Current Knowledge and Conservation Status of *Eriogonum tiehmii* Reveal (Polygonaceae), Tiehm buckwheat.

edited by James D. Morefield

Nevada Natural Heritage Program, Department of Conservation and Natural Resources,
1500 East College Parkway, Carson City, NV 89710. (702) 687-4245

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4600 Kietzke Lane, C-125, Reno, NV 89502. (702) 784-5227

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SUMMARY: *Eriogonum tiehmii* was first discovered in 1983 in the Silver Peak Range of Esmeralda County, Nevada, and named as a new species in 1985. As of 1993, it was known only from the type locality in the Silver Peak Range between 5970 and 6120 ft elevation. Because of its rarity and potential vulnerability to mineral exploration and development, livestock grazing, road building, off-road vehicle activity, and other impacts in its known habitat, it was placed on the list of category-2 candidates for listing under the Endangered Species Act, which require more information before a listing decision can be made. Field surveys were undertaken by Tiehm (1994) in western Nevada to relocate the historical population, discover any additional populations, and document their biology, ecology, and conservation status. This report summarizes the results of these surveys, reviews all previous knowledge of the species, and recommends conservation and recovery actions designed to prevent it from becoming a Threatened or Endangered species.

Field surveys discovered 5 new Nevada populations totalling about 10,000 plants and covering about 9 acres, all on the same geologic formation within 1 mile of the historic site. *Eriogonum tiehmii* is now known from 6 sites under federal management near Cave Spring on the west slope of the Silver Peak Range, Esmeralda County, Nevada, between 5960 and 6200 ft elevation. At least 17,015 plants on 21-22 acres have been documented. Numerous other potential sites have been searched, including 33 in 1994, without finding additional populations, and the likelihood of further populations awaiting discovery appears very low.
The species was found to be narrowly restricted to dry, open, relatively barren, light-colored rocky clay soils derived from a peculiar formation of interbedded claystones, shales, tuffaceous sandstones, and limestones local to the Rhyolite Ridge area, surrounded by shadscale shrub associations. *Eriogonum tiehmii* appears to be distinct from all related species, and is not known to hybridize. The entire species population is very small and limited in numbers and area, unprotected, and highly vulnerable to impacts and population declines, mainly from mineral exploration and development and associated road-building and off-road vehicle activities. All populations are incorporated in recent mineral claims, and all but one have been impacted by past trenching or other exploration.

Based on current knowledge, *Eriogonum tiehmii* meets the definition of a Threatened species under the Endangered Species Act. Aggressive measures are needed to prevent its extinction, including frequent monitoring, pursuit by BLM of ACEC designation with minerals withdrawals, and pursuit by USFWS of conservation agreements, and of listing as Threatened if necessary to prevent further declines.

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I. CLASSIFICATION AND NOMENCLATURE

Scientific Name: *Eriogonum tiehmii* Reveal (1985a).

Original Publication: Reveal, J.L. 1985a. New Nevada entities and combinations in *Eriogonum* (Polygonaceae). *Great Basin Naturalist* 45: 276-280.

Type Specimen: U.S.A. NEVADA, Esmeralda Co., Silver Peak Range, just N of the road from Silver Peak to Fish Lake Valley, 1.2 air miles NNW of Cave Springs, 31 May 1984, *Tiehm, Williams, Reveal & Reveal 8534* (Holotype: US: Isotypes: CAS, NY, RENO, RM, RSA, UTC and elsewhere).

Synonym(s): None.

Vernacular Name(s): Tiehm buckwheat.

Family: Polygonaceae (buckwheat family).

Major Groups:	Cronquist (1988)	Takhtajan (1980)	Thorne (1992)
Class	Magnoliopsida	Magnoliopsida	Magnoliopsida
Subclass	Caryophyllidae	Caryophyllidae	Magnoliidae
Superorder	—	—	Theanae
Order	Polygonales	Polygonales	Polygonales

Review of Alternative Taxonomic Treatments: None known and none recommended. *Eriogonum tiehmii* appears distinct from all other closely related species.

II. TAXON HISTORY

1983. First collected in Silver Peak Range by Arnold Tiehm on 18 May.
1984. Collected at same location by Arnold Tiehm, Margaret Williams, James L. Reveal and Jack Reveal on 31 May.
1985. First described by James L. Reveal (1985a).
1987. Recognized in Kartesz's (1987) flora of Nevada, where reported in error from Mineral County.
1994. Found at five new sites by Arnold Tiehm and Jan Nachlinger on 27 May.

III. PRESENT LEGAL OR OTHER FORMAL STATUS

International: The Nature Conservancy (TNC) ranks sensitive taxa at state, national, and global levels on a scale of 1 to 5, 1 being the most vulnerable and 5 the most secure. *Eriogonum tiehmii* was most recently ranked 1 by TNC at all levels (Morefield and Knight, 1992). This remains consistent with the findings reported.

Federal: *Eriogonum tiehmii* is presently a category-2 candidate for listing as Endangered or Threatened under 16 U.S.C. 1531 *et seq.*, the Endangered Species Act as amended in 1988 (USDI Fish and Wildlife Service 1993, p. 51164).

State: No legal status; Northern Nevada Native Plant Society's Threatened list (Morefield and Knight 1992).

IV. DESCRIPTION

Non-technical: **Perennial** herb, forming low grayish clumps to 2 ft across; overall color bluish gray with pale yellow to reddish balls of flowers; **leaves** only at the base of the plant, upright to spreading, bluish gray in color, leaf blades longer than wide, to 1 inch long and less than 1/2 inch wide, gray hairy on both surfaces, petioles to 2/3 inch long; **stems** upright, unbranched, leafless, to 6 inches high, covered with hairs; **flower cups** bell-shaped or nearly so, 1/6-1/5 inch long, narrower than long, hairy on the outside; **flowers** (May-June) in tight balls, light yellow to cream, aging lighter and/or turning red with age, 1/9-1/6 inch long, flower parts 6, longer than wide, fused for 1/5-1/4 of their length, with stalked glands on the outside; **stamens** extending beyond flower parts, stalks about 1/6 inch long, hairy at base; **seeds** (May-July) light brown, about 1/6 inch long, 3-angled at tip, triangular in outline.

Technical: Low, spreading perennial herbs forming a dense compact mat up to 6 dm across and to 1.6 dm high, with a much branched woody caudex arising from a stout, gnarled taproot; overall color bluish gray with pale yellow to reddish flowers; **leaves** erect to spreading, numerous, persistent, with a bluish gray hue, the leaf-blades elliptic to oblong, (0.8) 1-2 (2.5) cm long, 5-8 (10) mm wide, entire, grayish to whitish tomentose on both surfaces, often slightly greenish under the tomentum with age on the upper surface, the petiole 0.5-1.6 (2) cm long, tomentose without, glabrous within, with an expanded petiole base 3-5 mm long and 1-2 mm wide; **stems** erect, unbranched, leafless, (0.6) 1-1.3 (1.5) dm long, floccose, greenish or reddish under the hairs; **involucres** several in each head, turbinate-campanulate, 4-5 mm long, 3-4 mm wide, rigid, floccose and reddish without, glabrous within except for a few hairs at the very tip in some, with 5-6 erect to slightly spreading, 1.5-2 mm long, narrowly triangular lobes, the bractlets linear, 2-4 mm long, minutely glandular and toothed, the pedicels exserted, 4-7 mm long, glandular throughout and especially so near the apex; **flowers** (May-June) greenish - light yellow to yellowish-white or cream, lighter at the tips, darker green at the base, older tepals cream colored with reddish midribs and apices, becoming reddish with age, 2.5-3.5 mm long at anthesis, up to 4 mm long in early fruit, the tepals 6, oblong, the outer slightly broader than inner, both with out-rolled margins, the apices truncate with a slightly emarginate apex in the outer series of tepals, stipitate glandular along the midrib and base without, sparsely glandular within, united 1/5 to 1/4 of the length; **stamens** 6, exserted, the filaments 3-4 (4.5) mm long, pilose basally, the anthers pale yellow, 0.4-0.5 mm long, oval to oblong; **fruit** (May-July) light brown achenes 3-4 mm long, the subglobose base tapering to a long, 3 angled beak about 1/3 the length of the fruit, the stigma 1-1.2 mm long. (Modified from Reveal 1985a.)

Field Characters: *Eriogonum tiehmii* is the only buckwheat known to have well defined stalked glands on the outer surfaces of the tepals. The glands of *Eriogonum argophyllum* are sparser and more obscure. *Eriogonum tiehmii* can be separated from similar or co-occurring buckwheats in Nevada using the following key adapted from Reveal (1985b).

1. Plants annual *or* shrubby *or* not forming mounds or mats *or* flowering stems leafy or branched *or* flowers forming 2 or more groups on each stem *or* not yellow *or* stalk of each flower jointed near middle, old flowers falling with a stalk-like portion attached ..... other ***Eriogonum***

1' Plants perennial, forming mounds or mats, not shrubby; flowering stems leafless, unbranched; flowers yellow, in a single tight ball at stem tip; stalk of each flower jointed immediately below flower, old flowers falling free from stalk.

2. Flowers hairy outside *or* flower parts of two distinct sizes ..... ***Eriogonum ovalifolium, shockleyi, villiflorum***

2' Flowers hairless outside, the 6 parts about equal in size.

3. Flowering stem hairs glandular, not cobwebby.

4. Flower cups woolly outside, not glandular ..... ***Eriogonum ochrocephalum***

4' Flower cups glandular-hairy outside, not woolly ... ***Eriogonum beatleyae, rosense***

3' Flowering stems hairless or cobwebby to woolly, not glandular.

5. Flowering stems hairless ..... ***Eriogonum ochrocephalum, prociduum***

5' Flowering stems cobwebby to woolly.

6. Flowers bright yellow.

7. Longest leaf blades 1.5-3 cm; flower cups white-woolly, various lengths; flowering stems various.

8. Flower cups 3.5-5 mm long; flowering stems greenish, cobwebby ..... ***Eriogonum ochrocephalum***

8' Flower cups 2-3 mm long; flowering stems densely woolly ..... ***Eriogonum desertorum***

7' Longest leaf blades < 1.5 cm; flower cups gray-cobwebby, 2-3 mm long; flowering stems greenish, cobwebby.

9. Flowers 2-3 mm long; widest leaf blades 5-7 mm ..... ***Eriogonum lewisii***

9' Flowers 1.5-2 mm long; widest leaf blades 1.5-5 mm .. ***Eriogonum crosbyae***

6' Flowers pale yellow to whitish.

10. Flower cup 4-5 mm long; stalked glands on flowers prominent ..... ***Eriogonum tiehmii***

10' Flower cup 2-3.5 mm long; stalked glands on flowers obscure or none.

11. Flower cup 2.8-3.5 mm long ..... ***Eriogonum kingii***

11' Flower cup 2-2.5 mm long.

12. Flower cups rigid; flowers smooth outside; largest leaf blades 9-15 mm long, 5-11 mm wide, stalk > 1.5 mm long .... ***Eriogonum anemophilum***

12' Flower cups papery; flowers sparsely glandular outside; largest leaf blades 4-8 mm long, 2-5 mm wide, stalk 0.5-1.5 mm long ..... ***Eriogonum argophyllum***

Photographs and Line Drawings: No published photographs or line drawings are known for *Eriogonum tiehmii*. Photographs taken during this survey are presented in Appendix 2, Figures 13-16 and are on file with the Nevada Natural Heritage Program in Carson City.

V. SIGNIFICANCE OF TAXON

Natural: *Eriogonum tiehmii* is another example of a local endemic species that is adapted to a specialized substrate. Within subgenus *Eucycla* section *Capitata* it is one of five species endemic to Nevada with the other four being *E. anemophilum, E. argophyllum, E. kingii* and *E. holmgrenii*.

Human: *Eriogonum tiehmii* has potential as a rock garden plant as matted perennials are favorites of rock garden enthusiasts. Gardeners have had good luck growing *Eriogonum* from seed and many species are listed in seed catalogues. There have been no known attempts to cultivate *Eriogonum tiehmii*.

VI. GEOGRAPHIC DISTRIBUTION

Geographic Range: (Appendix 2, Figures 1a-b). Globally, *Eriogonum tiehmii* is known only from 6 closely spaced sites on the west slope of the Silver Peak Range, west of Rhyolite Ridge near Cave Spring, in Esmeralda County, Nevada, all under management by the USDI Bureau of Land Management, Battle Mountain District, Tonopah Resource Area. Kartesz (1987, p. 285) reported it in error from Mineral County.

Precise Occurrences: Site numbers are from Appendix 1, Table 1, and match the equivalent Nevada Natural Heritage Program element occurrence numbers. Sites are mapped in Appendix 2, Figures 1b-10.

Historical site(s) rediscovered or recently known extant: Site 1, the type locality and the only previously known site, was rediscovered and resurveyed for this report.

New site(s) discovered: Sites 2-5, comprising about 10000 plants on about 9 acres, were newly discovered and documented for this report.

Historical site(s) searched for but not rediscovered: None.

Other site(s) searched where not discovered: Sites 7-39, comprising about 301 acres between 4870 and 6840 feet elevation, were surveyed for this report without encountering *Eriogonum tiehmii* (Appendix 2, Figures 2-10). This probably represents all of the potential habitat in western Nevada.

Eriogonum tiehmii occurs on seemingly barren light-colored hillsides which stand out from the surrounding areas (Figures 11-13). Many of these areas were easily visible during Tiehm's (1994) aerial reconnaissance on 22 April 1994. All of these seemingly likely areas were then field checked in late May and early June of 1994.

Sites 7-39 are therefore all of those that appeared from the air to be suitable habitat, but which on closer inspection did not harbor *Eriogonum tiehmii*.

In past years (see Field Research below) Tiehm "*spent many days looking for plants in the Silver Peak Range, mostly on the eastern slopes around Mineral Ridge and Nivloc. There are some interesting habitats in these areas and none of them were found to harbor Eriogonum tiehmii.*" During Tiehm's (1994) aerial reconnaissance these areas appeared "*not to be right for Eriogonum tiehmii as the areas were either the wrong color, contained too many other plants, or the parent rock material was not weathered enough.*" The lack of the correct substrate appears to be confirmed by the available geologic data for the area (see below). Tiehm was unable to accurately mark all of these locations on maps so long after the fact, and therefore many are not mapped or tabulated herein.

Historical site(s) known or suspected to be erroneous reports: None.

Historical site(s) known or assumed extirpated: None.

Historical site(s) where present status unknown: None.

Potential site(s) meriting future field surveys: None known or expected.

Biogeography and Phylogeny: *Eriogonum tiehmii* is a member of subgenus *Eucycla* section *Capitata* which is characterized by a perennial caespitose habit, non-stipitate tepals which are essentially equal, and naked scapes capped by a cluster or head of flowers (Figures 14-16). Members of section *Capitata*, whose distribution is centered in the Great Basin, tend to have limited geographic distributions and many are adapted to specific substrates.

Within the section *Capitata*, *Eriogonum tiehmii* is morphologically closest to *E. anemophilum* which has shorter scapes, smaller involucres and smaller tepals that lack glands on the outside. *Eriogonum anemophilum* occurs on clay outcrops at lower elevations and on exposed ridge lines at higher elevations. There is a large elevation difference in these occurrences which range from 4750-9850 feet. Despite its occurrence in two distinct habitats and its large elevation range *E. anemophilum* is remarkably uniform. It is currently known from the Eugene Mts., Fish Creek Mts., Humboldt Range, Jackson Mts., Jersey Valley, Reese River Valley and the Sonoma Range in Humboldt, Lander, and Pershing counties. *Eriogonum anemophilum* is know from as close as 180 miles nearly due north of *E. tiehmii*. Geographically the closest congener of *E. tiehmii* is *E. beatleyae* which occurs as close as about 7 air miles SE of the type locality of *E. tiehmii*. This population of *E. beatleyae*, vouchered by *Tiehm 11825*, occurs at 8400 feet in elevation along an exposed ridgeline. *Eriogonum beatleyae* differs in having glandular scapes, smaller involucres, and yellow tepals lacking glands on the outside. There are populations of *E. beatleyae* which have cream-colored flowers but they are consistent with the yellow flowered populations in all other characters. These cream-colored populations are known from Churchill, Eureka, Lander, and Nye counties (Reveal, 1985b). *Eriogonum shockleyi* also occurs in the southern part of the Silver Peak Range at 5500 feet in elevation. The closest occurrence is near

Upper Cowcamp Springs about 19 air miles SSE of the type locality of *E. tiehmii*. *Eriogonum shockleyi* differs in having smaller tepals which are long pubescent without, smaller leaves, and pubescent ovaries. The site is vouchered by *Tiehm and Nachlinger 12073*.

VI. HABITAT CHARACTERISTICS

Environment and Habitat Summary: (Appendix 2, Figures 11-13) *Eriogonum tiehmii* is narrowly restricted to dry, open, relatively barren, light-colored rocky clay soils derived from a peculiar formation of interbedded claystones, shales, tuffaceous sandstones, and limestones local to the Rhyolite Ridge area, on all aspects with slopes up to about 50%, from 5960-6200 feet elevation. The vegetation varies from pure stands of *Eriogonum tiehmii* to sparse associations with a few other low herb and grass species such as *Pleuraphis jamesii* and *Sporobolus airoides*. Vegetation surrounding the sites consists of Shadscale (*Atriplex confertifolia/Sarcobatus baileyi*) or black sagebrush (*Artemisia nova*) shrub associations.

Physical Characteristics:

Physiography: Most of Nevada, including the Silver Peak Range, consists of block-faulted, generally north-south-oriented basins and ranges, and is included in the Great Basin section of the Basin and Range Physiographic Province (Fenneman, 1931). The range of *Eriogonum tiehmii* lies in the southwestern part of Holmgren's (1972) Great Basin Division, in the western portion of his Tonopah Section, a zone transitional to the Mojave Desert to the south and characterized by broad, low, "hot, dry desert valleys covered mostly by shadscale vegetation," small irregular mountain ranges reaching a mere 9447 feet in the Silver Peak Range, and bedrock largely of volcanic origin.

Climate: *Eriogonum tiehmii* populations generally experience warm dry summers (average daily maximum 85-90°F) and cold moist winters (average daily minimum 20-25°F), with high daily variations. Moisture averages 5-6 inches annually, and originates mainly from November through April in Pacific storm systems from the west, the majority falling as snow (Hidy and Klieforth 1990; Holmgren 1972). The western Great Basin is within the Sierra Nevada rain shadow, which is the dominant influence on local climate. The western Great Basin also lies near the northwestern limit of sub-tropical summer moisture, which originates in the Gulfs of Mexico and California and spreads over most of Arizona during July and August. This "monsoonal" influence produces a secondary summer peak of precipitation in the region (averaging 1-2 inches of the annual total), and can deliver a substantial majority of annual precipitation to limited areas in any given year. Both summer and winter precipitation are highly variable from year to year, ranging between about 40% to 200% of the long-term averages (Hidy and Klieforth 1990). The 7 years prior to the survey for this report were characterized by drought conditions, especially during the winter.

The following information on climate and precipitation was kindly provided by Dr. Harold Klieforth of the Desert Research Institute. Dyer is in Fish Lake Valley on the west side of the Silver Peak Range at 4899 feet in elevation and is approximately 16 air miles southwest of the type locality of *Eriogonum tiehmii*. The town of Silver Peak is on the east side of the Silver Peak Range at 4250 feet in elevation and is approximately 13 air miles east-southeast of the type locality of *Eriogonum tiehmii*.

Season	TEMPERATURE (°F)							PRECIPITATION (inches water)						
	Daily Averages			Seasonal Extremes				Averages		Seasonal Extremes				
	Max	Min	Avg	High	Date	Low	Date	Avg	Days > .01	High	Year	Low	Year	Max Day
DYER (16 miles SSW, Fish Lake Valley, 4899 ft)														
Winter	48.8	18.0	33.4	76	1982.02.20	-23	1989.02.07	1.07	7	3.45	1969	0.11	1982	1.32
Spring	67.3	32.5	49.9	95	1967.05.22	- 6	1969.03.11	1.41	9	3.34	1981	0.07	1968	1.12
Summer	90.0	50.9	70.4	106	1961.06.20	27	1967.06.03	1.40	8	4.49	1965	0.02	1978	2.05
Fall	70.5	33.1	51.8	99	1969.09.02	- 6	1964.11.20	1.19	6	3.32	1967	0.00	1977	1.33
Year	**69.1**	**33.6**	**51.4**	**106**	**1961.06.20**	**-23**	**1989.02.07**	**5.08**	**30**	**8.47**	**1976**	**2.23**	**1968**	**2.05**
SILVERPEAK (13 miles ESE, Fish Lake Valley, 4250 ft)														
Winter	48.7	20.1	34.4	77	1981.02.18	-22	1974.01.02	0.92	7	3.50	1990	0.00	1991	1.51
Spring	69.6	39.2	54.4	99	1974.05.26	7	1971.03.01	1.30	9	4.54	1975	0.07	1972	2.25
Summer	93.6	59.6	76.6	111	1975.07.23	35	1982.06.06	1.25	7	4.68	1984	0.00	1987	1.15
Fall	71.1	38.5	55.1	104	1975.09.07	- 2	1985.11.12	1.18	6	4.57	1975	0.17	1977	1.04
Year	**70.9**	**39.3**	**55.1**	**111**	**1975.07.23**	**-22**	**1974.01.02**	**4.66**	**29**	**10.14**	**1975**	**1.80**	**1970**	**2.25**

Geology: The formation on which *Eriogonum tiehmii* occurs is a thick sedimentary sequence of interbedded claystones, shales, tuffaceous sandstones, and subordinate limestones. This formation is endemic to the area west of Rhyolite Ridge (Robinson, 1966), is probably middle to late Pliocene in age, and was deposited in a narrow elongate basin. Throughout most of its existence this basin contained a small lake as is shown by evidence of freshwater gastropods, the fine-grained nature of the deposits, and abundant oscillatory ripple marks (Robinson, 1966).

Soils: No detailed soil analyses are known from any of the *Eriogonum tiehmii* sites. The light-colored soils are very young and are weathered from siltstones, shales and light brown volcanic sandstones (Figures 11-13). There is no evidence that any of the sites of *Eriogonum tiehmii* contain any calcareous soils from weathered limestone and limestone is rather rare in the general area. The soils are poor, with little development, lack an A horizon, are clayey in nature, and are replete with broken pieces of the parent bedrock which often form a surface pavement.

Hydrology: *Eriogonum tiehmii* occurs on generally dry, upland sites, subject only to occasional inundations by rain and snow. *Eriogonum tiehmii* is not found in association with free surface or subsurface waters, except possibly at site 6 where the

dominance of *Sporobolus airoides* suggests relatively high subsurface moisture levels. The species appears to depend primarily on incident precipitation for its moisture supply.

Geomorphology: *Eriogonum tiehmii* does not appear to associate with or prefer any specific geomorphic features. Most of the hills in the basin west of Rhyolite Ridge are covered by loose unsolidified material eroded from the nearby mountains. In some cases this surface material has eroded away and exposed the deep consolidated sedimentary bedrock. In many cases this sedimentary rock remains unweathered and does not provide habitat for *Eriogonum tiehmii*. In other places the bedrock has fractured, eroded, and weathered to form areas of poor soils. It is on these exposed weathered areas that *Eriogonum tiehmii* occurs.

Aspect and slope: *Eriogonum tiehmii* has been found on nearly all aspects, with slopes of up to about 50%.

Biological Characteristics:

Community physiognomy: *Eriogonum tiehmii* can occur in pure stands or with just a few other species which results in an open community with low plant cover and stature (Figures 13, 15 and 16). The largest pure stands were noted at sites 1 and 6. At site 2 there were many more grasses present and they co-dominated with *E. tiehmii*.

Vegetation type: Zonal vegetation for the area surrounding sites 1 and 2 is shadscale desert dominated by *Atriplex confertifolia* and occasionally co-dominated by *Sarcobatus baileyi*. The vegetation surrounding sites 3-6 is dominated by black sagebrush, *Artemisia nova*, with small patches of shadscale intermixed.

Associated species: The most common associates of *Eriogonum tiehmii* are *Atriplex confertifolia, Pleuraphis jamesii* and *Sporobolus airoides*. A complete list of all plants found to occur with *E. tiehmii* (nomenclature mainly from Barneby 1989; Cronquist 1994; Cronquist *et al.* 1972, 1977, 1984; Hickman 1993) is as follows:

TREES: None.

SHRUBS:
Artemisia nova
Atriplex canescens
Atriplex confertifolia
Chrysothamnus viscidiflorus var. *puberulus*
Ephedra nevadensis
Glossopetalon spinescens var. *aridum*
Gutierrezia microcephala
Kochia americana
Krascheninnikovia lanata
Menodora spinescens

SUCCULENTS: None.

GRAMINOIDS:

Achnatherum hymenoides
Elymus elymoides
Pleuraphis jamesii
Sporobolus airoides

NON-GRAMINOID PERENNIAL HERBS:

Arenaria kingii
Astragalus serenoi var. *shockleyi*
Castilleja chromosa
Caulanthus glaucus
Cryptantha humilis
Enceliopsis nudicaulis var. *nudicaulis*
Eriogonum microthecum var. *laxiflorum*
Eriogonum nummulare
Chamaesyce fendleri
Hymenopappus filifolius var. *nanus*
Mirabilis alipes
Penstemon barnebyi
Sphaeralcea ambigua
Stanleya pinnata
Stephanomeria pauciflora

NON-GRAMINOID ANNUALS:

Gilia sp.
Phacelia gymnoclada
Plagiobothrys kingii

Other endangered, threatened, and sensitive species: None were found at or near the six known sites for *Eriogonum tiehmii*. The following other sensitive plant taxa are known to occur in the general region, with only the *Mentzelia* and *Sclerocactus* occupying habitats similar to those of *Eriogonum tiehmii*.

NAME		STATUS		
Scientific	**Vernacular**	**Federal**	**State**	**NNNPS**
Arabis shockleyi	Shockley rockcress	3C	—	D
Asclepias eastwoodiana	Eastwood milkweed	C2	—	W
Cordylanthus tecopensis	Tecopa birdsbeak	C2	—	T
Eriogonum ampullaceum	Mono buckwheat	3C	—	W
Eriogonum beatleyae	Beatley buckwheat	3C	—	D
Mentzelia candelariae	Candelaria stickleaf	—	—	—
Opuntia pulchella	sand cholla	3C	CY	D
Oryctes nevadensis	oryctes	C2	—	W
Sclerocactus polyancistrus	Mojave fishhook cactus	3C	CY	D

Land Management: All known sites are on public lands administered by the Tonopah Resource Area, Battle Mountain District, USDI Bureau of Land Management. For all sites, ownership status of associated minerals and water rights was not determined, nor was the presence or absence of any easements or other encumbrances. All sites are within a large area designated "open for multiple use" (Ted Angle, Tonopah Resource Area BLM,

pers. comm. 1994). Among the present uses are mineral exploration, livestock and feral horse range, hunting, and other dispersed recreation.

VIII. BIOLOGY

Population Summary: Based on the survey for this report, the total global population of *Eriogonum tiehmii* was estimated to be at least 17015 genetic individuals, and to cover about 21-22 acres of habitat divided among 6 sites near Cave Spring in the Silver Peak Range of Esmeralda County, Nevada, between 5960 and 6200 feet elevation. Based on the extent of potential habitat now surveyed, the probability of additional undocumented populations existing is considered low to non-existent.

Demography: Long-term monitoring has not been conducted for *Eriogonum tiehmii* populations to determine demographic trends. Absence of the species from numerous apparently suitable sites provides circumstantial evidence that the species may have undergone population declines at least during prehistoric times, and/or that it may have limited ability to disperse to and establish in unoccupied habitat.

No evidence for recent recruitment could be found except for a very few (< 1%) apparent first-year plants at site 1. All other plants observed appeared to be well-established and mature. No seedlings of *Eriogonum tiehmii* were noted, but they may be difficult to detect and identify, and could have been present.

Average plant densities based on reported population numbers and areas are relatively consistent, ranging from about 300-2400 per acre, and averaging about 790 per acre over all populations. Site 6 harbored the densest (and second largest) population; site 3 was the sparsest.

Mats of *Eriogonum tiehmii* sometimes spread and divide enough to resemble multiple individuals from above ground. In order to be certain that complete genetic individuals were counted, one plant with several ramets was excavated to verify that it comprised a single genet.

Phenology: *Eriogonum tiehmii* has been noted in flower from 18 May to 11 June. Tiehm's (1994) observations indicated that it begins to flower in early May and some plants will continue to flower through June. Fruits have been noted as early as 31 May, and probably continue dispersing through July. These times may vary considerably with year-to-year fluctuations in temperature and precipitation patterns. Low precipitation could entirely prevent reproductive activity in some years.

Reproduction and Dispersal: Not studied, but buckwheats in general are sexual reproducers and *Eriogonum tiehmii* has been known to produce seed (Reveal, 1985a). The primary seed dispersal agents are probably gravity, wind, and water.

Hybridization: None observed or suspected.

Pathology: Several plants at site 6 had abnormally enlarged leaves, and a few others had yellow edges on the leaves, both apparently resulting from fungal infections. No fruiting bodies were seen and therefore no attempt was made to collect and identify the pathogens. Otherwise, no evidence of disease or parasitism was noted.

Predation: Horse sign was noted at sites 1 and 4-6, and cattle sign at site 1, but no evidence of grazing or clipping of *Eriogonum tiehmii* was noted.

Competition: *Eriogonum tiehmii* appears restricted to low-competition conditions, with very few individuals of other associated species present.

Other Interactions: None noted.

IX. EVIDENCE OF THREATS TO SURVIVAL

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range: All sites except 5 have been impacted by trenches, mine shafts, or mining claim markers associated with mineral exploration activities. The trenches and mine shafts do not appear to be recent activities as plants of *Eriogonum tiehmii* have colonized some of the bottoms of the trenches as well as the edges of the debris piles. The trenches and mine shafts on sites 1, 2, 3, and 6 have destroyed some habitat for *Eriogonum tiehmii* and the total area of lost habitat is perhaps a tenth of an acre. Most of the mining claim markers are not physically on sites but their area of coverage includes all sites. The newer set of markers are white PVC pipe and are named CAVE 1, CAVE 2 etc. with CAVE 36 and 38 near site 1. One old 4x4 post, noted near site 2, had the inscription " NE corner Mud Plate # 2". All sites are open to mineral entry and exploration which may modify or destroy habitat in the future.

Over-utilization For Commercial, Recreational, Scientific, or Educational Purposes: None known.

Disease or Predation: Several plants at site 6 had abnormally enlarged leaves and a few others had yellow edges on the leaves. Both of these appear to be caused by fungal infections. The long-term impact of these pathogens to the population is unknown. All other sites appeared to be free of disease.

Horse droppings and/or tracks were seen at sites 1 and 4-6 and cow droppings were seen at site 1. No *Eriogonum tiehmii* showed evidence of having been grazed or clipped. There are about 300 head of feral horses, about 120 mule deer, and about 120 bighorn sheep in the Silver Peak Range (USDI Bureau of Land Management, 1984). For the size of the range this is a small number of herbivores and they appear not to be impacting *E. tiehmii*.

Inadequacy of Existing Regulatory Mechanisms: No enforceable protective designations, conservation agreements, or approved management plans are known to exist for *Eriogonum tiehmii* or its habitat. Unless it is listed as Endangered or Threatened (50 CFR 17.61, 17.71) and occurs within federal jurisdiction, a plant has no formal protection under the

federal Endangered Species Act (ESA), except for regulatory determinations by some federal land management agencies (Forest Service, BLM) that candidate species will be managed as if they were listed. No federal protection currently extends to plants under non-federal jurisdiction unless they are listed as Endangered and removing, cutting, digging up, damaging, or destroying them would be "*in knowing violation of any law or regulation of any state or . . . of a state criminal trespass law*" [ESA Sect. 9(a)2(B)], and that law extended to non-federal jurisdictions. It should also be noted that the Endangered Species Act and the various agency regulations implementing it are in direct conflict with provisions of the 1872 mining law, and are therefore of uncertain protective value when mineral-related projects are involved.

USDI Bureau of Land Management policy provides that the agency "*shall carry out management, consistent with the principles of multiple use, for the conservation of candidate species and their habitats and shall ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as Threatened or Endangered.*" If *Eriogonum tiehmii* occurred entirely on federal lands, BLM policy would further require that the candidate species be included as a priority species in land use plans, and that range-wide or site-specific management plans be prepared "*that identify specific habitat and population management objectives designed for recovery, as well as the management strategies necessary to meet those objectives*" (BLM Manual Section 6840).

Eriogonum tiehmii is not listed as "Critically Endangered" under Nevada Revised Statute (NRS) 527.270. Such listing would provide that "*. . . no member of its kind may be removed or destroyed at any time by any means except under special permit issued by the state forester firewarden*" on any lands in Nevada. The adequacy of this law, however, would depend on informed and cooperative landowners, or on some form of deterrent enforcement. Such enforcement does not now exist. It also depends on the state forester firewarden's discretion in issuing or withholding permits, and in placing protective conditions on permits that are issued. To date, very few requests for such permits are known to have been denied. Nevada law does not require the continued survival of any plant species which it declares to be in danger of extinction.

Other Natural or Man-made Factors: The small area, numbers, and range of *Eriogonum tiehmii* populations make them vulnerable to natural events such as climatic shifts or unprecedented extremes of heat, cold, drought, as well as to random human impacts. If *Eriogonum tiehmii* is dependent on insect pollinators for successful reproduction, any natural or man-made factors affecting the viability of such insects would also affect the viability of *Eriogonum tiehmii*. So far, exotic plant species have no significant presence at or impact to *Eriogonum tiehmii* sites.

X. GENERAL ASSESSMENT AND RECOMMENDATIONS

General Assessment: As now known, the global population of *Eriogonum tiehmii* consists of about 17015 plants restricted to about 21-22 acres of publicly owned land at 6 sites in the Silver Peak Range of Esmeralda County, Nevada. It appears to be a distinct species with no taxonomic controversy. *Eriogonum tiehmii* is restricted to dry, open, relatively barren,

light-colored rocky clay soils derived from a peculiar formation of interbedded claystones, shales, tuffaceous sandstones, and limestones local to the Rhyolite Ridge area, on all aspects with slopes up to about 50%, from 5960-6200 feet elevation. Its global distribution appears to be completely documented, with little or no potential habitat remaining to be explored.

No effective protection now exists to prevent the extinction of this taxon. All sites have been impacted by past mineral exploration activities, and potential mineral exploration and development will continue to threaten *Eriogonum tiehmii* with extinction indefinitely under present circumstances. Unknown but potentially significant impacts and threats may also exist from fungal infections noted at one site. The species is also vulnerable to impacts to possible insect pollinators, and to natural environmental fluctuations impacting the small and limited populations.

Status Recommendations: Tiehm buckwheat is now classified as a category-2 candidate for listing by the U.S. Fish and Wildlife Service, is ranked at the highest vulnerability to extinction by The Nature Conservancy, and is considered threatened by the Northern Nevada Native Plant Society.

Based on this report, *Eriogonum tiehmii* meets the definition of a Threatened species under the Endangered Species Act. Immediate and aggressive measures are needed to prevent its extinction and to protect it sufficiently to avoid formal listing.

Critical Habitat Recommendations: If it becomes necessary to designate critical habitat through the provisions of the Endangered Species Act, it should include all known populations, each surrounded by a minimum 100-meter wide habitat buffer. It is recommended that this critical habitat not be formally designated if it would subject *Eriogonum tiehmii* to increased threats to its survival.

Conservation and Recovery Recommendations:

1. All known sites should be monitored at least yearly to assess population trends and any further impacts from habitat disturbance of any kind, to observe effects from any pathogens, and to detect any establishment of exotic or noxious weeds.

2. Detailed long-term monitoring should be conducted at site 6 to determine the status and effects of the fungal infection observed there.

3. Any establishment of exotic, invasive, or noxious weeds detected in or near the known sites should be quickly eradicated to avoid possible competitive impacts.

4. No fire suppression, reseeding, or range treatment activities of any kind, including access routes, should be permitted to occur in or near *Eriogonum tiehmii* sites.

5. Fencing, salt block placement, or other livestock management activities likely to increase concentrations of animals should be prohibited in and near the known sites.

6. The nature and role of insect pollinators in the reproductive success of *Eriogonum tiehmii* should be assessed, and impacts to any such pollinators monitored and avoided.

7. The Bureau of Land Management (BLM) should pursue designation of an Area of Critical Environmental Concern (ACEC) which includes all known populations, provides for minerals withdrawals for all sites, and prescribes management measures necessary to prevent any further impacts.

8. The U.S. Fish and Wildlife Service should pursue a formal conservation agreement with BLM to insure that the above recommendations are carried out on a long-term basis.

9. If the above measures are successful and no further population declines are noted, those measures necessary to maintain species viability should be continued, and category-2 candidate status should be maintained for *Eriogonum tiehmii*. Otherwise, formal listing as a Threatened species under the endangered species act should be proposed and pursued if deemed the most effective means to prevent the extinction of *Eriogonum tiehmii*.

XI. INFORMATION SOURCES

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Map Sources:

BLM 1:500,000 Topographic Series, Surface Management Status:
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U.S.G.S. 1:100,000 scale topographic series:
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U.S.G.S. 1:24,000 scale topographic series:
Lida Wash NW, Nevada (1987 provisional edition).
Lida Wash SW, Nevada (1987 provisional edition).
Mohawk Mine, Nevada (1987 provisional edition).
Oasis Divide, Nevada (1987 provisional edition).
Rhyolite Ridge, Nevada (1987 provisional edition).
Rhyolite Ridge NW, Nevada (1987 provisional edition).
Rhyolite Ridge SW, Nevada (1987 provisional edition).

Field Research: Field surveys were conducted in 1994 by Arnold Tiehm and Jan Nachlinger on 22 April (aerial reconnaissance), 27-29 May and 10-11 June (ground surveys) to document the biology, ecology, and conservation status of historical and previously undiscovered populations of *Eriogonum tiehmii*. Previous general collecting trips in and near potential *Eriogonum tiehmii* habitat were conducted by Arnold Tiehm on 6 May 1981, 18 May 1983, 31 May 1984, 25-26 June 1987, 24-25 May 1988, and 4-5 July 1988, but did not discover any populations beyond those documented herein.

Specimens:

Site Number and Name	Collector and Number	Date	Disposition*
1. Type	*Tiehm, A. 7707*	18 May 1983	BRY, CAS, MARY NY, RSA, UTC
	Tiehm, A. et al. 8534	31 May 1984	CAS, MARY, NY, RENO, RM, RSA, US, UTC, etc.

* Abbreviations according to Holmgren *et al.* 1990.

Knowledgeable/Interested Individuals:

Ted Angle
BLM, Tonopah Resource Area
P.O. Box 911
Tonopah, NV 89409
(702) 482 6214

Janet Bair, Botanist
U.S. Fish and Wildlife Service
Nevada State Office
4600 Kietzke Lane, C-125
Reno, NV 89502
(702) 784 5227

Center for Plant Conservation
Missouri Botanical Garden
P.O. Box 299
St. Louis, MO 63166
(314) 577 5100

Teri A. Knight
Director of Science and Stewardship
The Nature Conservancy
Nevada Field Office
1771 East Flamingo, Suite 111B
Las Vegas, NV 89119
(702) 737 8744

Gayle Marrs-Smith, Botanist
Bureau of Land Management
4765 West Vegas Drive
Las Vegas, NV 89126
(702) 647 5156

Mary Pat Matheson, Director
Red Butte Garden and Arboretum
University of Utah
Salt Lake City, UT 84108
(801) 581 5322

James D. Morefield, Botanist
Nevada Natural Heritage Program
Department of Conservation and Natural Resources
1550 East College Parkway
Carson City, NV 89710
(702) 687 4245

Dr. Larry Morse, Chief Botanist
The Nature Conservancy
1815 N. Lynn Street
Arlington, VA 22209
(703) 841 5361

Jan Nachlinger, Protection Planner
The Nature Conservancy
443 Marsh Avenue
Reno, NV 89509
(702) 322 4990

Ann Pinzl
Curator of Natural History
Nevada State Museum
600 North Carson Street
Capitol Complex
Carson City, NV 89710
(702) 687 4811

James L. Reveal
Department of Botany
University of Maryland
College Park, MD 20742-5815
(301) 405-1624

Arnold Tiehm
P.O. Box 21387
Reno, NV 89515
(702) 829 1645

Roy Trenoweth, State Forester
Nevada Division of Forestry
123 W. Nye Lane
Carson City, NV 89710
(702) 687 4350

Margaret Williams, Executive Director
Northern Nevada Native Plant Society
4975 Malapi
Sparks, NV 89431
(702) 358 7759

TABLE 1. Actual and potential sites searched for *Eriogonum tiehmii*, all in Esmeralda County, Nevada.

Site #	NV EO	Fig.	Site name, Map quadrangle Legal description	Est. Acres	Elevation Range (ft)	Est. Plants	Land Management*
HISTORICAL SITES WHERE *ERIOGONUM TIEHMII* WERE REDISCOVERED							
1	001	1b	type, Rhyolite Ridge quad T1S R37E S27 SW of SW of SE	13	5960-6120	> 7000	b
NEW SITES WHERE *ERIOGONUM TIEHMII* WERE DISCOVERED							
2	002	1b	prospect ridge, Rhyolite Ridge quad T1S R37E S27 SW of SE of SE	3	6040-6120	> 3000	b
3	003	1b	south saddle, Rhyolite Ridge quad T1S R37E S34 SW of SE of NW	1.5	6000-6080	> 500	b
4	004	1b	greasebush, Rhyolite Ridge quad T1S R37E S34 NW of SE of SW	1	6120-6160	> 500	b
5	005	1b	horse tracks, Rhyolite Ridge quad T1S R37E S34 SE of NW of SW	< 1	6140	15	b
6	006	1b	dropseed, Rhyolite Ridge quad T1S R37E S34 SW of SE of SW	2.5	6120-6200	> 6000	b
6 sites	= = = SUBTOTALS = = =			< 22	5960-6200	> 17015	b
SITES SEARCHED WHERE *ERIOGONUM TIEHMII* WERE NOT DISCOVERED							
7-12		2	landing field E, Rhyolite Ridge SW quad T1S R37E S8	12	5330-5480		b
13		3	landing field SE, Rhyolite Ridge SW quad T1S R37E S20	1	5870-5980		b
14		3	landing field SSE, Rhyolite Ridge SW quad T1S R37E S31	40	5510-5720		b
15		4	landing field NE, Rhyolite Ridge NW quad T1S R37E S6	3	5080-5100		b
16-19		4	Emigrant Pass SW, Rhyolite Ridge NW quad T1N R37E S31	8	5040-5090		b
20		4	Fish Lake Valley, Rhyolite Ridge NW quad T1N R36E S36	30	4870-5080		b
21		4	hill 5050, Rhyolite Ridge NW quad T1N R36E S36	2.5	4900-5050		b
22		4	Emigrant Pass Road, Rhyolite Ridge NW quad T1N R37E S30	17	5280-5560		b
23		5	Emigrant Peak SW, Rhyolite Ridge NW quad T1N R36E S12	5	5240-5280		b
24		6	Upper Cowcamp Spring E, Lida Wash NW quad T4S R38E S3	5	5050-5100		b
25-27		7	Upper Cowcamp Spring, Mohawk Mine quad T3-4S R38E S4,33	32	5260-5450		b,p
28		8	Argentite Canyon NW, Rhyolite Ridge quad T1S R37E S34	< 1	6120-6130		b
29-30		8	ruins W, Rhyolite Ridge quad T1S R37E S28	1	5790-5900		b

Site #	NV EO	Fig.	Site name, Map quadrangle Legal description	Est. Acres	Elevation Range (ft)	Est. Plants	Land Management*
31-33		8	Cave Spring NNE, Rhyolite Ridge quad T1S R37E S25	6	6360-6480		b
34		8	landing field SE, Rhyolite Ridge quad T1S R37E S21	25	6040-6500		b
35		8	hill 7159, Rhyolite Ridge quad T1S R37E S22	32	6590-6840		b
36		8	hill 6574, Rhyolite Ridge quad T1S R37E S22	20	6310-6540		b
37		8	hill 6627, Rhyolite Ridge quad T1S R37E S23	40	6350-6530		b
38		9	Upper Cowcamp Spring E, Lida Wash SW quad T4S R38E S3	19	5100-5170		b
39		10	Upper Cowcamp Spring E, Oasis Divide quad T4S R38E S3	2	5100-5140		b
33 sites	= = = SUBTOTALS = = =			301	4870-6840	0	b,p
39 sites	**= = = TOTAL SITES EXAMINED = = =**			**< 323**	**4870-6840**	**> 17015**	**b,p**

*** Land Management:** b=BLM Battle Mountain District, Tonopah Resource Area; p=Private.

NV EO = Element Occurrence number in the Nevada Natural Heritage Program database. **Fig.** = Figure in Appendix 2.

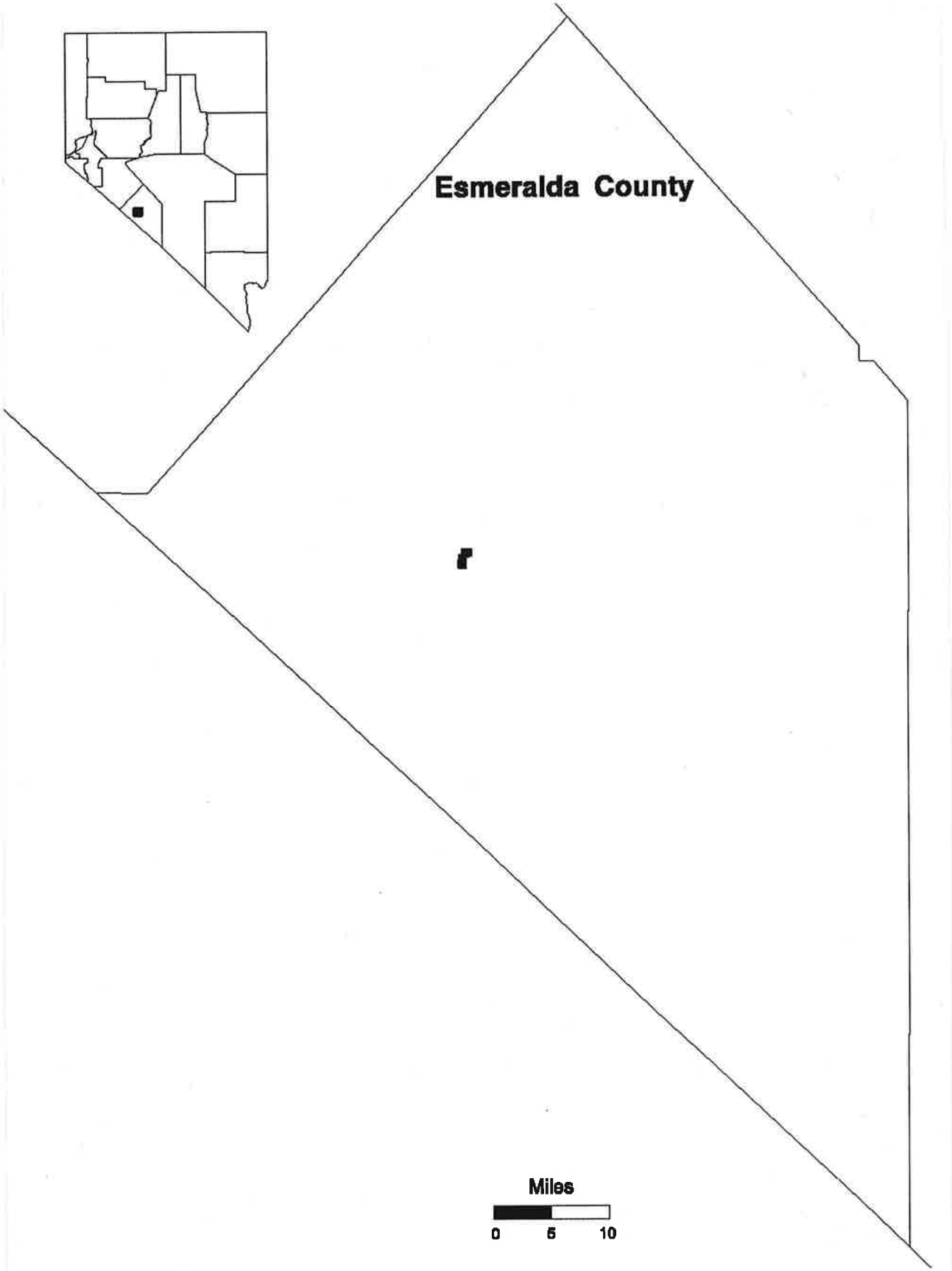

Figure 1a. Global distribution of *Eriogonum tiehmii*, Esmeralda County, Nevada.

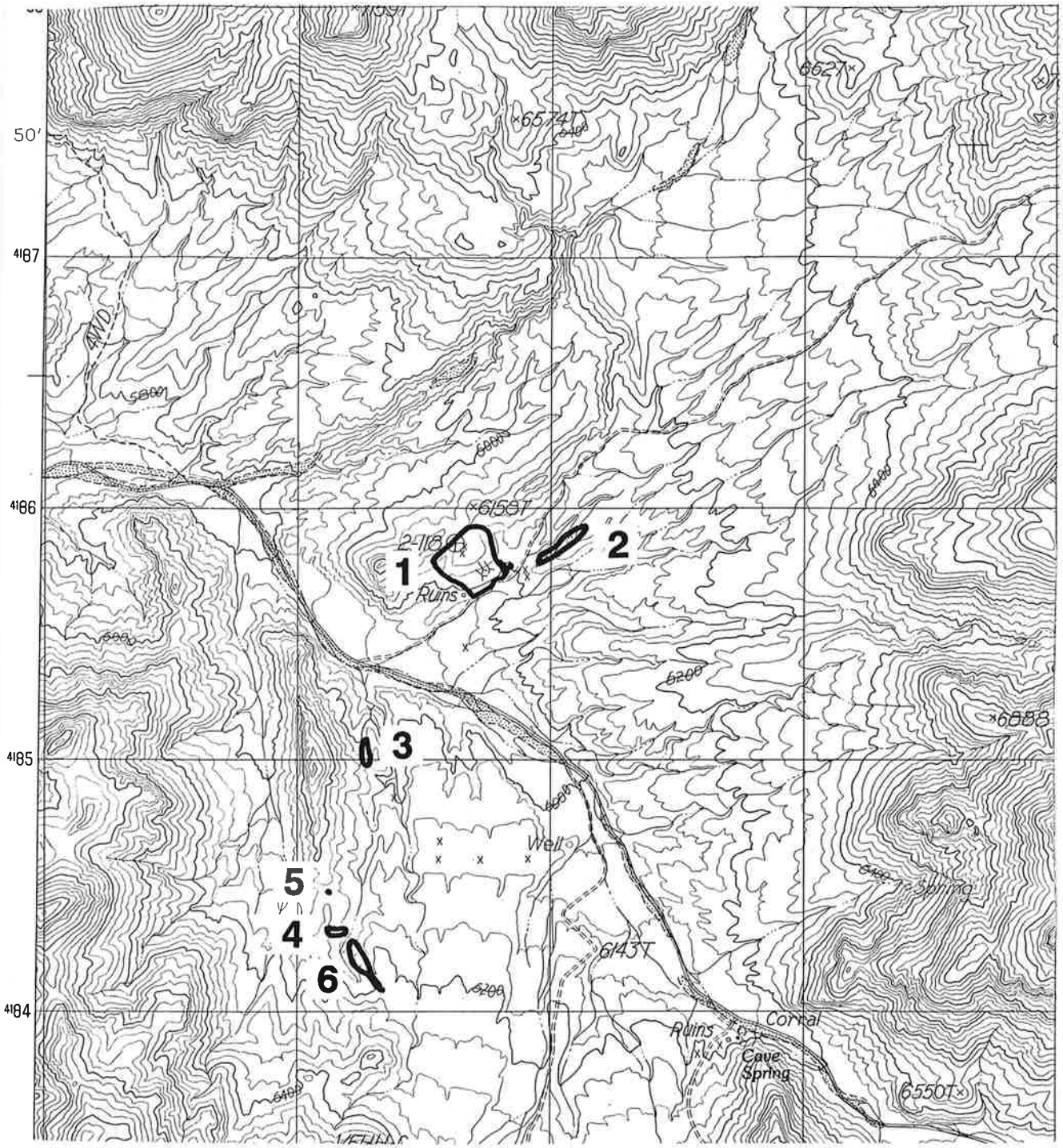

Figure 1b. Known sites (1-6) for *Eriogonum tiehmii* (Rhyolite Ridge, Nevada, 1:24,000 quadrangle).

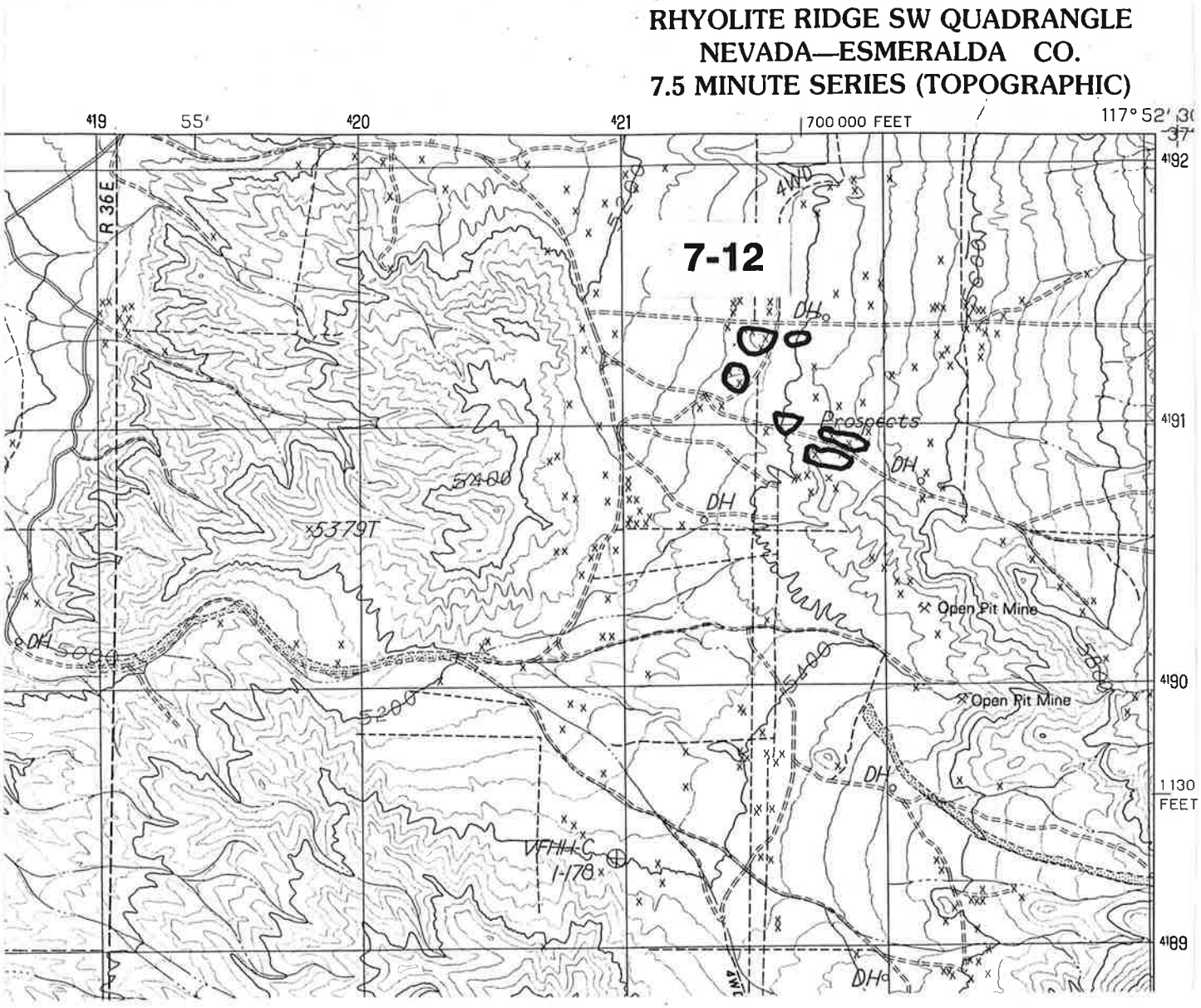

Figure 2. Sites 7-12 searched where no *Eriogonum tiehmii* were found (Rhyolite Ridge SW, Nevada, 1:24,000 quadrangle).

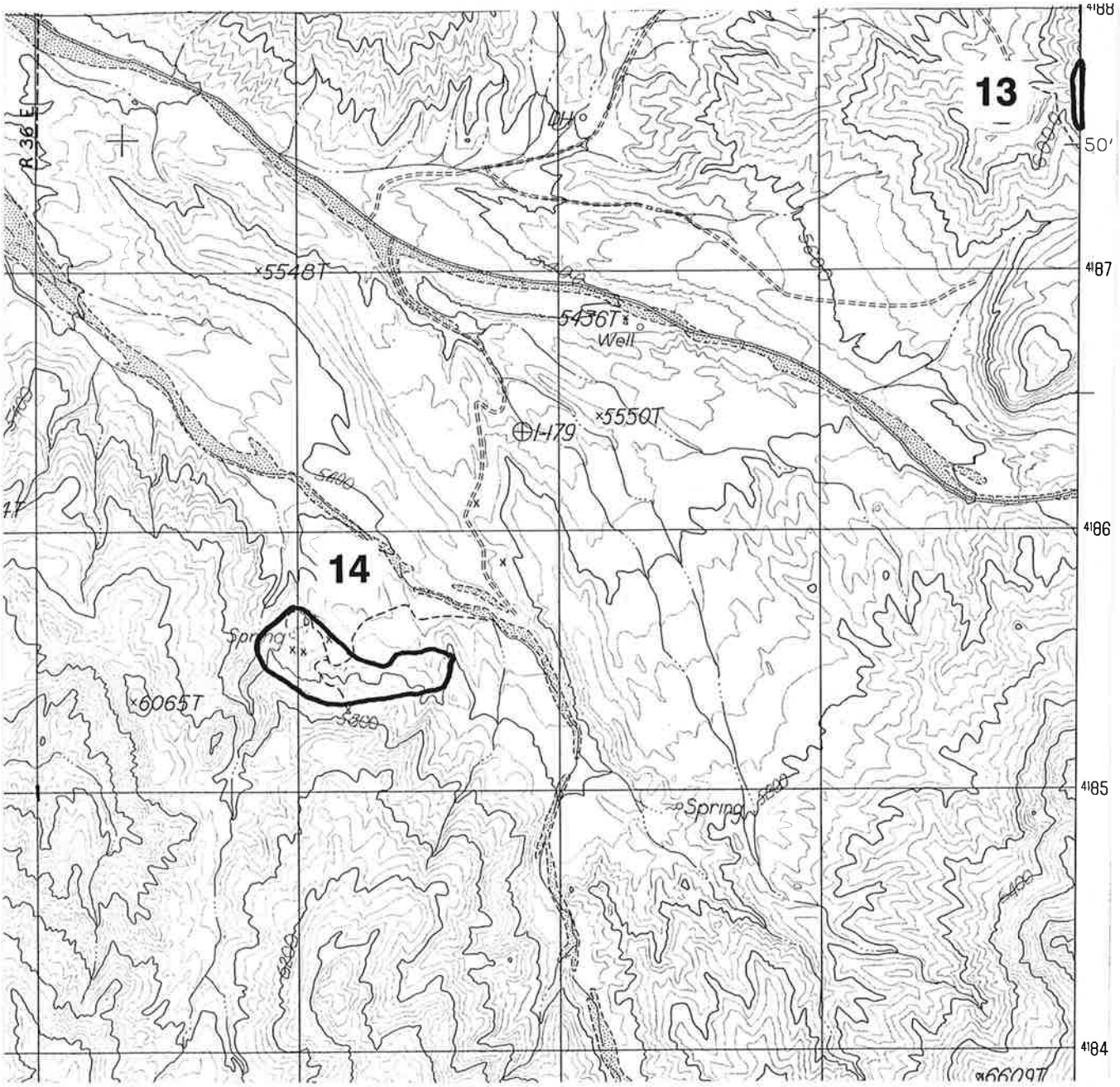

Figure 3. Sites 13-14 searched where no *Eriogonum tiehmii* were found (Rhyolite Ridge SW, Nevada, 1:24,000 quadrangle).

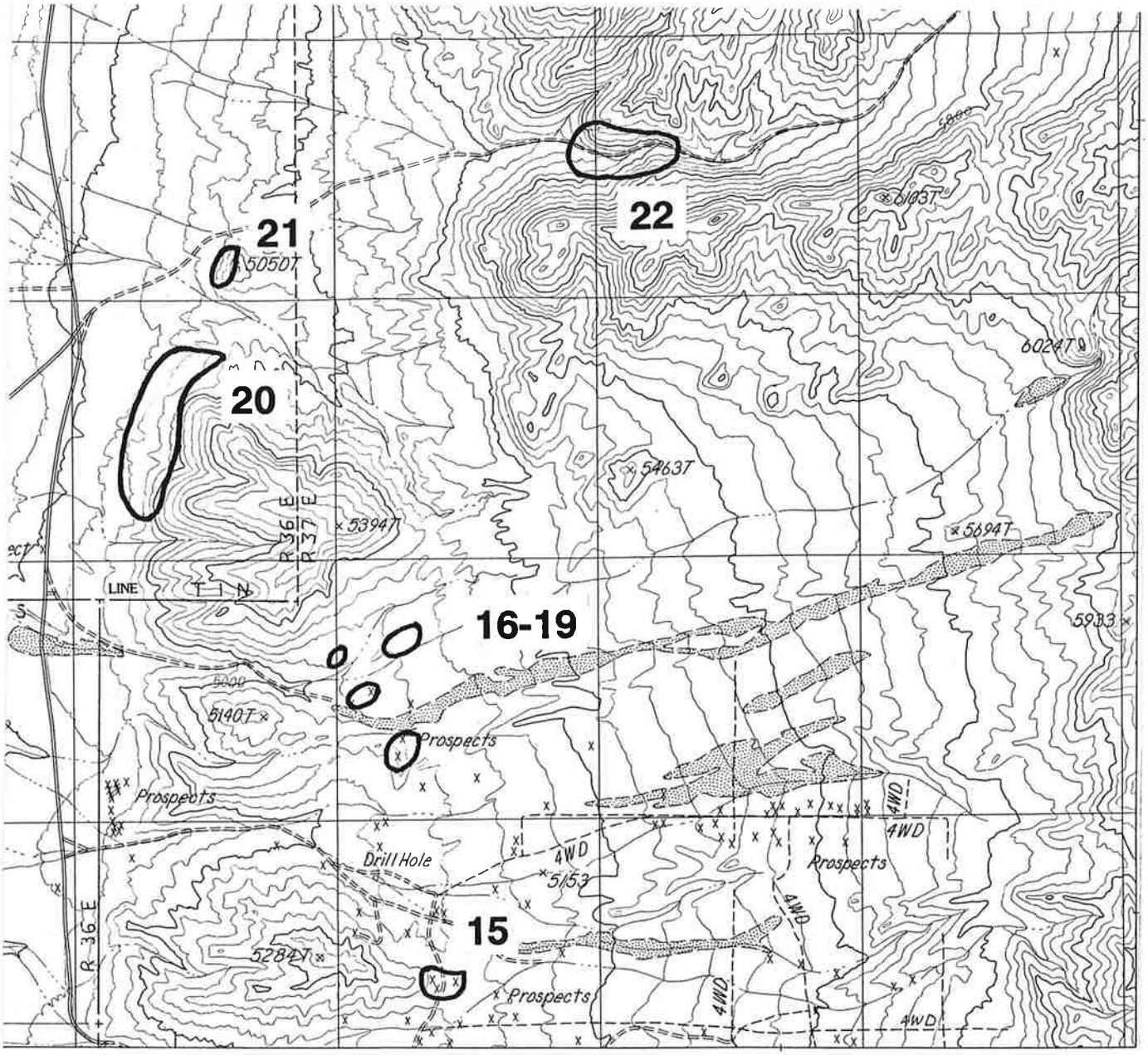

Figure 4. Sites 15-22 searched where no *Eriogonum tiehmii* were found (Rhyolite Ridge NW, Nevada, 1:24,000 quadrangle).

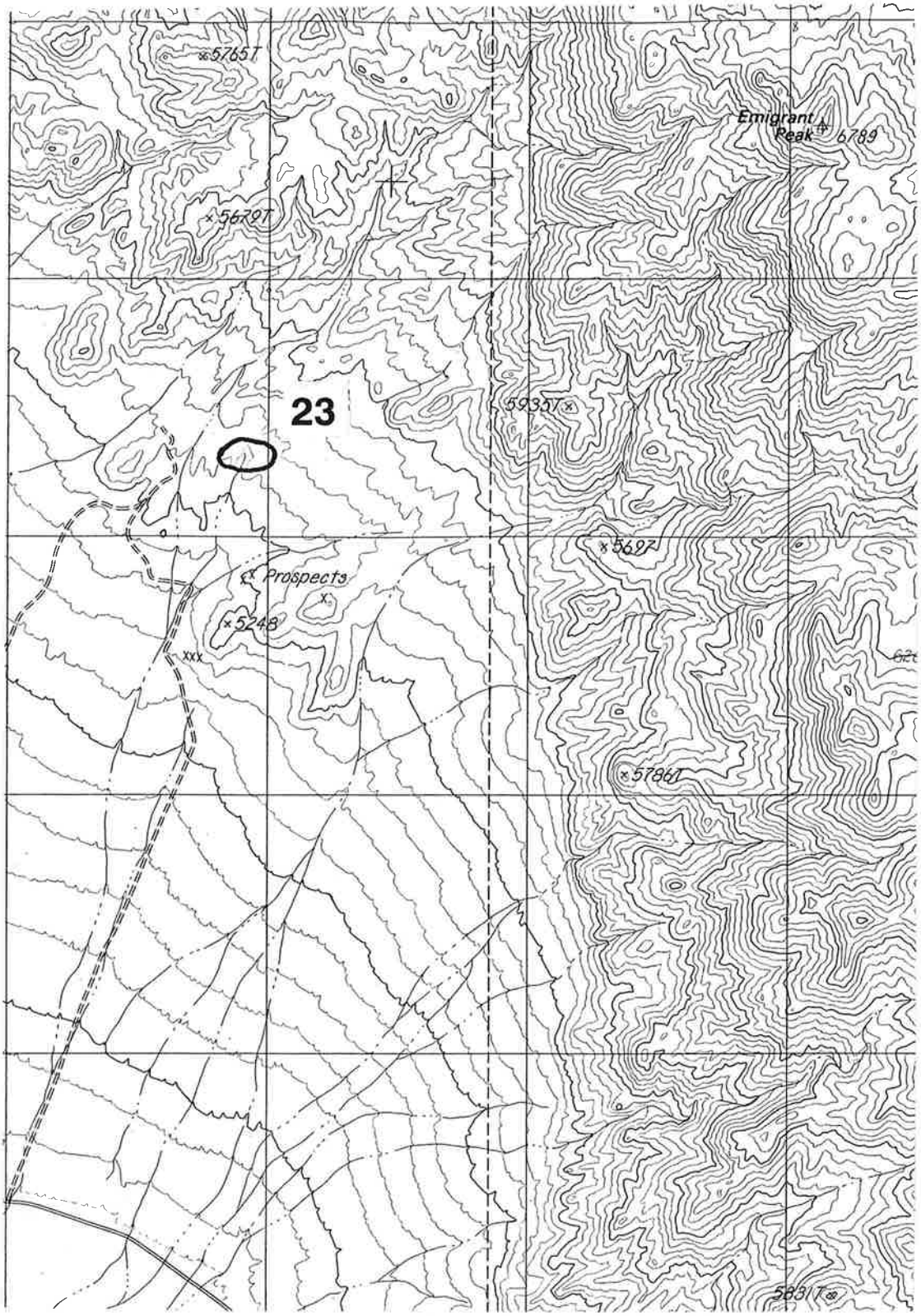

Figure 5. Site 23 searched where no *Eriogonum tiehmii* were found (Rhyolite Ridge NW, Nevada, 1:24,000 quadrangle).

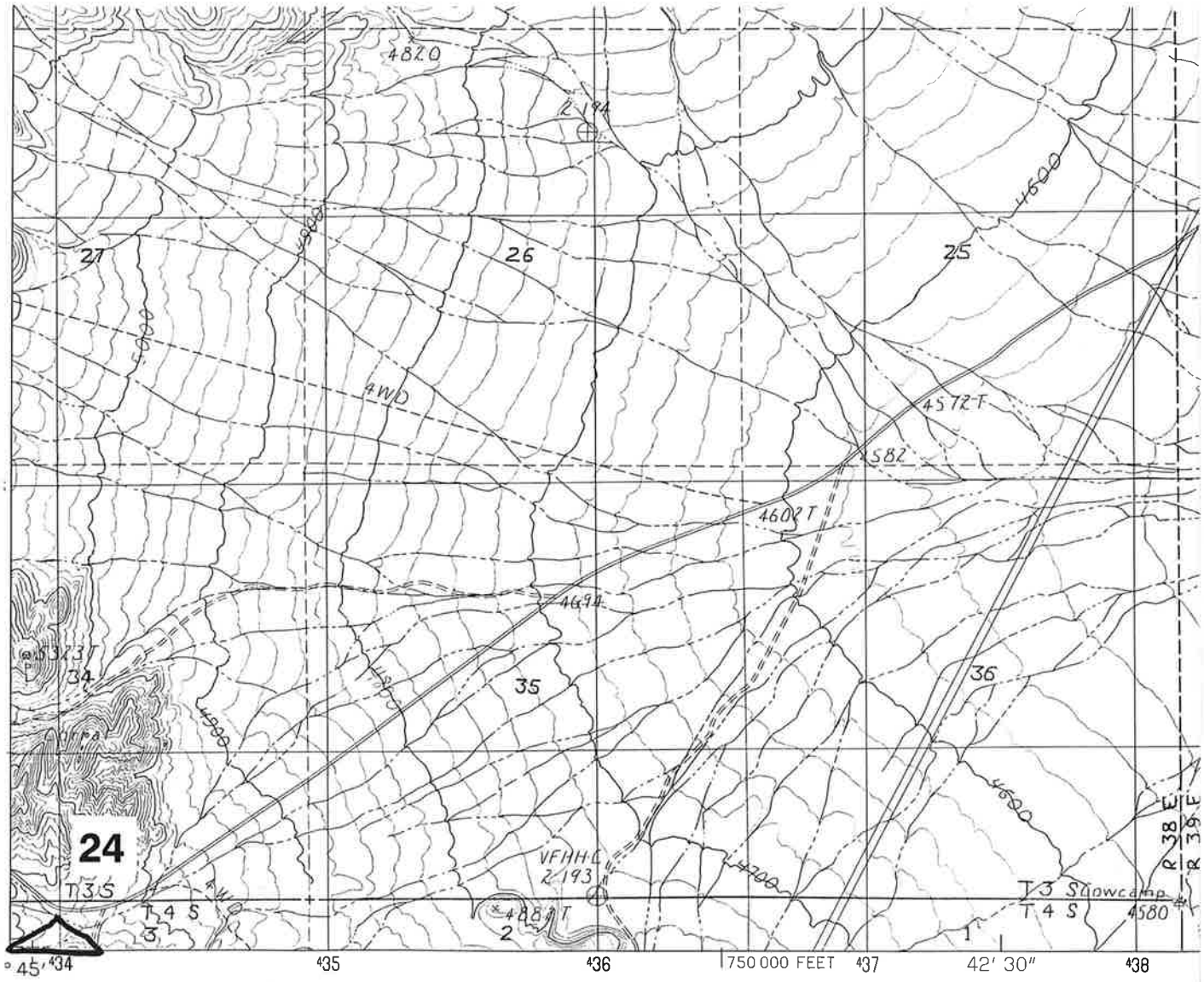

Figure 6. Site 24 searched where no *Eriogonum tiehmii* were found (Lida Wash NW, Nevada, 1:24,000 quadrangle).

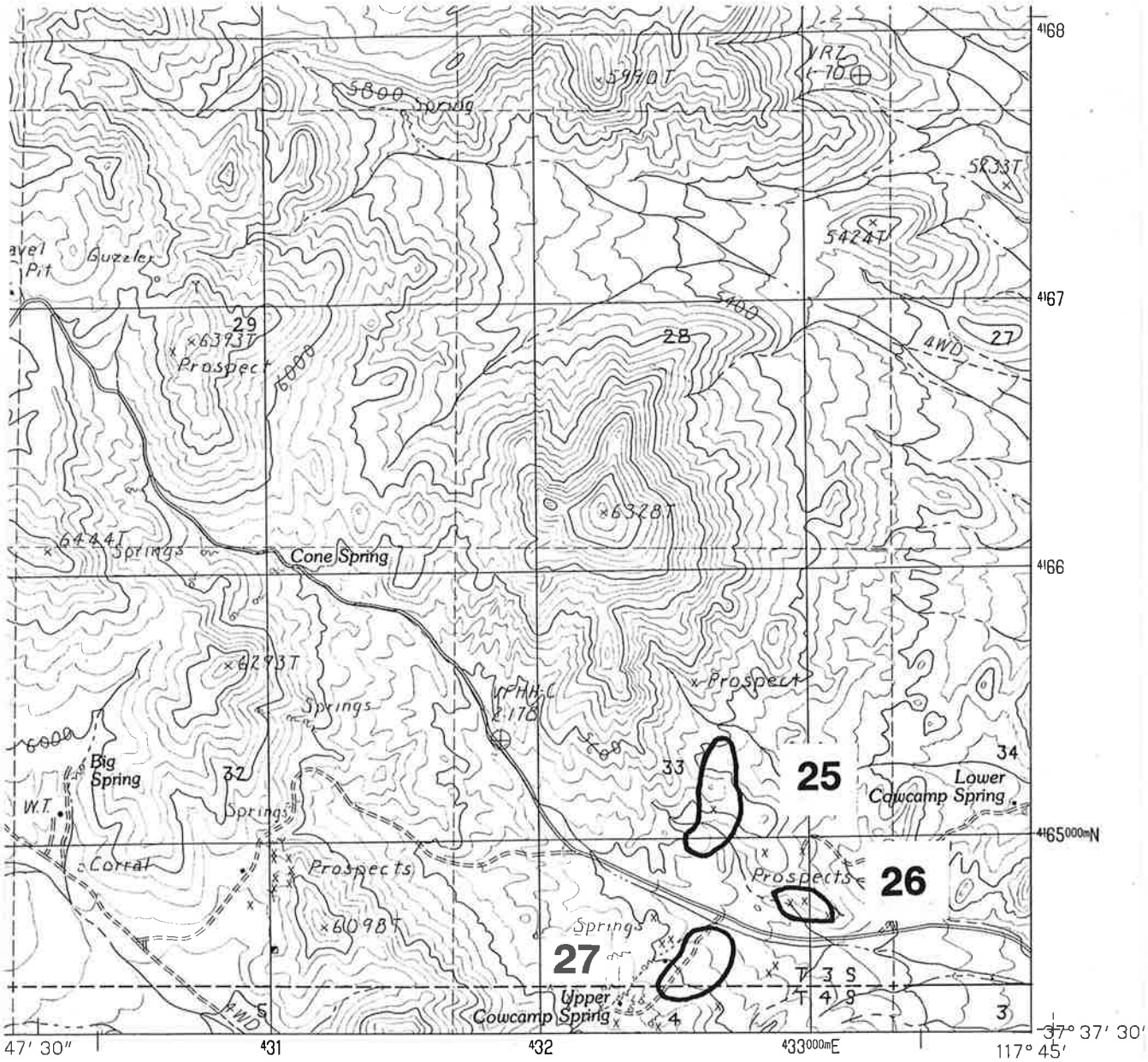

Figure 7. Sites 25-27 searched where no *Eriogonum tiehmii* were found (Mohawk Mine, Nevada, 1:24,000 quadrangle).

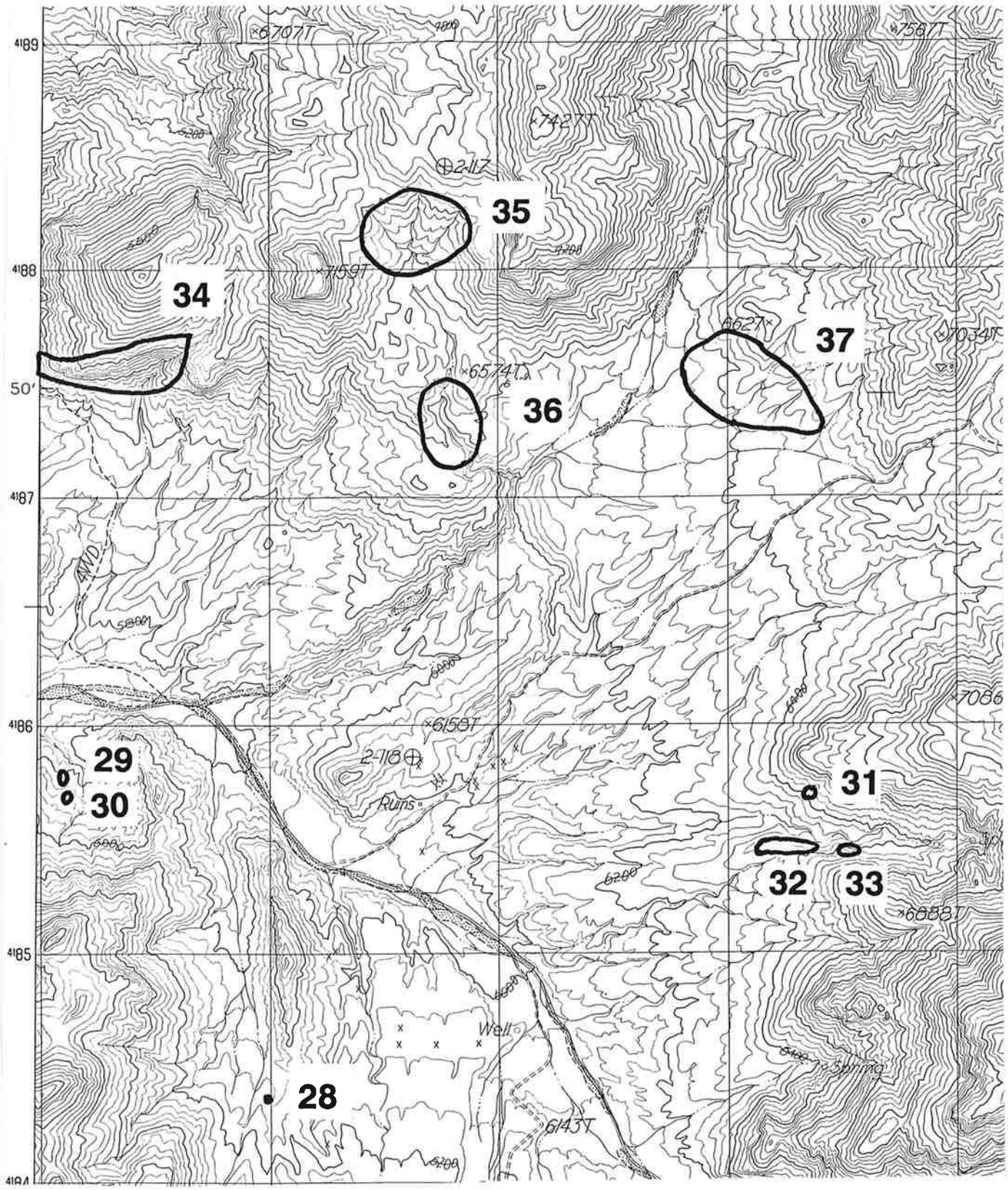

Figure 8. Sites 28-37 searched where no *Eriogonum tiehmii* were found (Rhyolite Ridge, Nevada, 1:24,000 quadrangle).

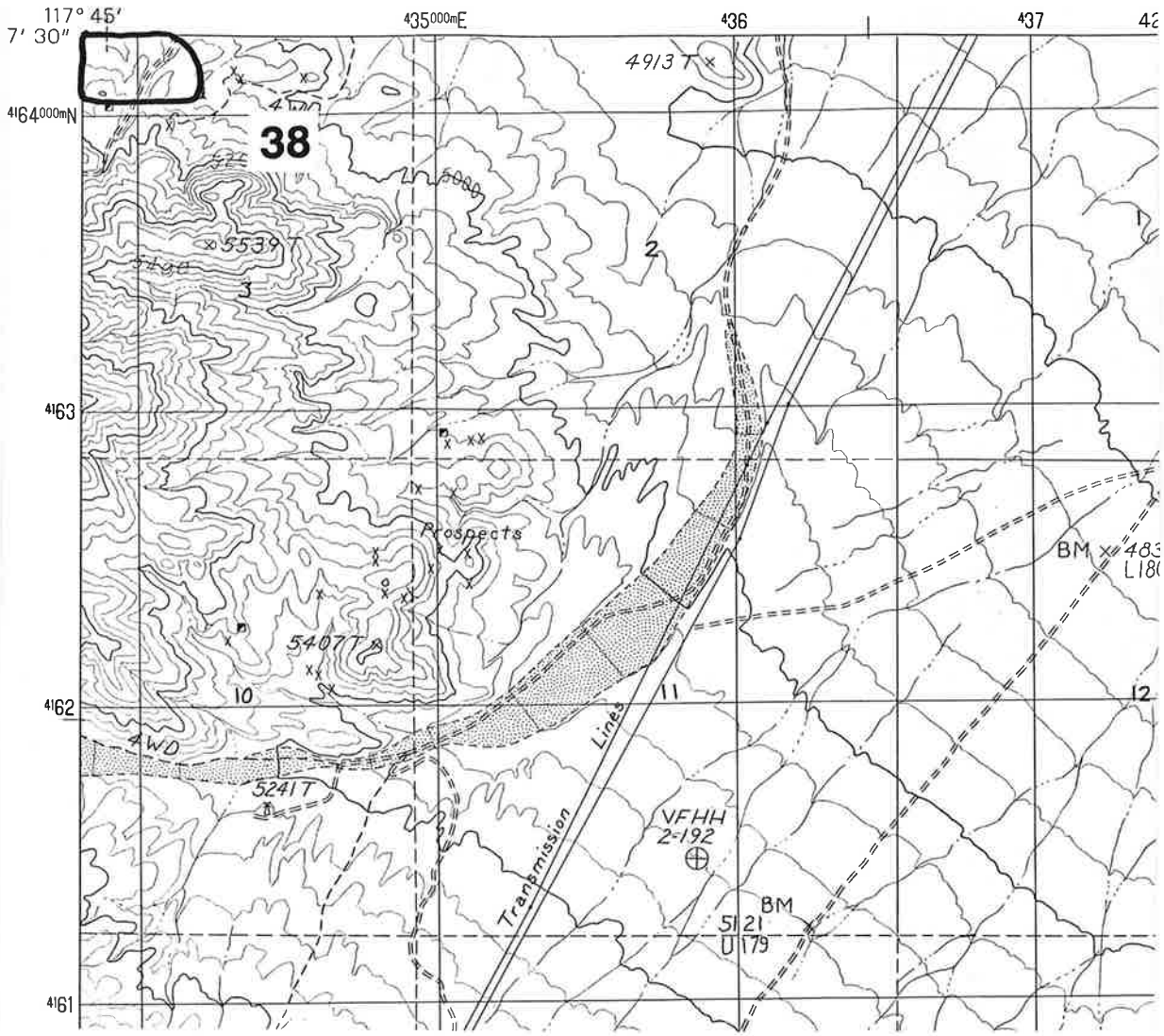

Figure 9. Site 38 searched where no *Eriogonum tiehmii* were found (Lida Wash SW, Nevada, 1:24,000 quadrangle).

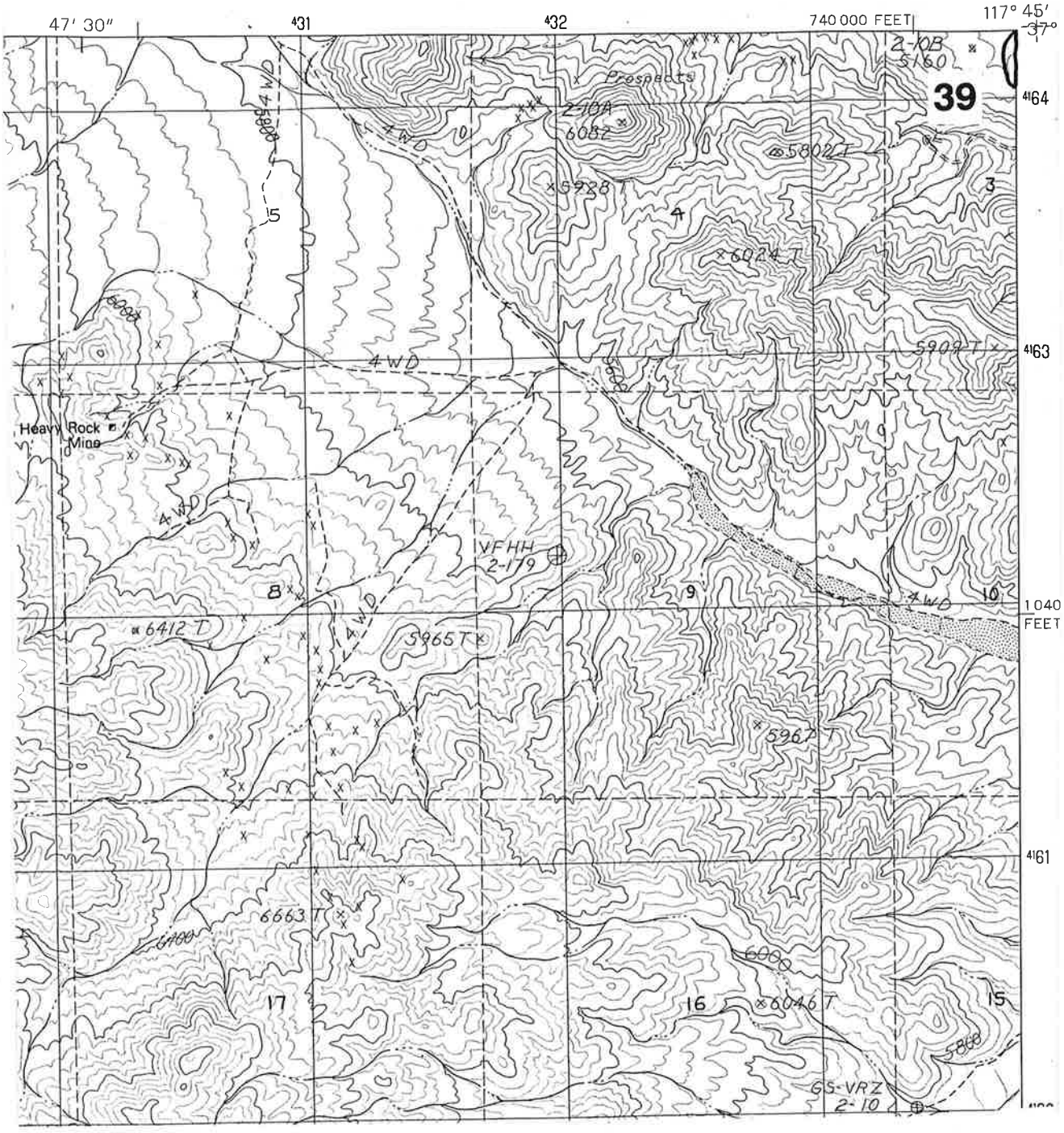

Figure 10. Site 39 searched where no *Eriogonum tiehmii* were found (Oasis Divide, Nevada, 1:24,000 quadrangle).

Figure 11. Aerial view of type locality (site 1 of this report) of ***Eriogonum tiehmii***, the large light-colored area just to upper-right of center (photo by Jan Nachlinger).

Figure 12. View of type locality (site 1) of ***Eriogonum tiehmii*** looking WSW from site 2 (photo by Jan Nachlinger).

Figure 13. Habitat shot of ***Eriogonum tiehmii*** at the type locality (site 1) (photo by Jan Nachlinger).

Figure 14. Closeup of flowers of ***Eriogonum tiehmii*** (photo by Jan Nachlinger).

Figure 15. Plants of ***Eriogonum tiehmii*** (photo by Jan Nachlinger).

Figure 16. Plants of ***Eriogonum tiehmii*** (photo by Jan Nachlinger).