



DEPARTMENT OF THE INTERIOR

National Park Service

[NPS-WASO-GRD-22583]

[GPO Deposit Account 4311-H2]

Notice of Proposed Addition of Thermal Features within Valles Caldera National Preserve to the Geothermal Steam Act List of Significant Thermal Features within Units of the National Park System

AGENCY: National Park Service, Interior.

ACTION: Notice of Proposal.

SUMMARY: The National Park Service (NPS) is publishing for public review and comment a proposal that the Department of the Interior (Department) designate the thermal features within Valles Caldera National Preserve (Preserve), New Mexico, as “significant thermal features,” and that they be added to the list of significant thermal features within units of the National Park System, in accordance with the Geothermal Steam Act (the Act), as amended. The Act requires that those thermal features in units of the National Park System that are determined to be significant, and included in or added to the list at 30 U.S.C. 1026, must be protected from any geothermal leasing, exploration, development or utilization that might adversely affect those features.

DATES: Comments must be received on or before [INSERT 30 DAYS AFTER THIS PROPOSAL IS PUBLISHED IN FEDERAL REGISTER] to be assured of receiving consideration. After considering all comments received, the NPS will issue a final notice of the Department's determination in the Federal Register. Copies of public comments received in response to this Notice will be available for public review according to the specifications of the final notice.

ADDRESSES: Submit comments to the PEPC website at <https://parkplanning.nps.gov/vallego>.

FOR FURTHER INFORMATION CONTACT: Ms. Julia F. Brunner, Policy and Regulatory Specialist, Geologic Resources Division, National Park Service, P.O. Box 25287, Lakewood CO 80225-0287; telephone 303-969-2012.

SUPPLEMENTARY INFORMATION:

The Geothermal Steam Act (the Act), as amended, authorizes the Secretary of the Interior (Secretary) to issue geothermal leases for exploration, development and utilization of geothermal resources on available public lands administered by the Department of the Interior, as well as on federal lands administered by the Department of Agriculture, and on lands that have been conveyed by the United States subject to a reservation to the United States of the geothermal resources in those lands. 30 U.S.C. 1002. The Bureau of Land Management (BLM) administers the geothermal program pursuant to its regulations at 43 CFR Parts 3000, 3200, and 3280. On federal lands managed by the Agriculture

Department or used for a federal water power project, the BLM must first obtain the consent of the Secretary of Agriculture or Secretary of Energy, respectively, before it may issue any leases for geothermal resources underlying those lands. See 30 U.S.C. 1014(b).

The Act does not make lands administered by the NPS subject to geothermal leasing, thereby prohibiting geothermal leasing in park units (30 U.S.C. 1002, 1014(c)). In addition, the Valles Caldera National Preserve has been expressly withdrawn from the operation of the geothermal leasing laws. 16 U.S.C. 698v-11(b)(9).

The Act requires the Secretary to maintain a list of significant thermal features within units of the National Park System (30 U.S.C. 1026(a)). For those listed significant thermal features, the Act requires:

- (1) the Secretary to maintain a monitoring program, including a research program carried out by NPS in cooperation with the U.S. Geological Survey (30 U.S.C. 1026(b));
- (2) the Secretary to determine, on the basis of scientific evidence, and subject to notice and public comment, whether exploration, development, or utilization of the land subject to a lease application would be reasonably likely to result in a significant adverse effect on any listed feature and, if so, not to issue the lease (30 U.S.C. 1026(c));
- (3) the Secretary to determine, on the basis of scientific evidence, whether the exploration, development, or utilization of the land subject to a lease or drilling permit is reasonably likely to adversely affect any listed features and, if so, to include stipulations in the lease or drilling permit to protect those features (30 U.S.C. 1026(d));

(4) the Secretary of Agriculture to consider the effects on significant thermal features within units of the National Park System in determining whether to consent to leasing on national forest lands or other lands administered by the Department of Agriculture (30 U.S.C. 1026(e)).

The Act lists sixteen park units as having significant thermal features, and the Act also authorizes the Secretary to add significant thermal features within park units to the list after notice and public comment (see 30 U.S.C. 1026(a)). With regard to the proposed designation of the thermal features within Valles Caldera, it is instructive to briefly review the earlier law and Federal Register notices on which the provisions of the Act, which are described above, were based.

In 1986, the Department of the Interior and Related Agencies Appropriations Act, Pub. L. 99-591, Section 115 paragraph 2(a) (the 1986 Act) directed the Secretary to collect and publish in the Federal Register, within 120 days, a proposed list of significant thermal features within park units, and provided a preliminary list of 22 park units. The 1986 Act required four criteria to be applied to each thermal feature when making an overall determination of significance. These four criteria were:

- (1) Size, extent, and uniqueness,
- (2) Scientific and geologic significance,
- (3) The extent to which such features remain in a natural, undisturbed condition, and
- (4) Significance of thermal features to the authorized purposes for which the park unit was created.

The Department designated the NPS as the lead agency to prepare and publish the list. On February 13, 1987, as directed by the 1986 Act, the NPS published a Notice of the Proposed List of Significant Thermal Features within Units of the National Park System (52 FR 4700). After receiving 23 comments on the February 1987 notice, the NPS published the final list on August 3, 1987 (52 FR 28790), concluding that 13 park units contained significant thermal features. The 1988 Act subsequently listed these 13 park units, as well as three additional park units, as containing significant thermal features (30 U.S.C. 1001(f)).

In the process of designating the significant thermal features pursuant to the 1986 Act, the NPS defined a “thermal feature” broadly as “surface manifestations of a subsurface heat source” (see 52 FR 29890, 28792 (Aug. 3, 1987)) or “subsurface thermal activity” (see 52 FR 4700, 4702 (Feb. 13, 1987)). The NPS’s 1987 definition of “thermal feature” encompassed not only the surface manifestations of underlying hydrothermal systems, but also surface manifestations of volcanic processes (see 52 FR 29890, 28792). When listing various thermal features, the NPS categorized them as “hydrothermal” or “volcanic” to indicate the surface manifestation resulting from differing types of subsurface thermal activity, systems or features, although this description did not affect the significance of any particular feature (see *id.*; 53 FR 4700, 4702).

More recently, the NPS has defined “thermal resources” as comprising a subsurface heat source, heat conduit rock formations, and air and/or water that circulates through the

formation and may discharge at the surface; such resources create features such as geysers, hot springs, mudpots, fumaroles, unique/rare mineral precipitates and formations, and hydrophilic biotic communities (NPS Management Policies § 4.8.2.3)(2006)). To be consistent with both the 1987 and the 2006 definitions, the NPS proposes in this notice to define “thermal feature” as the surface manifestation of subsurface thermal resources, systems, or activity, and to use the words “hydrothermal” and “volcanic” as a simple description of the type of underlying thermal activity that resulted in how the feature appears on the earth’s surface.

For the purpose of this notice, the NPS also proposes to remain consistent with both of its 1987 interpretations of the four significance criteria as follows:

(1) Size, extent, and uniqueness -- NPS does not establish lower or upper limits on the size or extent of a feature. Each feature is identified according to its existing surface dimensions. For a feature to be considered significant under this criterion, it is identified as unique to the region, the nation, or, in some cases, the world.

(2) Scientific and geologic significance -- NPS considers the feature "significant" when the feature has been identified as contributing to geologic, biological, or other scientific knowledge compared with similar features in other areas or makes a significant contribution to the understanding of similar systems.

(3) The extent to which such features remain in a natural, undisturbed condition -- Under this criterion, no limits are established for amount or degree of development. The feature may be significant if it remains in a natural, relatively undisturbed condition.

Modifications or improvements may be acceptable if: the alterations were necessary to

preserve a developed feature; modifications intended to accommodate or improve public enjoyment of the feature are judged to be consistent or compatible with the intent of the enabling legislation; and so long as disturbances or developments, if any, have not affected the subsurface thermal regime.

(4) Significance of thermal features to the authorized purposes for which the park unit was created -- NPS considers features significant if they were the basis for establishment of the unit (i.e., the feature was specifically identified in the enabling legislation) or if they are consistent with the statutory purposes for which the area was set aside (see 52 FR at 28793).

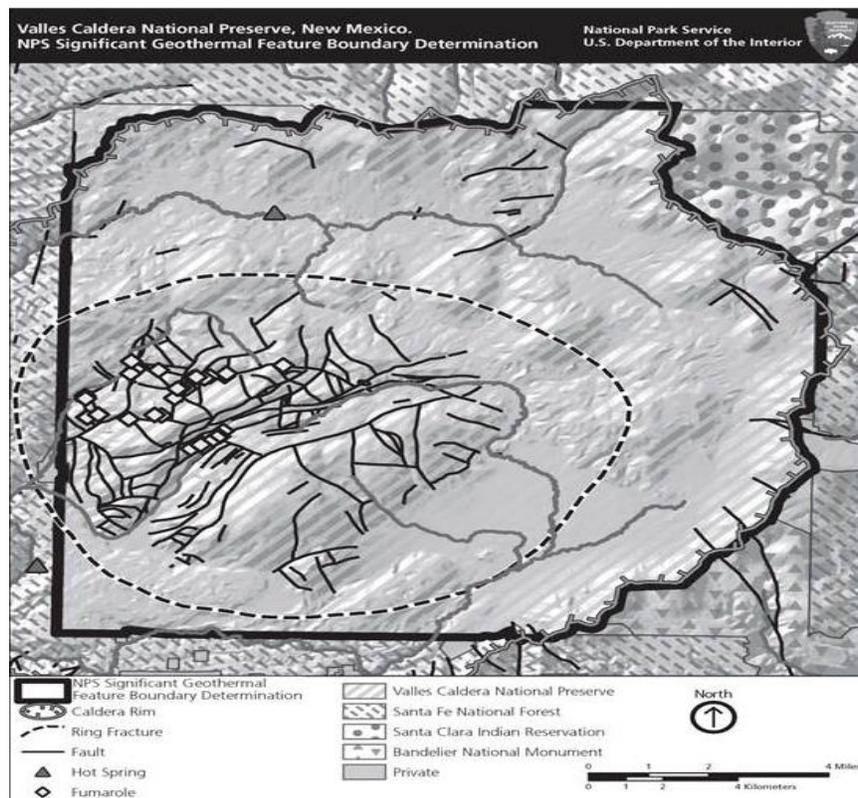


Figure 1. Map of the Valles Caldera National Preserve showing the boundary of the designated significant thermal feature.

Proposal

Valles Caldera National Preserve was added as a unit of the National Park System on December 19, 2014. This unit includes the vast majority of the caldera itself, which is hereby proposed for addition to the list of significant thermal features as a single volcanic feature. Excepted from this proposal is the portion of the caldera (10-15%) which lies outside the Preserve's western and southern boundaries (see Figure 1). The subsurface heat that remains of this volcanic activity allows meteoric waters percolating down from the surface to become heated, which is expressed at the surface in several places within and in the vicinity of the caldera in the form of hydrologic hot springs or, in dry seasons, fumaroles or steam vents. The Preserve contains numerous thermal features (single or grouped contiguous features such as hot spring pools) in four geographic areas containing surface waters (Redondo Creek, Alamo Canyon, Sulphur Creek Canyon, and San Antonio Creek), as well as seasonal fumaroles and acid ponds or springs. These thermal features are also separately proposed for inclusion to the list as significant thermal (hydrothermal) features.

The Department proposes to list the entirety of the caldera that lies within Valles Caldera National Preserve as one significant thermal feature. The Preserve's thermal feature is part of a geothermal landscape that extends beyond the Preserve's perimeter boundary; thermal features located outside the Preserve's perimeter boundary are not included in this proposed designation (Fig. 2). The magma chamber beneath the Preserve is located under the southwest portion of the caldera (Fig. 3), with surface expressions of thermal features primarily in the vicinity of Redondo Canyon, Sulphur Creek Canyon, and Alamo Canyon. A total of 29 geothermal fumaroles have been mapped in these canyons (Fig. 4), and others may exist in other areas of the Preserve that have not yet been surveyed (Goff and Goff, 2017). Currently, approximately 1/3 of the Preserve has been surveyed. In addition, a detailed geologic and hydrologic GIS map has been developed. See http://geoinfo.nmt.edu/repository/data/2011/20110002/GM-79_mapsheet.pdf. (Fig. 5).

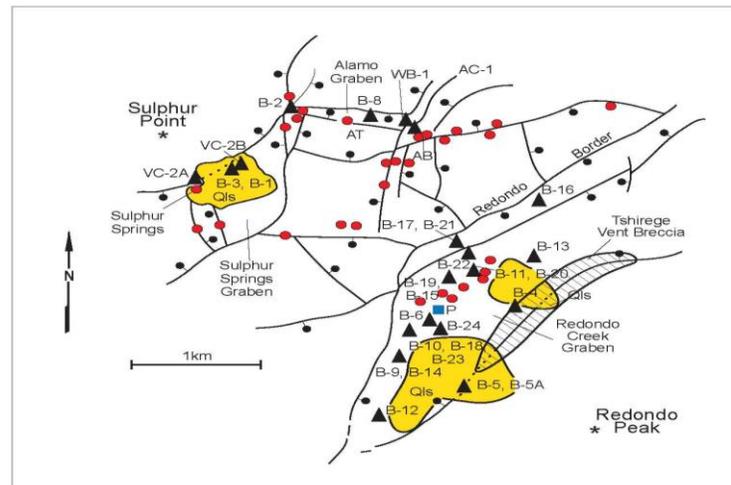


Figure 4. Simplified fault map of the southwestern resurgent dome area showing locations of H₂S-rich fumaroles and gas vents (red circles). Abbreviations : AB = Alamo Bog and AT = Alamo Tank. Locations of the majority of geothermal and scientific wells are shown as black triangles. Largest landslides (QIs) are yellow, which disguise some of the larger faults. Small blue square by letter P shows proposed 1980 location of 50 MWe power plant. Most of the gas vents have not been sampled or studied.

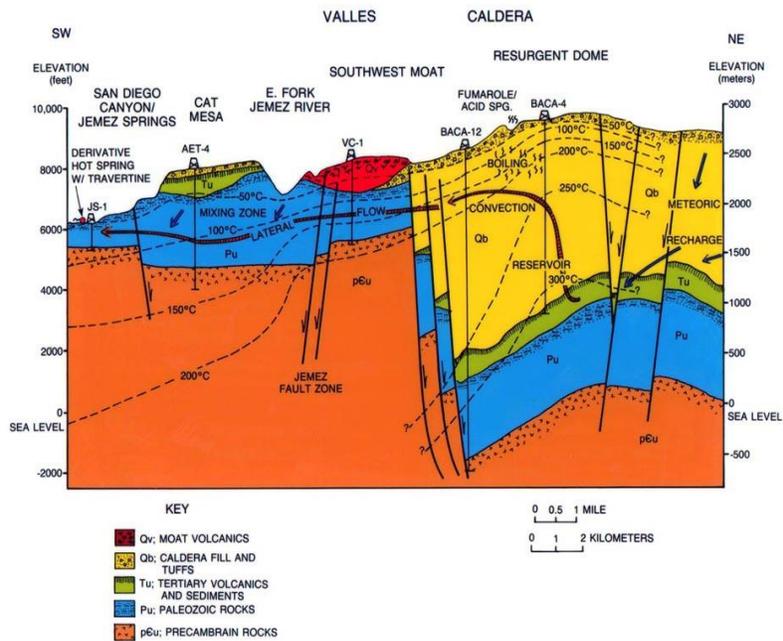


Figure 5. Schematic cross-section map of the Valles Caldera geothermal system, showing belowground formations and flow patterns of water and heat. From Goff (2009). As stated by Goff (2009, Fig. 44, p. 76), “Rainwater and snowmelt (“meteoric water”) percolate slowly into the caldera, where they are heated to 570° F (300° C) and form a reservoir. The hot reservoir fluid leaches minerals from the enclosing rocks. Because hot water is more buoyant than cold water, the reservoir fluids rise by convection and boil as they approach the surface. Steam from boiling makes fumaroles and acid springs at the surface. The residual water in the top of the reservoir leaks through the southwest caldera wall and flows down faults and other permeable pathways along San Diego Canyon. The residual water mixes with other groundwaters and eventually issues as hot springs at Soda Dam and Jemez Springs.”

The following significance criteria have been analyzed and are applicable to every component of the caldera feature and volcanic system within the Preserve.

(1) Size, extent, and uniqueness:

The approximately 89,000-acre Preserve encompasses a 1.25 million year-old dormant volcanic caldera (13.7 miles in diameter) that lies in the center of the Jemez Mountains in northern New Mexico. The youngest post-caldera volcanic eruption (Banco Bonito Rhyolite lava flow) occurred about 68 thousand years ago. The Valles Caldera that

formed 1.25 million years ago is the younger of two calderas within the Preserve, and lies to the southwest of the comparably sized but now nearly imperceptible Toledo Caldera (1.62 Ma; Fig. 6). Each caldera produced about 95 mi³ (400 km³) of ash flow tuff collectively known as the Bandelier Tuff. Numerous geothermal features occur throughout the Jemez Mountains. The Preserve does not encompass the entirety of the Valles Caldera depression itself—a portion of the northwestern caldera lies outside the boundary of the park unit to the west and south of the Preserve, in the Santa Fe National Forest. The subsurface volcanic heat anomaly or thermal system similarly extends outside of the park unit to the west.

(2) Scientific and geologic significance:

Water, steam, and soil samples from these sites have been and continue to be collected by scientists conducting geothermal and planetary research, and by scientists searching for living organisms in extreme environments. Because of its geologic uniqueness, NPS staff will use this area for public education, as the site illustrates the exceptional geologic values of the Jemez Mountains—sulfuric acid fumaroles and mud pots, and chloride-bicarbonate hot springs and cold springs—all characteristics of geologically active volcanic formations.

(3) The extent to which the feature remains in a natural, undisturbed condition:

The San Antonio Warm Springs and the Sulphur Springs-Alamo Canyon areas have been moderately to significantly disturbed by development (recreational structures, containment ponds, and other improvements as well as several geothermal exploration wells (drilled between 1970-1984), most of which have been permanently capped and reclaimed) that occurred prior to federal acquisition of the Preserve in 2000; however,

such alterations have not changed the thermal regime. Other features, such as acid ponds and fumaroles, are undisturbed in natural habitats. Despite some past geothermal exploration and drilling, the caldera itself as a volcanic feature remains unaffected in the operation of its volcanic thermal regime, and thus remains in a natural, undisturbed condition.

(4) Significance of thermal features to the authorized purposes for which the park unit was created:

Valles Caldera National Preserve was established “to protect, preserve, and restore the fish, wildlife, watershed, natural, scientific, scenic, geologic, historic, cultural, archaeological, and recreational values of the area” (P.L. 113-291, Sec. 3043(b)(1)). The caldera is an important natural and geologic resource, contributes to scientific understanding of the geology of the region, and also contributes to the other values for which this NPS unit was established.

Conclusion: Because the Valles Caldera appears to meet all four criteria as a volcanic feature, the Department proposes to add it to the list of significant thermal features within the National Park System.

Hydrothermal Features

Like Yellowstone National Park, which is also a caldera, Valles Caldera National Preserve contains multiple hydrothermal features that are related to the magma source. In addition, the dynamic nature of this area means that additional hydrothermal features may develop over time. The NPS therefore proposes to list these hydrothermal features as one

significant thermal feature. The following significance criteria have been analyzed for each feature listed and has been found to be applicable to each feature within the system.

(1) Size, extent, and uniqueness:

Size -- The hydrothermal features within the Preserve are located on approximately 500 acres.

Extent – (a) San Antonio Warm Spring is a single spring discharging potable hot water at 101°F, over which 20th-century ranchers built an enclosed concrete bath adjacent to a nearby cabin. This spring is located in the north-central portion of the Preserve adjacent to the segment of the San Antonio Creek within the Valle San Antonio.

(b) In addition, the Preserve has numerous hot and cold sulfuric acid fumaroles, particularly in the Alamo Canyon and Redondo Canyon regions. There are at least 29 fumaroles mapped in the Redondo and Alamo canyon areas; see Fig 2 and the map at: http://geoinfo.nmt.edu/repository/data/2011/20110002/GM-79_mapsheet.pdf. Others may occur but have not been sampled or surveyed.

(c) The 40-acre private inholding of Sulphur Springs contains the highest temperature hot springs (189°F) in the state of New Mexico; the Sulphur Springs area includes at least 7 significant named hot springs, mud pots and fumaroles, all of which are thermally anomalous; several other acid springs and gas vents are cold. The springs include such colorful descriptive names as Kidney and Stomach Trouble Spring, Footbath Spring, Ladies' Bathhouse Spring, Laxitive [sic] Spring, Turkey Spring, Lemonade Spring, and Electric Spring. Some of these were historically referred to as Main Bathhouse Spring, Sour Spring, and Alum Spring.

(d) Valle Grande spring: The easternmost named spring within the Preserve is the Valle Grande Spring (14°C), although topographic maps indicate numerous other surrounding unnamed springs.

Uniqueness -- These springs and fumaroles (some of which take the form of bubbling mudpots in wet seasons) are indicators of subsurface thermal processes, are unique to the region, and are easily accessible for study and research; there are no comparable features in the State of New Mexico. The only other places in the United States that have such systems are Yellowstone National Park in Wyoming, Montana, and Idaho; Lassen Volcano, the Long Valley Caldera, and The Geysers in California, the latter two having thermal regimes degraded by geothermal production; and a very small system at Dixie Valley, Nevada.

(2) Scientific and geologic significance: Water, steam, and soil samples from these sites have been and continue to be collected by scientists conducting geothermal and planetary research, and by scientists searching for living organisms in extreme environments.

Because of its geologic uniqueness, NPS staff will use this area for public education, as the site illustrates the exceptional geologic values of the Jemez Mountains—sulfuric acid fumaroles, mud pots, hot springs, cold springs—all characteristics of geologically active volcanic formations.

(3) The extent to which the feature remains in a natural, undisturbed condition: San Antonio Warm Spring has been slightly to moderately disturbed by construction of recreational structures such as a cabin and a containment ponds that occurred prior to federal acquisition of the Preserve in 2000, but these were constructed to support the recreational use of the feature. However, such alterations have not changed the thermal

regime. The overall hydrothermal system activity and temperature thus remains unchanged and in a natural, undisturbed state. The Sulphur Springs-Alamo Canyon areas were moderately to significantly disturbed by development (recreational structures, containment ponds, and other improvements as well as several geothermal exploration wells (drilled between 1970-1984); however, such alterations have not changed the thermal regime. Other features, including the Redondo Creek fumaroles (steam vents in dry season and mud pots or minor springs in wet seasons) are undisturbed in natural habitats. The overall hydrothermal system remains unchanged because it was never subjected to full-scale commercial development.

(4) Significance of the feature to the authorized purposes for which the unit was created: Valles Caldera National Preserve was established “to protect, preserve, and restore the fish, wildlife, watershed, natural, scientific, scenic, **geologic**, historic, cultural, archaeological, and recreational values of the area” (P.L. 113-291, Sec. 3043(b)(1) (emphasis added)). While the Act does not specifically refer to hydrothermal features or their use by the public among the criteria for which the park unit was created, the presence and preservation of such features as surface expressions of the subsurface volcanic activity is consistent with the purposes and uses of which the park was created. The hydrothermal features are important geologic resources associated with the Preserve and the Jemez Mountains, contribute to scientific understanding of the geology of the region, and also contribute to the other values for which this system unit was established. Conclusion: Because the hydrothermal system at Valles Caldera appears to meet all four criteria, the Department proposes to add it to the list of significant thermal features within the National Park System.

Once designated, the NPS will continue to work closely with the BLM and the U.S.

Forest Service to ensure that monitoring data and other scientific information regarding the significant thermal features of Valles Caldera National Preserve are incorporated into leasing and permitting decisions.

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DATED: December 19, 2016.

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