RUNNING BUFFALO CLOVER MONITORING

in the

Hamilton County Park District
Hamilton County, Ohio

Final Report
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Final Report Prepared by:

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RUNNING BUFFALO CLOVER MONITORING IN THE HAMILTON COUNTY PARK DISTRICT

Summary

OBJECTIVES: Monitoring of Trifolium stoloniferum was continued in the 1990 season to study the population dynamics by following the growth of selected plants, to obtain total counts of plants to determine if decline or increase in population sizes was occurring, and to search for additional populations.

METHODS: Shawnee Lookout Park was visited several times in May and again in June and July to record numbers of plants and flowering. Plants were counted in Mitchell Memorial Park. Field notes were kept as to stolons and flowers of selected plants. Other picnic areas and deer paths were searched for additional populations. The Cabin View population was mapped.

RESULTS: Five hundred and fifty-six plants of T. stoloniferum were counted in the Hamilton County Park District in 1990. This increase of 215 plants since 1989 includes two newly located populations: Cabin View Picnic Area at Shawnee Lookout Park and the Parcours Trail at Miami Whitewater Forest, as well as increases in Number of four of the five previously known populations. Flowering was commonly seen this year at most sites.

RECOMMENDATION: Picnic area and trail maintenance should be continued as usual with the exception that herbicide use should be avoided in the vicinity of the T. stoloniferum. 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

INTRODUCTION

Running buffalo clover (Trifolium stoloniferum), a federally endangered species, was found in Ohio in 1988. Of the eight populations found, all in southwestern Ohio, four were in Shawnee Lookout Park of the Hamilton County Park District (HCPD). In 1989, another population was discovered in the HCPD's Mitchell Memorial Park. Four new discoveries were made in 1990, two of these are within and one is adjacent to Hamilton County Parks. Monitoring for the second year has included more individual plants, seen the disappearance of others and should offer more insight into the growth and reproductive habits of this species.

PURPOSE

All known clover plants in the HCPD were mapped in 1989 (Becus 1989) which allows us to determine which ones survive, flower, or reproduce by stolons in 1990 as compared to last year's data. The purpose was to study the population dynamics by following the growth of selected plants, obtain total counts of plants to determine if decline or increase in population sizes was occurring, and to search for additional populations.

METHODS

1. Attempts were made to relocate all plants found in 1989 by using the 1989 maps. Shawnee Lookout Park was visited May 4, 8, 18, June 5, and July 14 to record numbers of plants and flowering. The plants were counted at Mitchell Memorial Park on May 23.

2. Field notes were taken of flowers, stolons, and locations of selected plants, and attempts were made to correlate these with 1989 plants.

3. Other picnic areas and deer trails at Shawnee Lookout Park were searched extensively for additional populations. The running buffalo clover at Cabin View Picnic Area was found, mapped and counted.

4. John Klein observed and photographed running buffalo clover plants at the Miami Fort on several occasions during the winter and verified their over-wintering as tiny rosettes despite sub-zero temperatures in December 1989.

RESULTS

1. An increase in number of plants found, occurred both because of increase in individuals in several populations, and discovery of new populations. Fig. 1.

2. An increase in number of plants flowering occurred in all populations except Trailside and Blue Jacket Trail. Fig. 2.

Fig. 1 Total numbers of Trifolium stoloniferum plants found in the Hamilton County Park District, 1988 to 1990.

	1988	1989	1990
Shawnee Lookout Park			
Bobcat Ridge Picnic Area	9	82	109
Blue Jacket Trail	5	12	15
Cabin View Picnic Area	unknown	unknown	148
Miami Fort	100-110	103	104
Site 1	unknown	38	54
Site 2	unknown	8	19
Site 3	unknown	17	7
Site 4	unknown	13	12
Site 5	unknown	8	4
Others	unknown	19	12
Trailside	5	9	2
Mitchell Memorial Park	unknown	135	168
Miami Whitewater Forest	unknown	unknown	10
TOTALS	129	341	556

Fourteen plants were found on ODOT property just upstream from Newberry Wildlife Sanctuary of the HCPD. Perhaps running buffalo clover will be found in Newberry.

Fig. 2. Flowering Plants of Trifolium stoloniferum in the Hamilton County Park District

	1989	1990
Shawnee Lookout Park		
Bobcat Ridge Picnic Area	16*	20*
Blue Jacket Trail	0	0
Miami Fort	6	27**
Trailside	2	0
Mitchell Memorial Park	1***	43

* Weekly mowing probably destroyed some flowers.
** Mowing was off schedule because of the wet spring weather and coincided with the flowering. This probably destroyed some flowers.
*** These plants were only discovered in August, long after flowering.

RESULTS continued:

3. Flowering occurred May 4 through June 5.

This is the first year since the recent (1988) discovery of the running buffalo clover in southwestern Ohio that flowering was abundant, and various populations were observed on several dates from late April through July. Flower buds were observed at Bobcat Ridge on April 29 and the first flower on May 4, the same date that numerous plants were in bloom at the Warder-Perkins Audubon Preserve less than 10 miles away. The flowering peak at the Miami Fort seemed to be between May 8 and 18, although mowing may have clouded the picture. The plants at Mitchell Memorial appeared in full bloom with many plants supporting two big, fresh, white flowers on May 23. Three fresh white flowers were seen at the Miami Fort as late as June 5, therefore flowering occurred for a full month.

4. It appears that flowering is not an annual event, nor is it the final event in the life of an individual plant. Some plants which flowered last year appeared vegetatively this year and others which were vegetative last year flowered this year. Although trying to follow the flowering, stolon production and separation of daughter plants of several selected running buffalo plants was not very successful, some data were collected.

Plants along the trail to the right at the Miami Fort

	5-25-89	5-8-90	5-18-90	6-5-90	7-4-90
1.	1 fl,1 st	1 stolon	1 stolon	1 stolon	not found
2.	1 plant	not found	1 plant	1 stolon	not found
3.	1 plant	3 st, 2fl buds	4 st 3 fl	stolons	2 plants

Plant at the fork of the trail

	1 st,1 fl	2 plants		2 plants, 1 st

(st = a plant with a stolon, plant = a vegetative plant consisting of a few leaves, fl = flower)

5. On July 14, 1990 at the Miami Fort, 54 vigorous (mostly simple, consisting of three or four large leaves) plants were easily counted at Site 1, and 19 at Site 2. These counts were increases from 44 and 9 in May. Virtually no other plants could be found at any other sites in the fort on this date. One third (28) of the plants counted in May (when a total of 88 plants were found) could not be found in July and 20 new plants had appeared. A similar observation had been made in August 1989. Many plants had disappeared, but a few previously unknown plants were large and obvious. Are these new plants which have grown during the season and disconnected from stolons? Or are these plants results of the fruiting observed in 1988? Site 1 is known to have had flowering plants in 1988. It will be interesting to see if new plants will appear in mid-summer of 1991 at the sites of the few flowering plants of 1989.

6. All running buffalo clover plants in the Hamilton County Park District were mapped in 1989. These maps were helpful in relocating colonies in 1990. Also for each plant at Shawnee Lookout Park, records were kept of stolons, and flowers. An attempt was made to compare the mapped plants of 1989 to the plants found in 1990. For example: It was expected that a 1989 plant with two stolons would in 1990 be two, three or more plants. Other than the four plants listed above in number 3, little correlation could be made. Where there were five plants one year, there may be none the next, or many, and other plants appeared well away from the mapped plants of the previous year. Most of the remapping was done at Bobcat Ridge as the scattered plants on the almost bare soil appeared to be a good area for following their development. Frequent mowing was part of the problem, but similar results were found with the Miami Fort populations.

Cabin View Picnic Area

The running buffalo clover at Cabin View Picnic Area was discovered June 5, 1990. This picnic area like Bobcat Ridge is mowed weekly. Patches of bare soil appear between the shortly mowed and trampled vegetation of common lawn species. Five colonies of clover and one isolated plant were found. A few brown flowers remained in the short, thickly growing colony at Site 2. This was the largest colony covering an area of nine feet by five feet. The first five sites were measured from the corner of the parking lot which points toward the large red elm in the center of the picnic area. Site 6 is a distance away and is measured from a black cherry tree with three trunks near the woods.

	Distance from parking lot	degrees north	number of plants
Site 1	11 feet	130	26
Site 2	9 feet	30	88
Site 3	27 feet	20	2
Site 4	21 feet	10	21
Site 5	20 feet 2 inches	355	1
Site 6	15 ft 6 in from cherry	330	10
		TOTAL	148

RECOMMENDATIONS:

Park Maintenance:

1. The Miami Fort should be mowed on the previously suggested schedule of mid-April, first week in May and early July. This will be especially important in 1991 as the Alliaria petiolata is expected to be abundant. This plant was killed on the Fort in 1989 where ever it was mowed in mid-April.

2. The weekly mowing schedule for the picnic areas should be continued as usual. Scraping and dragging across the soil of the picnic areas should be avoided. Herbicides should be avoided in the vicinity of the clover populations both in picnic areas and along the trails.

3. Part of the Cabin View Picnic Area was graded and reseeded in 1990. Any plans to continue this should be reviewed by the Land Manager before hand.

4. The clover on the Blue Jacket Trail was overgrown by other vegetation after the trail was moved further away. Mowing with a weed eater once or twice during the summer would help eliminate competitive vegetation.

Monitoring:

1. Total counts of plants and flowers should be made in May at all known locations in the HCPD.

2. Other picnic areas and trails at Shawnee Lookout Park should be searched for running buffalo clover, especially the Columbia Terrace Picnic Area which has patches of bare soil between colonies of Trifolium repens similar to Bobcat Ridge and Cabin View Picnic Areas.

3. A recount should be made in the Miami Fort in late July or early August, 10 days to two weeks after mowing when the clover is easily found.

4. In order to better study the development of individual plants in 1991, manageable sized sections of two or three populations should be marked in a way not to draw the attention of the public visitors, but to allow collection of precise data as to location and development of these plants. These plots if checked every two or three weeks during the season, together with photographs during the winter and late fall, should give a better picture of the habits of this species.

DISCUSSION: Some thoughts on running buffalo clover.

Between 1989 and 1990, some running buffalo clover populations increased in numbers and others declined or could not be found. The grass of the Miami Fort is thick and when mowed lays in piles which tend to smother the vegetation it covers. In 1989, Site 3 consisted of 17 vigorous plants which pushed their way through all obstacles of competing vegetation and piles of hay. In May 1990, when these plants were not visible, a few were located by using the 1989 maps and searching under the grass leaves. The plants found by this method were tiny, fragile and appeared to lack the vigor to push through the grass. The clover plants at some other sites were not obviously affected. These fragile plants apparently did not survive, as they were not found again.

When you consider that this species is lacking the rhizobial bacteria which fix nitrogen (Campbell et al 1988) and the clover is believed to be dispersed by herbivores after passing through the gut, then it would follow that each incident of dispersal would be accompanied by the deposition of nutrients including nitrogen. This nutrient supply would, however, be of limited duration. Perhaps populations of this clover are of limited duration unless the necessary nutrients are replenished every few years. In an area frequented by deer or other animals, the clover could survive indefinitely in the absence of destructive events, but may undergo continuous migration dependent on animal droppings within the

areas of suitable habitat. When clover plants reproduce by stolons, the entire network would temporarily live off of the nutrient source available to the mother plant. Then either this nutrient source would become depleted and the plants would lose vigor and disappear, or it would be replenished by animal feces and the plants would prosper. Meanwhile, the daughter plants would have rooted and either have encountered a nutrient rich location or not. This would determine their fate. This theory would help explain the inconsistency of individual clover plant survival from one year to the next.

Are the herbivores necessary for dispersal, or for supplying nitrogen and other nutrients? This does not explain how the clover has apparently survived for many years on lawns. Perhaps once the clover was established, there were dogs or other animals which supplied the necessary nutrients.

Running buffalo clover is often, but not always, growing under a black walnut tree (Juglans nigra). Brooks (1951) stated that black walnut trees inhibit or kill certain plant species while other species are more abundant than usual near these trees. This process is most likely a factor in the distribution of the clover. Black walnut trees apparently either inhibit competing species and/or enhance the growth of the clover.

The Trailside population of five vegetative plants in 1988, had increased to nine plants with two flowering in 1989, but the following year found only two tiny vegetative plants. Despite the large black walnut tree near by, this may not have been a suitable habitat. Perhaps there was too much shade, or the gravelly area which was washed with runoff after heavy rains may have quickly become nutrient deficient. Or perhaps this is the normal life span of a running buffalo clover population.

Monitoring this species includes the challenge of locating new colonies as old colonies disappear.

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