

RUNNING BUFFALO CLOVER MONITORING

in the

Hamilton County Park District

1992

Hamilton County, Ohio

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RUNNING BUFFALO CLOVER MONITORING IN THE HAMILTON COUNTY PARK DISTRICT-1992

Summary

OBJECTIVES: Monitoring of Trifolium stoloniferum was conducted for a fourth year in order to study representative sections of clover populations, for the purpose of better understanding reproduction by seeds and stolons, and life span of individual plants.

METHODS: Plants within the marked square meter plots were mapped five times during the season. Individually marked plants were found and their growth recorded during these visits. Total counts or estimates of numbers of clover plants were made for all known Hamilton County Park populations this season.

RESULTS: It is estimated that 1050 running buffalo clover plants were present within the known populations in the Hamilton County Park District in the 1992 season. This is an increase of about 300 plants since last year. The number of flowering plants at the Miami Fort has also increased each year since 1989.

Following the plants in the square meter plots, including the individually marked plants, allowed a better understanding of the life history of clover plants: It appears that seedlings overwinter with tiny leaves. Older plants experience dormancy until April. May is a crucial time, with some plants disappearing. New plants appear throughout the summer, either from stolons or as seedlings with the population peak in late summer. Dormancy occurs in the fall for all plants except seedlings.

RECOMMENDATIONS: Monitoring the marked plots twice in 1993 (May and August) should help substantiate the clover life history story as understood at present and hopefully add a few missing pieces of information.

Picnic area and trail maintenance should be continued as usual. Herbicide use should be avoided in the vicinity of the running buffalo clover. Continuing the suggested mowing schedule at the Miami Fort will be very important because of competition by other plants.

RUNNING BUFFALO CLOVER MONITORING IN THE HAMILTON COUNTY PARK DISTRICT-1992

INTRODUCTION:

Running buffalo clover (Trifolium stoloniferum) is a federally endangered species of which little is known. Monitoring running buffalo clover in the Hamilton County Park District for a fourth year, has resulted in a better understanding of the growth and reproduction of this clover and should allow better development of management plans to protect the populations extant within the parks. This year's study concentrated on the life histories of individual clover plants within three plots marked in early 1991.

PURPOSE

The purpose of this project was to monitor square meter plots within three selected populations of running buffalo clover in the Hamilton County Park District, in order to learn more about reproduction by seeds and stolons, and life histories of individual plants.

METHODS

1. The plants within the marked square meter plots were counted five times during the season, from early April through late September, and mapped on graph paper.
2. Running buffalo clover plants were counted at Mitchell Memorial Park, at the Miami Fort in Shawnee Lookout Park and on the ODOT property adjacent to Newberry Wildlife Sanctuary. Bobcat Ridge and Cabin View picnic areas were perused, but no total counts were made. The Blue Jacket and Miami Fort trails were searched for clover plants.
3. The five individual plants marked in 1991 at the Miami Fort were relocated and followed throughout the season. Addition tiny seedlings thought to be clover plants were marked with a different colored wire.

RESULTS

INCREASE IN POPULATION SIZES: Every population of running buffalo clover counted or estimated showed a substantial increase.

Table 1. Numbers of Running Buffalo Clover plants found at each location.

	1989	1990	1991	1992
Miami Fort	103	104	188	427
Mitchell Memorial Park	135	168	198	235
ODOT property adjoining Newberry Wildlife Sanctuary	?	14	35	162

An estimate of 1050 running buffalo clover plants within the Hamilton County Park District in 1992 is probably conservative. Cabin View and Bobcat Ridge picnic areas were estimated to have at least the 246 and 115 respectively that were counted in 1991. The small Miami Whitewater Park population was not checked until late September at which time five plants remained. Again this year, no clover plants could be found at the Trailside or Blue Jacket Trail areas. (The ODOT property count is not included in this estimate.)

The different populations were counted and/or estimated at different times during the season. In the past, most counts were made in May. It is felt that despite the counts being taken at different times, the overall pattern is towards substantial increases in numbers of plants over the past five years since the rediscovery of the plants. This trend was also seen at the Warder-Perkins site where a huge increase from May 1991 to May 1992 was observed.

SQUARE METER PLOTS: Counting and mapping the clover plants within the marked square meters for a second year allowed the following observations (Fig. 1):

The counts and locations of the plants in October 1991 were very similar to those of early April 1992. Therefore the plants which were visible above ground in the late fall, either over-wintered or were the first up in the spring.

For the second year, a decrease in numbers was observed in two of the three populations in late April or May, followed by an increase. Some plants appear to over-winter and then disappear.

The peak in numbers appeared at the July 22 count at Cabin View and at the September 23 count at Bobcat Ridge and the Miami Fort. No August count was made in 1992. The peak in numbers in 1991 at Cabin View was also in late July with the other two sites peaking in late August. Cabin View appears to be a warmer, drier site, whereas the other two are in deeper shade.

The patterns of the mapped plants within the square meters have changed very little from April 26, 1991 to September 23, 1992. In other words, if the southeast corner of the square was without any plants and thickly growing plants covered the southwest corner of the square, these patterns have continued with only minor changes.

The Cabin View population appears to be on the decline, both in counts within the square meter and survey of the other colonies in this picnic area. However, a new vigorous plant with rooted stolons was discovered near the woods opposite the cherry tree with three trunks. Perhaps this will give rise to a new colony as the old colony wanes.

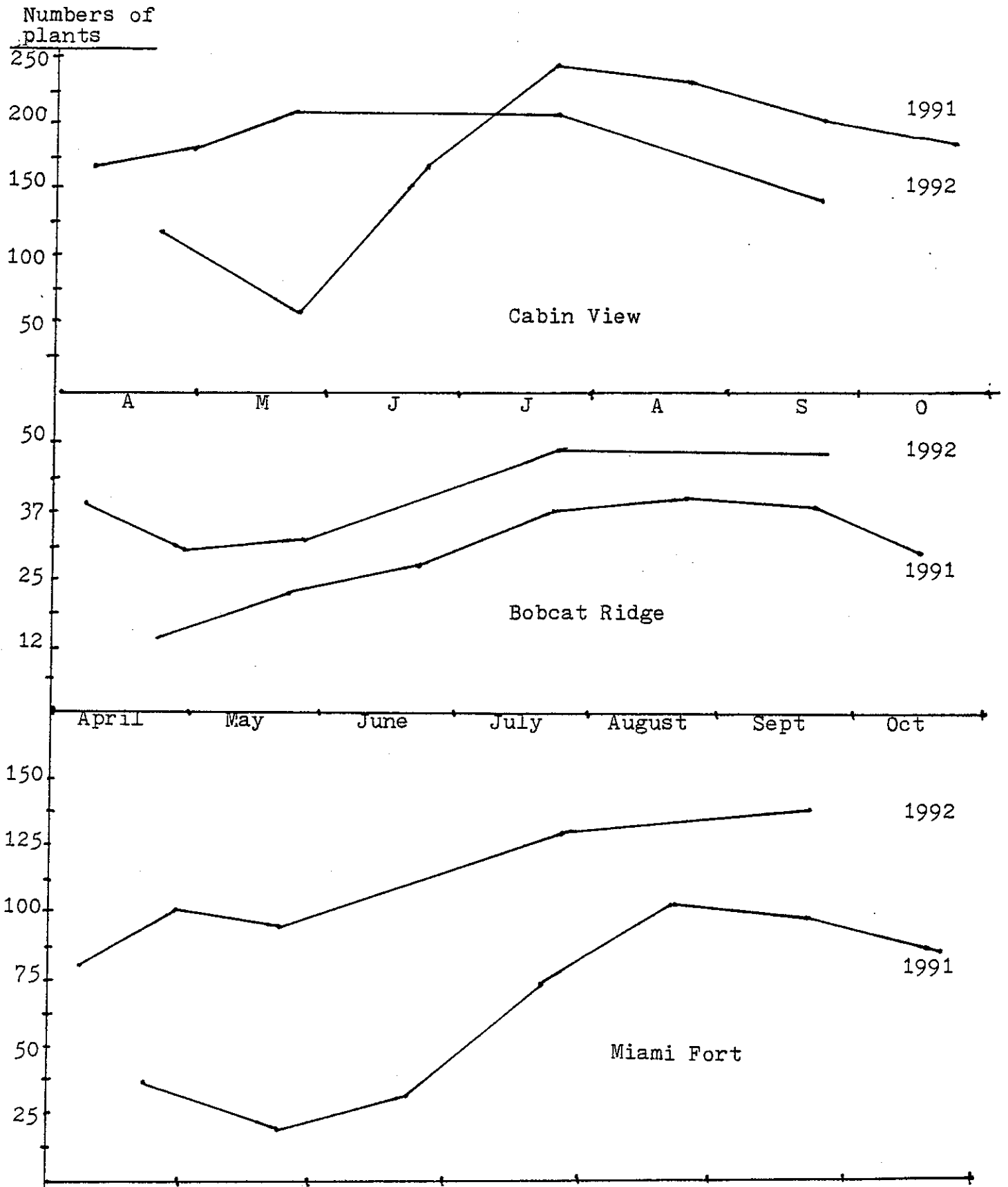


Fig. 1. Numbers of Running Buffalo Clover plants counted in each square meter plot at each monitoring visit.

INDIVIDUAL MARKED PLANTS: The five tiny seedlings which were marked with loops of colored wire on September 17, 1991, were relocated and followed throughout this season. These plants when marked, were about one inch in height with two tiny, but typical clover leaves. All had tiny thread like roots and were not attached to, or close to stolons. The tiny plants appeared to have germinated in the leaf liter and were barely attached to the soil by the thread-like roots. The 1992 growth was as follows:

- April 3, all five were tiny.
- April 29, two were tiny, and three were of medium size.
- May 22, one tiny, and four with large leaves.
- July 22, four with large leaves, one not found.
- September 23, all five plants found with large leaves.

These five plants were still simple plants without any suggestion of stolons. The simple plants consist of four or five large leaves from one axis above thread-like roots. This is in contrast to plants attached to stolons which generally do not have roots in their early stages, and plants observed at Cabin View in April after heavy rains had washed across the area leaving thick horizontal roots exposed. These thick roots were attached to the soil by vertical hair-like roots. These exposed roots looked similar to violet roots. Various lines or scars could be discerned which might be the results of several growing seasons.

Fig. 2. Cabin View plant with exposed roots. Sketch includes two tiny leaves and one folded leaf. Stipules are inconspicuous at this stage. April 1992. Actual size.



During the 1992 season, some tiny seedlings were observed in each monitored population. At the Miami Fort, numerous tiny plants with only cotyledons were observed in April. All seemed to have disappeared by the following monitoring visit. In July, two new tiny plants with only cotyledons were marked with a different colored wire to see if these could be running buffalo clover seedlings. Unfortunately only the wire could be relocated at the next visit. They will be searched for next year.

FLOWERING: A few tiny flower buds were observed in late April with the flowering peak occurring in late May. Flowering was observed in all the square meter plots: four flowering plants in the Bobcat Ridge plot, 25 in the Cabin View plot with the possibly of others having been mowed, and 16 flowering plants appeared in the Miami Fort plot. Flowering was more profuse this year at the Miami Fort with many plants bearing two flowers per aerial stem. Seventy flowering plants were counted in the walnut-black cherry colony alone. One hundred and eleven flowering plants were counted on the Miami Fort this year representing an increase each year for the past four years (Table 2).

Table 2. Numbers of flowering plants at the Miami Fort each year of monitoring.

	1989	1990	1991	1992
Flowering plants	6	27	76	111

DISCUSSION

Continued increase in population sizes: Since monitoring began in 1989, a continued increase in total numbers of plants and flowering plants has been observed. This has occurred despite sub-zero temperatures in December 1989 without a snow cover, two extremely dry years (1988 and 1989) and finally the cool, wet summer of 1992. If running buffalo clover normally multiplies at this rate, and has over the past 100 years, it surely would not be a rare plant. There must be some naturally limiting event which has not occurred over the past five years since the rediscovery of this species in Ohio. The theory of the reoccurrence of the species corresponding to the reoccurrence of large deer populations in the state (Cusick 1989) is quite plausible, however, this does not explain the increase in numbers of plants within the monitored square meter plots. The only obvious connection could be if deer droppings on the areas of the square meters were supplying scarified seed and/or nutrients. It is the opinion of this author that the deer may very well have been responsible for the occurrence of the populations at the locations known today, however, most of these populations are presently increasing in size and numbers of plants because of plants on stolons and seeds germinating at the sites of the fallen fruits.

Extreme weather events such as the 1976-77 and 1977-78 extreme winters could have destroyed prospering clover populations in the vicinity of those known today. Then it could be theorized that, with or without the help of deer, some surviving seed germinated within the next few years, and this plant or plants began to grow and reproduce to become the populations discovered in 1988. We should anticipate these populations to be knocked back again, and practice good management to give this endangered species the best possible chance of survival.

Life histories of individual plants: The five plants followed for a year, germinated prior to September 1991, but remained tiny until the following summer. Hopefully these plants can be relocated and followed in 1993 and flowering and stolon production can be observed.

The many large simple plants observed at the Miami Fort in late July or August are apparently young plants from seeds germinated either the preceeding summer or perhaps early in the same year. Except in the monitored square meters or on bare soil, the tiny plants would go unnoticed until they produced large leaves. The monitoring is usually coordinated with the mowing of the Miami Fort. The monitoring visits are planned for one to two weeks after mowing in the summer and fall. At this time the grass is short and the simple, big-leafed clover plants stand tall and conspicuous above the

mown grass. Meanwhile, many of the plants counted earlier in the season, including whole colonies, have disappeared. Perhaps the young plants are the over-wintering plants as the October 1991 to early April 1992 square meter counts indicate. In April, the mature-rooted plants observed at Cabin View were beginning to grow tiny leaves. These apparently were dormant in winter. By June the increase in population sizes is because of plants on stolons and tiny seedlings.

Table 3 presents a theory of life histories of clover plants. Attempts have been made at filling in the numbers from two years of monitoring the square meters, but the counts did not include the exact situation of each plant, i.e. attached to a stolon, seedling, etc.

Table 3. Life Histories of Individual Running Buffalo Clover Plants.

Plant type	Seedlings	2nd year plants	Mature rooted plants
early April		over-wintering	
late April-May		some disappear	plants leaf out
late May		?	flowers / stolons
June	seedlings	?	plants from stolons
July-August	big, simple more seedlings	?	plants from stolons
October-March	over-wintering	dormant	dormant

Hopefully, following the young marked plants in 1993 will help to fill in the question marked spaces. Also, very little is known about the age of the mature-rooted plants (Fig. 2). These apparently remain underground during the winter and send up leaves in April.

Some colonies increased in size, some disappeared and new ones appeared:

In May, the clover population at Bobcat Ridge picnic area appeared to have decreased considerably from last year. Several colonies could not be found, or were represented by one or two plants. The two largest colonies near the parking lot appeared much smaller than in recent years. The number of plants in the square meter plot has continued to increase in size each year since 1989. However, a new colony of approximately 12 plants was

first seen on July 22, 1992 at a location where two flowering plants had been observed in 1990. It is felt that the Bobcat Ridge population is still stable in size, but consists of plants at different locations from previous years.

Dispersal: In past reports (Becus 1989, 1990, 1991) there has been discussion on dispersal by herbivores (probably deer) and by water (seeds being washed along a stream). Also mentioned was dispersal by logging vehicles. There is evidence to suggest that the tires of the tractors used to mow the fort and the picnic areas are also a means of dispersal when the ground is muddy and bare soil is exposed along with clumps of mud from the tires.

RECOMMENDATIONS

Despite increases in population sizes, no new populations have been found in Ohio since 1990. More and more people are aware of and are looking for this plant each year. This species should still be considered rare and proper management policies should be practiced in order to encourage its continued existence.

Picnic area and trail maintenance should be continued as usual. All herbicide use should be avoided in the vicinity of the running buffalo clover. Continuing the suggested mowing schedule at the Miami Fort will be very important because of competition by other plants.

Two counts of the square meter plots in 1993, one in late May and one in August, will serve to document the condition of these colonies. It is hoped that the five marked plants can be relocated and their stage of development recorded at these times.

ACKNOWLEDGEMENTS

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