedge that will confine livestock?" Many plantings could be pointed out which after several years of growth could not be called stock-proof fences, and some farmers became discouraged with the results they had obtained.

In recognition of the need for more definite knowledge of the various characteristics of this plant under conditions found in this area, the Division of Forestry, West Virginia University Agricultural Experiment Station, carried out a survey of Multiflora rose plantings throughout the State during the summer months of 1954 and 1955. It is the purpose of this bulletin to present the results of that survey, together with some of the basic information previously published concerning this plant.

The Plant Concerned

Multiflora rose is not native to North America, but like several other Asiatic plants and animals, it has found conditions in the United States well suited to its growth and reproduction. It is the parent stock from which some of our popular cultivated varieties of roses have been developed. There are evidently a number of strains in existence, some of which are thornless, and some of which have a somewhat trailing growth habit.

The typical strain used as a living fence, however, is an upright shrub, with high arching branches, somewhat the shape of an umbrella. A single row of plants reaches an ultimate height of six to ten feet, and the branches spread about eight to 12 feet, depending on the amount of moisture and fertility available. Occasionally a plant may be found which has taken advantage of the opportunity to support itself on a neighboring tree, and has thus grown to a height two or three times the normal figure. However, Multiflora is not a true climbing rose, having neither tendrils nor a twining habit.

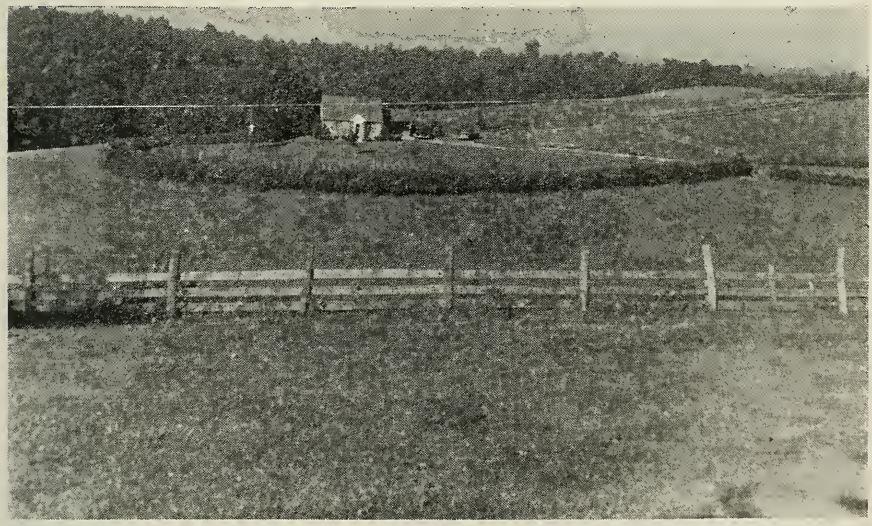
The thorns are long, sharp, and slightly recurved, and domestic animals soon learn to respect them. The leaves are quite long, and

THIS HEDGE in Summers County is 12 feet high and over 12 feet in width. Plenty of moisture and fertility were responsible for this unusual growth.

usually have nine leaflets, paired along a central stem. The leaflets are one-half to one and one-half inches in length, and finely toothed. In the spring it is easy to see why this plant was named "many-flowered rose." During late May and early June the plants are literally covered with clusters of small white flowers. As the fruits mature in late summer and fall, they go through a progressive color change, starting with green, turning to yellowish and orange, and finally becoming bright red. The clusters of red berries remain on the bushes until the new leaves begin to grow in the spring, so that the plants present an attractive appearance at all seasons of the year. In fact, Multiflora rose is often planted purely for ornamental purposes, particularly on large estates.

It is often desirable to be able to distinguish between Multiflora and other varieties of roses. Usually this is not too much of a problem when the flowers or fruits are in evidence, but mistakes in identification are sometimes made in the case of young plants. For example, one farmer in Barbour County constructed a pond a few years after establishing a Multiflora rose hedge. The first summer after the pond was completed, the farmer noticed a large number of

THIS PRESTON COUNTY picture demonstrates that the "many-flowered rose" is truly an ornamental plant in the spring.



A WELL-PLACED HEDGE of Multiflora rose can add much to the attractiveness of a farmstead. Songbirds like to stay here, too.

rose seedlings growing on the lower face of the dam. He concluded that this was sufficient evidence of the danger that Multiflora rose would spread rapidly over the entire farm, so he immediately uprooted the hedge with a bulldozer, and burned the plants. Examination of the seedlings on the pond fill, however, showed that they were all native roses, which undoubtedly had been growing on the farm for many years.

The recurved thorns and the nine leaflets mentioned earlier have been listed as points of identification. These prove somewhat variable, however, and the most reliable characteristic found during the course of this survey is the size and shape of the stipules at the base of each leaf. On Multiflora, these stipules are comparatively long and feathery, and spread away from the leaf stem for nearly their entire length. Figure 1 shows the comparison between the stipules of Multiflora and those of the roses found wild in West Virginia. This characteristic was found to be reliable in separating Multiflora from all other roses except certain of the ramblers, which either have been developed from Multiflora or are very closely related to it.

Plantings in West Virginia

Multiflora rose has been used for several decades by commercial nurserymen as the rootstock for many grafted varieties of ornamental roses. Since it is much hardier than most of these ornamentals, the latter were frequently killed by severe winter weather, while the roots survived to produce "wild" bushes of Multiflora rose. For this reason, it is difficult to say just when the first plantings of this species appeared in West Virginia. The earliest instance discovered in this survey was the planting of seeds of a "Baby Rambler" (probably Multiflora) in a Hardy County garden in 1917 or 1918. However, there were probably some other examples of the escape of this species prior to that date.

In more recent years, Multiflora rose has been purposely planted throughout the State to serve as a living fence, and to provide cover and food for wildlife. The U. S. Soil Conservation Service has sponsored the largest number of such plantings in West Virginia to date. Its program of distribution began in 1943 with a trial planting of 200 roses. The program really got underway in 1945, and soon became one of the most popular conservation practices offered by the Service. Slightly more than six million plants have been distributed by the Soil Conservation Service up to and including the 1957 planting season.

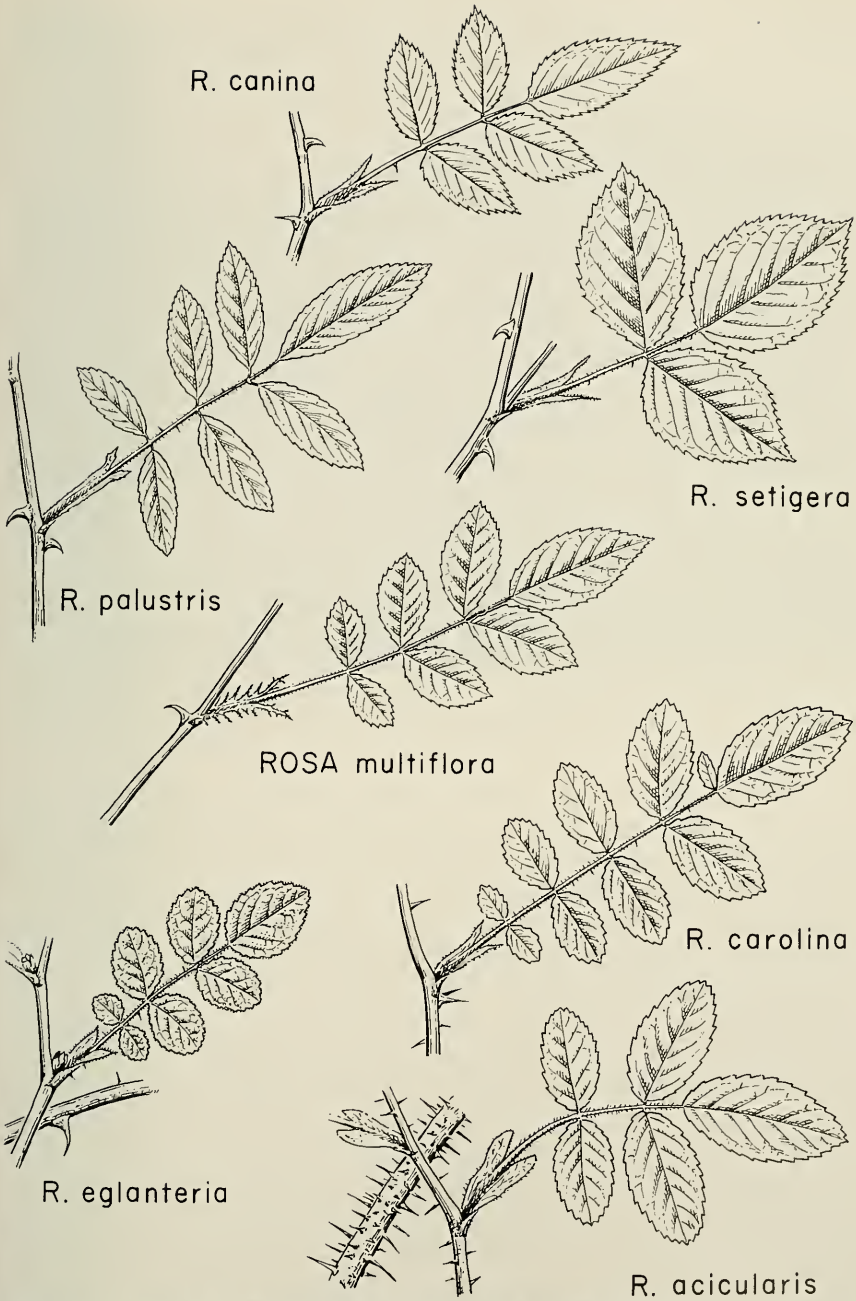


FIGURE 1. Stipule characteristics of Multiflora rose compared with those of the various rose species found wild in West Virginia. (Drawing by William A. Lunk.)

MANY OF THE rose fences in West Virginia have been planted on the advice of Soil Conservation Service technicians like George Tabb, who recognize their conservation values.

Multiflora rose has also been extensively used by farmers and others cooperating with the Farm Game Management project of the Conservation Commission of West Virginia. This project was begun in 1948, and has been continued to the present time. The Conservation Commission reports that it has distributed nearly seven million seedlings through the 1957 season.

In addition to the distribution made by these two agencies, many individuals have planted hedges for various purposes, using stock purchased from commercial nurseries. It is probably safe to say that approximately 14 million Multiflora rose plants have been planted in West Virginia during the past 25 years.

These plantings are of all ages, from one year to more than 15 years. They are to be found at elevations of less than 350 feet to more than 3,000 feet. Multiflora rose is planted in every county of the State and has been used on both public and private land. As might be expected, however, the vast majority of the hedges are on privately-owned farmland in the more agricultural areas of the State.

The Survey

As explained in the Introduction, the object of this survey was to obtain more definite information regarding the behavior of Multiflora rose under West Virginia conditions so that agencies and individuals interested in using it as a conservation plant could do so more intelligently and successfully. The principal questions to which answers were sought were:

1. What are the effects of variations in elevation, soil type, exposure, moisture supply, fertility, shade, competition from other plants, and browsing by animals on the growth of Multiflora rose?
2. What are the results obtained from various methods of planting, spacing of plants, fertilization, cultivation, and pruning?
3. Under a given set of site conditions and management practices, at what age can Multiflora rose be expected to confine the various classes of livestock kept on West Virginia farms?
4. How much value does the plant possess as cover and food for wildlife? Are there other special values to be considered?
5. Under what conditions, and by what means, will Multiflora rose spread from the original planting? What methods are effective in controlling such spread?
6. To what extent is Multiflora rose in this area affected by diseases and insects?

The field work was done during the summer months of 1954 and 1955. A total of 282 plantings were examined on 170 farms in 44 counties of West Virginia. In each county, the plantings to be visited were selected by technicians of the Soil Conservation Service and/or the State Conservation Commission. A letter was written to these technicians well in advance of the date set for the author's visit, and they were asked to select enough farms to require about two and one-half days' field work in each county. The letter emphasized the fact that samples were needed from as wide a range of site conditions as possible, including both successful and unsuccessful plantings. The county technicians were asked to include as many of the older plantings as possible (if the history of their treatment was available) and to be sure to include all plantings where complaints had been received regarding spreading, or other undesirable characteristics of the rose.

For each planting visited, a combination questionnaire and data sheet, a sample of which is reproduced in the Appendix, was filled in. The first page (through question 11) was completed according

to information supplied by the landowner or tenant who had established the planting. The remainder of the data came from office records of the Soil Conservation Service and the Conservation Commission; Soil Conservation Service soils maps; U. S. Geological Survey topographic maps; and field observations and measurements made by the author, with assistance from Soil Conservation Service and Conservation Commission personnel.

Items 15 through 18 were taken from Soil Conservation Service soils maps, and item 19 from the topographic quadrangles. Item 20 was recorded as the growing season during which the rose was examined. (A hedge planted in the spring of 1949 and measured in the summer of 1954 was designated as six years old.) In practically all cases, the original planting stock was one year old when the hedge was established.

The figures for items 21 through 24 were obtained by measuring and examining samples spaced at regular intervals along the entire length of the planting. The distance between samples was adjusted according to the total length of the planting so that each planting was measured in at least five places, but in no case were the intervals between samples more than 100 feet. (On a few extremely long hedges, samples were measured on alternate 500-foot sections.)

The location of each sample was determined by means of a land measuring wheel. Since the circumference of the wheel was 0.1 chain (6.6 feet), the interval used on hedges of more than 500 feet total length was for convenience set at 99 feet, or 15 revolutions of the wheel.

On each sample thus selected, data were recorded for a six-foot linear section of the planting. The height recorded was the average for the six-foot section, and except for very young or underdeveloped plants, was measured at the highest point at which the branches were dense enough to obstruct horizontal vision in their summer foliage. A similar criterion was used for measuring width, which was taken at the vertical level at which the hedge was the widest. Both height and width were recorded to the nearest foot.

Next, the number of stems growing from the original plants (seedlings and layered shoots were omitted) were counted within the six-foot section. For this figure, all stems growing directly from the crown were counted.

The fourth measurement taken on each sample was a classification of the capability of that six-foot section to confine livestock. Obviously, this was a matter of judgment, but the class assigned was

TOP PICTURE—History of each planting included in survey was carefully recorded during an interview with the farm operator. BOTTOM PICTURE—Each hedge was also measured and examined at regularly-spaced intervals. This is a stem count in progress. (Photographs by George Breiding.)

dependent on the decision of all the men present when the measurements were being made, and almost invariably there was unanimity in their choice. In the few instances where any disagreement existed, the lower category (poorer fence class) was recorded. The basis of classification was the ability of the entire six-foot section to serve as a barrier for various kinds of stock, so the weakest point in each sample was the deciding factor. Each sample was placed in one of four fence classes, defined as follows:

Fence Class 4—incapable of confining any type of livestock.

Fence Class 3—adequate as a barrier for cattle or horses, but not dense enough to confine sheep or hogs.

Fence Class 2—adequate as a barrier for cattle, horses, or sheep, but not dense enough to confine hogs.

Fence Class 1—adequate to confine cattle, horses, sheep or hogs.

With the spacings encountered in this survey (12 inches and up, in most cases) this proved to be a very workable classification, since the hedges were always of sufficient height and width to confine horses and cattle before the branches closed in enough at the ground level to turn sheep. However, if closer spacings were used in the original planting (see section on "Recommendations"), it is possible that some hedges might become dense enough to turn sheep while still so short that the larger animals could step over them.

Total length of the planting was measured with the same wheel used to locate the samples. "Obvious gaps" refer to openings caused by failure of survival or growth, which were so large that they would require replanting or special treatment before they could equal the fence capability of the rest of the hedge. Aspect was recorded in general terms, using not more than two cardinal directions in describing any particular section (i.e., N, NW, SE, etc.).

The site class assigned to each planting under item 28-A was based on the judgment of the most qualified technician available in each county. He was asked to classify each location, taking into account all the site factors present (but disregarding management methods used in the planting), as a poor, fair, or good site for Multiflora rose, according to whether he felt it was among the lower, middle, or upper one-third of all sites found in the county.

The site class listed under 28-B was obtained by fitting the recorded soil type, percentage of slope, aspect, and degree of erosion to the Woodland Site Capability Classification chart for West Virginia, used by Soil Conservation Service field officers. This chart places various sites in four classes, according to their capability for growing woodland. The factors upon which it is based are discussed in an article by Sidney Weitzman and G. R. Trimble entitled "A Capability Classification for Forest Land," which appeared in the September 1955 issue of the **Journal of Soil and Water Conservation.**

Since Multiflora rose is a woody plant, it seems appropriate to use a woodland site classification in describing sites for its growth. The classes are listed in the chart by number—1, 2, 3, 4—and are

defined in that order as Excellent, Good, Medium, and Poor for tree growth. With few exceptions, the designation of site class by this method was substantially in agreement with that named by the county technicians.

The remainder of the items on the data sheet were filled in with the field observations of the author and technicians working with him in the various counties.

The 282 samples examined during the survey covered an elevation range of 350 to 3,000 feet, an age spread of 2 to 14 growing seasons, 86 different soil types, and a wide variety of site conditions and management practices. As shown in Figure 2, the counties visited cover much of the State, and include all the important types of topography and land-use on which Multiflora rose has been planted in West Virginia.

Information Collected

The following is a summary of the pertinent data gathered by interviews and field examinations of the plantings.

Of 282 samples, 261, or 93 per cent, were planted in the spring—the remainder in the fall.

On 184 samples the site was plowed or disked before planting; on the other 98 there was no preparation of the ground before the actual planting.

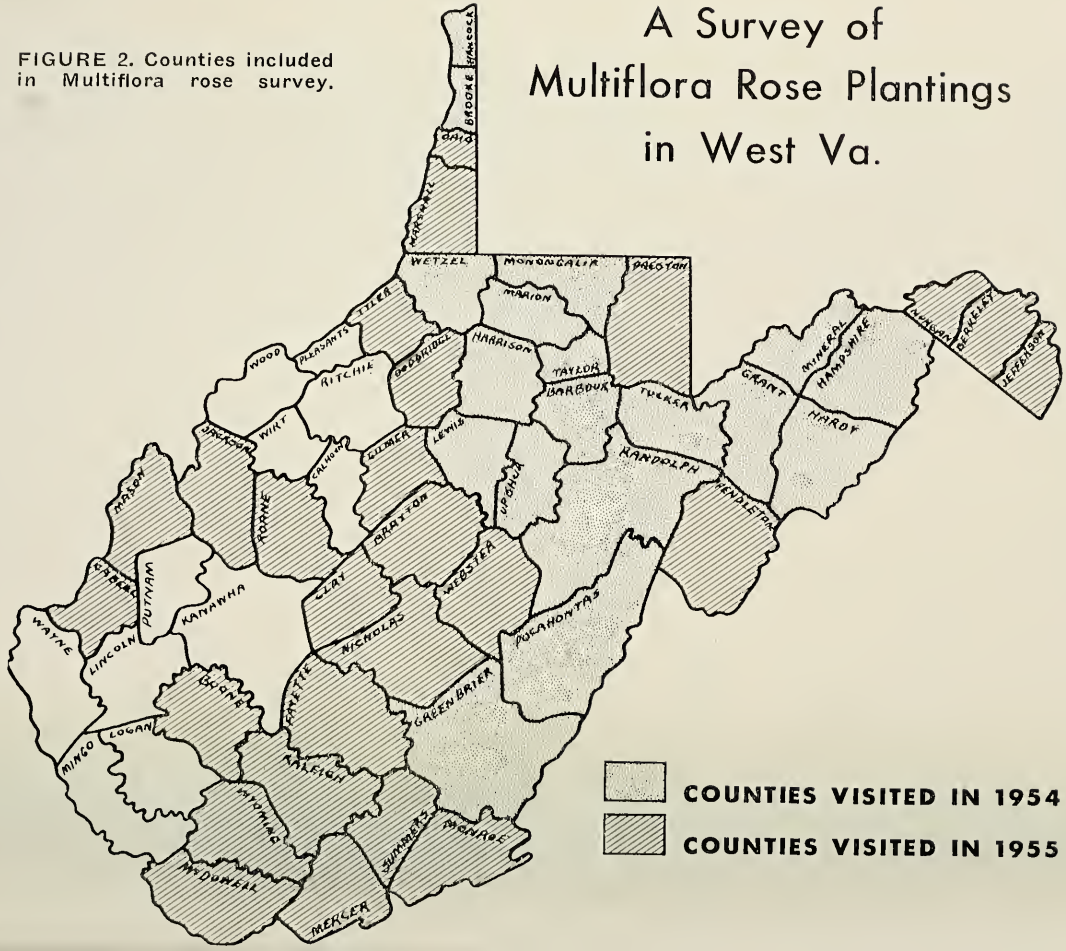
A spacing of approximately one foot was used in 68 per cent of the 282 plantings; 27 per cent of them were spaced more widely, and only 5 per cent were spaced closer than 12 inches.

In 282 samples, 20 per cent had been used to confine horses or cattle, or both; 6 per cent had been used as sheep fence, and one sample had been used to confine hogs. The remaining 74 per cent had not been used as stock fences at the time of the survey.

Landowners reported having seen evidence of disease on 8 per cent of the 282 samples, and insect infestations on 20 per cent. In addition to these, the field examination disclosed evidence of disease on 48 samples, and of insect attack on 13. Thus, the total visibly affected by disease was 25 per cent, and by insects, also 25 per cent. However, in no case observed had either disease or insects caused any noticeable damage to the growth rate of the hedge.

According to reports of the farmers, 23 per cent of the 282 plantings had been used by wildlife for cover only; 3 per cent had furnished wildlife with food only, whereas 54 per cent had been used for both cover and food. Field examination gave evidence of wild-

FIGURE 2. Counties included in Multiflora rose survey.



life use on an additional 20 samples, so that in total, more than 87 per cent of the plantings had received noticeable use by wildlife. The species most commonly reported as using Multiflora rose for food were songbirds (especially cardinals), quail, rabbits, and deer. Those making use of it for cover included rabbits, quail, woodchucks, grouse, pheasants, and songbirds.

Owners reported 10 per cent of the 282 samples as spreading by layering only, 22 per cent spreading by seed only, and 8 per cent spreading by both methods. In addition, spreading was noted during field examination on 63 other samples, so that the total number of samples on which spreading was reported made up about 62 per cent of those included in the survey. However, on 45 of the plantings reported by their owners as spreading, the amount of spread was so slight that it could not be detected during the field examination.

Spreading was regarded as an undesirable feature by all the farmers who had experienced it. However, only three expressed doubt as to their ability to control it effectively. Most of them were well satisfied with their plantings, and several indicated their desire to plant more hedges.

Undesirable features other than the possibility of spread were mentioned by 23 of the 170 farmers interviewed. Among these, 15 said it was too difficult to grow a good fence, 5 thought it occupied too much space, 2 reported sheep got tangled in the thorns, 1 was worried about Japanese beetle infestation, 1 said the rose obstructed the view at the entrance to the highway, and 1 was simply afraid he might lose his fence by fire.

Statistical analyses were made of those data suitable for such treatment. In analyzing the various relationships, the average fence class designation of each sample was used as the measure of its success, since the primary interest of most farmers who plant Multiflora rose is to obtain a living fence. This fence class evaluation has been defined in the section entitled, The Survey, beginning on page 13.

Correlation coefficients within age classes were computed for height and fence class, width and fence class, and density (as measured by stem count) and fence class. Respectively, these were 0.723, 0.720, and 0.610. Although a definite correlation with each of these three measurements is indicated, the correlation is not strong enough so that any one of the three, or any combination of two or three of the measurements could be substituted for the fence class designation. Therefore, the fence class was used in the subsequent analyses of the effects of site characteristics and management practices.

In order to select the factors likely to yield meaningful results, three measurements of site and seven management practices were compared with fence classes in two-way tables. The site measurements used were Land Use, Capability, Site Class estimated by Soil Conservation Service technicians, and Site Class calculated from the Woodland Site Capability chart. The management practices examined were Distance from Woodland, Spacing, Fertilization, Cultivation, Preparation of Planting Site, Replacement of Dead Plants, and Season of Planting.

The Season of Planting compared with Fence Class gave a chi-square value of 0.47 (10 per cent point = 6.25), while Replacements compared with Fence Class yielded chi-square = 1.01 (10 per cent point = 6.25). Since these low values of chi-square indicate no significant correlation, these management practices were given no further consideration.

Distance from Woodland compared with Fence Class showed chi-square = 34.23 (0.5 per cent point = 28.30), and Spacing compared with Fence Class gave chi-square = 11.76 (10 per cent point = 10.64). In both of these tables, however, there was a rather small number of samples in a major fraction of the classifications, and it was obvious that further analysis would probably not be of value.

Compared with Fence Class, Fertilization gave a chi-square value of 17.20 (0.5 per cent = 12.84). Cultivation showed chi-square = 19.23 (0.5 per cent point = 12.84), and Preparation of Site showed chi-square = 3.60 (10 per cent point = 6.25). These three were selected for further analyses. Although the chi-square value for the Site Preparation factor was relatively low, it was felt that the significance of this factor might improve when errors due to site variations were reduced.

In order to minimize errors due to variations in site conditions, a measure of site quality was necessary. The one chosen was the Land Use Capability (L.U.C.) Class used by the Soil Conservation Service, which is based on soil type, percentage of slope, and amount of erosion present. L. U. C. Class, when tabulated with Fence Class, gave a chi-square value of 40.09 (0.5 per cent point = 37.16). Since L. U. C. Class is automatically determined by the factors mentioned, its use as a classifying factor eliminated the errors of human judgment which might have been present in other methods of measuring site quality.

The final step was to determine the effect of certain management practices on the length of time required to develop the various fence classes. This was done by computing the regressions of Fence Class

on Age, within L. U. C. Classes, for three treatments, Site Preparation, Fertilization, and Cultivation. Each of these was computed in two sets of data, one for plantings receiving the specified treatment, the other for plantings not given that treatment. The resulting pairs of regression line are presented in graph form in Figures 3, 4, and 5.

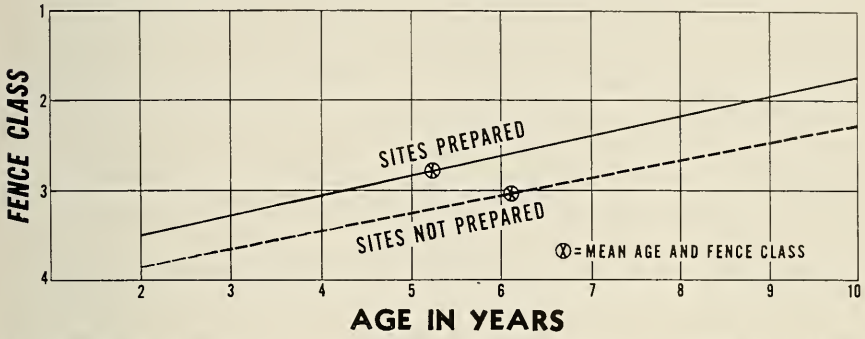


FIGURE 3. Average length of time to develop various fence classes when sites are prepared before planting compared with no site preparation before planting.

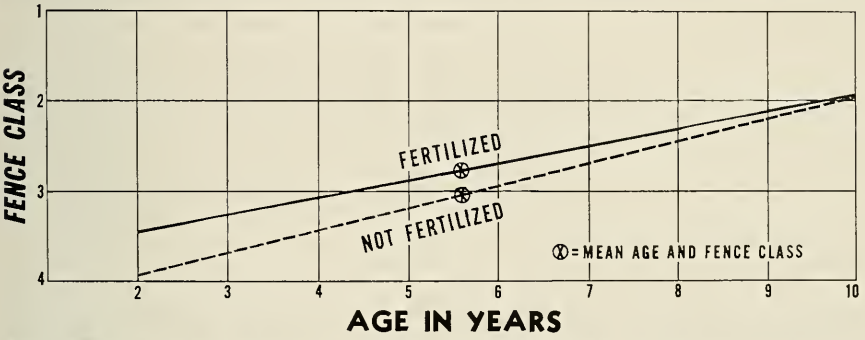


FIGURE 4. Average length of time to develop various classes when plantings are fertilized compared with plantings which are not fertilized.

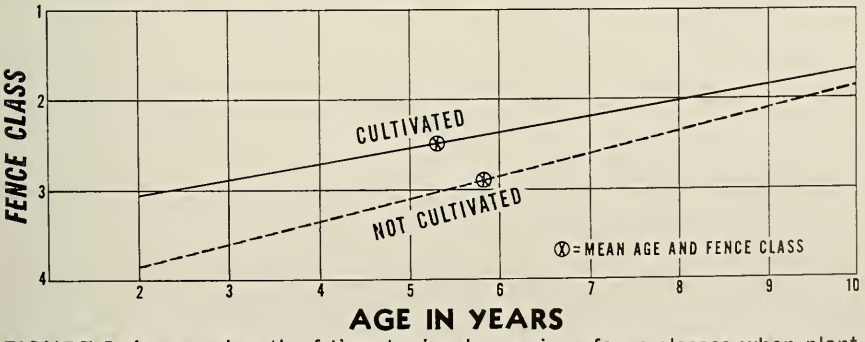


FIGURE 5. Average length of time to develop various fence classes when plantings are cultivated compared with plantings which are not cultivated.

Analysis of variance of the differences in regression coefficients for these three management factors yielded the following values of F:

Site Prepared vs. No Site Preparation: F = 0.136, d.f. 1 and 255.
Fertilization vs. No Fertilization: F = 0.810, d.f. 1 and 255.
Cultivation vs. No Cultivation: F = 1.313, d.f. 1 and 222.

Since all these values correspond to probabilities of more than 5 per cent, it was concluded that the slopes of each pair of regression lines do not differ significantly.

A t-test on the differences between Fence Class means at the six-year age, however, gave the following results:

Site Prepared vs. No Site Preparation: t = 3.510, d.f. 257 (P 0.001).
Fertilization vs. No Fertilization: t = 1.928, d.f. 257 (P = 0.055).
Cultivation vs. No Cultivation: t = 3.627, d.f. 222 (P 0.001).

Therefore, the differences in height of the two regression lines in each comparison were accepted as significant. It should also be pointed out that the same test applied to the heights of regression lines paired in individual L. U. C. classes, showed, in the case of Fertilization, progressively more significant differences as site quality became poorer. In other words, fertilization produced much more marked difference in fence class at a given age when applied to plantings on L. U. C. class VII land, than when used on L. U. C. class I or II.

Explanation of Figures 3, 4, and 5

These graphs show the average fence class reached at various ages by plantings of each description examined during the survey. Fence classes are defined as follows:

4. Incapable of confining any type of livestock.
3. Adequate as a barrier for cattle or horses, but not dense enough to confine sheep or hogs.
2. Adequate as a barrier for cattle, horses, or sheep, but not dense enough to confine hogs.
1. Adequate to confine cattle, horses, sheep, or hogs.

To determine the effect of each treatment, select the fence class in which you are most interested, then follow the horizontal line to its intersections with the sloping lines indicating plantings with and without the given treatment. The average age at which this fence class is attained is then read by following a vertical line from the

aforementioned intersection down to the age scale at the bottom of the graph. For instance, in Figure 3, note that Fence Class 3 was reached at an average age of 4.3 years by plantings in which the sites were prepared, whereas the same Fence Class was reached at an average age of 6.4 years by those plantings in which there was no site preparation.

Since there was some overlapping of treatments (e.g., some plantings in which the sites were prepared also received fertilization) you should not expect to shorten the time required to develop a fence by twice as much if you use two of these treatments. But it is fair to conclude that the application of one or more of these practices, as indicated by the site conditions where the planting is made, will shorten the time required to produce a satisfactory fence, on the average, between one and three years.

Conclusions

The information gathered in this survey indicates the following answers to the original questions listed on page 13:

1. At least within the range of 350 to 3,000 feet above sea level, elevation seems to have little or no effect on the growth of Multiflora rose in West Virginia. If there is any significant difference in growth at various elevations, it is covered up by much more important site factors.

The combined influences of soil type, moisture supply, slope, fertility, and exposure, expressed as site class or land use capability class, is undoubtedly the major factor in determining the rate of growth and ultimate success of Multiflora rose as a living fence. It is difficult to separate the effects of these individual components of site class, but probably the most important ones are moisture and fertility. Growth was invariably slow on dry sites, and when rose was planted on a badly eroded, droughty site, failure always followed unless moisture and fertility were provided by cultural practices.

Competition from other plants can be a serious hindrance to the growth of rose, and its severity is directly proportional to the scarcity of moisture and fertility in the site. Woody plants are the most serious competitors, and it is extremely difficult to grow rose within the spread of branches of trees. This is evidently more the result of competition for moisture than it is an effect of shade, since roses were observed making rather good growth in woodland where plenty of moisture was supplied by a small stream.

SITE QUALITY is very important in the growth of Multiflora. The roses in this picture were all planted at the same time and received similar treatment. Those at the left, however, had dry, badly eroded soil to contend with.

Browsing and trampling by livestock was one of the most common causes of failure to obtain a satisfactory fence. This damage is severe during the first two or three years, but after the rose gets a good start, it is practically immune to livestock damage.

2. Insufficient data were available to draw any definite conclusions as to the effect of various spacings. Observations indicated, however, that spacings of about six inches in a single row will cause the rose to fill in at the ground line more quickly than will spacings of 12 inches or more. The closed spacings would thus speed up the formation of a hedge dense enough to confine sheep and hogs.

Pruning of stems or branches did not produce significant differences in the time required for Multiflora rose to develop into an effective fence. The chief value of this practice would appear to be that of controlling the width of the hedge in cases where it was encroaching on a road or driveway.

Preparation of the planting site by plowing and disking, the addition of either organic or inorganic fertilizer, and the control of competing vegetation through cultivation during the first two or three years definitely increased the growth rate of Multiflora rose. Plantings which received one or more of these cultural practices developed into effective fences from one to three years earlier, on the

average, than plantings on similar sites which did not receive such treatment. As would be expected, the effects of these practices, especially of fertilization, were more pronounced on the poor sites.

3. With the data available from this survey, it is not possible to draw up a formula for predicting exactly how long it will take for a given planting to produce a fence which will confine livestock. In general, however, the observations indicate that with reasonably good management on most of the sites used for plantings in this State, Multiflora rose can be expected to confine cattle and horses in from three to five years, and will ordinarily turn sheep and hogs in an additional one or two years.

4. The information gathered in this survey indicates that Multiflora rose is of high value as escape and nesting cover for rabbits, quail, woodchucks (ground hogs), and songbirds. In areas where ring-necked pheasants are plentiful, it serves as excellent escape cover for them also. The fruit is a good emergency food for all these species, but probably is not a staple item in the diet of any except certain songbirds. Some browsing by both deer and rabbits was noted.

Multiflora rose was valued by some landowners as an aid in trespass control, and several mentioned its ornamental value. It has been used successfully in a few cases to control erosion.

5. In West Virginia, Multiflora rose spreads by two methods, tip layering and natural seeding. The former is relatively unimportant because it is slow and easily controlled. It occurs only when

WHEN PLANTED on the contour, Multiflora rose helps control erosion on hillside farms. It also makes better use of rainfall, and so grows faster.

the tips of the branches are covered with soil or debris such as weeds or leaves. Mowing or cultivation along the edge of the planting is all that is necessary to control this type of spreading.

Spreading by seed is much more spectacular and more apt to alarm landowners. The seeds are carried mainly by birds and by running water. Seedlings appear along fence rows, in brush piles, and in idle land or brushy pasture, particularly in areas where moisture is plentiful, and some protection from grazing animals is afforded.

This type of spreading can often be controlled effectively by either machine or hand mowing once or twice a year. Where this is not practical the seedlings are readily killed with an application of brush-killer spray (2,4,5-T). Very few of the farmers interviewed expressed any worry over their ability to control spreading. The general sentiment seemed to be that expressed by one farmer who had several plantings of various ages on his land. He said, "I can kill all of the new roses that come up on my place in much less time than it took me to replace posts, staples, and wire every year when I was using barbed wire fences. So I figure I'm still way ahead of the game."

6. Although there was frequent evidence of infestation by several kinds of disease and insect pests, no cases were found in which either disease or insects were noticeably affecting the growth of the rose. In several instances, Multiflora rose plantings did contain heavy infestations of Japanese beetles. There was no evidence that this was producing any measurable difference in the total population of Japanese beetles in the area; however, in a situation where Multiflora rose was used on all fence lines over a large area of land, this might become a significant factor.

In summing up the results of this survey, it becomes evident that Multiflora rose is not a miracle plant—it will not produce a stock-tight fence in a couple of years simply as the result of sticking the seedlings in the ground and forgetting about them. Like any other agricultural practice, it requires a reasonable amount of management. And, like any other plant grown on the farm, it responds to good site conditions plus planting site preparation, fertilization, and control of competition. It is adaptable to a wide range of site conditions, and with reasonable management, can be grown successfully anywhere in West Virginia. It has not presented any real problem as a weed plant in any area where an attempt is made to control weeds and brush. Its values as a living fence and as cover and food for farm game and songbirds far outweigh its relatively few disadvantages.

Recommendations

In the light of the results of this survey, the following items of advice are offered to those interested in using Multiflora rose in West Virginia for living fences and to provide cover and food for wildlife:

1. Provide an adequate supply of moisture. Whenever possible, plant the rose on the contour. A few contour furrows plowed above the hedge may help in dry locations. The use of liberal amounts of manure worked into the soil plus a heavy mulch on the surface is also desirable.

2. Supply plenty of fertility. Use either organic or inorganic fertilizer, but be sure the nitrogen content is high. One of the best types is chicken manure with super phosphate added.

3. Prepare the seed bed as thoroughly as possible. It is best to plow and disk a strip four to six feet wide, and six or eight inches deep. Plant in a trench in the center of the strip, and leave the surface slightly lower along the line of plants to collect rainfall.

4. Space the plants not more than 12 inches apart for horse or cattle fences, and not more than six inches apart for sheep and hog fences. This will produce a hedge dense enough at the ground level to turn stock by the time it has grown high enough so that they will not walk across it.

5. Cultivate both sides of the planting during the first two or three years to reduce competition. If it is not possible to plow the ground, at least keep the brush and weeds cut down. Pruning the rose itself is of doubtful value, but cultivation and continued fertilization and mulching will pay good dividends. The first three years usually determine the success of a rose fence.

6. Replace dead plants immediately. The most common factor making rose hedges unusable as fences is gaps caused by the death of one or more plants. These gaps can be filled in either by planting new seedlings (or cuttings) or by layering (bending down a branch and covering part of it with soil) from adjacent plants.

7. Protect the roses from livestock for at least three years. Browsing and trampling can kill plants growing in an otherwise ideal situation. If the rose is to replace an existing fence, plant it on the side opposite the pasture. If no other protection is available, put up a temporary fence (electric, for instance), but place it far enough from the hedge so that stock cannot reach across and nip off the rose branches.

If these recommendations are followed, there is no reason why Multiflora rose should not grow into a completely stock-tight fence in from three to six years on all but the very poorest sites in West Virginia.

Need for Further Research

Any survey-type investigation has both advantages and limitations, and this one is no exception. By using existing plantings, it was possible to obtain information covering a wide range of age-classes, geographical locations, and types of treatment in a relatively short time. On the other hand, it was not possible to control certain variables and test new methods as could have been done in a long-term controlled experiment. For this reason, although much valuable information has been secured concerning the behavior of Multiflora rose in this State, there is still opportunity for increasing our knowledge of this plant through further experimentation.

One feature which has been emphasized by the observations of this survey is the fact that Multiflora rose exists, and is being planted, in a number of different varieties. Some strains grow more upright than others. There seems to be some variation in vigor of growth. And variations have also been discovered in size and color of flowers. There is a real need for investigating the characteristics of these various strains and perhaps isolating one or two which have more desirable features than the rest.

One of the most valuable contributions of such a project would be the possible development of a strain bearing seeds with an extremely low germination rate. It was noted in this survey that some of the older fences showed a considerable amount of spreading in adjacent land by seedlings, whereas others, under apparently very similar conditions, produced no seedlings. This gives rise to the speculation that there may be a decided difference in the viability of seed from various strains of Multiflora. If a variety could be isolated which could be counted on to produce absolutely no seedlings, it would be acceptable to practically all the farmers who are now hesitant about planting rose fences.

Another aid to the use of Multiflora rose which might be developed by further research is a better method of planting. The present system of planting seedlings by hand is rather tedious, and depends upon supplies from large nurseries, which are costly to operate. If a faster, cheaper method of establishment were available, many more landowners would be interested in using this plant.

Mr. Layton Sharp, Soil Conservation Service technician at Marlinton, reported to the author that he had observed the accidental propagation of Multiflora rose on his farm through the cutting of branches (of the previous season's growth) from an established hedge, and the burial of these branches under a shallow layer of soil early in the spring before the buds had begun to swell. According to Mr. Sharp, this produced a row of closely-spaced rose plants, growing from the buds along the branch. This method of propogation, if feasible, presents interesting possibilities. In the first place, it would be quick and easy, since each branch would plant from three to nine feet of row. The planting stock could be obtained locally, reducing the need for large production by nurseries. And, perhaps most important of all, if a particularly desirable strain of rose is developed, this would represent a method of vegetative reproduction, thus guaranteeing the same characteristics in the new plants, which is not possible through the use of seed.

The desirability of closer spacing to obtain fences for sheep and hogs has already been mentioned. Experiments are needed, however, to determine the optimum spacings on various sites, and the variations in treatment needed to give best results in all cases.

In addition to developing new techniques for handling Multiflora rose, controlled experiments over a period of several years would also yield more complete and accurate data on the other characteristics which have been investigated in this survey. It is therefore highly desirable that this project should not represent the finish of inquiries along this line in West Virginia, but rather should serve as the stimulus for further, more intensive research.

Summary

Multiflora rose has been widely used in conservation plantings throughout the United States during the past 25 years. Its chief values are as a living fence and for wildlife cover and food.

In West Virginia, approximately 14 million Multiflora rose plants have been distributed to farmers and other landowners. Most of these plants were provided as part of the programs of the U. S. Soil Conservation Service and the Conservation Commission of West Virginia.

The use of Multiflora rose in this State has been slowed by the lack of good answers to the following questions:

1. Will it actually grow into an effective livestock fence?
2. Will it spread into adjacent fields and become a troublesome weed?

In order to secure answers to these and other questions relevant to the use of this plant in West Virginia, a survey of existing plantings was made during the summers of 1954 and 1955. This survey included 282 plantings, located in 44 counties, under 170 different ownerships, covering a range of 350 to 3,000 feet elevation, and a wide variety of site conditions and management practices. Data collected indicate the following conclusions and recommendations:

1. Multiflora rose grows well and develops into a highly effective living fence practically anywhere in West Virginia. It is also one of the finest wildlife cover plants yet found, and is a good source of emergency winter food.

2. It is not a miracle plant, but requires a reasonable amount of management to produce the desired results. Its main requirements are moisture, fertility, and protection from competition and grazing. It should not be planted under the branches of trees.

3. The best insurance of success is to select a good site. Three cultural practices are also recommended: plowing and disking in advance of planting, use of a high-nitrogen fertilizer, and cultivation for the first two or three years. The rose should be protected from livestock until it is at least three years old.

4. Any gaps caused by the death of one or more plants must be filled in immediately either by new seedlings or by tip layering from adjacent plants.

5. Multiflora rose will spread by layering when the tips are covered with soil or plant debris. Mowing once or twice a year will effectively control this. It will also spread by seed into idle or unmanaged land. It does not get started in cultivated fields or in pastures which are closely grazed and mowed. In brushy pasture or idle land, or along fence rows, control of seedlings is easily accomplished by either machine or hand mowing, or by the use of brush-killer spray (2,4,5-T).

6. If sheep and hogs are to be confined by the rose fence, a spacing of six inches in a single row is advisable. For horses and cattle only, one-foot spacing is adequate.

7. The rate of growth of Multiflora rose does not appear to be affected by any of the diseases or insects found in this State.

8. Like any other plant or practice used on a farm, Multiflora rose has some disadvantages. It needs management during the first two or three years especially, and in some situations, spreading must be controlled. But 98 per cent of the farmers interviewed in this survey felt that these faults were greatly outweighed by its advan-

tages—its economy and effectiveness as a living fence, plus its wildlife and esthetic values. Most of those who have had experience with this plant want to use more of it.

9. The information collected in this survey points out the need for further research on Multiflora rose, particularly in the form of controlled experimental plantings. More information is needed on spacing, methods of planting, and management practices. It is also hoped that a strain can be developed which may have such a low viability of seed that spreading will no longer be a problem.

Bibliography

1. Ager, James H., *Multiflora Rose*. Wildlife Management Notes, Nebraska Game, Forestation, and Parks Commission, Vol. 1, No. 1.

2. Allen, Durward L., "Hunter Management with Multiflora Rose." *Journal of Wildlife Management*, Vol. 12, No. 3 (1948), pp. 325-6.

3. Anderson, Wallace L. and Edminster, Frank C., *The Multiflora Rose for Fences and Wildlife*. USDA Leaflet No. 374, 1954.

4. Baskett, Thomas S., *Experimental Trials of Wildlife Food and Cover Plants*. U. of Mo. Agr. Exp. Sta. (Columbia) Research Bulletin 584.

5. ....., "Pruning as a Means of Thickening Multiflora Rose Hedges," *Journal of Wildlife Management*. Vol. 17, No. 1 (1953), pp. 87-8.

6. Bird, Rex. L., "Some Observations on Altitudinal Tolerance of Multiflora Rose," *7th Annual Conference S. E. Assn. of Game and Fish Commissioners*. N. C. Wildlife Resources Commission, 1953.

7. Dambach, Charles Arthur, *A Study of the Ecology and Economic Value of Crop Field Borders*. Columbus, Ohio, The Ohio State University Press, 1948.

8. Davis, R. K., *Multiflora Rose*. The Ohio State University Agr. Extension Service, The Ohio State University, 1956.

9. Dickey, J. B. R., "The Multiflora Rose as the Troublesome Weed in Pastures and on Idle Land," *Proceedings of the N. E. Fish and Wildlife Conference*. Jackson's Mill, W. Va., 1952 (Mimeographed).

10. Edminster, Frank C., "Use of Shrubs in Developing Farm Wildlife Habitat," *Transactions of the 15th North American Wildlife Conference*, 1950, pp. 530-3.

11. ....., and May, Richard M., *Shrub Plantings for Soil Conservation and Wildlife Cover in the Northeast*. USDA Circular No. 887, 1951, pp. 24-30.

12. Gysel, Leslie W. and Walter Lemmien, "The Growth and Wildlife Use of Planted Shrubs and Trees at the W. K. Kellogg Multiple Use Forest," *Mich. State University Quarterly Bulletin* 38-1.

13. Johnson, Herbert E., "Multiflora Rose Hips as Pheasant Food," *Journal of Wildlife Management*, Vol. 15, No. 2 (1951), pp. 221-2.

14. Keefe, Jim, "Multiflora Rose Fencing—The Farmer's View." *Missouri Wildlife*, Vol. 14, No. 2 (April, 1952).

15. Klimstra, W. D., "Problems In the Use of Multiflora Rose," *Illinois Academy of Science Transactions.* Vol. 48, 1956, pp. 66-72.

16. ....., "Some Factors Affecting the Growth and Survival of Multiflora Rose as Cover for Quail in Davis County, Iowa," *Journal of Wildlife Management,* Vol. 15, No. 2 (1951), pp. 158-160.

17. Lloyd, Charles H. and Gail W. Eley, "Multiflora Rose Bradication," *Journal of Soil and Water Conservation,* Vol. 10, No. 2 (March, 1955).

18. Patrick, Austin L., *Multiflora Rose Study and Recommendations.* Regional Memorandum #666, USDA Soil Conservation Service, Region #1. 1953.

19. Rosene, Walter, Jr., "Spreading Tendencies of Multiflora Rose in the Southeast," *Journal of Wildlife Management,* Vol. 14, No. 3 (1950), pp. 315-19.

20. Schrader, Walter, "Multiflora As Wildlife Help," *South Carolina Wildlife,* Vol. 2, No. 1 (Winter, 1955).

21. Snedecor, George W., *Statistical Methods.* 5th Edition, Ames, Iowa, Iowa State College Press, 1956.

22. Steavenson, High A., "Multiflora Rose for Farm Hedges," *Journal of Wildlife Management,* Vol. 10, No. 2 (1946), pp. 227-34.

23. Terrell, Edward E. and Cyril Kabat, *A Survey of Multiflora Rose Plantings in Wisconsin.* Wisconsin Conservation Department, September 1952.

24. Wandell, Willet N., "Agricultural and Wildlife Values of Habitat Improvement Plantings on the Illinois Black Prairie," *Transactions of the 13th North American Wildlife Conference,* 1948, pp. 255-56.

25. Weitzman, Sidney and G. R. Trimble, Jr., "A Capability Classification for Forest Land," *Journal of Soil and Water Conservation,* Vol. 10, No. 5 (September, 1955), pp. 228-32.

26. White, Andrew J., "Safer Superhighways," Quoted in Soil Conservation, Vol. 19, No. 9 (April, 1954), (Reprint from *Science News Letter* for December 12, 1953).

27. Young, B. P., "No Clipping Needed for Multiflora Rose," *Illinois Wildlife,* Vol. 10, No. 1 (December, 1954).

28. Zimmerman, F. R., *Multiflora Rose—Living Fence.* Wisconsin Conservation Bulletin, Vol. 20, No. 4, April, 1955.

Appendix

Data sheets used in Multiflora Rose Survey

Bankhead-Jones, Section 5, Project No. 66
Field Data Sheet, Multiflora Rose Survey

Information collected by ..... Date .....

Landowner's or tenant's name .....

Mailing Address .....

County ..... Location on County road map .....

.....

1. Date planted: Month..... Year.....
2. Site preparation and planting method used .....

.....

3. Fertilization used .....
4. Cultivation after planting .....
5. Replacement planting .....
6. Has the planting been used to confine stock? .....

   What kinds, and at what times? .....

   .....

7. What kind of disease has been seen on the rose? .....

   .....

   When did it occur? .....
8. What kind of insect damage has been noticed? .....

   .....

   When did it occur? .....
9. What kinds and numbers of wildlife have been seen using the planting?

   For cover .....

   For food .....
10. Has the rose spread?..... By what method? .....

    How far from the planting? .....

    Into what type of land? .....

    How has it been controlled? .....

    ....
11. Are there other features of the plant which make it undesirable to you? .....

    .....

12. Date plants delivered to farm: Month ..... Year .....

13. Number of plants delivered .....

14. Plants furnished for replacement: Number ..... Date .....

15. Soil type .....

16. Per cent of slope .....

17. Degree of erosion .....

18. Land Use Capability Class .....

19. Elevation .....

20. Age, in number of growing seasons, when examined .....

21. Average height .....

22. Average width .....

23. Average number of stems per foot at ground level .....

24. Average Fence Class .....

25. Total length of planting .....

26. Number of obvious gaps in hedge .....

27. Aspect or exposure .....

28-A. Site class (poor, fair, good) ..... 28-B. Site class (IV to I) .....

29. Distance from woodland .....

30. Amount of fruiting (poor, fair, good) .....

31. Evidence of disease .....

.....

32. Evidence of insect damage .....

.....

33. Evidence of use for living fence .....

.....

34. Evidence of use by wildlife .....

35. Evidence of spreading: Method of dispersal .....

Type of land .....

Maximum distance from planting .....

Density at various distances .....

.....

36. Other pertinent observations: .....

.....

.....