

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FC
USGS
OFR
80-1290

SELECTED ADMINISTRATIVE, LAND, AND RESOURCE DATA
FOR KNOWN GEOTHERMAL RESOURCES AREAS IN ARIZONA,
CALIFORNIA, IDAHO, NEVADA, OREGON, AND WASHINGTON

by

H. E. Burkhardt, C. A. Brook, and F. W. Smith

**UNIVERSITY OF UTAH
RESEARCH INSTITUTE
EARTH SCIENCE LAB.**

Open-File Report 80-1290

1980

This report has not been edited for conformity
with U.S. Geological Survey editorial standards

CONTENTS

	<u>Page</u>
Introduction	1
Explanation of Data Sheets	2
Set A	2
Set B	4
Sources of Additional Information.	5
References Cited	7
Data Sheets.	8
Arizona	9
California.	11
Idaho	16
Nevada.	18
Oregon.	23
Washington.	26

Selected Administrative, Land, and Resource Data
for Known Geothermal Resources Areas in Arizona,
California, Idaho, Nevada, Oregon, and Washington

By H. E. Burkhardt, C. A. Brook, and F. W. Smith

INTRODUCTION

With the enactment of the Geothermal Steam Act of 1970, effective December 24, 1970, 43 Known Geothermal Resources Areas (KGRAs) were created in the States of Alaska, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Washington (Godwin and others, 1971). By late 1980, the number of KGRAs had increased to 107 as Arizona and Colorado were added to the list of States having KGRAs. Of this total, 80 KGRAs (75 percent) are in the six westernmost States--Arizona, California, Idaho, Nevada, Oregon, and Washington--administered by the Western Region of the U.S. Geological Survey's Conservation Division.

This is a summary of various administrative, land, and resource data for KGRAs in the six States. The data are compiled from published and unpublished classification, lease-sale evaluation, and resource assessment documents prepared by the Geological Survey and are current to December 1980. The KGRAs are listed alphabetically for each state. Because many of the KGRAs have undergone additions, deletions, and even name changes, additional classification actions for each KGRA are listed chronologically under the KGRA

name, thus affording a historical perspective of the KGRA's evolution.

EXPLANATION OF DATA SHEETS

The KGRA data summary for each State consists of two sets, A and B, indicated in brackets following the State name. Set A gives the following information for each KGRA and its additions and (or) deletions: the administrative number assigned to each classification document ("minutes"), three milestone dates, and five categories of acreage. Set B briefly describes the location of each KGRA, any surface geothermal expressions, and estimated reservoir temperatures where applicable. The various headings in the data sheets, though generally self-explanatory, are briefly defined here.

SET A

Minutes No.--The administrative number assigned to the document that defines or modifies a KGRA. This document is known as "Minutes of the Mineral Land Evaluation Committee" and contains the evidence supporting the classification action.

Minutes Date--An identifier date that appears in the heading of the minutes and generally indicates the beginning date (month-day-year) of minutes preparation.

Date Defined--The date (month-day-year) that the minutes and KGRA plat were signed by the Regional Conservation Manager, thereby officially promulgating the classification action.

Effective Date--The date (month-day-year) when the evidence supporting the classification action either was reviewed or became known, particularly in cases of competitive interest as defined in Title 43, Chapter II of the Code of Federal Regulations, subpart 3200.0-5(k)(3), or the date for the initial classification actions required by the Geothermal Steam Act of 1970 (see Godwin and others, 1971). Depending on the circumstances, the effective date precedes or coincides with the date that the KGRA was defined.

Total Acres Defined--The total, in acres, for land defined in each KGRA determination. "Total acres" is a sum of the approximate federal acres, which consist of federal competitive interest acres and federal non-competitive interest acres, and the private and State acres. Inasmuch as the acreages have been retabulated since definition of the KGRA, they may not correspond to the acreages reported in the minutes or on the KGRA plat (see footnote for set A of each State). Though not necessarily inaccurate, the acreages reported here should not be considered definitive for legal purposes.

Approximate Federal Acres--The total of federal competitive interest acres and federal non-competitive interest acres. For KGRAs that were originally defined with enactment of the Geothermal Steam Act of 1970 (see Godwin and others, 1971), federal competitive interest and federal non-competitive interest acres are listed as "0". Thus, the horizontal

summation of the competitive interest and non-competitive interest columns may not total to the acreage given in the "Approximate Federal Acres" column.

Federal Competitive Interest Acres--Land that was classified as a KGRA based on a formal determination by the Bureau of Land Management of competitive interest in that land. Competitive interest, as defined in Title 42, Chapter II of the Code of Federal Regulations, subpart 3200.0-5(k)(3), was demonstrated by lease applications that overlapped by at least one-half during the same filing period.

Federal Non-Competitive Interest Acres--Land that was classified as a KGRA based on geological information. At the time of classification, competitive interest did not exist.

Private and State Acres--The total of non-federal land.

SET B

Location/Township and Range, County, and BLM District or National Forest--

General geographic and administrative locators.

Surface Expression--A brief description of the surface geothermal manifestations that indicate the presence of a geothermal system.

Surface Temperature--The temperature(s) in degrees Celsius of thermal waters issuing at the surface.

Average Estimated Reservoir Temperatures--Three estimates--a minimum, maximum, and most likely--of characteristic reservoir temperatures in degrees Celsius, following the methodology of Brook and others (1979). In economic terms, reservoir temperatures give an approximation of the grade of the geothermal resource.

SOURCES OF ADDITIONAL INFORMATION

The back-up data for the classification actions are contained in the KGRA minutes for each action. These documents generally contain a description of the geology and other geotechnical data as they apply to defining KGRA boundaries, a brief description of any past exploration and development activities, a description of any geothermal manifestations (indicia), the legal basis for the action, a description of the lands involved, and a list of references. Copies of KGRA minutes can be purchased through a private vendor on contract with the Geological Survey. For the name, address, and phone number of the current vendor, contact the Office of the Deputy Conservation Manager, Resource Evaluation, Conservation Division, M/S 80, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025; telephone (415) 323-8111 extension 2053. Requests to the vendor should include the KGRA name, State, and minutes number(s).

Reports by Mariner and others (1978) and Renner and others (1976) contain compilations of data on several individual hydrothermal convection systems, many of which are within KGRAs and formed the basis, in whole or in part, for the KGRA classification. These publications list the locations,

brief descriptions of hydrothermal manifestations, well depths and temperatures, water chemistry, geothermometry, estimates of reservoir temperatures and volumes, calculated thermal energy contents, and references for each hydrothermal system. Much of this information is summarized in Brook and others (1979) and Renner, White, and Williams (1975). Brook and others (1979) also list estimates of recoverable thermal energy, beneficial heat, and electrical energy for those hydrothermal systems reported by Mariner and others (1978).

REFERENCES CITED

- Brook, C. A., Mariner, R. H., Mabey, D. R., Swanson, J. R., Guffanti, Marianne, and Muffler, L. J. P., 1979, Hydrothermal convection systems with reservoir temperatures $\geq 90^{\circ}\text{C}$, in Muffler, L. J. P., ed., Assessment of geothermal resources of the United States--1978: U.S. Geological Survey Circular 790, p. 18-85.
- Godwin, L. H., Haigler, L. B., Rioux, R. L., White, D. E., Muffler, L. J. P., and Wayland, R. G., 1971, Classification of public lands valuable for geothermal steam and associated geothermal resources: U.S. Geological Survey Circular 647, 18 p.
- Mariner, R. H., Brook, C. A., Swanson, J. R., and Mabey, D. R., 1978, Selected data for hydrothermal convection systems in the United States with estimated temperatures $\geq 90^{\circ}\text{C}$ --Back-up data for U.S. Geological Survey Circular 790: U.S. Geological Survey Open-File Report 78-858, 493 p.
- Renner, J. L., and others, 1976, Selected geothermal resources data--Hydrothermal convection systems in the States of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming: Springfield, Virginia, U.S. Department of Commerce, National Technical Information Service, PB-250 377, 357 p.
- Renner, J. L., White, D. E., and Williams, D. L., 1975, Hydrothermal convection systems, in White, D. E., and Williams, D. L., eds., Assessment of geothermal resources of the United States--1975: U.S. Geological Survey Circular 726, p. 5-57.

DATA SHEETS

Arizona.....	9
California.....	11
Idaho.....	16
Nevada.....	18
Oregon.....	23
Washington.....	26

NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	¹ TOTAL ACRES DEFINED	¹ APPROX. FEDERAL ACRES	¹ FEDERAL COMPETITIVE INTEREST ACRES	¹ FEDERAL NON-COMPETITIVE INTEREST ACRES	¹ PRIVATE & STATE ACRES
CLIFTON	1	09-24-74	11-25-74	02-01-74	780	780	780	0	0
GILLARD	2	09-25-74	09-27-74	02-01-74	2,460	2,460	2,460	0	0
" ADDITION	3	08-19-75	09-16-75	02-01-74	460	460	460	0	0
" TOTAL					2,920	2,920	2,920	0	0
GRAND TOTAL		2 KGRA _s			3,700	3,700	3,700	0	0

¹ The acreages reported here have been retabulated since the definition of the KGRA. For any of a variety of reasons, including recent cadastral surveys, recalculations of lake and land grant areas, and accounting errors, they may not be identical to those acreages reported in the KGRA minutes or on the KGRA plats. Although discrepancies are generally minor (less than 1 percent), these acreages should not be considered accurate for legal purposes.

NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	ELM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP. (°C)	¹ AVERAGE ESTIMATED RESERVOIR TEMPERATURES (°C)		
						MIN	MAX	MOST LIKELY
CLIFTON	T. 4 S., R. 30 E.	GREENLEE	SAFFORD	NONE	NONE		NONE	
GILLARD	T. 5 S., R. 29 E.	GREENLEE	SAFFORD	HOT SPRINGS	82	107	169	134

¹ From USGS Open-File Report 78-858 or estimated from chemical geothermometry and (or) well temperatures.

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
BECKWOURTH PEAK	26	06-04-75	07-02-75	02-01-74	2,558	2,558	2,558	0	0
BODIE	25		06-03-75	05-01-74	640	640	640	0	0
BRAWLEY	12	04-02-71	04-12-71	12-24-70	28,885	0	0	0	28,885
[CALISTOGA-REDESIGNATED IN GEYSERS-CALISTOGA KGRA]	4	03-01-71	03-04-71	12-24-70	351	0	0	0	351
COSO HOT SPRINGS	7	03-01-71	03-08-71	12-24-70	51,760	48,560	0	0	3,200
" ADDITION	29	06-15-76	06-21-76	02-01-74	5,106	5,106	5,106	0	0
" ADDITION	30		04-06-78	01-02-78	49,886	46,407	1,119	45,288	3,479
" TOTAL					106,752	100,073	6,225	45,288	6,679
DUNES	13	04-02-71	04-12-71	12-24-70	7,680	7,680	0	0	0
EAST MESA	15	09-03-71	09-23-71	09-03-71	37,714	31,052	0	0	6,662
FORD DRY LAKE	17	05-30-75	07-02-75	02-01-74	7,687	7,167	7,167	0	520
[GEYSERS-REDESIGNATED IN GEYSERS-CALISTOGA KGRA]	1	02-11-71	02-19-71	12-24-70	163,428	25,337	0	0	138,091
GEYSERS-CALISTOGA	16	12-18-74	12-24-74	02-01-74	92,509	2,478	2,478	0	90,031
" ADDITION	24	03-13-75	03-13-75	02-01-74	118,622	56,572	51,974	4,598	62,050
" ADDITION	31	04-24-78	05-22-78	09-01-77	1,120	720	720	0	400
" TOTAL (INCLUDES ORIGINAL GEYSERS AND CALISTOGA KGRA'S)					376,030	85,107	55,172	4,598	290,923
GLAMIS	14	04-02-71	04-12-71	12-24-70	25,460	23,539	0	0	1,921

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
GLASS MOUNTAIN	9	02-25-71	03-12-71	12-24-70	15,409	15,248	0	0	161
" ADDITION	23	05-30-75	05-30-75	02-01-74	17,927	17,667	13,746	3,921	260
" TOTAL					33,336	32,915	13,746	3,921	421
HEBER	11	04-02-71	04-12-71	12-24-70	58,568	10	0	0	58,558
KNOXVILLE	19	02-19-75	02-20-75	02-01-74	14,740	9,792	9,715	77	4,948
[LAKE CITY-REDESIGNATED IN LAKE CITY-SURPRISE VALLEY KGRA]	5	02-26-71	03-08-71	12-24-70	37,160	20,019	0	0	17,141
LAKE CITY-SURPRISE VALLEY	18	12-20-74	12-20-74	02-01-74	35,780	Large uncertainties owing to resurveys; values are approximations. (30,000) (28,000) (2,000) (4,000)			
" TOTAL					72,940	(50,019)	(28,000)	(2,000)	(21,141)
LASSEN	8	03-01-71	03-08-71	12-24-70	78,705	52,569	0	0	26,136
LITTLE HORSE MOUNTAIN	20	01-31-75	02-03-75	02-01-74	1,196	1,196	1,196	0	0
LOVELADY RIDGE	21	03-28-75	03-28-75	02-01-74	6,879	6,239	6,239	0	640
MONO-LONG VALLEY	3	02-17-71	03-01-71	12-24-70	458,514	352,072	0	0	106,442
RANDBURG	27	08-05-75	10-07-75	02-01-74	12,896	12,418	0	0	478
SALINE VALLEY	28	08-08-75	12-09-75	02-01-74	3,199	3,199	3,199	0	0
SALTON SEA	2	02-23-71	03-01-71	12-24-70	95,802	22,324	0	0	73,478
" ADDITION	33	09-05-80	09-19-80	09-05-80	7,085	0	0	0	7,085
" TOTAL					102,287	22,324	0	0	80,563
SESPE HOT SPRINGS	10		03-22-71	12-24-70	7,035	6,036	0	0	999
WENDEL-AMEDEE	6	03-02-71	03-08-71	12-24-70	18,431	9,385	0	0	9,115
WESTMORLAND	32	07-30-80	08-25-80	07-30-80	3,200	0	0	0	3,200

12

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
WITTER SPRINGS	22	05-07-75	05-30-75	02-01-74	18,770	4,004	4,004	0	14,586
GRAND TOTAL		24 KGRA's			1,484,702	*819,000	*138,000	*56,000	662,817

¹ KGRA's in brackets have been either completely deleted or redesignated in other KGRA's and are included here for historical purposes.

² The acreages reported here have been retabulated since the definition of the KGRA. For any of a variety of reasons including recent cadastral surveys, recalculations of lake and land grant areas, and accounting errors, they may not be identical to those acreages reported in the KGRA minutes or on the KGRA plats. Although discrepancies are generally minor (less than 1 percent), these acreages should not be considered accurate for legal purposes.

* Because of uncertainty for Lake City-Surprise Valley KGRA, values are rounded to nearest thousand.

NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	BLM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP. (°C)	2 AVERAGE ESTIMATED RESERVOIR TEMPERATURES (°C)		MOST LIKELY
						MIN	MAX	
BECKWORTH PEAK	T. 22-23 N., R. 14 E.	PLUMAS	PLUMAS N.F.	NONE	NONE			NONE
BODIE	T. 4 N., R. 26 E.	MONO	BAKERSFIELD	NONE	NONE			NONE
BRAWLEY	T. 12-13 S., R. 14 E.	IMPERIAL	RIVERSIDE	NONE	NONE	230	280	250
[CALISTOGA- REDESIGNATED IN GEYSERS-CALISTOGA KGRA]	T. 8-9 N., R. 6-7 W.	NAPA	UKIAH	HOT SPRINGS	78	137	153	141
COSO HOT SPRINGS	T. 20-22 S., R. 37-39 E.	INYO	BAKERSFIELD, CHINA LAKE NAVAL ORDINANCE TESTING SITE	HOT SPRINGS	97	190	240	230
DUNES	T. 15-16 S., R. 19 E.	IMPERIAL	RIVERSIDE	NONE	NONE	105	170	120
EAST MESA	T. 15-17 S., R. 16-18 E.	IMPERIAL	RIVERSIDE	NONE	NONE	165	200	180
FORD DRY LAKE	T. 6-7 S., R. 19 E.	RIVERSIDE	RIVERSIDE	NONE	NONE			NONE
[GEYSERS- REDESIGNATED IN GEYSERS-CALISTOGA KGRA]	T. 10-14 N., R. 7-9 W.	LAKE, SONOMA	UKIAH	FUMARoles, HOT SPRINGS, STEAM WELLS	101	215	255	240
GEYSERS-CALISTOGA	T. 10-15 N., R. 5-10 W.	LAKE, MENDOCINO, NAPA, SONOMA	UKIAH	HOT SPRINGS	SEE DATA FOR GEYSERS AND CALISTOGA KGRAS			
GLAMIS	T. 13-14 S., R. 17-18 E.	IMPERIAL	RIVERSIDE	NONE	NONE	105	170	120
GLASS MOUNTAIN	T. 43-44 N., R. 3-4 E.	SISKIYOU	KLAMATH, MODOC, SHASTA N.F.	WEAK FUMAROLE	NONE			NONE
HEBER	T. 16-17 S., R. 13-16 E.	IMPERIAL	RIVERSIDE	NONE	NONE	160	185	180
KNOXVILLE	T. 11-12 N., R. 4-5 W.	LAKE, NAPA, YOLO	UKIAH	WARM SPRINGS, SPRING DEPOSITS	22			NONE
[LAKE CITY- REDESIGNATED IN LAKE CITY- SURPRISE VALLEY KGRA]	T. 43-44 N., R. 15-17 E.	MODOC	SUSANVILLE	HOT SPRINGS, SMALL MUD VOLCANOES	98	129	185	143

NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	BLM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP. (°C)	AVERAGE ESTIMATED RESERVOIR TEMPERATURES (°C)		MOST LIKELY
						MIN	MAX	
LAKE CITY- SURPRISE VALLEY	T. 41-45 N., R. 15-17 E.	MODOC	SUSANVILLE, MODOC N.F.	HOT SPRINGS	SEE DATA FOR LAKE CITY KGRA			
LASSEN	T. 29-30 N., R. 4-6 E.	PLUMAS, TEHAMA	LASSEN N.F.	HOT SPRINGS	95	176	245	230
LITTLE HORSE MOUNTAIN	T. 16 N., R. 8-9 W.	LAKE	MENDOCINO N.F.	NONE	NONE	NONE		
LOVELADY RIDGE	T. 16 N., R. 6 W.	COLUSA	UKIAH	NONE	NONE	NONE		
MONO-LONG VALLEY	T. 1-4 S., R. 26-30 E.	MADERA, MONO	FOLSOM, BAKERSFIELD, INYO N.F.	FUMARoles, HOT SPRINGS	94	100	250	180
RANDBURG	T. 29-30 S., R. 41-42 E.	SAN BERNARDINO	RIVERSIDE	STEAM WELL	BOILING	115	250	150
SALINE VALLEY	T. 13 S., R. 39 E.	INYO	BAKERSFIELD	HOT SPRINGS	65	65	96	65
SALTON SEA	T. 9-12 S., R. 12-14 E.	IMPERIAL	RIVERSIDE	HOT SPRINGS, COOL MUD POTS	101	300	340	330
SESPE HOT SPRINGS	T. 6 N., R. 20 W.	VENTURA	LOS PADRES N.F.	HOT SPRINGS	89	109	148	136
WENDEL-AMEDEE	T. 28-29 N., R. 15-16 E.	LASSEN	SUSANVILLE	HOT SPRINGS	96	107	143	128
WESTMORLAND	T. 13 S., R. 13. E.	IMPERIAL	RIVERSIDE	HOT WELLS	NONE	180	225	190
WITTER SPRINGS	T. 15-16 N., R. 10-11 W.	MENDOCINO	UKIAH	NONE	NONE	NONE		

¹ KGRAs in brackets have been either completely deleted or redesignated in other KGRAs and are included here for historical purposes.

² From USGS Open-File Report 78-858 or estimated from chemical geothermometry and (or) well temperatures.

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
BRUNEAU	3		02-10-75	02-01-74	5,120	2,600	2,600	0	2,520
CASTLE CREEK	5	06-13-75	06-13-75	11-01-74	79,722	51,030	1,132	49,898	28,692
CONDA	10	08-17-78	08-29-78	01-01-78	2,566	1,242	1,242	0	1,324
CRANE CREEK	8	10-30-75	11-18-75	02-01-74	4,342	3,240	2,443	797	1,102
[FRAZIER- REDESIGNATED IN RAFT RIVER KGRA]	2	02-23-71	02-23-71	12-24-70	7,680	4,120	0	0	3,560
ISLAND PARK	7	10-15-75	11-18-75	04-01-75	28,539	28,539	28,539	0	0
MOUNTAIN HOME	4	03-21-75	03-21-75	02-01-74	9,520	5,103	5,103	0	4,417
RAFT RIVER	9	02-20-76	02-24-76	05-01-75	22,529	17,430	17,021	409	5,099
" TOTAL (INCLUDES FRAZIER KGRA)					30,209	21,550	17,021	4,529	8,659
VULCAN HOT SPRINGS	6	07-23-75	08-01-75	02-01-74	3,836	3,836	3,836	0	0
YELLOWSTONE	1	02-24-71	03-16-71	12-24-70	14,164	14,164	0	14,164	0
GRAND TOTAL		9 KGRAs			178,018	131,304	61,916	69,308	46,794

¹ KGRAs in brackets have been either completely deleted or redesignated in other KGRAs and are included here for historical purposes.

² The acreages reported here have been retabulated since the definition of the KGRA. For any of a variety of reasons, including recent cadastral surveys, recalculations of lake and land grant areas, and accounting errors, they may not be identical to those acreages reported in the KGRA minutes or on the KGRA plats. Although discrepancies are generally minor (less than 1 percent), these acreages should not be considered accurate for legal purposes.

1 NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	BLM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP (°C)	2 AVERAGE ESTIMATED RESERVOIR TEMPERATURES (°C)		MOST LIKELY
						MIN	MAX	
BRUNEAU	T. 7 S., R. 6 E.	OWYHEE	BOISE	HOT SPRINGS	41	90	120	110
CASTLE CREEK	T. 3-5 S., R. 1-3 E.	ADA, ELMORE, OWYHEE	BOISE	THERMAL WELLS, HOT SPRINGS	83	90	120	110
CONDA	T. 8 S., R. 42 E.	CARIBOU	IDAHO FALLS	NONE	NONE		NONE	
CRANE CREEK	T. 11 N., R. 3-4 W.	WASHINGTON	BOISE	HOT SPRINGS	92	151	200	163
[FRAZIER-REDESIGNATED IN RAFT RIVER KGRA]	T. 15 S., R. 26 E.	CASSIA	BURLEY	SEE DATA FOR RAFT RIVER KGRA				
ISLAND PARK	T. 10-12 N., R. 42-45 E.	FREMONT	IDAHO FALLS, TARGHEE N.F.	NONE	NONE		NONE	
MOUNTAIN HOME	T. 3-4 S., R. 8-9 E.	ELMORE	BOISE	HOT SPRING	55	110	150	125
RAFT RIVER (INCLUDES FRAZIER KGRA)	T. 13-16 S., R. 26-27 E.	CASSIA	BURLEY	HOT WELLS, WARM SEEPS	93	135	164	147
VULCAN HOT SPRINGS	T. 14 N., R. 6 E.	VALLEY	BOISE N.F.	HOT SPRINGS	87	87	140	138
YELLOWSTONE	T. 12-14 N., R. 45 E.	FREMONT	TARGHEE N.F.	NONE	NONE		NONE	

1 KGRAs in brackets have been either completely deleted or redesignated in other KGRAs and are included here for historical purposes.

2 From USGS Open-File Report 78-858 or estimated from chemical geothermometry and (or) well temperatures.

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
BALTAZOR	23	08-19-75	09-10-75	02-01-74	5,617	5,537	5,537	0	80
BEOVAWE	1	02-19-71	03-01-71	12-24-70	12,711	5,971	0	5,971	6,740
" ADDITION	16	10-17-74	11-19-74	02-01-74	20,512	10,639	10,639	0	9,873
" DELETION	39	12-10-79	12-10-79	12-10-79	7,044	2,764	2,764	0	4,280
" TOTAL					26,180	13,846	7,875	5,971	12,333
[BRADY HOT SPRINGS- REDESIGNATED IN BRADY-HAZEN KGRA]	5	02-24-71	03-04-71	12-24-70	19,020	10,646	0	10,646	8,374
BRADY-HAZEN	15	05-16-74	06-13-74	05-16-74	79,488	41,530	20,991	20,539	37,958
" TOTAL (INCLUDES BRADY HOT SPRINGS KGRA)					98,508	52,176	20,991	31,185	46,332
COLADO	22	08-12-75	08-13-75	02-01-74	640	640	640	0	0
DARROUGH HOT SPRINGS	7	02-26-71	03-04-71	12-24-70	8,363	5,843	0	5,843	2,520
DIXIE VALLEY	30	10-20-75	10-22-75	04-01-74	38,348	37,472	36,272	1,200	876
" ADDITION	38	03-28-79	03-28-79	02-01-79	29,274	29,274	28,634	640	0
" DELETION	40	07-10-80	07-28-80	07-10-80	5,720	5,720	5,080	640	0
" TOTAL					61,902	61,026	59,826	1,200	876
DOUBLE HOT SPRINGS	10	02-25-71	03-08-71	12-24-70	10,815	10,375	0	10,375	440
" ADDITION	21	06-31-75	08-19-75	03-01-74	18,511	18,431	17,868	563	80
" TOTAL					29,326	28,806	17,868	10,938	520
ELKO HOT SPRINGS	13	03-05-71	03-12-71	12-24-70	8,960	1,940	0	1,940	7,020
FLY RANCH	2	02-17-71	03-01-71	12-24-70	5,125	2,080	0	2,080	3,045
" ADDITION	18	02-13-75	02-20-75	03-01-74	15,633	13,212	13,212	0	2,421
" TOTAL					20,758	15,292	13,212	2,080	5,466
FLY RANCH NORIHEAST	29	11-14-75	12-05-75	08-01-74	7,680	7,680	7,680	0	0

18

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
GERLACH	8	02-25-71	03-08-71	12-24-70	8,972	7,823	0	7,823	1,149
" ADDITION	28	09-29-75	10-06-75	10-01-74	17,354	16,914	14,994	1,920	440
" TOTAL					26,326	24,737	14,994	9,743	1,589
GERLACH NORTHEAST	25	08-26-75	10-07-75	10-01-74	7,971	7,971	4,135	3,836	0
HOT SPRINGS POINT	17	11-08-74	11-13-74	02-01-74	8,549	5,341	5,341	0	3,208
KYLE HOT SPRINGS	37	03-19-76	04-22-76	03-19-76	2,560	2,400	0	2,400	160
LEACH HOT SPRINGS	3	02-16-71	03-01-71	12-24-70	9,006	8,446	0	8,446	560
" ADDITION	36	08-23-76	08-24-76	02-01-74	3,840	3,800	3,800	0	40
" TOTAL					12,846	12,246	3,800	8,446	600
MOANA SPRINGS	9	02-24-71	03-08-71	12-24-70	5,120	0	0	0	5,120
MONTE NEVA HOT SPRINGS	12	02-16-71	03-12-71	12-24-70	10,302	7,547	0	7,547	2,755
PINTO HOT SPRINGS	24	10-15-75	12-23-75	03-01-74	8,015	7,975	4,140	3,835	40
RUBY VALLEY	32	11-19-75	11-26-75	04-01-74	5,743	4,023	3,702	321	1,720
RYE PATCH	19	08-12-75	08-12-75	04-01-74	801	801	801	0	0
SALT WELLS BASIN	34	12-22-75	01-16-76	03-01-74	19,233	19,217	19,217	0	16
SAN EMIDIO DESERT	20	08-25-75	08-08-75	03-01-74	7,678	5,512	5,231	281	2,166
SILVER PEAK	26	09-25-75	10-03-75	02-01-74	5,117	5,079	5,079	0	38
SOLDIER MEADOW	31	10-15-75	01-19-76	02-01-74	5,967	3,984	3,984	0	1,983
STEAMBOAT SPRINGS	4	02-22-71	03-01-71	12-24-70	8,912	1,548	0	1,548	7,364
STILLWATER-SODA LAKE	6	02-24-71	03-04-71	12-24-70	225,260	116,872	0	116,872	108,388
TREGO	33	11-13-75	12-23-75	02-01-74	7,013	7,013	7,013	0	0
WABUSKA	11	03-01-71	03-08-71	12-24-70	11,520	5,640	0	5,640	5,880

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
WARM SPRINGS	35	12-16-75	01-20-76	03-01-74	3,812	3,532	1,320	2,212	280
WILSON HOT SPRINGS	27	11-05-75	11-03-75	02-01-74	1,294	1,294	654	640	0
GRAND TOTAL			30 KGRAS		651,972	435,518	213,040	222,478	216,454

¹ KGRAs in brackets have been either completely deleted or redesignated in other KGRAs and are included here for historical purposes.

² The acreages reported here have been retabulated since the definition of the KGRA. For any of a variety of reasons, including recent cadastral surveys, recalculations of lake and land grant areas, and accounting errors, they may not be identical to those acreages reported in the KGRA minutes or on the KGRA plats. Although discrepancies are generally minor (less than 1 percent); these acreages should not be considered accurate for legal purposes.

NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	BLM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP. (°C)	AVERAGE ESTIMATED RESERVOIR TEMPERATURE (°C)		MOST LIKELY
						MIN	MAX	
BALTAZOR	T. 46-47 N., R. 28-29 E.	HUMBOLDT	WINNEMUCCA	HOT SPRING	80	152	165	158
BEOVAWE	T. 30-32 N., R. 47-49 E.	EUREKA, LANDER	BATTLE MOUNTAIN, ELKO	FUMARoles, MUDPOTS, BOILING SPRINGS	98	211	251	226
[BRADY HOT SPRINGS]	T. 22-23 N., R. 26-27 E.	CHURCHILL,	WINNEMUCCA, CARSON CITY	FUMARoles, HOT SPRINGS	86- BOILING	140- 208	170- 229	155- 225
*BRADY-HAZEN	T. 20-23 N., R. 25-28 E.	CHURCHILL, LYON	WINNEMUCCA, CARSON CITY		SEE DATA FOR BRADY HOT SPRINGS KGRA			
COLADO	T. 28 N., R. 32 E.	PERSHING	WINNEMUCCA	HOT WELLS	60	61	128	101
DARROUGH HOT SPRINGS	T. 11 N., R. 42-43 E.	NYE	BATTLE MOUNTAIN	HOT SPRINGS	95	129	136	132
DIXIE VALLEY	T. 22-26 N., R. 34-38 E.	CHURCHILL, PERSHING	WINNEMUCCA, CARSON CITY	HOT SPRINGS	72	79- 127	114- 145	86- 145
DOUBLE HOT SPRINGS	T. 35 1/2-37 N., R. 26-27 E.	HUMBOLDT, PERSHING	WINNEMUCCA	HOT SPRINGS	80- 90	114- 116	140- 148	122- 127
ELKO HOT SPRINGS	T. 34 N., R. 55 E.	ELKO	ELKO	HOT SPRINGS	56	80	114	86
FLY RANCH	T. 33-34 N., R. 23-24 E.	WASHOE, PERSHING	WINNEMUCCA	HOT SPRINGS	80	99	126	100
FLY RANCH NORTHEAST	T. 35 N., R. 23 E.	PERSHING	WINNEMUCCA	NONE	NONE		NONE	
GERLACH	T. 31-33 N., R. 23-24 E.	WASHOE, PERSHING	WINNEMUCCA	HOT SPRINGS	96	158	205	170
GERLACH NORTHEAST	T. 33-34 N., R. 24 E.	PERSHING	WINNEMUCCA	NONE	NONE		NONE	
HOT SPRINGS POINT	T. 29-30 N., R. 48-49 E.	EUREKA	ELKO	HOT SPRINGS	54	74	116	87
KYLE HOT SPRINGS	T. 29 N., R. 36 E.	PERSHING	WINNEMUCCA	HOT SPRINGS	77	154	161	161
LEACH HOT SPRINGS	T. 31-32 N., R. 38-39 E.	PERSHING	WINNEMUCCA	HOT SPRINGS	92	155	170	160
MOANA SPRINGS	T. 19 N., R. 19 E.	WASHOE	CARSON CITY	HOT WELLS	90	96	155	96
MONTIE NEVA HOT SPRINGS	T. 21 N., R. 63-64 E.	WHITE PINE	ELY	HOT SPRING	79	79	104	79
PINTO HOT SPRINGS	T. 20 N., R. 28 E.	HUMBOLDT	WINNEMUCCA	HOT SPRING DEPOSITS	92	153	190	176

NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	BLM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP. (°C)	AVERAGE ESTIMATED RESERVOIR TEMPERATURE (°C)		MOST LIKELY
						MIN	MAX	
RUBY VALLEY	T. 31-32 N., R. 59 E.	ELKO	ELKO	HOT SPRINGS	93	171	183	181
RYE PATCH	T. 31-32 N., R. 33 E.	PERSHING	WINNEMUCCA	HOT SPRING DEPOSITS	NONE		NONE	
SALT WELLS BASIN	T. 17-18 N., R. 30-31 E.	CHURCHILL	CARSON CITY	NONE	NONE		NONE	
SAN EMIDIO DESERT	T. 29 N., R. 23 E.	WASHOE	WINNEMUCCA	HOT SPRINGS	95	125	189	185
SILVER PEAK	T. 2 S., R. 39 E.	ESMERALDA	LAS VEGAS	HOT SPRINGS	48		NONE	
SOLDIER MEADOW	T. 40 N., R. 24-25 E.	HUMBOLDT	WINNEMUCCA	THERMAL SPRINGS	54	64	113	84
STEAMBOAT SPRINGS	T. 17-18 N., R. 19-20 E.	WASHOE	CARSON CITY	HOT SPRINGS	96	186	207	207
STILLWATER-SODA LAKE	T. 19-21 N., R. 27-31 E.	CHURCHILL	CARSON	HOT SPRINGS, HOT WELLS	96	140- 144	165- 177	159- 161
TREGO	T. 34 N., R. 25-26 E.	PERSHING	WINNEMUCCA	HOT SPRINGS	84	96	124	124
WABUSKA	T. 15 N., R. 25 E.	LYON	CARSON CITY	HOT SPRING	97	106	146	140
WARM SPRINGS	T. 4 N., R. 50 E.	NYE	BATTLE MOUNTAIN	HOT SPRING	61	61	111	80
WILSON HOT SPRINGS	T. 10-11 N., R. 25 E.	LYON	CARSON CITY	STEAM VENTS(?)	NONE		NONE	

¹ KGRAs in brackets have been either completely deleted or redesignated in other KGRAs and are included here for historical purposes.

² From USGS Open-File Report 78-858 or estimated from chemical geothermometry and (or) well temperatures.

* Includes the "Desert Peak" prospect.

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
ALVORD	11	01-21-75	01-30-75	08-01-74	176,835	106,798	40,376	66,422	70,037
BELKNAP-FOLEY HOT SPRINGS	10	08-23-74	08-29-74	02-10-74	5,066	4,546	4,546	0	520
BREITENBUSH HOT SPRINGS	1	02-25-71	03-04-71	12-24-70	8,960	8,800	0	8,800	160
" ADDITION	16	06-12-75	06-12-75	03-01-74	4,485	4,485	4,485	0	0
" TOTAL					13,445	13,285	4,485	8,800	160
[BURNS BUTTE]	13	11-26-74	11-27-74	02-01-74	640	640	640	0	0
" DELETION	19	02-11-80	02-27-80	02-11-80	640	640	640	0	0
" TOTAL					0	0	0	0	0
CAREY HOT SPRINGS	6	02-25-71	03-08-71	12-24-70	7,579	7,427	0	7,427	152
CRUMP GEYSER	2	02-23-71	03-04-71	12-24-70	21,304	3,769	0	3,769	17,535
" ADDITION	14	05-29-75	05-29-75	02-01-74	64,359	35,414	5,143	30,271	28,945
" TOTAL					85,663	39,183	5,143	34,040	46,480
KLAMATH FALLS	7	03-31-71	04-12-71	12-24-70	17,300	40	0	40	17,260
" ADDITION	17	11-13-75	11-25-75	02-01-74	33,000	10,023	9,833	190	22,977
" DELETION	20	08-26-80	09-05-80	09-01-80	20,431	7,660	7,660	0	12,771
" TOTAL					29,869	2,403	2,173	230	27,466
LAKEVIEW	5	02-26-71	03-08-71	12-24-70	12,165	0	0	0	12,165
McCREDIE HOT SPRINGS	9	08-27-74	08-29-74	02-01-74	3,659	3,659	3,659	0	0
MOUNT HOOD	4	02-24-71	03-08-71	12-24-70	8,671	8,671	0	8,671	0

¹ NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	² TOTAL ACRES DEFINED	² APPROX. FEDERAL ACRES	² FEDERAL COMPETITIVE INTEREST ACRES	² FEDERAL NON-COMPETITIVE INTEREST ACRES	² PRIVATE & STATE ACRES
NEWBERRY CALDERA	18	05-21-76	05-21-76	02-01-74	31,284	31,284	17,103	14,181	0
SUMMER LAKE HOT SPRINGS	15	06-13-75	06-13-75	02-01-74	13,631	9,752	9,752	0	3,878
VALE HOT SPRINGS	3	02-26-71	03-04-71	12-24-70	8,940	1,347	0	1,347	7,593
" ADDITION	8	09-25-74	09-27-74	08-01-74	11,535	10,894	7,694	3,200	641
" ADDITION	12	12-18-74	12-20-74	05-01-74	2,523	2,003	2,003	0	520
" TOTAL					22,998	14,244	9,697	4,547	8,754
GRAND TOTAL		12 KGRAs			410,865	241,252	96,934	144,318	169,612

¹ KGRAs in brackets have been either completely deleted or redesignated in other KGRAs and are included here for historical purposes.

² The acreages reported here have been retabulated since the definition of the KGRA. For any of a variety of reasons, including recent cadastral surveys, recalculations of lake and land grant areas, and accounting errors, they may not be identical to those acreages reported in the KGRA minutes or on the KGRA plats. Although discrepancies are generally minor (less than 1 percent), these acreages should not be considered accurate for legal purposes.

1 NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	BLM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP (°C)	2 AVERAGE ESTIMATED RESERVOIR TEMPERATURES (°C)		
						MIN	MAX	MOST LIKELY
ALVORD	T. 32-37 S., R. 33-36 E.	HARNEY	BURNS	HOT SPRINGS	73-96	148	231	164-207
BELKNAP-FOLEY HOT SPRINGS	T. 16 S., R. 6 E.	LANE	WILLAMETTE N.F.	HOT SPRINGS	71-79	81	148	108
BREITENBUSH HOT SPRINGS	T. 8-9 S., R. 7 E.	MARION	MT. HOOD N.F.	FUMARoles, HOT SPRING	92	99	149	127
[BURNS BUTTE]	T. 23 S., R. 30 E.	HARNEY	BURNS	NONE	NONE		NONE	
CAREY HOT SPRINGS	T. 6 S., R. 6-7 E.	CLACKAMAS	MT. HOOD N.F.	HOT SPRINGS	86	87	126	98
CRUMP GEYSER	T. 37-41 S., R. 23-25 E.	LAKE	LAKEVIEW	HOT SPRINGS	78	144	185	173
KLAMATH FALLS	T. 38-41 S., R. 9-10 E.	KLAMATH	LAKEVIEW	HOT SPRING, HOT WELLS	74-99	99	138	104-131
LAKEVIEW	T. 38-39 S., R. 20 E.	LAKE	LAKEVIEW	HOT SPRINGS	96	143	158	149
McCREDIE HOT SPRINGS	T. 21-22 S., R. 4-5 E.	LANE	WILLAMETTE N.F.	HOT SPRINGS	73	81	96	96
MT. HOOD	T. 2 S., R. 9 E.	HOOD RIVER, CLACKAMAS	MT. HOOD N.F.	FUMARoles, HOT SPRING	90	90	150	125
NEWBERRY CALDERA	T. 21-22 S., R. 12-13 E.	DESCHUTES	DESCHUTES N.F.	THERMAL SPRING	62	180	280	230
SUMMER LAKE HOT SPRINGS	T. 33 S., R., 17-18 E.	LAKE	LAKEVIEW	HOT SPRING	43	107	134	112
VALE HOT SPRINGS	T. 18-20 S., R. 45-46 E.	MALHEUR	VALE	HOT SPRING	97	152	161	157

1 KGRAs in brackets have been either completely deleted or redesignated in other KGRAs and are included here for historical purposes.

2 From USGS Open-File Report 78-858 or estimated from geothermometry and (or) well temperatures.

NAME OF KGRA	MINUTES NO.	MINUTES DATE	DATE DEFINED	EFFECTIVE DATE	¹ TOTAL ACRES DEFINED	¹ APPROX. FEDERAL ACRES	¹ FEDERAL COMPETITIVE INTEREST ACRES	¹ FEDERAL NON-COMPETITIVE INTEREST ACRES	¹ PRIVATE & STATE ACRES
INDIAN HEAVEN	4	06-11-75	06-12-75	03-01-75	2,547	2,547	2,547	0	0
KENNEDY HOT SPRING	2	11-26-74	11-27-74	02-01-74	3,311	3,311	3,311	0	0
MOUNT ST. HELENS	1	02-23-71	03-04-71	12-24-70	17,622	13,420	0	13,420	4,202
" ADDITION	3	04-09-75	04-09-75	02-01-74	12,133	9,700	9,700	0	2,433
" TOTAL					29,755	23,120	9,700	13,420	6,635
GRAND TOTAL			3 KGRA _s		35,613	28,978	15,558	13,420	6,635

¹ The acreages reported here have been retabulated since the definition of the KGRA. For any of a variety of reasons, including recent cadastral surveys, recalculations of lake and land grant areas, and accounting errors, they may not be identical to those acreages reported in the KGRA minutes or on the KGRA plats. Although discrepancies are generally minor (less than 1 percent), these acreages should not be considered accurate for legal purposes.

NAME OF KGRA	LOCATION TOWNSHIP & RANGE	COUNTY	BLM DISTRICT OR NATIONAL FOREST (N.F.)	SURFACE EXPRESSION	SURFACE TEMP (°C)	¹ AVERAGE ESTIMATED RESERVOIR TEMPERATURES (°C)		MOST LIKELY
						MIN	MAX	
INDIAN HEAVEN	T. 6 N., R. 8-9 E.	SKAMANIA	GIFFORD PINCHOT N.F.	LAVA FLOWS	NONE			NONE
KENNEDY HOT SPRING	T. 30-31 N., R. 12 E.	SNOHOMISH	MT. BAKER N.F.	THERMAL SPRING	32			NONE
MOUNT ST. HELENS	T. 7-9 N., R. 4-6 E.	SKAMANIA, COWLITZ	GIFFORD PINCHOT N.F.	ACTIVE VOLCANO, FUMARoles, HOT SPRING	80			NO DATA

¹ From USGS Open-File Report 78-858 or estimated from chemical geothermometry and (or) well temperatures.