

United States Department of the Interior
Geological Survey

Principal facts for 106 gravity stations in and around the Resting Spring Range, Nopah Range, Kingston Range, Castle Peak, Cinder Cones, and Fort Piute Bureau of Land Management Wilderness Study Areas in southeastern California.

by

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Open-File Report 86-260

1986

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards.

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INTRODUCTION

The purpose of this report is to release the principal facts for 106 gravity stations that will be used in subsequent geophysical interpretive reports. These data were collected for improved gravity control in and around six Bureau of Land Management (BLM) Wilderness Study Areas in southeastern California. The 1° by 2° quadrangle maps in which these study areas reside are Kingman, Trona, and Death Valley.

EXPLANATION OF TABLES

The principal facts are listed in Table 2 and Table 3 and include station name, accuracy code, latitude, longitude, elevation, observed gravity, free-air anomaly, hand terrain correction, total terrain correction, Bouguer anomaly and isostatic anomaly. Station name can have up to eight characters. Four digit accuracy codes are included for each station. Table 1, modified from Robbins and others (1977) explains each digit. The first digit is the location accuracy. The second digit is the elevation accuracy. The third digit is the latitude accuracy and the fourth digit is the observed gravity accuracy. The latitude and longitude are expressed in degrees, minutes and hundredths of minutes.

The datum of the observed gravity is the International Gravity Standardization Net of 1971 (IGSN-71) (Morelli, 1974). These values have been corrected for earth-tides and linear meter drift and expressed to 0.01 mGal. The free-air anomalies were calculated with the Geodetic Reference System formula of 1967 (GRS67) (International Union of Geodesy and Geophysics, 1971) and are expressed to 0.01 mGal.

Hand terrain corrections were calculated based on formulas by Hayford and Bowie (1912). To a radius of 68 m (223 ft) from the station, a correction was estimated in the field. From 68 m (223 ft) to 590 m (1935 ft), terrain corrections were calculated from topographic maps with the aid of templates.

Total terrain corrections are the addition of the hand correction plus the computer generated correction calculated from a distance of 0.59 km (1935 ft) to 166.7 kilometers. The computer correction is produced from a FORTRAN program written by Plouff (1977).

The Bouguer anomalies are expressed to 0.01 mGal and are calculated based on a density of 2.67 g/cm^3 . The Bouguer anomaly is calculated by taking the observed gravity, adding the free-air, terrain and curvature corrections, then subtracting the Bouguer correction and the theoretical gravity.

The isostatic anomaly is computed by a FORTRAN program, "isocomp", based on a sea level crustal thickness of 25 kilometers, with a topographic density of 2.67 g/cm^3 and a density contrast across the base of the model crust of 0.4 g/cm^3 (Jachens and Roberts, 1981).

BASES

The gravity sub-base used for the 1984 field work, STANSLAG, is located at the southwest corner of the parking garage on the west side of the workshop

of the Standard Slag iron mine. A standard USGS gravity disk is cemented to the concrete slab. It was tied by multiple readings to PB1021 and PB1022 (Roberts and Jachens, 1986). The gravity sub-base used for the 1985 field work is located at the northeast corner of the building in the center of the Hole-in-the-Wall BLM fire station compound. The observed gravity of HOLEWALL was established by multiple ties to PB1217 at Mitchell Caverns (Roberts and Jachens, 1986).

Figure 1 is a location map showing the location and boundaries of the various Wilderness Study Areas. Also shown on this figure is the location of the sub-bases STANSLAG and HOLEWALL. HOLEWALL is located at a distance far enough away from any study area that its location would not plot on any of the individual area plots.

Figures 2 through 7 are plots showing the boundaries and new gravity stations for each of the six BLM Wilderness Study Areas.

It should be noted that although the study areas do not extend beyond the California-Nevada border, several gravity stations are located in Nevada.

References

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- Plouff, Donald, 1977, Preliminary documentation for a FORTRAN program to compute gravity terrain corrections based on topography digitized on a geographic grid: U.S. Geological Survey Open-File Report 77-535, 45 p.
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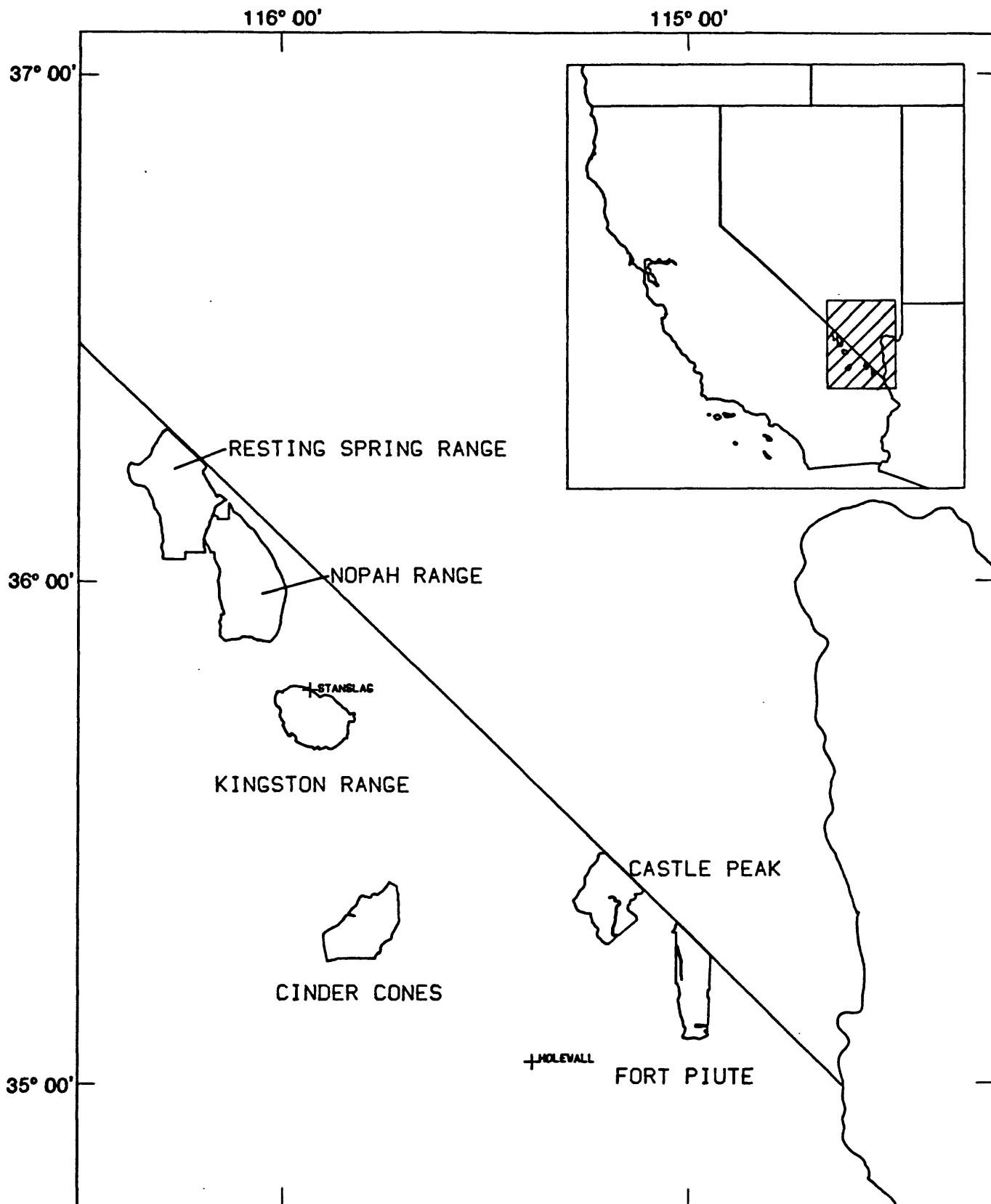


Figure 1.--Index of Wilderness Study Areas.

TABLE 1. Location and accuracy codes.

LOCATION CODE (1st digit)	
Code	Station Location Method (vertical and horizontal)
A) Survey marks (vertical) - Topo Maps (horizontal)	
	1) Base plate directly on bench mark
B-----	a) USGS or USC&GS level-line bench mark.
M-----	b) Level line bench marks other than a) such as USCE, BPR, CDH, private companys, etc.
V-----	c) Vertical angle (VABM) bench marks.
	2) Base plate near bench mark.
N-----	a) USGS or USC&GS level line bench mark.
E-----	b) Level line bench marks other than a) such as USCE, BPR, CDH, etc.
H-----	c) Vertical angle (VABM) bench marks.
P-----	3) Base plate on or near other reference marks (such as stakes, paint, etc.) that have been surveyed by the group doing the gravity survey or other known people.
X-----	4) On or near section corners, 1/4 section marks, 1/8 section marks, and other property boundary markers.
D-----	5) Destroyed or not found bench or reference marks.
B) Map locations (vertical and horizontal)	
F-----	1) Black spot elevations - field checked.
G-----	2) Brown spot elevations and elevations taken off original manuscripts - not field checked.
W-----	3) Blue lake elevations.
R-----	4) Lake or reservoir elevations determined from leveling to bench marks, and water level is determined from guaging stations.
S-----	5) Sea level elevations.
Q-----	6) Contour line interpolation.
C) Aerial photographs (vertical and horizontal)	
T-----	1) Elevations determined by U.S. Geological Survey Topographic Division by Kelsh plotter or least squares computer system.
K-----	2) Elevations determined by other groups by Kelsh plotter or least squares computer system.
L-----	3) Elevations determined by laser methods.
J-----	4) Elevations determined by other methods.
D) Altimetry (vertical) - topo maps (horizontal)	
A-----	1) Good control (leap frog, double loop, two or more altimeters, etc.
Y-----	2) Poor control.
E) Special sources	
Z-----	1) Elevations determined by methods such as mobile elevation recorders - horizontal control from topo maps.
I-----	2) Other special sources.
F) Unknown elevation sources.	
U-----	1) Elevation data sources unknown (this would include reference marks with unknown ties).

TABLE 1 (continued). Location and accuracy codes.

SUBJECTIVE NUMERICAL ACCURACY CODES FOR 2nd, 3rd & 4th DIGITS

Elevation Accuracy Code (2nd digit)
Relative to 1929 USC&SG mean sea level datum

Code	Elevation Accuracy (feet)	Typical types of elevation data	Approximate Gravity Effect (mGal)
1	0.2	On level BM	0.01
2	0.33	Beside BM	0.02
3	1	Transit and good alidade surveys	0.05
4	2	VABMs, most black map elevations	0.1
5	4	Black elevations on old maps, good photogrametry	0.2
6	10	Brown elevations on 20 foot contour maps	0.5
7	20	Brown elevations of 80 foot contour maps, good altimetry	1.0
8	40	Contour interpolation; 50 foot contour map may be used in Alaska.	2.0
9	80	Poor altimetry; data from 200 foot contour maps	5.0
0	>80	Altimetry in very bad weather or equipment failures	>5.0

Latitude Accuracy Code for California Data (3rd digit)
(based on mean value of 1.45 mgal/minute at 37 degrees latitude)

Code	Latitude Distance Accuracy (minutes) (feet)	Typical map measurement requirements in inches	Approximate Gravity Effect (mGal)
1	0.0075	42 Triangulation or special survey data	0.01
2	0.015	84 0.04 (1:24,000) map; special location care	0.02
3	0.035	210 0.10 (1:24,000) normal survey; 0.04 (1:62,500) maps	0.05
4	0.07	420 0.21 (1:24,000) map; 0.08 (1:62,500) normal survey	0.1
5	0.14	840 0.42 (1:24,000) map; 0.16 (1:62,500) map	0.2
6	0.35	2100 0.4 (1:62,500) map; 0.1 (1:250,000) map	0.5
7	0.70	4200 0.8 (1:62,500) map; 0.2 (1:250,000) map	1.0
8	1.4	8400 1.6 (1:62,500) map; 0.4 (1:250,000) map	2.0
9			5.0
0			>5.0

Station Observed Gravity Accuracy (4th digit)
(relative to local base station)

Code	Observed Gravity Accuracy (mGal)	Suggested types of gravity measurements
1	0.01	Local surveys with special meters
2	0.02	Multiple readings with LaCoste
3	0.05	Average LaCoste and multiple Worden
4	0.1	LaCoste data with small vibrations etc. Most USGS Worden data
5	0.2	Data from loops with closure errors this large
6	0.5	Data from loops with closure errors this large
7	1.0	Data from loops with closure errors this large
8	2.0	Data from loops with closure errors this large
9	5.0	Data from loops with closure errors this large
0	>5.0	Data from loops with closure errors this large

TABLE 2. Principal facts for 49 gravity stations in the Kingston Range, Nopah Range, and the Resting Spring Range Wilderness Study Areas collected in 1984.

STATION	CODE	LATITUDE		LONGITUDE		ELEVATION FEET	OBSERVED	FREE AIR	TERRAIN	BOUGUER	ISOSTATIC	
		DEG	MIN	DEG	MIN		GRAVITY MGAL	(1967) MGAL	HAND TOTAL MGAL		ANOMALY MGAL	ANOMALY MGAL
STANSLAG	C843	35	47.03	115	55.88	4475.1	979411.76	32.80	0.54	6.32	-114.85	-15.16
RLM00001	F423	35	45.75	116	3.54	2467.2	979541.63	-24.28	0.06	1.07	-108.26	-14.86
RLM00002	F423	35	45.22	116	3.11	2500.0	979537.00	-25.07	0.00	1.13	-110.12	-16.67
RLM00003	A723	35	45.41	116	2.54	2568.9	979530.71	-25.15	0.00	1.32	-112.38	-18.37
RLM00004	A723	35	45.26	116	2.07	2673.9	979522.97	-22.80	0.05	1.62	-113.34	-19.08
RLM00005	A723	35	45.29	116	1.52	2815.0	979514.07	-18.48	0.06	2.09	-113.40	-18.68
RLM00006	A723	35	45.22	116	1.10	2942.9	979505.61	-14.81	0.22	2.65	-113.56	-18.57
RLM00007	A723	35	45.10	116	0.70	3061.0	979497.45	-11.69	0.43	3.16	-113.99	-18.77
RLM00008	F423	35	47.05	116	5.38	2349.1	979555.87	-23.01	0.06	0.85	-103.15	-10.36
RLM00009	F423	35	46.38	116	5.59	2473.8	979548.78	-17.41	0.09	1.01	-101.68	-9.51
RLM00010	C823	35	47.10	116	8.32	2185.0	979574.88	-19.49	0.23	1.03	-93.81	-3.13
RLM00011	C823	35	46.54	116	8.19	2155.5	979572.59	-23.76	0.23	1.24	-96.84	-6.46
RLM00012	F433	35	46.13	115	56.93	6581.4	979250.66	70.97	11.67	32.37	-122.65	-24.57
RLM00013	F433	35	46.34	115	59.01	5436.4	979328.03	40.42	12.63	27.85	-118.61	-21.77
RLM00014	F423	35	45.64	116	0.58	3868.1	979439.82	5.79	7.19	12.07	-115.31	-19.80
RLM00015	C833	35	45.82	115	53.68	5479.0	979337.42	54.56	2.81	9.90	-123.87	-23.44
RLM00016	F433	35	42.18	115	56.62	5544.6	979322.68	51.19	5.45	21.44	-117.95	-21.39
RLM00017	F433	35	41.46	115	57.38	4619.4	979373.19	15.76	10.96	24.68	-118.48	-22.70
RLM00018	F433	35	43.45	115	55.60	6814.3	979236.14	82.17	5.38	29.05	-122.71	-25.05
RLM00019	F433	35	42.25	115	50.96	4632.5	979385.35	28.02	3.27	8.90	-122.44	-21.61
RLM00020	F433	35	43.85	115	51.78	4803.1	979375.35	31.78	1.70	7.36	-126.07	-25.17
RLM00021	V433	35	43.71	115	49.91	4806.4	979374.10	31.03	8.25	15.17	-119.12	-17.11
RLM00022	G733	35	47.09	115	54.74	5636.5	979336.02	66.15	3.93	12.81	-114.76	-14.46
RLM00023	F433	35	48.38	115	55.64	6190.9	979293.13	73.53	9.85	29.84	-109.29	-9.04
RLM00024	F433	35	48.94	115	52.50	4511.2	979420.80	42.51	2.10	5.11	-107.59	-4.66
RLM00025	F423	35	54.30	116	3.78	3930.4	979470.14	29.58	3.09	9.19	-96.53	1.93
RLM00026	F423	35	55.53	116	1.86	4215.9	979441.91	26.43	5.74	13.74	-104.92	-4.37
RLM00027	F423	35	56.86	116	4.07	4458.7	979434.21	39.65	5.00	12.58	-101.18	-1.21
RLM00028	F423	35	57.59	116	4.90	4465.2	979432.40	37.41	5.86	14.75	-101.48	-1.54
RLM00029	F423	35	58.79	116	5.48	3553.1	979500.89	18.43	2.11	6.04	-97.89	2.63
RLM00030	F423	35	58.72	116	2.77	4858.9	979407.56	47.96	7.86	18.29	-100.87	1.19
RLM00031	F423	35	59.74	116	2.69	4071.5	979468.44	33.36	1.87	7.22	-99.57	3.45
RLM00032	F433	36	0.80	116	3.34	5121.4	979393.29	55.38	9.23	23.35	-97.37	5.83
RLM00033	F433	36	2.62	116	3.48	3517.1	979503.78	12.44	4.30	7.63	-101.05	3.66
RLM00034	F433	36	1.56	116	5.08	5990.8	979328.93	71.65	13.06	39.68	-94.50	7.96
RLM00035	F433	36	1.80	116	6.58	3402.2	979511.69	10.73	4.50	8.69	-97.76	4.31
RLM00036	F433	36	3.28	116	5.68	5200.1	979391.52	57.46	8.41	25.21	-96.13	7.38
RLM00037	F433	36	5.20	116	6.23	4042.0	979474.82	29.13	6.47	12.30	-97.70	7.06
RLM00038	F433	36	4.50	116	7.40	5013.1	979406.24	52.85	9.38	25.31	-94.24	9.07
RLM00039	F433	36	6.78	116	9.60	4688.3	979432.17	44.97	11.09	23.95	-92.35	11.40
RLM00040	F433	36	8.04	116	8.49	3448.2	979520.27	14.68	2.39	5.13	-98.95	6.51
RLM00041	F433	36	9.46	116	12.22	5157.5	979399.79	52.85	9.75	27.79	-96.69	7.34
RLM00042	F433	36	8.32	116	14.35	3658.1	979502.42	16.17	8.45	13.39	-96.40	6.08
RLM00043	F433	36	6.46	116	13.49	3389.1	979525.17	16.29	2.57	4.96	-95.47	6.20
RLM00044	F433	36	5.79	116	15.40	2972.4	979548.44	1.35	4.92	7.42	-93.65	6.78
RLM00045	F433	36	4.64	116	13.94	4445.5	979446.92	39.97	9.83	23.28	-89.71	10.34
RLM00046	F433	36	1.96	116	14.79	3123.4	979531.35	3.94	5.11	9.87	-93.79	4.14
RLM00047	V433	36	0.80	116	12.78	3517.1	979497.49	8.76	8.06	15.62	-96.74	1.14
RLM00048	F423	35	41.86	116	2.78	2336.0	979549.91	-22.79	2.72	4.00	-99.32	-7.40

TABLE 3. Principal facts for 57 gravity stations in the Fort Piute, Castle Peaks, and Cinder Cones Wilderness Study Areas collected in 1985.

STATION	CODE	LATITUDE		LONGITUDE		ELEVATION FEET	OBSERVED	FREE AIR	TERRAIN	BOUGUER ANOMALY MGAL	ISOSTATIC ANOMALY MGAL	
		DEG	MIN	DEG	MIN		GRAVITY MGAL	(1967) MGAL	HAND TOTAL MGAL			
HOLEWALL	C833	35	2.54	115	23.14	4213.0	979358.45	18.16	0.34	2.60	-124.22	-28.18
85RLM101	C833	35	17.44	114	58.31	2962.6	979477.38	-1.61	1.47	2.65	-101.04	-3.00
85RLM102	F423	35	9.26	114	56.01	2370.4	979492.56	-30.50	0.00	0.71	-111.52	-19.80
85RLM103	F423	35	9.13	114	55.13	2516.4	979488.66	-20.49	0.35	1.00	-106.23	-15.16
85RLM104	F423	35	9.12	114	57.10	2486.9	979487.40	-24.52	0.00	0.95	-109.29	-17.02
85RLM105	F423	35	8.92	114	58.51	3005.2	979447.23	-15.65	1.45	3.13	-116.07	-23.21
85RLM106	F423	35	9.06	114	59.72	3917.3	979389.49	12.16	0.48	4.40	-118.29	-24.78
85RLM107	F423	35	9.13	115	0.90	4104.3	979375.40	15.56	1.63	5.28	-120.43	-26.21
85RLM108	F423	35	11.18	114	59.57	3841.9	979391.93	4.50	2.86	8.44	-119.33	-24.38
85RLM109	F423	35	13.17	114	59.47	3428.5	979423.98	-5.14	1.02	4.12	-119.10	-22.86
85RLM110	F423	35	14.50	114	59.62	3595.8	979418.83	3.55	1.57	5.20	-115.07	-17.94
85RLM111	F423	35	5.54	115	5.76	3927.2	979391.10	19.69	0.00	1.54	-113.96	-19.75
85RLM112	F423	35	18.06	115	11.92	4662.1	979346.80	26.71	0.00	1.83	-131.84	-27.59
85RLM113	F423	35	19.30	115	12.63	5196.9	979314.89	43.31	0.68	4.24	-131.13	-26.50
85RLM114	F423	35	20.09	115	14.10	4553.8	979360.43	27.28	0.95	3.25	-126.14	-20.71
85RLM115	F423	35	21.12	115	14.56	4583.3	979360.83	28.98	1.36	4.30	-124.40	-18.64
85RLM116	F423	35	21.15	115	15.55	4694.9	979348.02	26.62	2.69	8.39	-126.49	-20.63
85RLM117	F423	35	21.48	115	13.05	4990.2	979338.96	44.85	1.68	5.17	-121.59	-16.17
85RLM118	F423	35	21.06	115	11.28	5449.5	979306.58	56.24	1.45	6.27	-124.81	-20.07
85RLM119	F423	35	19.91	115	10.61	4990.2	979333.19	41.31	0.41	2.87	-127.43	-23.11
85RLM120	F423	35	21.09	115	7.99	4862.2	979348.95	43.37	0.95	3.37	-120.49	-16.59
85RLM121	F423	35	23.11	115	11.72	5170.6	979324.67	45.20	3.31	9.92	-122.66	-17.21
85RLM122	F423	35	26.17	115	13.71	3615.5	979418.16	-11.86	0.87	2.53	-133.83	-27.02
85RLM123	F423	35	26.71	115	13.30	3733.6	979409.35	-10.33	0.87	2.74	-136.14	-29.39
85RLM124	F423	35	27.55	115	12.81	3973.1	979397.37	-0.99	1.45	3.90	-133.85	-27.15
85RLM125	F423	35	26.55	115	11.23	4580.1	979360.72	20.85	1.12	4.71	-132.01	-25.89
85RLM126	F423	35	25.81	115	13.09	3864.8	979403.51	-2.55	1.22	3.17	-132.43	-25.88
85RLM127	F423	35	26.34	115	11.92	4281.5	979376.06	8.42	0.72	3.40	-135.52	-29.19
85RLM128	F423	35	27.84	115	11.09	4931.1	979343.50	34.79	2.16	7.60	-127.20	-21.07
85RLM129	F423	35	27.02	115	8.80	4698.2	979367.71	38.27	0.00	2.21	-121.14	-15.58
85RLM130	F423	35	24.10	115	9.46	4875.3	979350.08	41.45	1.25	4.18	-122.05	-16.89
85RLM131	F423	35	23.72	115	10.70	4619.4	979366.90	34.75	0.65	3.02	-121.15	-15.66
85RLM132	F423	35	22.98	115	13.16	4819.6	979346.92	34.64	2.47	7.45	-123.68	-17.87
85RLM133	F423	35	18.01	115	3.00	4635.8	979351.99	29.50	3.57	8.24	-121.74	-21.16
85RLM134	F423	35	20.12	115	2.58	3832.0	979413.99	12.93	0.18	2.02	-116.97	-15.50
85RLM135	F423	35	19.50	115	5.17	5131.2	979324.76	46.72	2.86	7.53	-122.18	-20.09
85RLM136	F423	35	22.56	115	14.42	4334.0	979375.78	18.45	2.31	5.82	-124.87	-18.78
85RLM137	F423	35	27.76	115	12.07	4399.6	979372.80	14.24	2.01	5.50	-131.65	-25.16
BMV733	B123	35	25.90	115	15.65	3160.1	979434.75	-37.70	0.21	1.46	-145.10	-37.98
85RLM138	P323	35	25.99	115	15.43	3186.9	979434.00	-36.05	0.00	1.25	-144.59	-37.43
85RLM139	P323	35	26.00	115	15.21	3227.9	979432.56	-33.65	0.00	1.27	-143.57	-36.43
85RLM140	P323	35	25.95	115	15.01	3269.9	979431.82	-30.37	0.00	1.29	-141.72	-34.66
85RLM141	P323	35	25.88	115	14.81	3313.9	979430.64	-27.32	0.00	1.32	-140.14	-33.12
85RLM142	P323	35	25.82	115	14.61	3357.1	979428.74	-25.07	0.00	1.36	-139.34	-32.37
85RLM143	P323	35	25.79	115	14.40	3405.0	979426.66	-22.60	0.00	1.41	-138.46	-31.54
85RLM144	P323	35	25.75	115	14.20	3450.0	979424.59	-20.38	0.00	1.45	-137.75	-30.89
85RLM145	P323	35	25.70	115	14.01	3493.0	979422.68	-18.18	0.00	1.49	-136.98	-30.17
85RLM146	P323	35	25.65	115	13.80	3542.9	979420.53	-15.57	0.04	1.58	-135.99	-29.23
85RLM147	P323	35	15.35	115	48.42	3582.7	979419.28	1.56	0.93	3.47	-118.34	-25.97
85RLM148	P323	35	15.24	115	50.55	2726.4	979478.89	-19.19	0.54	1.95	-111.20	-20.62
85RLM149	F423	35	18.05	115	51.93	2782.2	979484.87	-11.95	1.04	2.62	-105.21	-14.27
85RLM150	F423	35	18.56	115	50.62	3323.5	979444.10	-2.55	1.14	3.17	-113.85	-21.57
85RLM151	F423	35	18.95	115	48.02	4058.4	979394.64	16.53	0.86	3.28	-119.88	-25.32
85RLM152	F423	35	19.16	115	46.41	4488.2	979363.66	25.66	0.00	2.82	-125.94	-30.05
85RLM153	F423	35	19.29	115	45.37	4340.6	979371.89	19.82	0.00	1.96	-127.58	-30.79
85RLM154	F423	35	18.22	115	44.73	4317.6	979370.14	17.44	0.60	2.49	-128.65	-31.84
85RLM155	F423	35	18.48	115	43.80	4147.0	979381.21	12.10	0.00	1.48	-129.15	-31.44

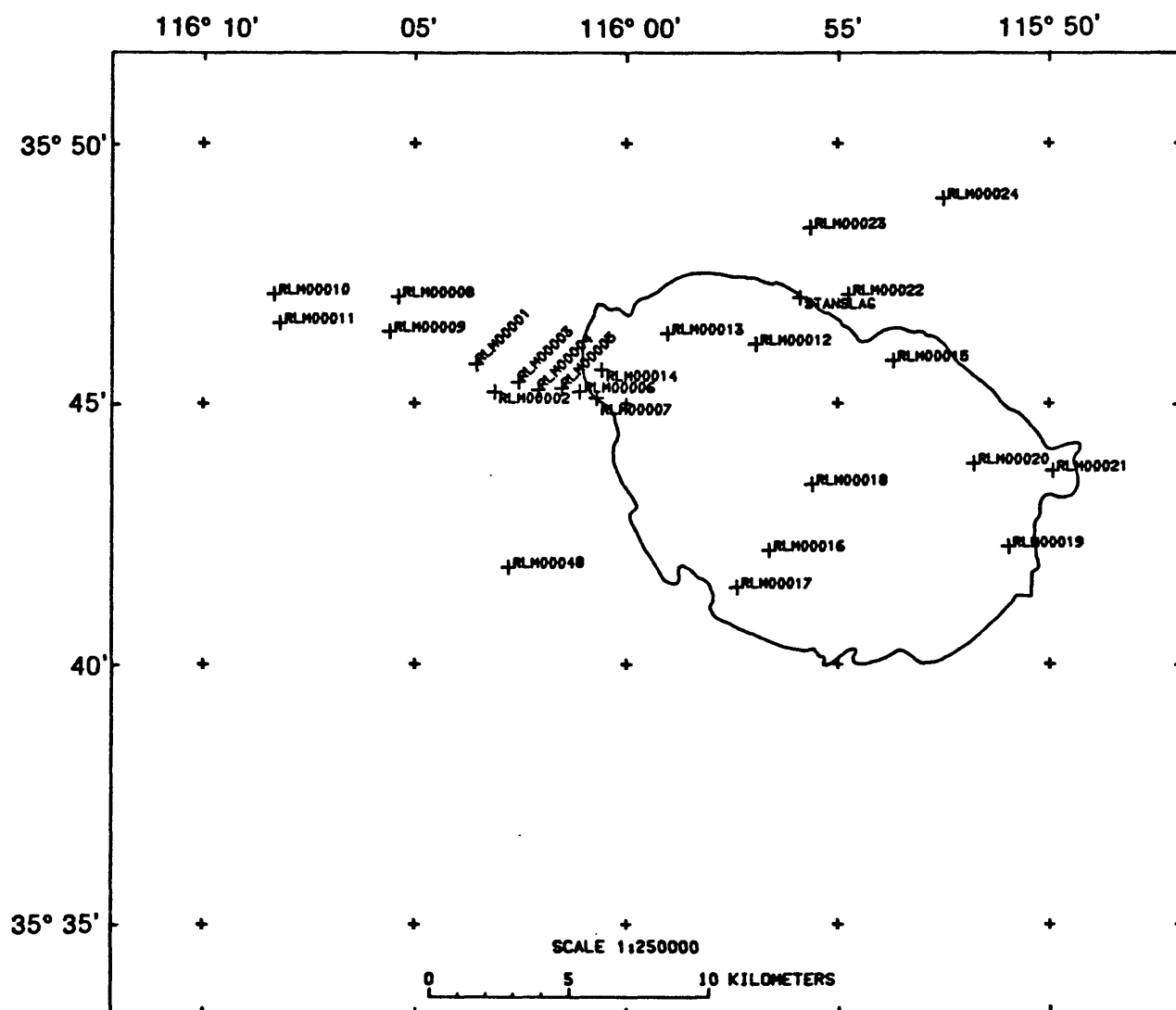


Figure 2.--Kingston Range Wilderness Study Area.

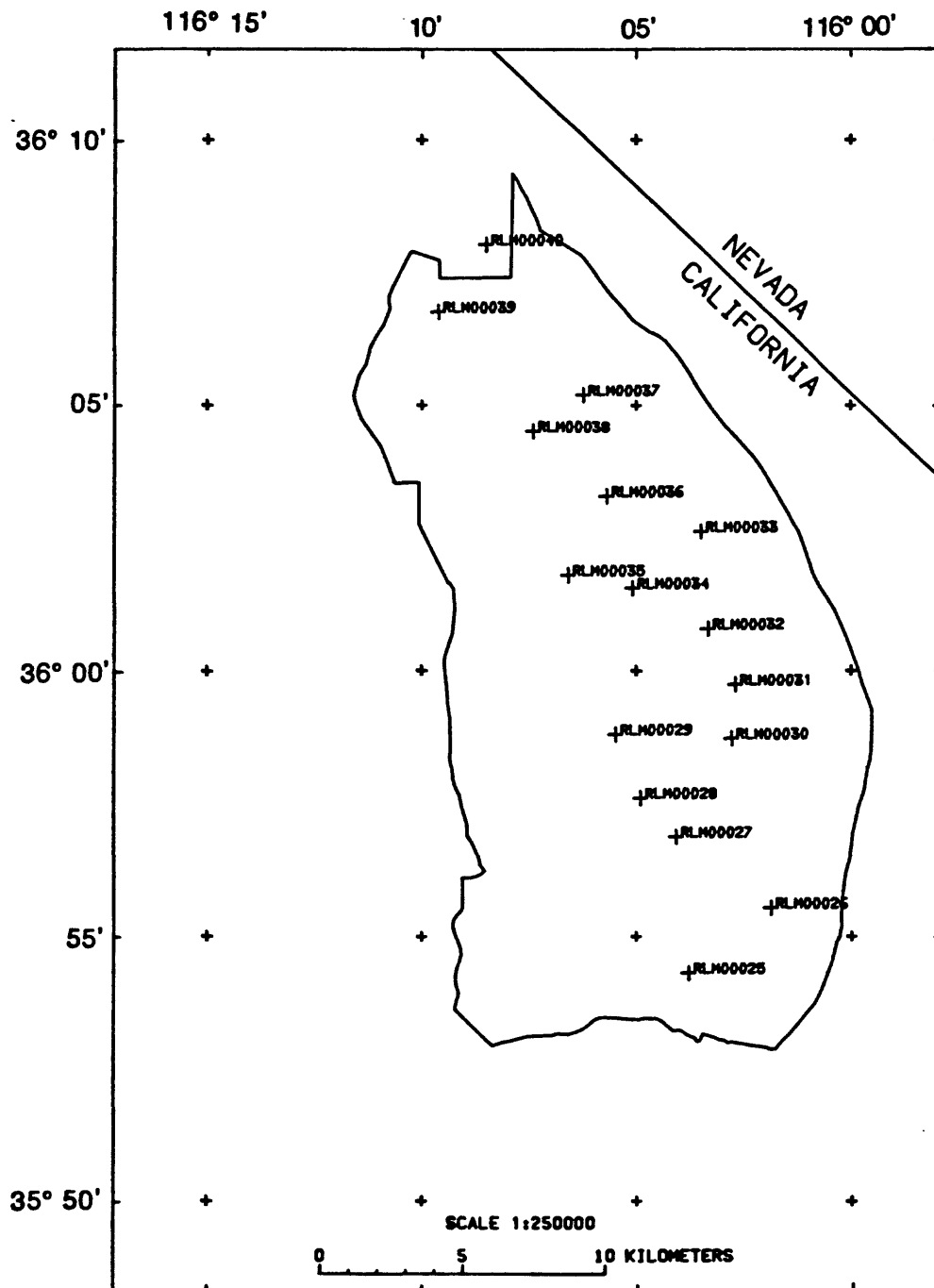


Figure 3.--Nopah Range Wilderness Study Area.

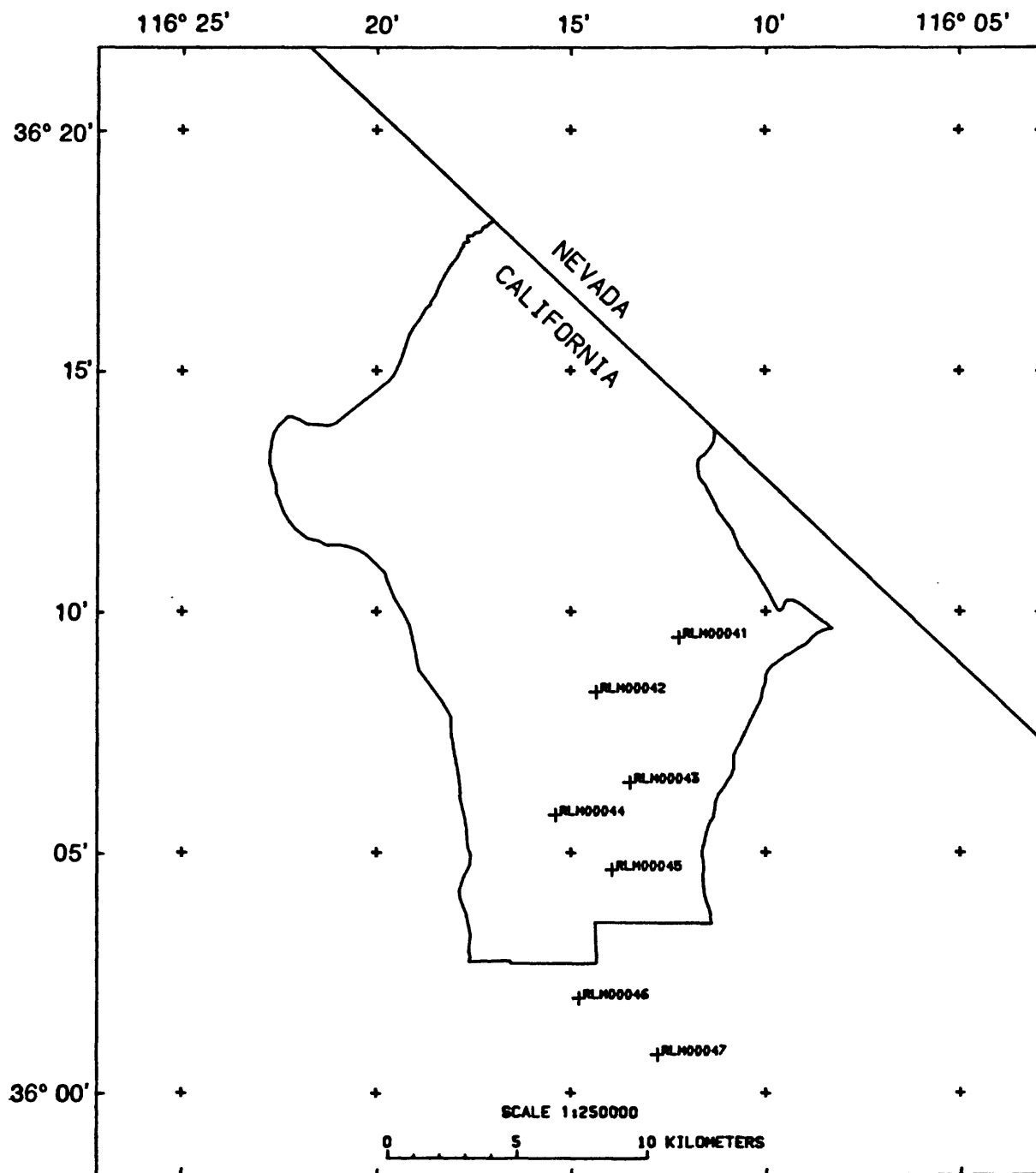


Figure 4.--Resting Spring Range Wilderness Study Area.

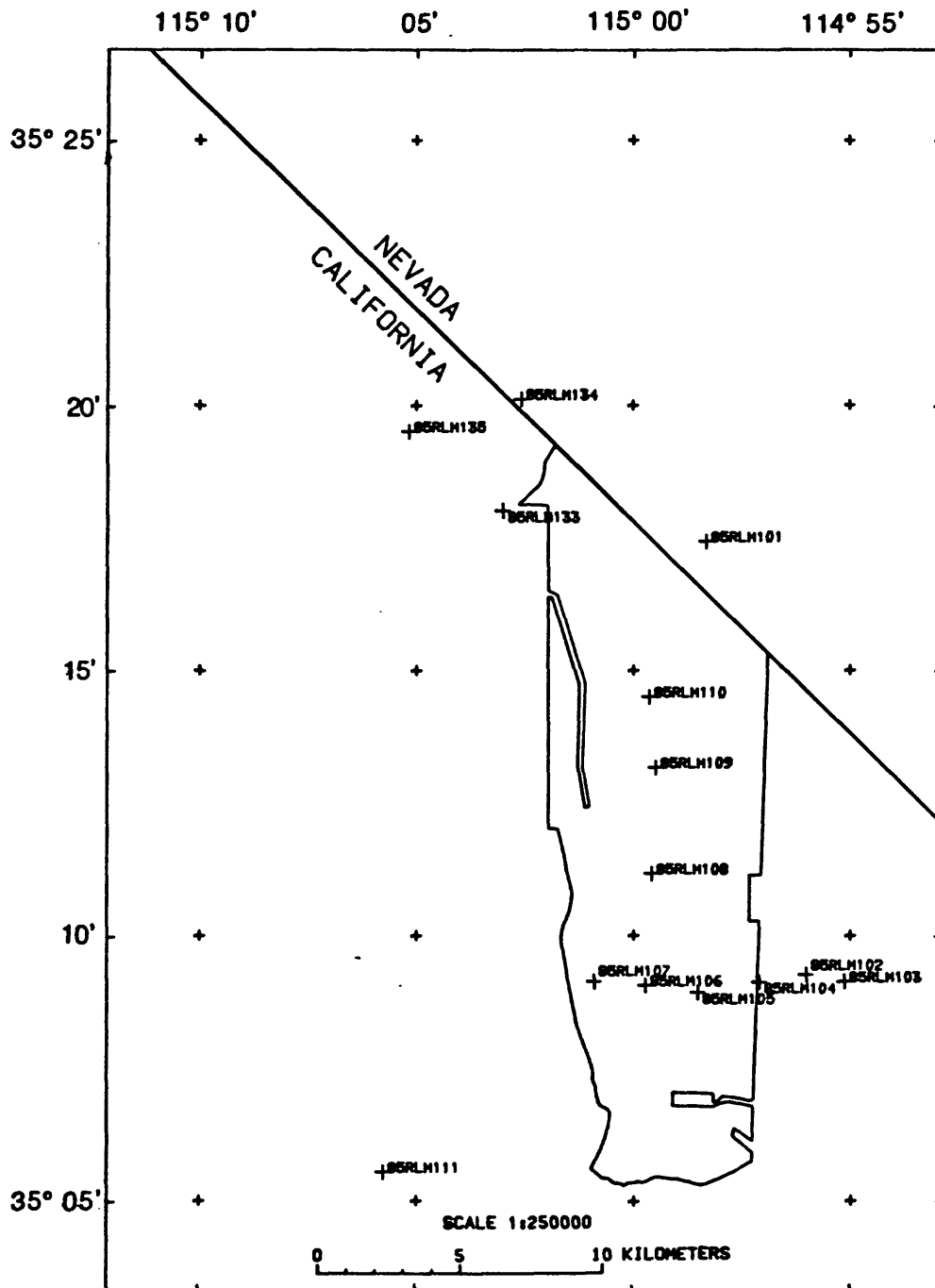


Figure 5.--Fort Plute Wilderness Study Area.

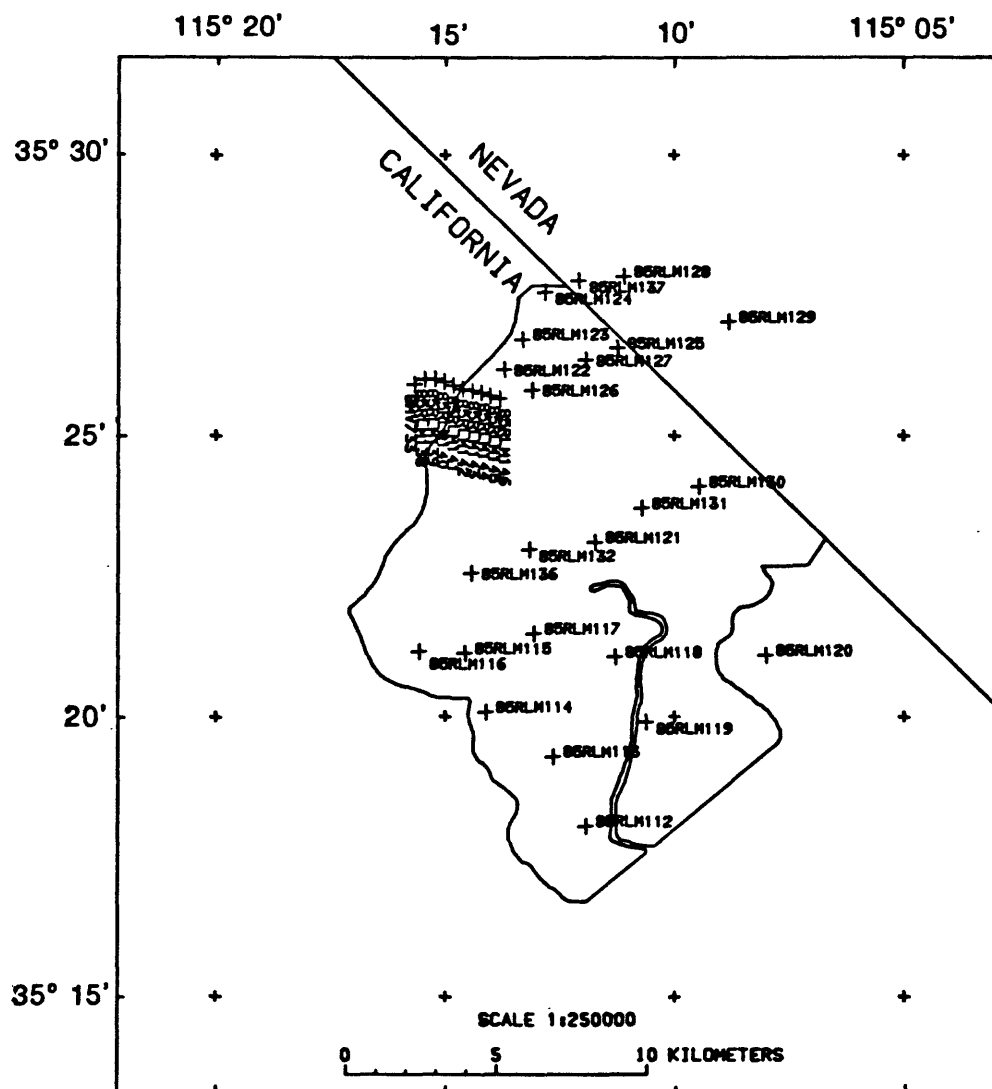


Figure 6.--Castle Peaks Wilderness Study Area.

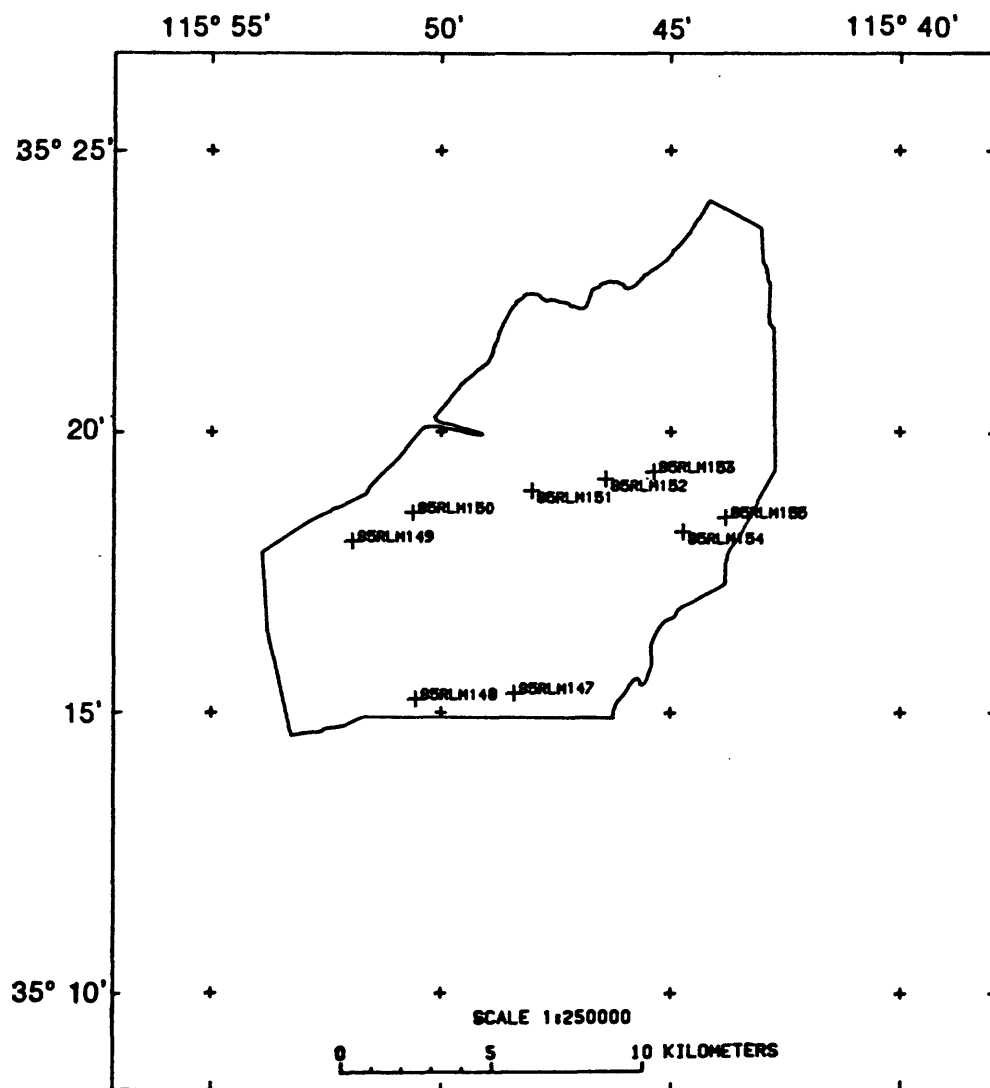


Figure 7.--Cinder Cones Wilderness Study Area.