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CENSUS OF COLORADO BUTTERFLY PLANT
(GAURA NEOMEXICANA SSP. COLORADENSIS)
ON F.E. WARREN AIR FORCE BASE, 1989

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INTRODUCTION

Gaura neomexicana ssp. coloradensis, the Colorado butterfly plant, is a Category 1 candidate for Federal listing (USFWS 1985). It is restricted to an area of less than 1500 sq. mi. in southeast Wyoming, and adjacent Colorado and Nebraska. Only 22 populations have been recently documented; these range in size from less than 10 to over 5000 individuals (Marriott 1987). All sites but two are on privately-owned land, and are grazed, hayed and/or sprayed with herbicide. Two populations occur on F.E. Warren Air Force Base (WAFB) (Figure 1), and are protected under a Memorandum of Understanding involving the US Air Force (USAF), the US Fish and Wildlife Service (USFWS), and The Nature Conservancy (TNC). This agreement has been in place since 1982.

The USAF contracted with TNC's Wyoming Natural Diversity Database (WNDDDB) through the USFWS for a study of Gaura neomexicana ssp. coloradensis from 1984 through 1986. The project was designed to document distribution, abundance, habitat and threats throughout the range of the species. A monitoring program was established on the Base to determine population trends, and gather life history information. Three years of sampling showed the sampling design to be inadequate for monitoring a biennial species with shifting distributions.

A census of Base populations was completed in 1986. In 1988 and 1989, counts were repeated by the WNDDDB on contract with the USAF. The 1988 census showed a decline of over 60% in numbers of flowering stems in the Diamond Creek drainage, with an obvious increase in area occupied by Canada thistle. On Crow Creek, there was a 33% decline in numbers of flowering stems, with no noticeable increase in Canada thistle (this species was not closely monitored). On the unnamed drainage in the southwest corner of the Base, there was a 20% decrease in flowering stems (Marriott 1989).

This report presents the findings of the 1989 census.

METHODS

The areas covered on WAFB by the 1986-1989 censuses included all of the Diamond Creek drainage bottom, Crow Creek above the confluence with Diamond Creek, and an unnamed drainage in the southwest corner of the Base. In 1986 and 1988, all second-year (flowering) stems of Gaura neomexicana ssp. coloradensis were counted. It is easier to count stems rather than individuals, and this method may provide a more accurate picture of population vigor. Numbers of stems were recorded for different areas within the sites, but no defined subdivisions were used.

In 1988, subdivisions were defined using metal fenceposts, and existing natural and man-made features. Defined subdivisions will

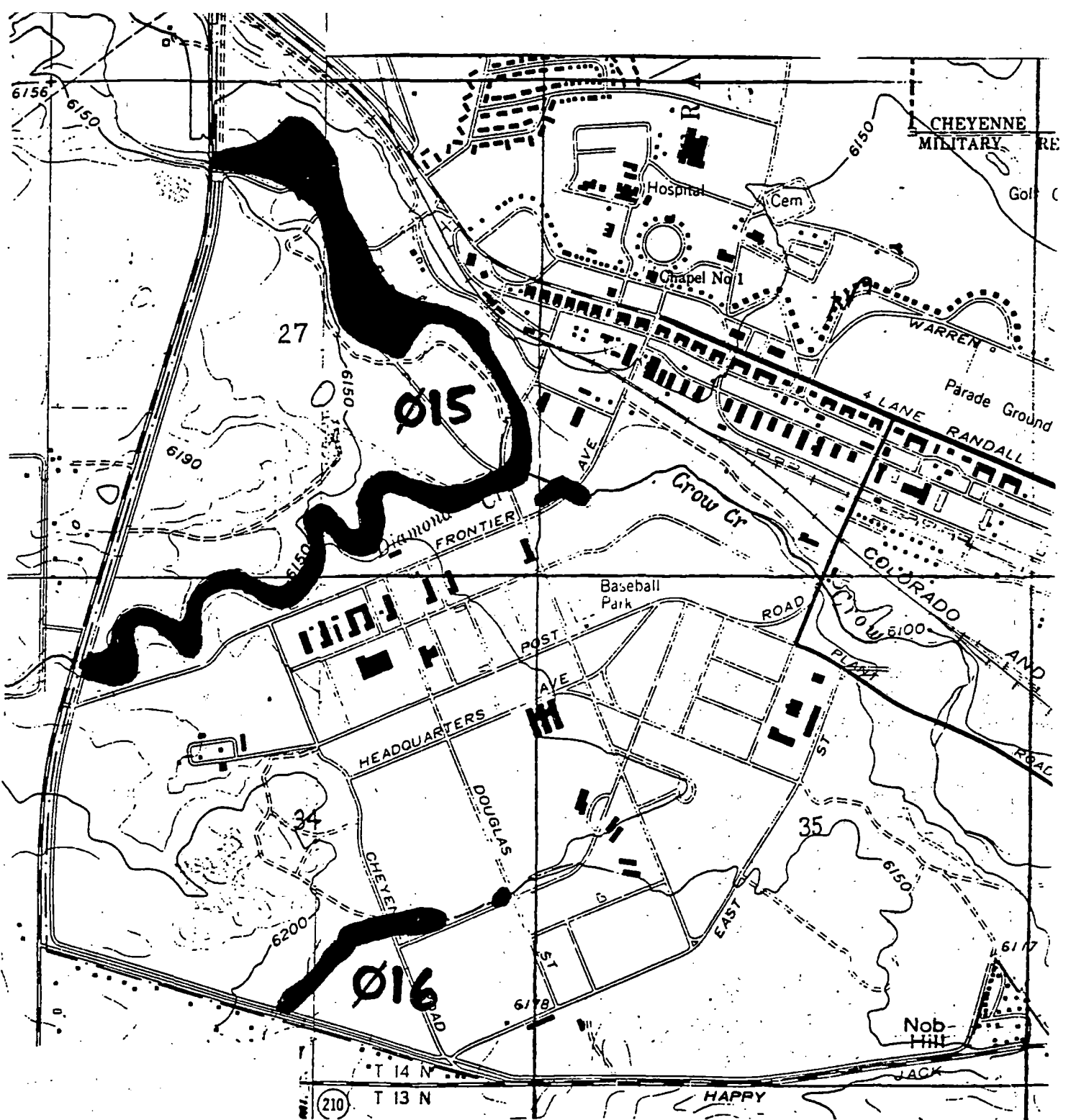


Fig. 1 Gaura neomexicana ssp. coloradensis populations on F.E. Warren Air Force Base; numbers are occurrence codes from the Wyoming Natural Diversity Database.

allow closer tracking of shifts in distribution within potential habitat, and will pinpoint more closely areas of Colorado butterfly plant increase and decrease. The census was expanded to include numbers of basal rosettes, as well as flowering stems.

Climatic data were obtained from the High Plains Research Station, located 1.5 miles northwest of the study sites.

RESULTS

Results of the 1986, 1988 and 1989 censuses are summarized in Table A. Complete data sheets are contained in Appendix B. There was an overall increase in flowering stem production in 1989 compared with 1988 (57%), but numbers still lagged behind those of 1986 (22% fewer stems in 1989 vs. 1986). Both Crow Creek and the unnamed drainage showed overall increases since the program started in 1986. Diamond Creek continued to show significantly lower numbers in 1989, compared with 1986 (48% decrease), although numbers were up from 1988. Canada thistle and leafy spurge infestations are extensive in that drainage, and are much more extensive than observed in 1986. Interestingly, the ratio of basal rosettes to flowering stems was highest at the Diamond Creek site, even though butterfly plant decline on Diamond Creek is the reason for overall downward trend in Gaura neomexicana ssp. coloradensis populations on the Base. The unnamed drainage in the southwest corner of the Base has shown a large increase in flowering stem production in the area just downstream from Cheyenne Avenue (93% increase from 1986 to 1989).

Counts of basal rosettes were made for the first time in 1989, and therefore no trend information is available.

Precipitation data for 1984-1989 are presented in Table B.

DISCUSSION AND MANAGEMENT RECOMMENDATIONS

From 1986 to 1988, an overall decline in Gaura neomexicana ssp. coloradensis populations in three drainages on WAFB was observed. This trend was reversed from 1988 to 1989, but numbers still remain significantly below 1986 levels in the Diamond Creek drainage. Large increases in noxious weed infestations were observed in the Diamond Creek drainage from 1986 to 1988, the probable reason behind loss of butterfly plant habitat. Crow Creek also supports large stands of Canada thistle, but these have not noticeably increased during the time of the study. One exception is the area of the dam downstream from FamCamp. Butterfly plants were observed in this area in 1986; in 1989, the area was occupied by Canada thistle and no butterfly plants were found.

Table A. Gaura neomexicana ssp. coloradensis, F.E. Warren AFB 1986/1988/1989 census data (rosettes not counted in 1986 and 1988). Complete data sheets are included in Appendix B.

F.S. = flowering stems; B.R. = basal rosettes

Site	1986	1988	1989	% change	% change	% change
	F.S./B.R.	F.S./B.R.	F.S./B.R.	86/88	88/89	86/89
	F.S./B.R.	F.S./B.R.	F.S./B.R.	F.S./B.R.	F.S./B.R.	F.S./B.R.
Diamond Creek	3216/***	1201/***	1684/5560	-63/***	+40/***	-48/***
Crow Creek	2095/***	1406/***	2395/2875	-33/***	+70/***	+14/***
Unnamed Drainage	565/***	452/***	734/1744	-20/***	+62/***	+30/***
TOTAL	5876/***	3059/***	4813/10179	-48/***	+57/***	-22/***

Table B. Precipitation data, USDA High Plains Research Center located 1.5 miles northwest of F. E. Warren Air Force Base (307 772-2434). Precipitation is given in inches (USDA 1989).

Dick Hart

	1984	1985	1986	1987	1988	1989	103-yr. average
JAN	0.9	1.0	0.3	0.2	0.7	0.3	0.4
FEB	1.4	0.2	0.5	1.4	0.9	0.1	0.6
MAR	1.3	0.4	0.7	1.7	1.2	0.9	1.0
APR	4.5	1.2	3.1	1.8	2.5	0.6	1.9
MAY	0.8	2.2	1.3	4.6	3.7	1.1	2.4
JUN	2.6	1.4	2.5	2.0	2.4	2.6	1.7
JUL	3.4	3.9	0.5	1.8	1.3	1.2	2.0
AUG	1.6	2.1	1.6	2.4	1.2	1.3	1.5
SEP	1.1	2.3	0.8	0.8	1.6	1.8	1.2
OCT	2.0	1.1	1.7	0.1	<.1	0.4	0.9
NOV	0.2	1.5	1.0	1.0	0.5	0.2	0.5
DEC	0.4	1.1	0.7	1.5	0.6		0.5
TOTAL	20.2	18.4	14.7	19.3	16.6	10.5*	14.6

* precipitation data for December 1989 not available.

The evidence strongly suggests that noxious weed invasion is responsible for Gaura neomexicana ssp. coloradensis decline on WAFB. Natural succession may also be a factor. Maintenance of butterfly plant populations on the Base will require noxious weed control methods compatible with continued butterfly plant viability (Marriott and Jones 1988). Some sort of periodic habitat "disturbance" may be needed as well, if natural disturbances (e.g. flooding) are brought under control. All management will have to be done on an experimental basis initially, until suitable methods are found.

It is recommended that the USAF designate the Diamond/Crow Creek drainages as a Colorado Butterfly Plant Research Natural Area (RNA) (Marriott and Jones 1988). Designation will highlight the need for special management of the area, and will provide longterm protection less likely to be affected by changes in Base administration. Designation may result in improved channels for administration and funding of projects, such as experimental weed management in the RNA.

Effective noxious weed management within the proposed RNA is badly needed. It is recommended that the USAF and the USFWS, the agencies responsible for continued viability of Colorado butterfly plant populations, fund a multi-year project of experimental noxious weed control within the proposed RNA.

Annual monitoring should continue, using the methods described in this report. Census is a cost-effective method for tracking population trends in Gaura neomexicana ssp. coloradensis. The second-year flowering stems can be seen and counted easily by someone familiar with the species. Basal rosettes are more difficult to spot, and require more time to count. However, by counting rosettes as well as flowering stems, one can collect information on survivorship and reproductive success.

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