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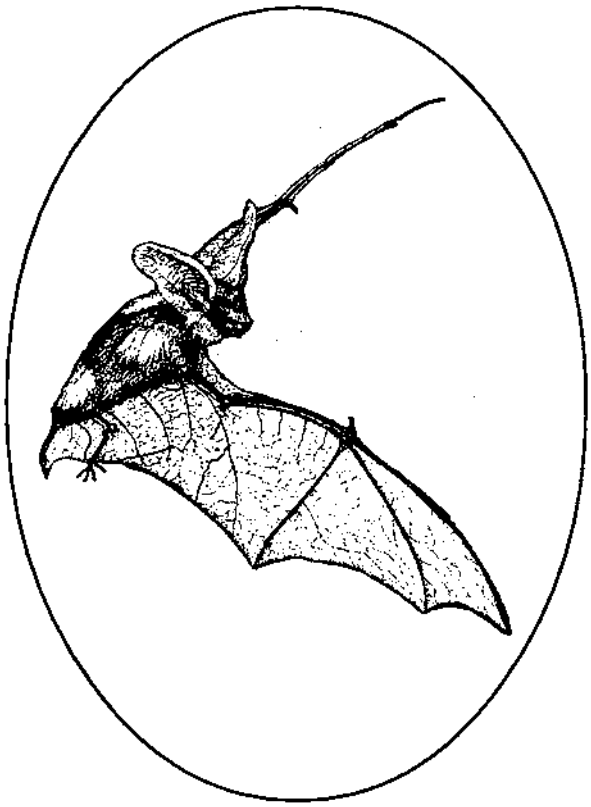

A Survey of Bat Species of the Bruneau-Jarbidge River Area of Southwestern Idaho with Special Reference to the Occurrence of the Spotted Bat (*Euderma maculatum*)

by Robert William Doering
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A SURVEY OF BAT SPECIES OF THE BRUNEAU-JARBIDGE RIVER AREA OF SOUTHWESTERN IDAHO WITH SPECIAL REFERENCE TO THE OCCURRENCE OF THE SPOTTED BAT (*EUDERMA MACULATUM*)

by

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EXECUTIVE SUMMARY

This report details the methods employed by and the results of a survey of bat species present within the Bruneau-Jarbidge River area of Owyhee County, Idaho. Surveys were conducted over the period of 1 September to 16 September 1995 and 24 July to 16 August 1996. The general objectives of the present study were 1) to perform a broad survey of bat species present with special attention to sensitive species (including spotted bats, *Euderma maculatum* and Townsend's big-eared bats, *Corynorhinus townsendii*), 2) to gather basic spotted bat locality and relative abundance data, and 3) to assess general bat habitat use patterns for foraging bat species found within the study area. To determine bat species occurrence, a combination of ultrasonic echolocation call monitoring and mist netting techniques were employed in a variety of habitat types. Seven bat species were detected during the study. Bat species flew and/or foraged over all habitat types examined. Species diversity was highest within canyons. Yuma myotis, *Myotis yumanensis*, are common within the study area, flying and foraging over slack water portions of rivers. Sagebrush, talus and boulder slide areas seemed to provide good foraging habitat for many of the bat species. A number of bats flew from presumed roosting areas within canyons to forage over crested wheatgrass dominated habitats. In one case bats flew over a broad burned area to reach this habitat. Townsend's big-eared bat, *Corynorhinus townsendii*, was detected in the study area. Additionally, a species previously undocumented in Idaho, the Brazilian free-tailed bat, *Tadarida brasiliensis*, was ultrasonically detected in the study area. Spotted bats are common throughout the study area with the highest numbers detected at the Mary's Creek area. They fly over all habitat types examined, even far from canyons. Heavy spotted bat foraging was detected over sagebrush uplands adjacent to riparian areas. Because of its rarity and cryptic habitats, information on abundance patterns, habitat use and even basic locality data for the spotted bat is important to secure at localities in Idaho. A single unsexed, mummified specimen, deposited at Albertson's College, constitutes the only voucher specimen for Idaho. Populations of this species subsequently have been located near the original collection locality, and at other locations in western Idaho. A single male spotted bat, captured by mist net in 1996, during this study, represents the second voucher specimen obtained from a confirmed Idaho resident population. Results presented in this report suggest that the Bruneau-Jarbidge River area of Owyhee County is an important population concentrating center for this species, with spotted bats detected at 5 of 11 sampling localities. Any region supporting populations of *Euderma maculatum* should be considered important or even critical to the species.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	*i*
TABLE OF CONTENTS	*ii*
INTRODUCTION	**1**
The Study	**1**
Objectives	**1**
A Review of Bat Habitat Characteristics	**1**
Spotted Bats	**3**
METHODS	**4**
Study Area	**4**
Bat Species Detection and Sampling	**5**
RESULTS AND DISCUSSION	**8**
Bat Fauna	**8**
Spotted Bats	**10**
SUMMARY AND CONCLUSIONS	**11**
LITERATURE CITED	**12**
TABLES	**14**
FIGURE	**19**
APPENDIX 1. Maps of survey sites within study area.	**20**
APPENDIX 2. Description sent to Idaho Department of Fish and Game of circumstances and conditions of *Euderma maculatum* voucher collection.	**28**

INTRODUCTION

The Study

This report details the methods employed by and the results of surveys of bat species present within the Bruneau-Jarbidge River area of Owyhee County, Idaho. Surveys were conducted over the period of 1 September to 16 September 1995 and 24 July to 16 August 1996. Because of the large region defined as the area of study and the lack of previous bat work in the area, the 1995 survey season was necessarily considered preliminary. A 1996 survey was undertaken to expand upon the initial work.

Objectives

The objectives of the 1995 study were 1) to perform a broad, preliminary survey of bat species present with special attention to sensitive species (including spotted bats, *Euderma maculatum* and Townsend's big-eared bats, *Corynorhinus townsendii*) and 2) to develop a direction and basis for future work on bat species utilizing the Bruneau-Jarbidge Canyons and associated areas. The 1996 survey used preliminary findings from the 1995 season as a basis to focus on the occurrence of spotted bats within the study area. The objectives of the 1996 season of study were 1) to continue general bat surveys both within the canyons and associated draws, as well as desert uplands above the rim, 2) to gather basic spotted bat locality and abundance data, 3) to assess general patterns of habitat use for foraging spotted bats and other species and 4) to verify, through a more intensive mist netting effort and multiple evenings allotted to selected sampling locations, bat species detected during an ultrasonic call analysis completed in 1995. Data from both field seasons were combined for this final report and serve as the basis for conclusions and recommendations.

A Review of Bat Habitat Characteristics

All bat species predicted and found to occur within the study area, as well as all 14 known Idaho bat species, are insectivorous (Keller 1985). Essential habitat components

for insectivorous bat populations are appropriate day roosts and foraging habitat. During the summer activity season, bats emerge in the evening from the concealment of day roosts to fly and forage for insects (Nowak 1991). Day roost selection varies among species but must provide stable protection and microenvironmental conditions appropriate to the animals' physiological requirements. Bat species variably roost in living trees and snags, cracks in cliff faces, large boulder piles, slide rock, talus, or caves and mines. The spotted bat, *Euderma maculatum*, is described as roosting solitarily in cracks within high cliff faces (Watkins 1977). In contrast, some species, such as the California myotis, *Myotis californicus*, anecdotally have been noted roosting in bushes and small mammal burrows on the desert floor (Barbour and Davis 1969). Foraging habitat must provide sufficient insect densities within the air column and be of some acceptable distance from day roosts so as to balance energetic input with the costs of flight, growth and maintenance. Some bat species exclusively forage high in the air column (Hoffmeister 1986, Watkins 1977) or preferentially forage at the surface of calm open water courses (Barbour and Davis 1969). Other species forage at variable heights (Hoffmeister 1986). Still others are considered "hover-gleeners" (Manning and Jones 1989), foraging close to or within the vegetative canopy. Habitat preferences vary broadly but habitat quality for all bat species is related to roosting and foraging habitat.

Additionally, the presence of open water has been found to enhance bat habitat for xeric species (Carpenter 1969). Because of their small body sizes, large surface to volume ratios, and often hot, dry day roosts, water stress may be a problem for many bat species. Increased water use efficiency has been described for populations inhabiting arid environments (Bassett 1982). Despite behavioral and physiological adaptations to hot dry climates, many desert bats must drink immediately following emergence in the evening and may drink prior to their return to day roosts or face potentially fatal osmotic conditions (Geluso 1975). Evaporative water loss can be particularly high during flight, with desert species losing as much as 3.9% of their body weight per hour (Carpenter 1969). Water is also linked to the life cycles of many insect prey species. For these reasons, open water sources often serve as significant activity centers for bats.

Viewed within the broader geographic context of the relatively unremarkable dry desert uplands of eastern Owyhee County, the canyons of the Bruneau-Jarbidge River country stand in striking contrast, providing unique habitat features for bat species. High relief, plunging cliff faces and permanent water sources create an assortment of roosting and foraging habitats. In the study area, some bat species may be transient, utilizing this quality habitat seasonally or during migrations. Individual populations within the detected summer resident bat fauna likely form maternity colonies, fledge young and may even hibernate within the study area. We would recommend further delineation of specific annual patterns of bat species use within the study area, a task beyond the scope of the present study.

Spotted Bats

In this report, special reference is made to the spotted bat (*Euderma maculatum*). The spotted bat is considered one of the rarest North American mammals (Barbour and Davis 1969). Only 73 specimens existed in museum collections in 1985 (Best 1988). The Bureau of Land Management lists *Euderma maculatum* as a sensitive species whereas the Idaho Department of Fish and Game designates it a species of special concern in Idaho (Conservation Data Center 1996). Populations appear to be concentrated in a few areas over the range of the species. These include the Big Bend area of Texas, northern New Mexico, southwestern Utah and southern British Columbia (Fenton et. al. 1987). Information on abundance patterns, habitat use and even basic locality data is lacking for spotted bat populations in Idaho as well as throughout most of the species range.

During an extensive survey for *Euderma* echolocation calls at various localities across the West, Fenton et. al. (1987) failed to detect spotted bats in Idaho. Tucker (1957) (cited in McMahon et. al. 1981 and Keller 1985) concluded that a spotted bat he collected on the ground in Canyon County, Idaho had been blown to where it was discovered as the result of storms and did not represent a member of a resident population. Keller, who was able to authenticate the original locality of collection for this specimen, heard spotted bat calls near the collection site (Keller 1987). Any region

supporting populations of *Euderma* should be considered important or even critical to the species. The importance of the detection of this species at multiple localities and in considerable numbers within the study area cannot be over-stressed.

METHODS

Study Area

The study area consists of approximately 120 kilometers of the Bruneau-Jarbidge River system and associated canyons from the Nevada-Idaho boundary to the head of the Bruneau Valley (Figure 1). The landscape is commanded by a highly branched system of deep, often narrow canyons. To gain a sense of nightly bat movements and activity patterns beyond the confines of the canyon system, canyon rims and portions of the desert upland filigreed by canyon cuts were included as part of the study area.

The geologic setting of the study area is dominated by the Bruneau-Jarbidge eruptive center, the remnant of an ancient rhyolitic volcanic caldera approximately 11 million years old (Bonnichsen 1984). The margin of the extinct caldera bounds the southern extent of the study area at Murphy Hot Springs and crosses the canyon country at a point near the Bruneau Canyon overlook. The Bruneau and Jarbidge Rivers and associated creeks within the region carve through the floor of the ancient caldera and overlying basalts. The result is a spectacular and often high-walled canyon system. In some areas, the main canyon reaches depths of nearly 300 meters. Distinct basalt flow units and interbedded sediments are readily discernible on canyon walls. In general, confluent draws of the main canyon, beginning as gentle creek bed depressions in the upland, end in plunging dry waterfalls, limiting access to the canyon floor. Upland habitats above the canyon rims are generally rolling and characterized by accumulated loess and fluvial sediments over and around basalt flows, craters, pressure ridges and broad low shield volcanoes. A few ephemeral and permanent alkaline ponds are present in the upland.

Bat Species Detection and Sampling

Distribution and natural history data from our personal experience with Idaho bat species, as well as information provided in Hall 1946, Barbour and Davis 1969 and Hoffmeister 1986 were evaluated within the context of the general habitat types expected to produce a master list of potential bat species that could occur in the study area. On-site evaluation of habitat types and adjacent habitats, combined with species natural history information allowed this initial list to be modified. Additionally, data in the Idaho Museum of Natural History database for specimens deposited at over 30 museums were used. The result was a list of species suspected to occur within the study area (Table 1). The most current species status was verified using the Idaho Department of Fish and Game Conservation Data Center Home Page (Conservation Data Center 1996). Though having some predictive value, this list may not represent the actual bat community within the study area.

Field work was conducted during the 1995 activity season over the period of 1 September to 16 September and during the 1996 activity season from 24 July to 16 August. Because of the large region defined as the area of study and the lack of any previous bat work in the area, the first year's survey season was considered preliminary. Single evenings of survey effort were allotted at each selected sampling site during the first year. Areas of obvious high bat use or efficiently accessible sampling locations were designated for re-survey or a more intensive effort during the next year. The 1996 survey was more focused to complete the documentation of species present.

A total of 11 different locations were surveyed over the course of this study. Site names, locations and dates are summarized in Table 2. Appendix 1 provides maps of all survey sites. An attempt was made to investigate as much of the variety of the study area as time and access would permit. Three sites were above the canyons and considered upland. Six sites were within the main canyon or arms of the main canyon. The Roberson Ford Rim and part of the Marys Creek Crossing site were considered canyon rim. One site was chosen at the head of the canyon (Head of Canyon) in a predominantly non-volcanic area probably within the Chalk Hills Formation.

To determine habitat use by individual species, observations of bats during their periods of activity and ultrasonic (echolocation) call recording were combined with direct sampling with mist nets. Observations were made each evening of sampling from before sunset until approximately 1:00 am and then resumed each morning at approximately 4:30 am until all bat activity had ceased. This pattern of observation was modified depending on bat activity levels. The sunset until 1:00 am observation period was designated the standardized observation period to permit *post hoc* inter-site comparisons, if warranted.

The production of ultrasonic echolocation calls by temperate bat species and their detection through the use of portable ultrasonic bat detectors affords investigators the ability to assess bat presence and relative levels of activity. Characteristic patterns within specific calls *could* be used to make precise species determination. However, with current technology, the discrimination of calls to the specific and, in some cases, the generic level is difficult (Fenton and Bell 1981, Thomas et. al. 1987, Brigham et. al. 1989), especially for members of the genus *Myotis*. Our study utilized an ANABAT II bat detector (Titley Electronics, Ballina, Australia) and cassette tape recorder system. The ANABAT II system uses a divide-by-counter for ultrasonic frequency compression and a zero crossing interface module for call analysis. Many diagnostic call components, including all power information and harmonics are lost with this system. Intra-specific (Brigham et. al. 1989) and intra-individual (Barclay and Brigham 1994) call variation compound these limitations. During surveys, ultrasonic calls were monitored and recordings made for analysis in the laboratory. Ultrasonic monitoring began each survey evening at dusk and was continued while all observations were made. A total of 71.5 hours of ultrasonic monitoring was performed. Recording of calls was not continuous during survey evenings but rather, periodic.

Calls were analyzed with an IBM compatible PC and ANABAT II call analysis software. A total of 110 calls sequences were of appropriate quality and ultimately used for analysis. Call characteristics were matched to those available in the current literature (Brigham et. al. 1989, Thomas et. al. 1987 and Fenton and Bell 1981). Consequently, the

ANABAT II was used to determine bat presence, intensity of activity, activity patterns and species identifications of unambiguous calls.

Although many bat species produce agonistic calls and some harmonics which are within the range of human hearing, only one species whose range overlaps the study area (the spotted bat, *Euderma maculatum*) produces echolocation pulses that may be heard without special equipment. Experienced observers may identify spotted bat calls and even specific behaviors (including navigation, agonistic interactions, foraging, feeding and prey capture) quite readily. Spotted bats were surveyed by attentive listening at each sampling site during the standardized observation period from sunset until approximately 1:00 am. The time and direction of flight, as well as status (flying, foraging, feeding etc.) of each detected pass were noted. Total detected passes were not considered counts of individual animals. Rather, these data provided some relative measure of spotted bat activity levels at sampling locations.

The direct sampling of bat fauna with mist nets relied on locally increased densities of active bats around calm surface water sources, flight corridors between prey patches or between roosts and foraging areas, and areas associated with high insect activity (Kunz and Kurta 1988). This technique complemented ultrasonic call surveys well, allowing for less ambiguous field identifications. For each sampling night, 50 and 110 denier 2.2 meter x 12.9 meter 2-ply nylon mist net (6.0 centimeter mesh, Avinet Corp.) arrays were deployed using 2.7 meter long, telescoped PVC pipe in areas likely to intersect the flight paths of bats. Extended poles set high on opposing banks could be elevated to heights as high as 10 meters before array stability was compromised. Bats were captured when they became entangled in the fine nylon mesh of the nets. Once captured in the nets, the bats were quickly removed and the time noted. Captured bats were identified to species, sexed and released. Forearm length and reproductive condition were determined. Typically, nets were tended until approximately 1:00 am, depending on activity levels, then checked again before dawn and closed. Factors influencing net locations included 1) proximity to open water, 2) foraging height of bat fauna, and 3) obvious bat flight corridors. Where appropriate, multiple mist nets were placed in complex "V", "Y" or other configurations

so as to restrict bat maneuverability and promote bat encounters with the nets. The present study accumulated over 12,295 net foot hours (Table 2).

At each sampling locality, general structural and vegetative habitat characteristics were noted as incidental qualitative observations. This allowed for some baseline habitat associations. Habitat was not quantified and no vegetative maps with established habitat categories were used for this study.

RESULTS AND DISCUSSION

Bat Fauna

A total of 27 bats from 5 species were captured during this study. Capture and detection results for all sampling locations directly surveyed for bats are summarized in Table 3. Care should be exercised when making between season comparisons from the data in Table 3. A primary purpose of this study was to determine bat species occurrence within the study area. The 1995 survey year consisted of single evening surveys weighted toward the use of the ANABAT II detection system. The 1996 survey year was more intensive and weighted toward mist net sampling.

Bat activity over the upland areas was variable. Moderate numbers of bats (11 counted within 34 minutes) were active over the Pond I and Crowbar Gulch sites. All bats flew rapidly and foraged on a general course from east to west as they moved from the canyon area to the east. Flying bats were detected at distances greater than 2.4 kilometers from the canyon. The habitat type at these sites was a relatively level crested wheatgrass dominated grassland containing some sagebrush. No drinking by bats was observed at the small pond (Pond I). This pattern was very similar at the Roberson Ford Upland site. Only a single high flying spotted bat was detected at the Long Lake site. No bats were detected at canyon rim sites, but the Roberson Ford Rim site had been recently burned.

No bats were detected at the downstream site beyond the terminus of Bruneau Canyon (Head of Canyon). This region contains deep sands and gravels associated with Miocene lake sediments and ash falls. The sampling site may not have been in appropriate

proximity to roost habitat. Weather conditions were poor during the survey with gusty winds, intermittent rain and lightning. Conversations with residents of the nearby town of Bruneau revealed that bats are often observed in the Bruneau Valley. In a previous study, the authors have detected bats (including spotted bats) along C. J. Strike Reservoir in areas of deeply eroded sediments capped by basalts of varying thickness.

The general pattern at all canyon sampling sites was for bats to fly and forage very high in the air column at dusk and then gradually "settle" into the lower areas of the canyon floor and slopes. This behavior may have resulted from nightly changes in prey distribution in the air column. At the Bruneau River sites (Indian Hot Springs and Roberson Ford), a mixed myotis community, dominated by Yuma myotis (*Myotis yumanensis*), worked closely to water courses. Long-eared myotis, *Myotis evotis*, and possibly long-legged myotis, *Myotis volans*, foraged close over sagebrush habitat and rocky slopes. Big brown bats, *Eptesicus fuscus*, appeared to be most common foraging above willows and Russian olives in the riparian areas. Spotted bat activity was variable (Table 4).

A single Townsend's big-eared bat was captured in a mist net at the Marys Creek site but escaped before it could be removed and examined. Little brown bats and spotted bats were common at this site. Bat fauna at the Winter Camp I site was very similar to the Indian Hot Springs site but fewer individuals were present.

Heavy foraging by an unidentified bat species was observed at a number of sampling localities (designated TABR in Table 3). Analyses of recorded calls were intriguing. Call sequences were characterized by constant frequency pulses spanning a range of 48 to 52 kHz. Sonograms produced patterns which were first qualitatively described as a series of "Flat 'J'?" or "Very Flat 'J'?" curves. The calls recorded were distinct tonal pulses with a "whistle-like" quality. Despite the fact that power characteristics cannot be quantified with the ANABAT II system, the calls sounded sharp and strong on recordings. Call patterns were very consistent. It was not possible to match the calls to any of the bat species predicted to occur within the study area or any known Idaho bat species. The typical descending chirps of the expected call patterns of

Idaho Vespertilionid bat species were absent. The constant frequency patterns would suggest the Brazilian free-tailed bat, *Tadarida brasiliensis*, a Molossid. This species has not been collected in Idaho, but Keller (1985) suggested that this species likely occurred in the state. In the West, the reported northern limit to the range of *Tadarida brasiliensis* extends across southern Oregon, curves southward to exclude Idaho, then extends across northern Nevada and Utah (Wilkins 1989). If *Tadarida brasiliensis* occurs in Idaho, Owyhee County would be a highly probable locality. The results of the present study suggest a new bat species and family for the Gem state but verification requires the collection of a voucher specimen.

It is known that during flight, many bat species produce an assortment of social or agonistic calls during both intra- and inter-specific interactions. Big brown bats, *Eptesicus fuscus*, will produce readily audible hisses and "barks" while foraging in close proximity to other bats (Doering, personal observation and Kurta and Baker 1990). Long-legged myotis, *Myotis volans*, is known to modulate its calls to a sort of constant frequency "honking" to avoid mid-air collisions with other bats (Warner and Czaplewski 1984). Invariably, many other "non-echolocation vocalizations" are used by bat species. The sonic characteristics of these calls are frequently not reported in the literature but may be quite unlike a species' normal echolocation calls. The intriguing pattern described above likely belongs to *Tadarida brasiliensis* but may be merely a new sound record for a known Idaho species. For now, this detection (designated TABR) will be considered tentative as the occurrence of *Tadarida brasiliensis* in southwestern Idaho requires further study.

Spotted Bats

Table 4 summarizes spotted bat detection data. Spotted bats were most commonly associated with canyons but could be found far from these areas (Long Lake site). The highest levels of activity were at the Marys Creek area. Foraging courses seemed to follow a path above the riparian corridor from presumed roosts within cliff faces downstream. Similar flight paths were observed each evening (see Woodsworth et. al.

1981). Bats foraged and fed over the riparian and adjacent sagebrush dominated uplands. A single male spotted bat was captured at Marys Creek (see Appendix 2).

Because they are considered late fliers, roost solitarily within cracks high on cliff faces and fly and forage high in the air column (generally at > 10 meters, Watkins 1977), spotted bats are notoriously difficult to capture. Keller (1985) surmised that the total number of spotted bats handled does not exceed 500 individuals. Populations of spotted bats appear to be concentrated in a few areas over the range of the species. These include the Big Bend area of Texas, northern New Mexico, southwestern Utah and southern British Columbia (Fenton et. al. 1987). The Bruneau-Jarbidge River area appears to be another important population center, with spotted bats detected at 5 of 11 sampling localities. This is comparable to the highest levels reported in the literature (Fenton et. al. 1987).

SUMMARY AND CONCLUSIONS

- Table 5 summarized species occurrence results. Seven species were confirmed to occur in the study area. Four others were considered highly likely or possible. One predicted species, the pallid bat, was not detected with certainty.

- Yuma myotis are common within the study area, flying and foraging over slack water portions of rivers.

- Sagebrush, talus and boulder slide areas seemed to provide good foraging habitat for a number of bat species.

- A significant number of bats flew from presumed roosting areas within the canyon to forage over crested wheatgrass dominated habitats. In one case bats flew over a broad burned area to reach this habitat.

- Brazilian free-tailed bats may occur in the study area. This would be a new bat species and family for the state of Idaho.

- Spotted bats are common throughout the study area with the highest numbers detected at the Marys Creek area. They fly over all habitat types surveyed, even far from canyons. Heavy spotted bat foraging was often detected over sagebrush uplands adjacent to riparian areas.

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COMMON NAME	SPECIES NAME	Abbreviation	STATUS			
			State Rank	IDFG	BLM	USFWS
Pallid bat	*Antrozous pallidus*	ANPA	S1?	none	none	none
Townsend's big-eared bat	*Corynorhinus townsendii*	COTO	S2?	SC	none	S
Spotted Bat	*Euderma maculatum*	EUMA	S2	SC	S	none
Big brown bat	*Eptesicus fuscus*	EPFU	none	none	none	none
California myotis	*Myotis californicus*	MYCA	S1?	none	none	none
Western small-footed myotis	*Myotis ciliolabrum*	MYCI	S4?	none	none	none
Long-eared myotis	*Myotis evotis*	MYEV	S3?	none	none	none
Little brown bat	*Myotis lucifugus*	MYLU	none	none	none	none
Fringed myotis	*Myotis thysanodes*	MYTH	S1?	SC	none	none
Long-legged myotis	*Myotis volans*	MYVO	S3?	none	none	none
Yuma myotis	*Myotis yumanensis*	MYYU	S3?	none	none	none
Western pipistrelle	*Pipistrellus hesperus*	PIHE	S1?	SC	none	none

Table 1. Species list and status of bats that have were predicted to occur in the study area. Species abbreviations used in this report are defined here.

SITE NAME	LOCALITY	DATE(S)	YEAR	Netting effort (Net Foot Hours)	ANABAT effort (Hours monitoring)
Grasmere-Blackstone Rd. (Pond I and Crowbar Gulch)	T9S R6E sec 3 SE1/4	8/7-8/8	1996	N/A	4
Head of Canyon (Hot Springs I)	T7S R6E sec 34 SW1/4ofSE1/4	9/16	1995	252.0	2
Indian Hot Springs	T12S R7E sec 33 NW1/4ofSW1/4	9/2-9/3	1995	1039.5	5
		8/14-8/16	1996	2310.0	12
Long Lake	T13S R6E sec 23 NW1/4ofNW1/4	9/8-9/9	1995	1372.6	6
Mary Creek Crossing	T13S R5E sec 11 SE1/4ofNE1/4	9/9-9/10	1995	1609.4	6
		7/24-7/27	1996	1134.0	10
Murphy Hot Springs I	T16S R9E sec 14 SE1/4ofSE1/4	8/16-8/17	1996	1344.0	4
Murphy Hot Springs at Fork	T16S R9E sec 10 SW1/4ofNE1/4	9/15-9/16	1995	1260.0	6
Roberson Ford	T9S R6E sec 12 SW1/4ofSW1/4	8/13-8/14	1996	378.0	5
Roberson Ford Rim	T9S R6E sec 11 SE1/4	8/6-8/7	1996	N/A	4
Roberson Ford Upland (@Gras-Black Rd Pond II)	T9S R6E sec 14 SW1/4ofNW1/4	8/12-8/13	1996	378.0	4.5
Winter Camp I	T10S R8E sec 9 SW1/4ofSE1/4 & NE1/4ofSW1/4	9/1-9/2	1995	1218.0	5
	TOTAL EFFORT			12295.5	69.5

Table 2. Summary of survey site locations and sampling effort expended for 1995 and 1996 survey seasons. Mist netting effort is in Net Foot Hours. This is calculated as the number of linear feet of mist net deployed times the number of hours that the nets were open. This allows for mist netting effort to be compared across sites. ANABAT effort describes hours of monitoring not hours of calls recorded or analysed. Survey effort was weighted toward ultrasonic analysis in 1995 and less ambiguous mist netting in 1996.

SITE	DATE(S)	COTO	EUMA	EPFU	MYCA	MYCI	MYEV	MYLU	MYTH	MYVO	MYYU	PIHE	TABR	MYsp	Specimens Retained
Grasmere-Blackstone Rd. (Pond I and Crowbar Gulch)	8/7-8/8/96					A?								A	
Indian Hot Springs	9/2-9/3/95	A?	H	A		A?	A		A?		A?	A?	A	A	
	8/14-8/15/96		H	A/H							M(6)			A	
	8/15-8/16/96		H	A							M(7)			A	5 MYYU
Long Lake	9/8-9/9/95		H												
Mary Creek Crossing	9/9-9/10/95		H					M(1)						A	1 MYLU
	7/24-7/25/96	M(1)	H			M(2)		M(6)						A	
	7/25-7/26/96		H											A	1 EUMA
	7/26-7/27/96		M(1)												
Murphy Hot Springs I	8/16-8/17/96						A			A?				A	
Murphy Hot Springs at Fork	9/15-9/16/95	A?		A		A?	A						A	A	
Roberson Ford	8/13-8/14/96		H					M(1)			M(2)			A	
Roberson Ford Upland	8/12-8/13/96													A	
Winter Camp I	9/1-9/2/95		H	A	A?	A	A?	A?						A	

Table 3. Bat detection and capture results for the entire study. Letters designate method of detection. A =ANABAT detection. M =Mist net capture. H =unaided Hearing of a bat. MYsp = uncertain Myotis detection. Numbers in parenthesis indicate the number of individuals of that species captured on that date. Question marks (?) indicate "likely" or low certainty ANABAT identifications. TABR =Tadarida brasiliensis. Patterns identified as TABR were consistent strong narrow-band constant-frequency calls but, this would be a new bat species for the state.

SITE	DATE(S)	Relative EUMA activity level
Grasmere-Blackstone Rd. (Pond I and Crowbar Gulch)	8/7-8/8/96	0
Head of Canyon (Hot Springs I)	9/16/95	0
Indian Hot Springs	9/2-9/3/95	3
	8/14-8/15/96	7
	8/15-8/16/96	5
Long Lake	9/8-9/9/95	1
Mary Creek Crossing	9/9-9/10/95	5
	7/24-7/25/96	11
	7/25-7/26/96	N/A
	7/26-7/27/96	9
Murphy Hot Springs I	8/16-8/17/96	0
Murphy Hot Springs at Fork	9/15-9/16/95	0
Roberson Ford	8/13-8/14/96	2
Roberson Ford Rim	8/6-8/7/96	0
Roberson Ford Upland	8/12-8/13/96	0
Winter Camp I	9/1-9/2/95	1

Table 4. Relative measure of EUMA activity at all surveyed areas. Values represent the total number of spotted bat passes detected during the evening observation period from sunset until 01:00 am. They should not be interpreted as the total number of spotted bats present. Frequently, other incidental spotted bat detections occurred throughout the night but, were not added to totals here. This allowed for more appropriate between site comparisons.

SPECIES	OCCURENCE
COTO	*Yes*
EUMA	*Yes*
EPFU	*Yes*
MYCI	*Yes*
MYEV	*Yes*
MYLU	*Yes*
MYYU	*Yes*
MYCA	*Highly likely*
MYVO	*Highly likely*
PIHE	*Highly likely*
MYTH	*Possible*
ANPA	*Unconfirmed*
TABR	*May occur*

Table 5. Summary of bat species occurence data from this study. Positive occurence classifications are based on mist net or unambiguous ANABAT results. "Highly likely" species classifications are based on low confidence ANABAT results. "Possible" species classifications are based on lower confidence ANABAT results. "Unconfirmed" species were predicted but not detected. "May occur" species refers to an unlikely or nonpredicted species (TABR) whose ANABAT results suggest occurence (see text).

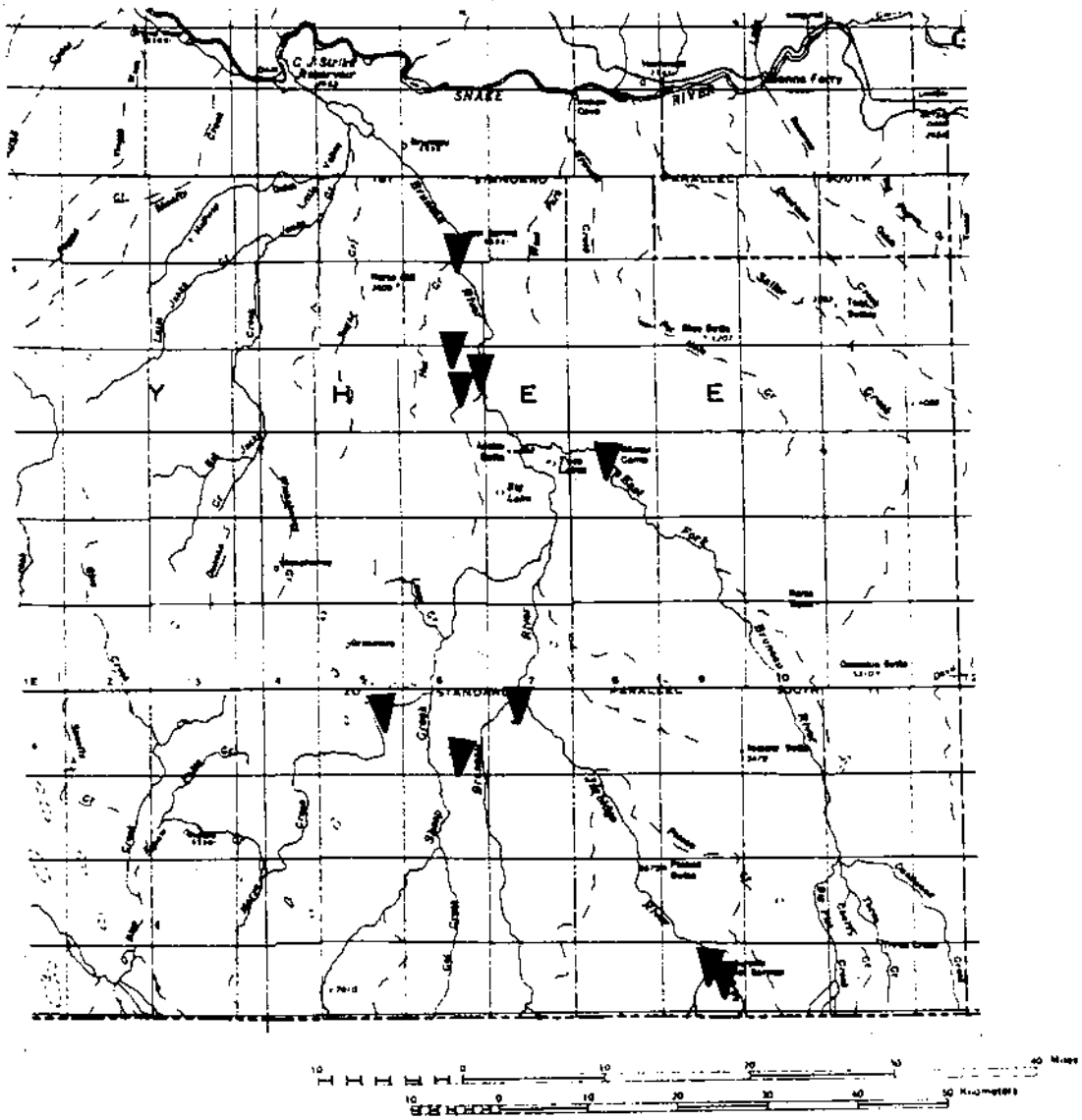

Figure 1. Map of study area with locations of survey locations marked. Triangular symbols represent areas where ultrasonic and/or mist net surveys occurred. Areas included deep canyon, shallow canyon, canyon head, rim and upland sites of the Bruneau-Jarbidge River Area of Owyhee County, Idaho and associated creeks and uplands. Repeated surveys of sites are not indicated.

APPENDIX 1. Maps of Survey Sites Within Study Area.

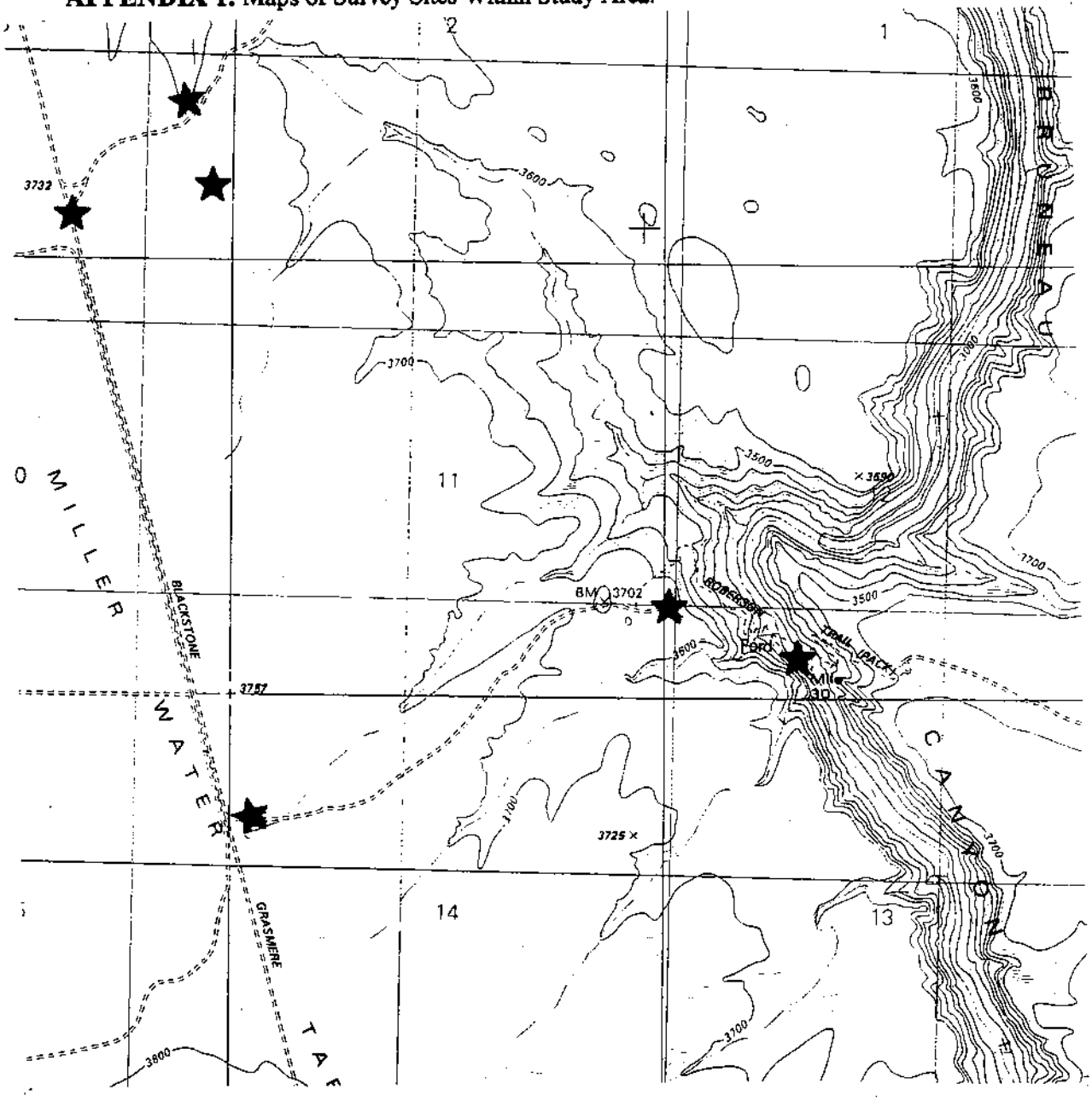

Figure A. Location of survey sites "Grasmere-Blackstone Rd. Pond I and Crowbar Gulch" (T9S R6E sec. 3 SE 1/4), "Roberson Ford" (T9S R6E sec. 12 SW 1/4 of SW 1/4), "Roberson Ford Rim" (T9S R6E sec. 11 SE 1/4) and "Roberson Ford Upland" (T9S R6E sec. 14 SW 1/4 of NW 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

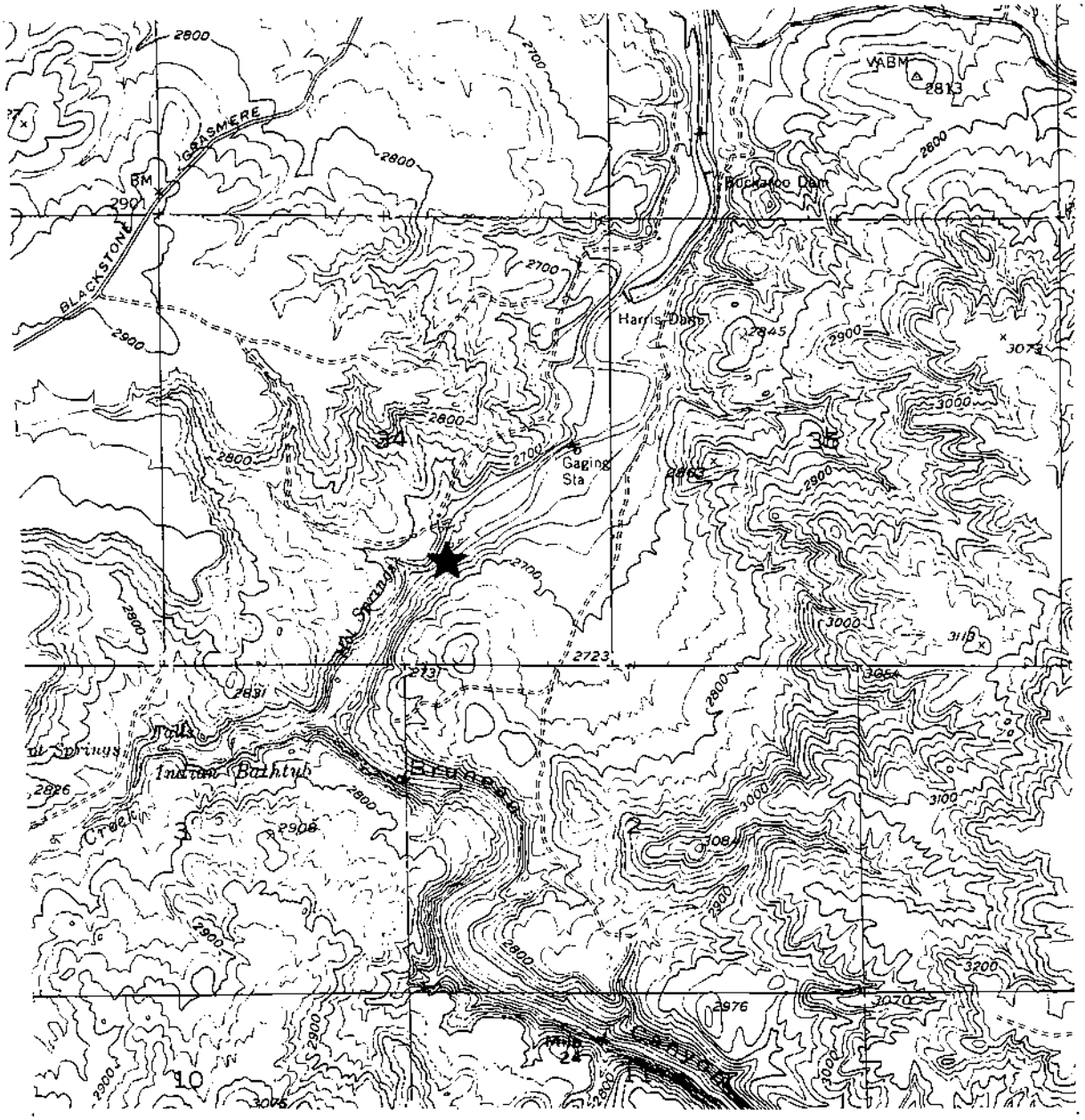

Figure B. Location of survey sites "Head of Canyon, Hot Springs I" (T7S R6E sec. 34 SW 1/4 of SE 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

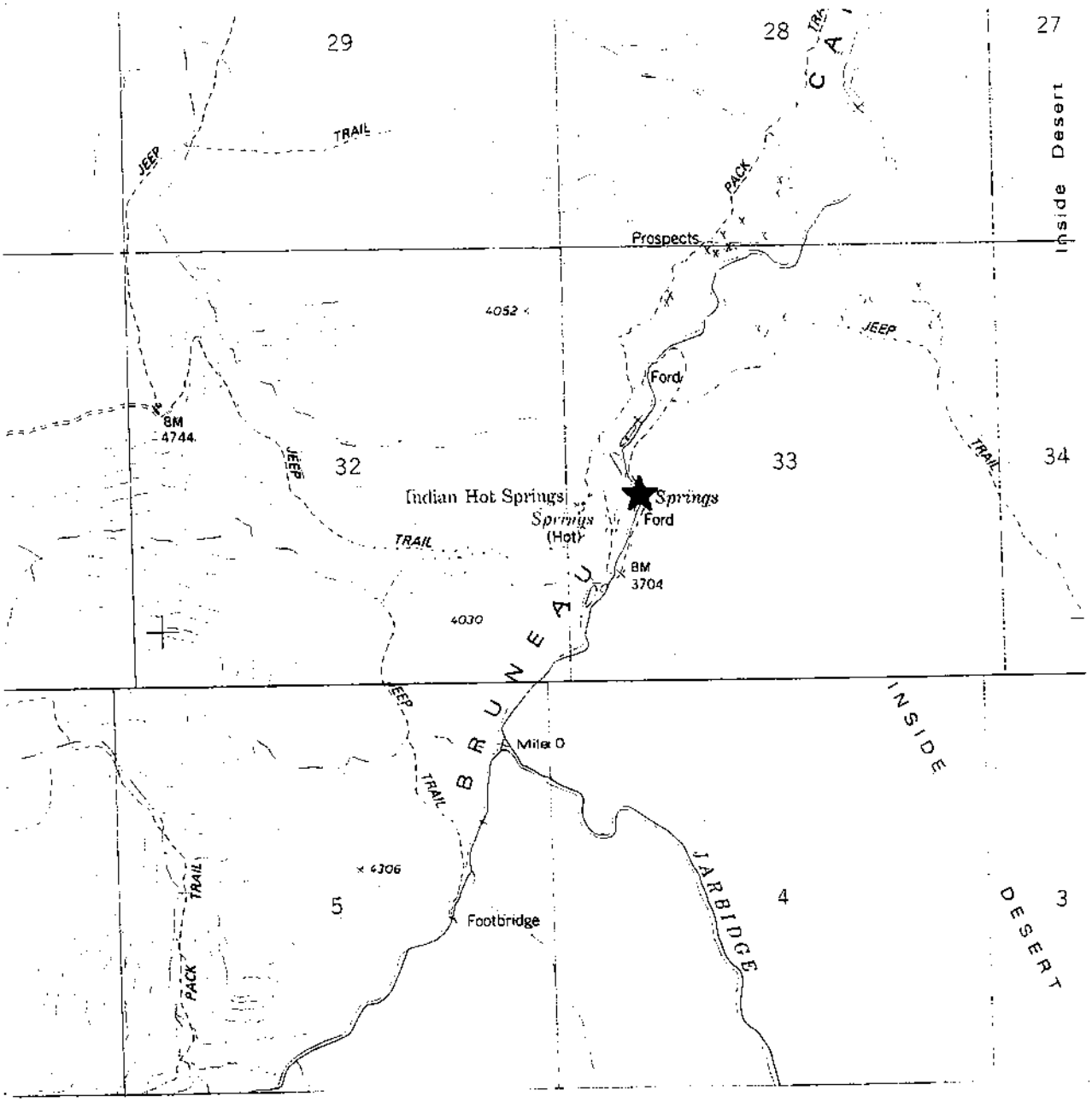

Figure C. Location of survey sites "Indian Hot Springs" (T12S R7E sec. 33 NW 1/4 of SW 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

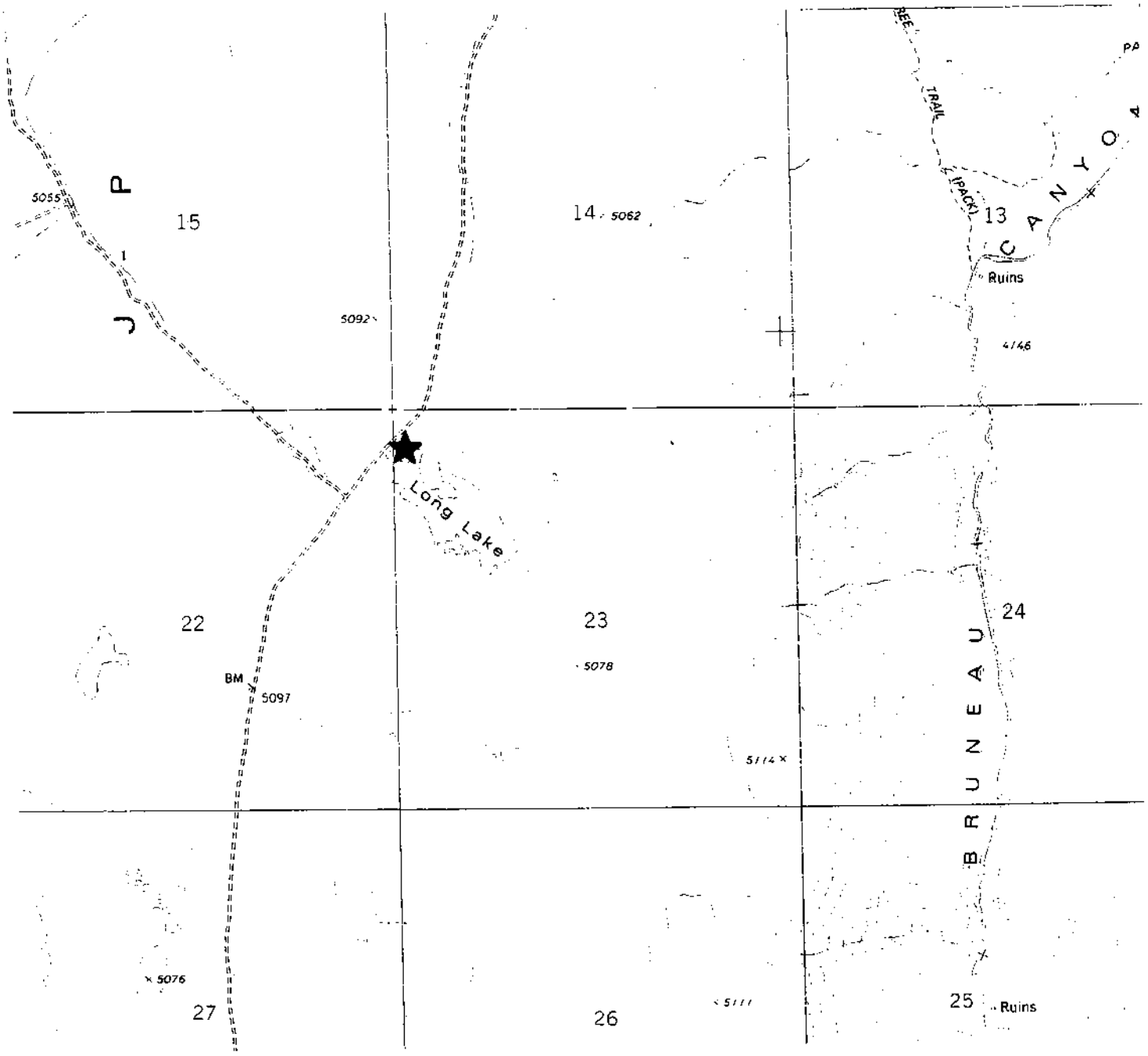

Figure D. Location of survey sites "Long Lake" (T13S R6E sec. 23 NW 1/4 of NW 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

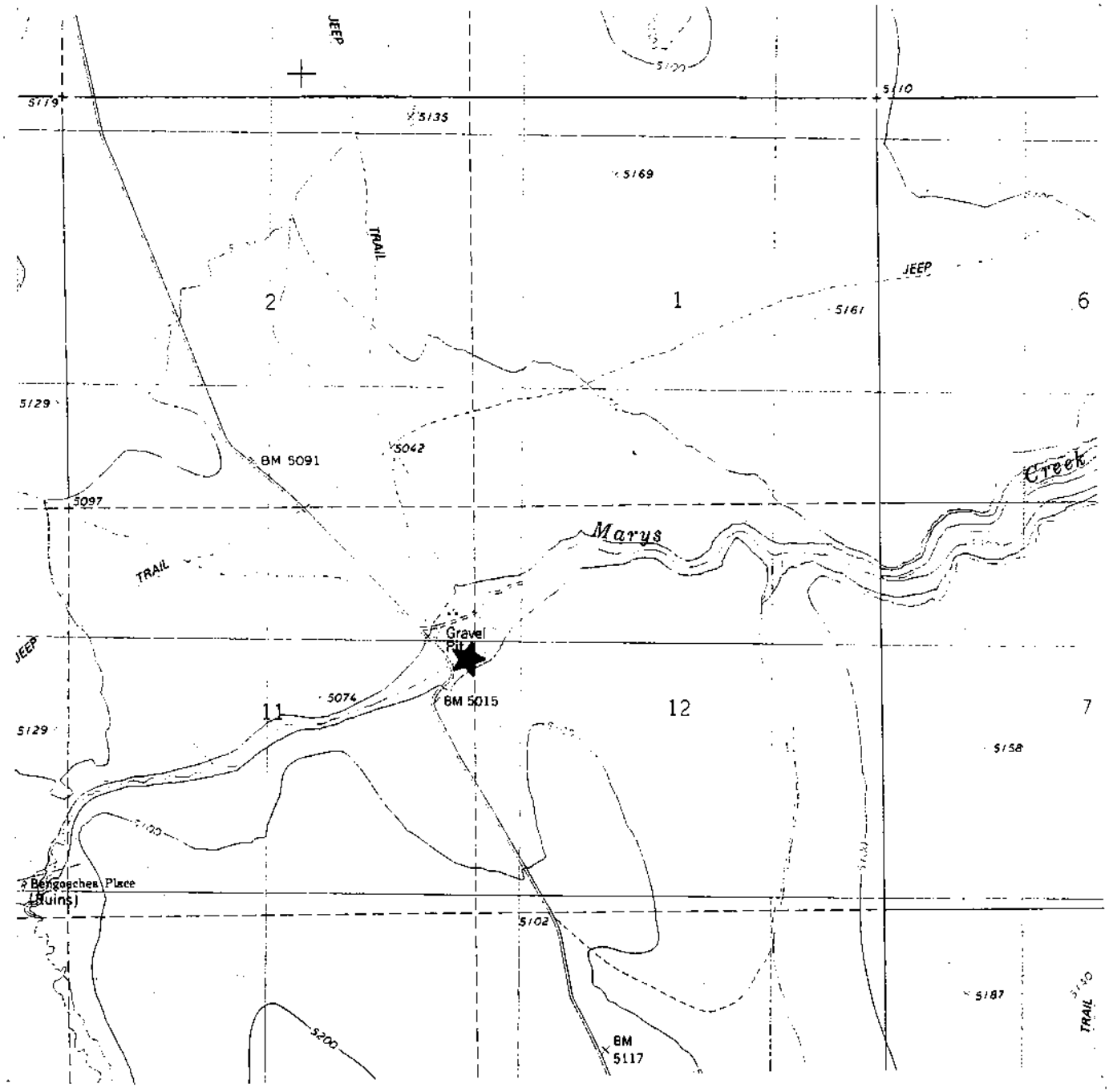

Figure E. Location of survey sites "Marys Creek Crossing" (T13S R5E sec. 11 SE 1/4 of NE 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

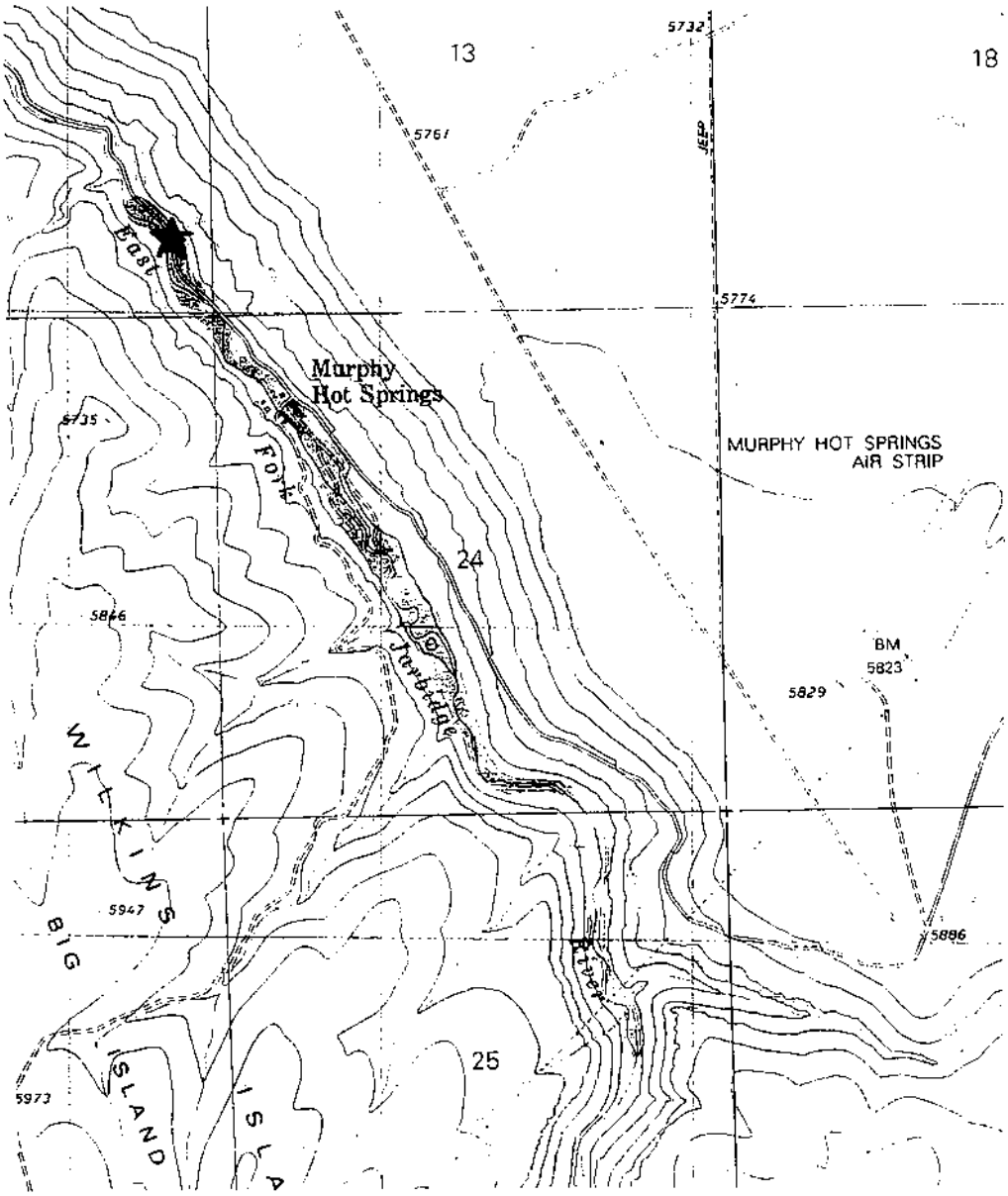

Figure F. Location of survey sites "Murphy Hot Springs I" (T16S R9E sec. 14 SE 1/4 of SE 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

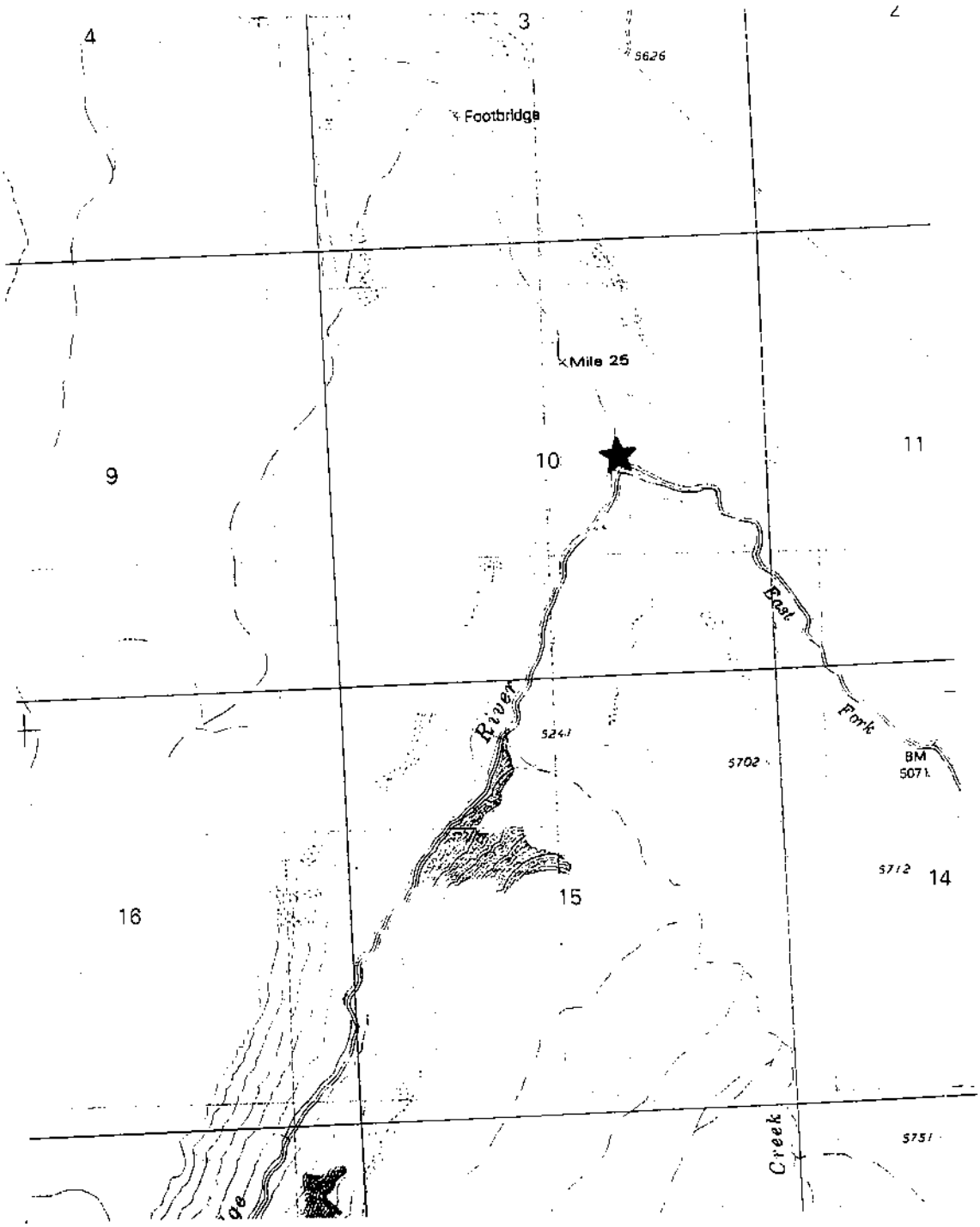

Figure G. Location of survey sites "Murphy Hot Springs at Fork" (T16S R9E sec. 10 SW 1/4 of NE 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

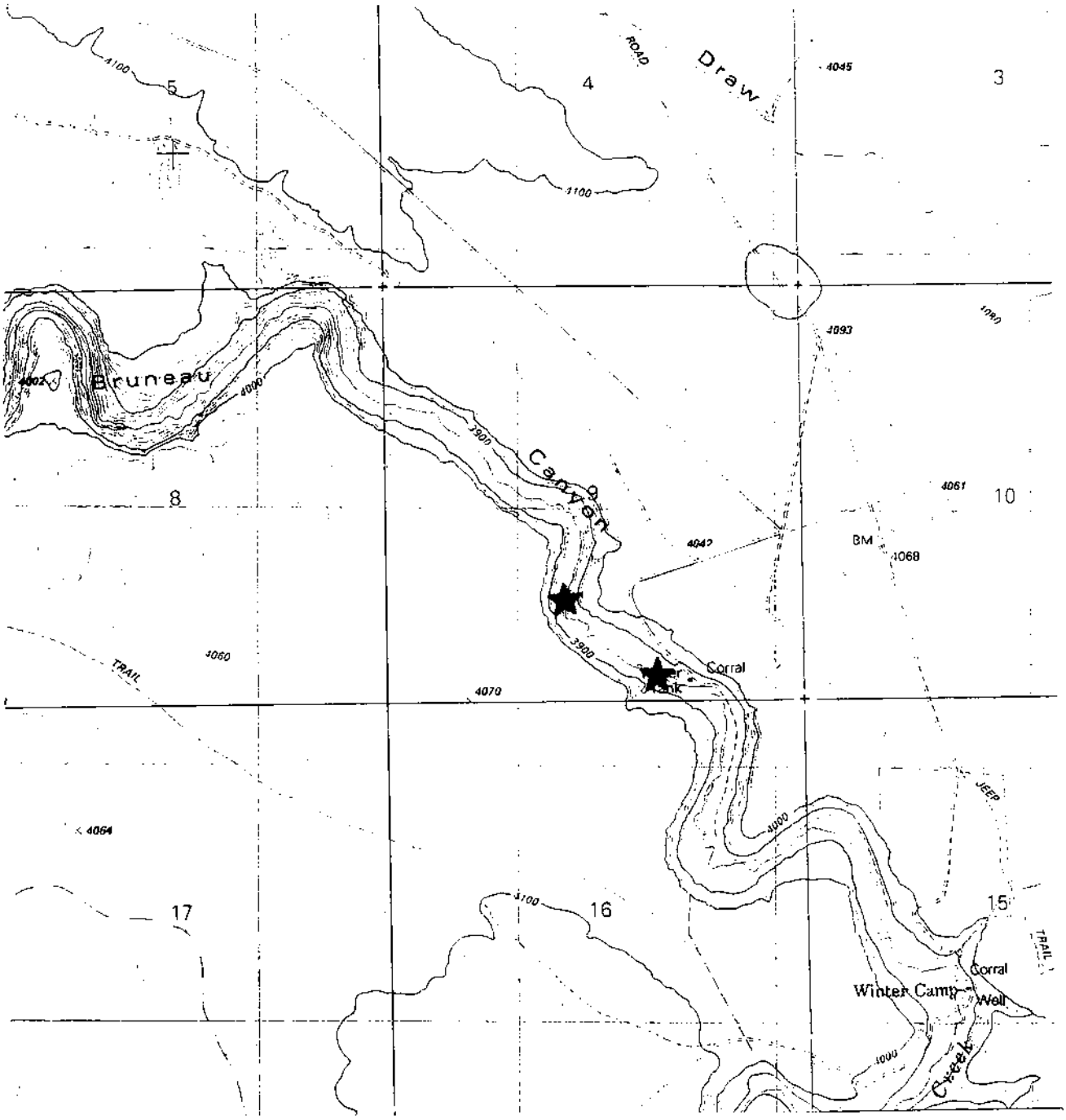

Figure H. Location of survey sites "Winter Camp I" (T10S R8E sec. 9 SW 1/4 of SE 1/4 and NE 1/4 of SW 1/4). Star symbols indicate locations of ultrasonic and/or mist net surveys. See Table 2. for survey dates and effort.

APPENDIX 2. Description of circumstances and conditions of *Euderma maculatum* voucher collection.

To place rapidly on record a description of the manner inwhich the spotted bat voucher specimen obtained during this study was gathered and handled, the following notification was sent to the Idaho Department of Fish and Game. A cover letter written by the p.i. (Dr. Barry Keller) was included.

30 August, 1996

RE: SPOTTED BAT CAPTURE IN IDAHO during bat surveys of the Bruneau-Jarbidge Canyon Area.

On 27 July, 1996 a **SPOTTED BAT** (*Euderma maculatum*) was captured during bat survey work being conducted by **Idaho State University** for the **Boise District BLM**.

LOCATION:

T13S R5E section 11. Owyhee County, Idaho.

The site of collection was the southeast quarter of the northeast quarter of section 11 near a point where a gravel road from Grasmere crosses Marys Creek.

TIME OF CAPTURE:

Approximately 4:00 am on the 27th of July, 1996. Mist net arrays were last checked at 3:30 am and no bats were observed. A spotted bat was heard as it passed over camp sometime around 4:00 am. When nets were checked at 5:10 am, the spotted bat was discovered.

COLLECTED BY:

Bill Doering, PhD student, Idaho State University.

Doering operates as a subpermittee of Dr. Barry Keller on permit no. 8604221.

REMARKS:

The spotted bat was captured in a 38 foot (11.7 meters) long 50 denier two-ply nylon mist net set on telescoped PVC poles. The point of capture in the net was 23 feet (7.1 meters) above the surface of Mary Creek (the net was set across the stream.).

Upon discovery of the spotted bat, all nets were collapsed. The net containing the spotted bat was gently lowered onto the gravel road surface of the bridge. This was done to reduce stress on the animal and prevent accidental escape. The bat was removed unharmed and in good condition. It remained relatively calm and passive. At no time did it appear aggressive. Photographs were taken during removal.

The spotted bat collected was a **MALE** with a capture weight of **17.31 grams**. Other physical parameters will be measured during specimen preparation.

Immediately, camp was broken and the field team returned to Idaho State University. The bat was photographed while still alive by Chuck Peterson. It was euthanized by personnel at the animal care facility of Idaho State University using a carbon dioxide chamber and then placed for temporary storage in a secure freezer. The specimen is awaiting permanent preservation and will be curated at the Idaho Museum of Natural History. No IMNH number has been assigned as of this writing.

Bureau of Land Management
Idaho State Office
1387 S. Vinnell Way
Boise, Idaho 83709

BLM/ID/PT-99/006+1150