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DEMOGRAPHIC MONITORING OF
PENSTEMON LEMHIENSIS
DILLON RESOURCE AREA
BUREAU OF LAND MANAGEMENT
ESTABLISHMENT AND PROGRESS REPORT

by

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I. INTRODUCTION

Penstemon lemhiensis is currently in Category 2 (some evidence of vulnerability but not enough data to support listing at this time) of the U.S. Fish and Wildlife Service Notice of Review (U.S. Department of the Interior 1990). In an effort to collect the data needed to support or reject listing, populations of this species are being monitored in southwestern Montana. Populations on the Beaverhead National Forest have been monitored since 1989 (Achuff and Shelly 1991, Shelly 1990).

The species also occurs on BLM land and, in 1990, plants within a BLM enclosure at the Badger Pass microwave site were marked and described. In 1991, three demographic monitoring transects were established in the enclosure and an additional transect was established near the Horse Prairie, also on BLM land.

Observations since 1986 of Penstemon lemhiensis population numbers at Badger Pass and other sites in southwestern Montana documented marked changes in population size, both increases and decreases (Achuff and Shelly 1991). Such changes may make a species more prone to local extirpation. Thus, there is a need to better understand the demographic dynamics of local populations (survivorship and reproduction) so that an assessment of vulnerability can be made. An increased understanding of the biology of this species is also important to developing a realistic species conservation strategy (Massey and Whitson 1980).

II. STUDY SITES

A. BADGER PASS MICROWAVE ENCLOSURE MARKED PLANTS

The Badger Pass microwave site is located about 20 miles west of Dillon on Highway 278. An access road leads south from the top of the pass to the microwave site and the enclosure is immediately north of the tower. The marked plants within the enclosure are in three groups, each referenced to a marked fencepost of the perimeter fence. The plants are marked by metal pins in the ground which are marked with a metal tag. Some of the marked plants also occur in the three monitoring transects that were established in 1991.

Group 1 (RP1): RP1 (Reference Point 1) is the fence post in the northernmost corner of the enclosure (Fig. 1). The plants are located as follows:

N
↑

2

Figure 1. Exclosure at Badger Pass microwave site.

<u>Heading</u>	<u>Distance</u>	<u>From</u>	<u>To</u>
231°	0.50 m	RP1	plant 1
126°	3.75 m	plant 1	plant 2
110°	3.60 m	plant 2	plant 3
140°	1.75 m	plant 3	plant 4
222°	4.95 m	plant 4	plant 5
112°	4.30 m	plant 5	plant 6

Group 2 (RP2): RP2 (Reference Point 2) is a corner post at a jog in the fence in the central northwest part of the exclosure (Fig. 1). The plants are located as follows:

<u>Heading</u>	<u>Distance</u>	<u>From</u>	<u>To</u>
112°	4.75 m	RP2	plant 7
157°	23.15 m	plant 7	plant 8
261°	13.10 m	plant 8	plant 9
260°	10.40 m	plant 9	plant 10
301°	0.50 m	plant 10	plant 11
195°	0.40 m	plant 11	plant 12
318°	0.40 m	plant 12	plant 13
83°	0.10 m	plant 13	plant 14
27°	0.50 m	plant 14	plant 15
222°	1.20 m	plant 15	plant 16
90°	0.25 m	plant 16	plant 17
132°	1.15 m	plant 17	plant 18
132°	0.50 m	plant 18	plant 19
253°	7.35 m	plant 19	plant 22
nd	0.30 m	plant 22	plant 23
nd	0.15 m	plant 23	plant 24
nd	0.40 m	plant 24	plant 26
nd	0.40 m	plant 26	plant 27
nd	0.70 m	plant 27	plant 29
148°	0.82 m	plant 29	plant 30
165°	17.70 m	plant 8	plant 31
70°	9.00 m	plant 31	plant 32

Group 3 (RP3): RP3 (Reference Point 3) is the fence post in the corner of the exclosure closest to the microwave tower (Fig. 1). The plants are located as follows:

<u>Heading</u>	<u>Distance</u>	<u>From</u>	<u>To</u>
356°	12.40 m	RP3	plant 33
55°	0.15 m	plant 33	plant 34
157°	0.40 m	plant 34	plant 35
174°	7.20 m	plant 35	plant 36
228°	0.60 m	plant 36	plant 37
nd	0.20 m	plant 37	plant 38
nd	0.45 m	plant 38	plant 39
60°	40.60 m	plant 39	plant 40

190°	1.25 m	rebar	plant 41
190°	1.35 m	rebar	plant 42
190°	1.34 m	rebar	plant 43
180°	1.00 m	plant 43	plant 44

B. BADGER PASS MICROWAVE EXCLOSURE MONITORING TRANSECTS

1. **Transect 1:** The starting pin for transect 1 is located 3.58 m from RP3 (Fig. 1) on an azimuth of 10°. The transect runs for 10 m at 10° with the 1 m² plots lying along the west side of the baseline. An additional 1 m² plot lies on the east side of the baseline between meters 1 and 2.
2. **Transect 2:** The starting pin for transect 2 is 13.8 m at 160° from the omnidata pod cover (Fig. 1) and is at the south end of the transect. The transect runs at 340° for 5 m. The 1 m² plots are along the east side of the baseline.
3. **Transect 3:** The starting pin for transect 3 is 2.8 m north of RP4, a painted fence post along the southwestern perimeter fence (Fig. 1) and is at the south end of the transect. The transect runs for 5 m at 350° along the edge of the trees parallel to the fence.

C. HORSE PRAIRIE MONITORING TRANSECT

The Horse Prairie transect is located at the site of the Montana Natural Heritage Program element occurrence 027 for Penstemon lemhiensis. The site is about ½ mile southeast of the Horse Prairie Guard Station. The transect is located on the north side of the road between the second and third water bars as the road goes up the hill. The transect runs parallel to the road in a generally westerly direction and is 5 m long. The 1 m² plots are north (upslope) of the base line.

III. MONITORING METHODS

The transects were established on 1 August 1991 following the methods of Lesica (1987). Individual plants were mapped on diagrams of each 1 m² plot and characterized by life history feature as:

S = seedling (cotyledons evident or rosette <15 mm in diameter)

R = rosettes (basal tufts of leaves on mature plants)

I = inflorescences (flowering stems)

F = fruits

A = aborted flowers (no fruit formation apparent)

The total number per plant of each life history feature was also recorded, except for seedlings. Thus, a plant with five rosettes, two inflorescences, 12 fruits, and 25 aborted flowers was recorded as $R_5I_2F_{12}A_{25}$. At some other Penstemon lemhiensis monitoring sites, seed capsules have been collected randomly and examined for the number of viable-appearing seeds (Achuff and Shelly 1991, Shelly 1990). However, there were so few capsules in 1991 at the monitoring sites that none were collected.

IV. RESULTS AND DISCUSSION

The Penstemon lemhiensis population within the Badger Pass exclosure has been followed for several years. In 1986, 75 plants were reported within the exclosure and in 1990, 38 plants were seen within the exclosure. In 1991, 51 plants were recorded within the exclosure as marked plants or within the transects; no effort was made to count all plants within the exclosure. Thus, the observations have not been made in a sufficiently rigorous way, either in terms of plant numbers or demographic category, that conclusions can be drawn regarding population trend.

Among the 34 plants marked in 1990 and relocated in 1991, there was no consistent trend. Of these, four died, about half remained unchanged, and the remainder were evenly divided between those that increased and those that decreased in size or vigor.

In summary, the present data are not sufficient to draw any conclusions but observing the individual plants over several years and the possible recruitment of new plants in the transects will provide a valid basis for assessing the demographic and life history status of this species.

V. LITERATURE CITED

- Achuff, P.L. and J.S. Shelly. 1991. Demographic monitoring of Penstemon lemhiensis, Beaverhead National Forest, 1990 progress report. Montana Natural Heritage Program, Helena. 34 pp.
- Massey, J.R. and P.D. Whitson. 1980. Species biology, the key to plant preservation. Rhodora 82: 97-103.
- Shelly, J.S. 1990. Status review and establishment of demographic monitoring studies: Penstemon lemhiensis. Montana Natural Heritage Program report to Beaverhead and Bitterroot national forests, Montana. 61 pp.
- U.S. Department of the Interior. 1990. Endangered and threatened wildlife and plants; review of taxa for listing as endangered and threatened species; notice of review. Federal Register 50 CFR Part 17: 6184-6229.

APPENDIX: DEMOGRAPHIC MONITORING DATA

These data show the performance of individual Penstemon lemhiensis plants in permanent monitoring plots in 1991 and, for some plants, in 1990. The following codes are used:

- A = aborted flowers (no fruit formation apparent)
- B = browsed flowering stem
- D = dead
- F = fruits
- I = inflorescences (flowering stems)
- P = predated
- R = rosettes (basal tufts of leaves on mature plants)
- S = seedling (cotyledons evident or rosette <15 mm in diameter)

The codes form a formula describing the state of the plant. For example, a plant with five rosettes, two inflorescences, 12 fruits, and 25 aborted flowers was recorded as $R_5I_2F_{12}A_{25}$.

BADGER PASS MICROWAVE ENCLOSURE MARKED PLANTS - RP1

<u>Plant</u>	<u>1990</u>	<u>1991</u>
1	R4	D
2	R1	R1
3	R4I1F14A17	R3I1F6A6
4	R3	R4
5	R12I1F24A10	R11I3F13A16P1
6	R2	R1P1

BADGER PASS MICROWAVE ENCLOSURE MARKED PLANTS - RP2

<u>Plant</u>	<u>1990</u>	<u>1991</u>
7	R4I1F15A19	R5I3F31A75
8	R1	D
9	R6I4F4A109+	R7
10	R8	R7I2F12A64
11	R6	R4
12	R5	R4I1F5A34
13	R2I1F7A17	R4
14	R1	R3
14A	--	R1

BADGER PASS MICROWAVE EXCLOSURE MARKED PLANTS - RP2 (cont.)

<u>Plant</u>	<u>1990</u>	<u>1991</u>
15	R4B1F1	R3I3F23A84
16	R5	R4
17	R2I1F13A19	R5I1F11A41
18	R4I1F12A21	R13I4F48A151
19	R4B1	R15
22	R8I1F6A10B1	R8I2F1A4B2
23	R5I1F1A3B1	R5I3F17A45
24	R7I2F23A31B1	R12I1F2A3B1
26	R1	R3
27	R6	R8I1B1
29	R1	R4I1F6A27
30	--	R7I1F15A38
31	R5	R3I2F8A61
32	R3I1F11A24	R3

BADGER PASS MICROWAVE EXCLOSURE MARKED PLANTS - RP3

<u>Plant</u>	<u>1990</u>	<u>1991</u>
33	R4	R1
34	R3B1	R1
35	R14I2F36A35	R4I2B2
36	R3I1F8A27	R3
37	R3I1F8A32	R3
38	R2I1F8A27	R3
39	R2	R1
40	--	R2I1F4A17
41	--	R1I1F6A16
42	--	R4I1F8A14
43	--	R3
44	--	R13I1F14A27

BADGER PASS MICROWAVE TRANSECT 1

The number in parentheses is the tag number for numbered plants that occur within a transect.

<u>Plot</u>	<u>Plant</u>	<u>1990</u>
1		no plants
2	a	R2
	b (37)	R3
	c (38)	R3
3-8		no plants

BADGER PASS MICROWAVE TRANSECT 1 (cont.)

<u>Plot</u>	<u>Plant</u>	<u>1990</u>
9	a (35)	R4I2B2
	b (34)	R1
	c (33)	R1
10		no plants
11	a (36)	R3
	b (39)	R1
	c (40)	R2I1F4A17

BADGER PASS MICROWAVE TRANSECT 2

The number in parentheses is the tag number for numbered plants that occur within a transect.

<u>Plot</u>	<u>Plant</u>	<u>1990</u>
1	a	R3I3F14A35
2-3		no plants
4	a	R4I3F14A44
	b	R4I1F4A12
	c	R2
	d	R3I2F15A4
5	a	R1 (dead?)
	b	R1I1F5A23
	c	R1
	d	R5I1F8A23
6-8		no plants
9	a (41)	R1I1F6A16
	b (42)	R4I1F8A14
	c (43)	R3
10	a (44)	R13I1F14A27

BADGER PASS MICROWAVE TRANSECT 3

The number in parentheses is the tag number for numbered plants that occur within a transect.

<u>Plot</u>	<u>Plant</u>	<u>1990</u>
1		no plants

BADGER PASS MICROWAVE TRANSECT 3 (cont.)

<u>Plot</u>	<u>Plant</u>	<u>1990</u>
2	a (30)	R7I1F15A38
	b (29)	R4I1F6A27
3	a	R1
	b (24)	R12I1F2A3B1
	c (27)	R8I1B1
	d (23)	R5I3F17A45
	e (22)	R8I2F1A4B2
4	a	R1
4	b (26)	R3
	c	R1
5		no plants

HORSE PRAIRIE MONITORING TRANSECT

<u>Plot</u>	<u>Plant</u>	<u>1990</u>
1	a	R2
	b	R1
	c	R1
	d	R2
	e	R2
	f	R2
	g	R2
	h	R1
	i	R2
	j	R1
	k	R1
2	a	R1
	b	R2
	c	R14
	d	R1
	e	R1
	f	R2
	g	R2
	h	R3
	i	S
3	a	R8I2B2
	b	R1
	c	R12I5F63A55B2
	d	R10I4F208A65P1
	e	R2
	f	R1

HORSE PRAIRIE MONITORING TRANSECT (cont.)

<u>Plot</u>	<u>Plant</u>	<u>1990</u>
	g	R1
	h	R3
	i	R2
	j	R5
	k	R1
	l	R1
	m	R1
	n	R1
	o	R3
	p	R2
4	a	R11I1F92A24
	b	R1
	c	S
5		no plants