

Summary of Findings and Conclusion

Unit Name and Number: WIU #CDCA 159-1 & 159A-1 (Upper Sage Canyon)

Summary

Results of Analysis:

1. Does the area meet any of the size requirements? **Yes**
2. Does the area appear to be natural? **Yes**
3. Does the area offer outstanding opportunities for solitude or a primitive and unconfined type of recreation? **Yes**
4. Does the area have supplemental values? **Yes**

Conclusion

The area has wilderness characteristics.

Prepared by:

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Date: 12-04-2013

Approved by:



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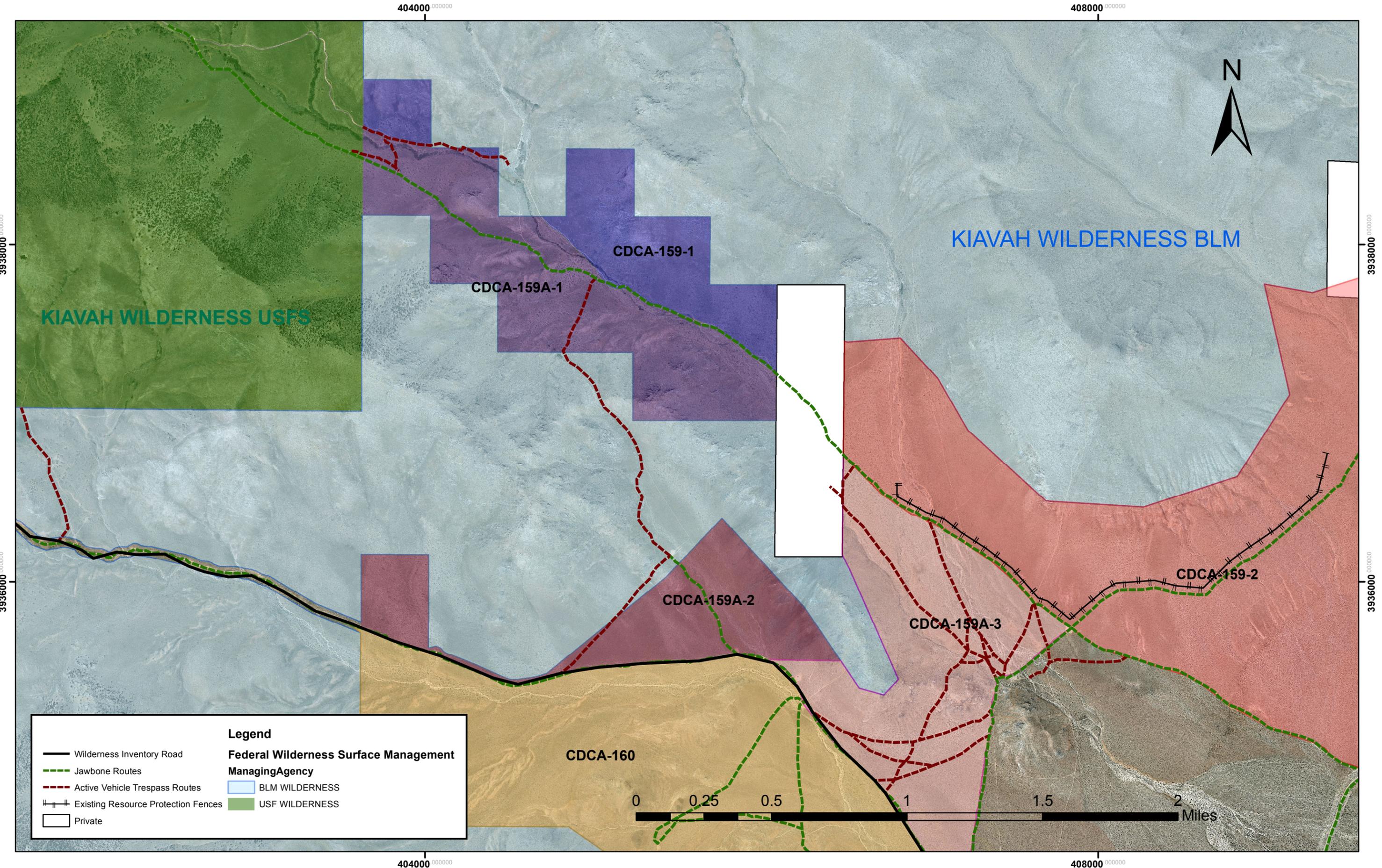
Date

12/19/2013



This form documents information that constitutes an inventory finding on wilderness characteristics. It does not represent a formal land use allocation or a final agency decision subject to administrative remedies under either 43 CFR parts 4 or 1610.5-2.

Overview Map WIU #CDCA 159-1, 159A-1 & 159A-2
October 25, 2013



Year 2013 Inventory Unit Number/Name WIU #CDCA 159-1 & 159A-1 (Upper Sage Canyon)

FORM 1

Documentation of BLM Wilderness Inventory Findings On Record

1. Is there existing BLM wilderness inventory information on all or part of this area? Yes

Inventory Source: 1979 CDCA Wilderness Inventory Final Descriptive Narratives, BLM Ridgecrest FO

Inventory Unit Name(s)/Number(s): WIU #CDCA 159 & 159A

Map Name(s)/Number(s): USDI BLM CASO Wilderness Final Inventory, March 31, 1979

BLM District(s)/Field Office(s): Ridgecrest Field Office

2. BLM Inventory Findings on Record

Existing inventory information regarding wilderness characteristics:

Inventory Source: 1979 CDCA Wilderness Inventory Final Descriptive Narratives, BLM, Ridgecrest FO

Unit#/ Name	Size (acres)	Natural Condition? Y/N	Outstanding Solitude? Y/N	Outstanding Primitive & Unconfined Recreation? Y/N	Supplemental Values? Y/N
1979 Findings within WIU #CDCA 159 (Upper Sage Cyn.)	Y ~14,500 acres	Y	Y	Y	Y
2013 Findings within WIU #CDCA 159 (Upper Sage Cyn.)	Y 212.39 contiguous acres	Y	Y	Y	Y
1979 Findings within WIU #CDCA 159A (Upper Sage Cyn.)	Y ~2,500 contiguous acres	N	Y	N	Y
2013 Findings within WIU #CDCA 159A (Upper Sage Cyn.)	Y 362.63 contiguous acres	Y	Y	Y	Y

Summarize any known primary reasons for prior findings in this table:

The original **1979 WIU #CDCA 159** was bounded on the north by Highway 178, on the east by the Los Angeles Aqueduct Maintenance Road, on the south by the Sage Canyon Road, and on the west by the Sequoia National Forest RARE II Area. Approximately 10-15% of the land was privately owned. Most of this land was located in the western and northern portions of the unit.

The unit encompassed the steep mountains of the eastern Sierra Nevada and their interface with the upper Mojave desert. The terrain consisted of high mountain ridges and intervening deep canyons. Elevations ranged from 3400' on the desert floor to 6700' along the tallest ridgetop. The canyon floors were notable for their dense clusters of Joshua trees, low desert shrubs, and cactus; the sandy, mountainsides for their sparse, mixed desert shrubs; and the ridgetops for their pinyon-juniper forests.

The area was defined as roadless and was characterized as being affected primarily by the forces of nature. Lower slopes where off-road vehicles had easy access were excluded from the unit, as was the maintained road into Cow Heaven where adjacent stock watering ponds and other range improvements were noticeable.

Outstanding opportunities for solitude and for primitive and unconfined recreation were found to be available within the unit. The deep, winding canyons and adjacent Sequoia National Forest RARE II Area were felt to enhance these opportunities.

The 1990 Wilderness Study Report called the unit the "Cow Heaven WSA," attaching 8,873 acres to the unit, 8,155 acres of which were publicly-owned land. The WSA was found to contain approximately 85% mountains and 15% alluvial fans. Elevations ranged from 4,000' along its eastern boundary to up to 6,000' on its tallest mountain ridgelines. The entire WSA was noted to be within the Jawbone-Butterbret Area of Critical Environmental Concern (ACEC).

The BLM recommended 0 acres for wilderness. The decision was based largely upon the fact that the contiguous Sequoia National Forest RARE II area had not been designated wilderness. BLM did not feel that the WSA was manageable as a stand alone unit. The western (Bakersfield) portion of the WSA was isolated from the eastern (Ridgecrest) portion by USFS land as well as by several private in-holdings. The cherry-stemmed route up the bottom of Cow Heaven nearly split the eastern unit in two; and the extension of this route of travel into the Forest did split the unit in two. The BLM also felt that the BLM WSA in-and-of -itself could not contribute anything of significance to the national wilderness preservation system as a whole.

BLM felt that opportunities for solitude and for primitive and unconfined recreation were no longer outstanding within the unit itself. The lack of comparable protection on the Forest, the location of many of the private inholdings, and the route up Cow Heaven all contributed to undermining naturalness. In addition, BLM felt the naturalness of the WSA had been "significantly impacted by off-highway vehicle use," specifically as a result of the creation of several new motorcycle trails and denuded areas used for vehicle camping. The report attributed the losses to the fact that: "The southern Sierra canyons

have traditionally been a spill-over area for off-highway vehicle use from the heavily used Jawbone Canyon Off-Highway Vehicle Area.”

Other factors cited for not recommending wilderness in the unit included the number of mining claims and range facilities in the area, and the fact that entire WSA was located within an active grazing allotment.

The original **1979 WIU #CDCA 159-A** was bounded on the north by Sage Canyon, on the west by the Sequoia National Forest RARE II Area, on the south, by Horse Canyon Road; and on the east by a road from Horse Canyon to Sage Canyon. Approximately 10-15% of the area along the northern border was privately owned, non-public land.

The unit extended over a major east-west trending ridge of the Sierra Nevada; some deep, heavily vegetated canyons to the north and south, and significant portions of desert floor. The canyons were filled with dense clumps of Joshua trees and other desert shrubs; while the ridgeline with peaks up to 6,000 feet, supported pinyon-juniper forest.

The integrity of the unit was found to have suffered from the use of off-road vehicles. Trails were noted to have criss-crossed many of the lower slopes and to have climbed to higher elevations. The scars left by these trails were felt to be substantially noticeable throughout virtually the entire roadless area.

The vegetation and topography of the area and the area’s continuity with the southern Sierra Nevada provided outstanding opportunities for solitude. However, the opportunities available for primitive and unconfined types of recreation were felt to be compromised by the numerous off-road vehicle trails.

The unit was not evaluated in the 1990 Wilderness Study Report.

In 1994, Congress designated lands in WIU #CDCA 159 and WIU #CDCA 159-A, as well as adjacent lands in WIU #CDCA 160, and contiguous upper elevation lands in Sequoia National Forest, part of the Kiavah Wilderness. This wilderness encompassed virtually all of the original Ridgecrest and Bakersfield BLM inventory units (totaling 40,960 acres), as well as most of the land in Sequoia National Forest spanning these units. Vehicle routes were cherry-stemmed out of wilderness in Cow Heaven, Horse, Cane, Cholla, Short, and Cap canyons. Private property was excluded along the western and northern boundaries of the new wilderness area and within Sage and Horse canyons, where the private property constituted a large block of contiguous land owned by the Rudnick Trust. Where Congress indicated clear intent to exclude private property, wilderness boundaries were adjusted to conform to the actual private property boundaries.

The Congressional maps accompanying the California Desert Protection Act of 1994 centered the private property block in Sage and Horse Canyons in the bottom of Sage Canyon rather than up on the ridge on the northside of the canyon. This may have been done in anticipation of a patent reformation thought to be underway at the time to “fix” or

change the location of the private property with respect to a 1983/84 survey. (See attached photo of the Kiavah Congressional map.) BLM based its legal wilderness boundary description, excluding the private property block, both on the Congressional map and on what BLM too believed would be the actual location of the property after the patent reformation. A legal description was prepared and submitted to Congress for final approval in June 2005.

BLM did not discover that the patent reformation had not gone through until sometime after 2005 when the property kept showing up as significantly offset from the wilderness boundary both on the Master Title Plats and in GIS.

At about the same time, BLM became aware that the indefinite BLM/USFS boundary shown on the 7 ½ minute quads had changed location with the 1983/84 survey. The agency administrative boundary shifted approximately 1 mile east and ½ mile south as a result of the survey. The actual location of the private property also shifted as a consequence; moving 1 mile east, without, however, moving south, as it would have if the patent reformation had gone through.

This shift did not conflict with BLM's 2005 legal description, but it did change the actual physical location of the administrative, private, and wilderness boundaries as legally described on the ground. The USFS gained land at the top of Sage Canyon while the BLM lost land. This severed the connection between the private/BLM/USFS boundary and other possibly excluded areas shown on the Congressional map. These areas are no longer aligned with or within reasonable distance of either the private property or the BLM/USFS boundaries depicted on the Congressional map. One of two such areas involving a side spring is now on USFS land ½ mile East of the BLM/USFS boundary and more than 2 miles south of the private property it was once adjoined to. Similarly, the 0.2 miles of vehicle route shown protruding just beyond edge of the private/BLM/USFS boundary on the Congressional map is now a mile east of the current administrative boundary on the opposite side of the creek.

In 2011, the Mojave Land Trust offered to sale all of the private lands in Sage and Horse canyons to BLM on the condition that they be added to the Kiavah Wilderness. Most of this land was already located within wilderness, because of the confusion over the patent reformation at the time the wilderness boundaries were defined. The private land did not coincide with the excluded portion of the canyon bottom as originally intended, but remained centered up on the north side of Sage Canyon. A portion of the land ended up as an edgeholding, located outside of wilderness, within the excluded area in the bottom of the canyon.

The non-wilderness edgeholding consists of a one-mile wide strip of land crossing the bottom of the canyon along the lower edge of the excluded area. If this part went into wilderness, it would effectively close SC56, the vehicle route currently in-use in the bottom of Sage Canyon, above the private property boundary. This would upset some users of the canyon (while it would delight others). It would also put all of the remaining excluded area in Upper Sage Canyon in wilderness. This would reduce

BLM's flexibility in managing this part of the canyon: it would have to be managed as wilderness.

However, putting all of upper Sage Canyon into wilderness would consolidate public ownership in the canyon, providing for more consistent management. It would stop off-road vehicle trespass, provide better protection for sensitive cultural and riparian resources, and would significantly improve and augment existing wilderness resources and opportunities in the area.

At the time of the Mojave Land Trust's last offer, BLM was not willing to accept land purchased or donated with conditions. BLM passed on the edgeholding, opting instead to purchase only the private inholdings that would automatically convert to wilderness. At the present time, the Mojave Land Trust retains ownership and control over the edgeholding, the last outstanding private parcel in Sage Canyon. They could close SC56 where it crosses private land at their private property boundary.

The units identified in this wilderness inventory as units WIU #CDCA 159 and #CDCA 159-A are comprised only of the existing public lands in the bottom of upper Sage Canyon above the private edgeholding that were excluded from wilderness, because Congress and the BLM thought the patent reformation of the original Rudnick Trust lands had gone through.

FORM 2

Documentation Of Current Wilderness Inventory Conditions

Unit Number/Name **WIU #CDCA 159-1 & 159A-1 (Upper Sage Canyon)**

(1) Sufficient size

Yes

Acreage: 212.39 acres and 362.63 acres for WIU #159-1 and WIU #159A-1 respectively, both units being immediately contiguous to the existing Kiavah Wilderness. Acreages were calculated in GIS.

Boundary revision:

WIU #CDCA 159-1 encompasses all public lands in the bottom of Sage Canyon on the *north* side of the stream and vehicle route, that were left out of the Kiavah Wilderness in 1994. This unit is bounded by private land on the east, the Kiavah Wilderness on the north, Sequoia National Forest on the west, and the stream and vehicle route on the south.

WIU #CDCA 159A-1 encompasses all public lands in the bottom of Sage Canyon on the *south* side of the stream and vehicle route, that were left out of the Kiavah Wilderness in 1994. This unit is bounded by private land on the east, the Kiavah Wilderness on the south, Sequoia National Forest on the west, and the stream and vehicle route on the north.

Description of Current Conditions

Land ownership: BLM (575.02 acres total); private inholdings (0 acres).

Location: Bottom of Upper Sage Canyon from the end of the private property block to the BLM/USFS boundary, Ts. 26/27 S., Rs. 36/37E.

Topography: Broad canyon floor bracketed by tall mountains, becoming more sinuous and narrow as it climbs in elevation. Deeply-incised stream channel meandering along the northern margins of the canyon floor, fed by multiple high springs and tributaries.

Vegetation features: Dense stands of Joshua Tree forest. Riparian special plant assemblages found along most of the stream channels and at isolated seeps and springs in the area. These assemblages include several large cottonwoods, willows, cattails, sedges, and rushes, as well as giant stream orchids and watercress.

Major human uses/activities: Hunting, hiking, horseback riding, grazing and off-road vehicle use.

(2) Natural condition

Yes. In the 1990 WSR reports, the two most significant factors detracting from the overall naturalness of these units were (1) the amount of OHV use and high number and visibility of user-created routes, mostly dirt bike trails and hillclimbs in these areas, and (2) the impacts of cattle grazing and associated range facilities and developments in the areas.

- (1) In 1994, wilderness designation curtailed much of the vehicle use in Sage Canyon, restricting it to one route, SC56, in the bottom of the canyon along the south side of the creek, where it was presumed to cross private land, and closing all other secondary jeep trails and associated single track dirt bike hill climbs where they exited off-route and into wilderness. Since 2001, BLM has put considerable effort into stopping vehicle use off of SC56, with signing, vehicle barriers, restoration, stepped-up holiday patrols, and “sting” operations. In 2007, Student Conservation Association crews constructed 5-miles of perimeter fence around Nellie’s Nip, a huge, still visible but steadily fading hill climb near the mouth of Sage Canyon. This project stopped virtually all vehicle use of the hill climb and the flanking ridgeline, including use of routes leading to and dropping in and out of Boulder Spring. Many of these routes have disappeared and/or are disappearing with time.

In 2011, Student Conservation Association crews constructed a substantial vehicle barrier and restored a closed route off of SC56 to a wilderness spring site with large cottonwoods. The crews also restored the most visible hill climb behind the spring site, as well as the approaches to other hill climbs in the vicinity. In the end, the project effectively closed virtually all routes to and through the spring site, along the canyon bottom, and up on the surrounding mountainsides. This laid the ground work for the remarkable recovery of what had been a very blown-out vehicle camping and use area along north side of the creek. The area is now a wet meadow, covered with grasses, sedges, and reeds, surrounded by several large cottonwoods and robust stands of willows.

These projects have successfully addressed three out of five major problem areas with respect to illegal vehicle use and impacts of such use in the canyon: Nellies Nip, Boulder Spring, and the wilderness spring site on the north side of the creek. All of these areas have seen a significant improvement in overall naturalness. Vehicle use has been curtailed and the scars of former use are fading with time.

Currently two problem areas remain: (1) spillover from the neglected USFS portion of the Kiavah Wilderness off of the extension of SC56 onto Forest Service land, and (2) the chronic vehicle trespass through BLM wilderness over the saddle between Sage and Horse canyons. These are serious remaining problem areas. However, they are more

limited in scope than the previous three, having spawned fewer illegal routes, and are expected to be somewhat effectively addressed by SCA projects planned in 2014-2015.

In short, while OHV use in the canyon, off of the designated route system and into designated wilderness, primarily by dirtbike and quad users, continues to be a problem in Sage Canyon, it is significantly improved from what it was at the time of wilderness designation, let alone from what it was at the time of the 1990 Wilderness Inventory Reports.

- (2) The BLM portion of Sage Canyon is still part of an active cattle grazing allotment. Since wilderness designation in 1994, most of the Rudnick Common allotment has been consolidated into one large use area operated by one permittee (the Hafenfeld Ranch) instead of multiple permittees. Use is rotated among 9 pastures. Sage Canyon and Horse Canyon constitute one of these pastures. Each pasture is grazed for a period of 2-5 months per year and pastures are rotated so that each one is rested every other spring (unless ephemeral grazing is authorized). This is an improvement over what was occurring before, when the Rudnick Trust used the Sage & Horse canyons pasture more exclusively and continuously.

The 1983/84 survey shifted the boundary of the Rudnick Common Allotment with the private/BLM/USFS boundary 1 mile east. This put one of the most heavily grazed and impacted areas outside of the allotment, on USFS land, inside designated wilderness (rather than on BLM land within the excluded area). The area in question extends across Bee Flat (a significant archeological site), about ½ mile west of the current BLM/USFS boundary, near the spring area that Congress may have intended to exclude for grazing purposes. Currently the area is unprotected by an allotment boundary fence at the BLM/USFS boundary, although an allotment fence still stands at the old, indefinite boundary. This area bears the brunt of grazing in the canyon. It has been heavily-impacted by cattle, and is now largely denuded and void of vegetation. (See 11/24/2013 Photos 8385-8400.)

Range conditions appear to have improved on BLM lands since the 1979 inventory and 1990 Wilderness Study Reports. BLM no longer administers Bee Flat and the cattle do not seem to concentrate in any one spot lower down in the canyon. As a result, the impacts of grazing on BLM land do not come close to approaching the scale and intensity of the impacts exhibited at Bee Flat. Most grazing impacts on BLM land are of short duration, and are relatively small, discrete, and dispersed. While the composition of some plant communities may have changed over time, plant cover and diversity have not significantly changed. They remain adequate throughout the area.

Since wilderness designation, vehicles have been limited to just one route (SC56) in the canyon. This has cut down on the amount of vehicle use off of SC56 on BLM land even if it has not stopped it entirely. Many formerly blown-out vehicle use areas have been able to recover and fill-in with vegetation. These areas are now more resilient to grazing pressure than before.

Riparian areas have expanded in sufficiently wet areas wherever vehicle use has been curtailed. The old vehicle camping and use area across the creek from SC56 with the tall cottonwoods was once bare ground. It is now a small meadow and functional wetland, flanked by willow thickets, as well as by a few tall trees. (See 11/24/2013 Photos 8310-8342.) These kinds of transformations are particularly important. Riparian vegetation helps protect (armor) sensitive spring, wetland, and stream areas from excessive cattle trampling and use.

Three small, discrete range developments (spring enclosure, pipeline, and trough) are located at Sage Spring. These developments are all outside of the excluded area, within BLM designated wilderness. Vehicles have not been used to service these developments for many years. It is, however, conceivable that some type of administrative vehicle access across excluded and wilderness lands may be needed to service them in the future.

(3) Outstanding opportunities for solitude

Yes, most of the time, outside of heavy OHV-use periods (i.e., cool season holiday weekends). Excellent opportunities for solitude exist when OHV-users are not present in great numbers and do not appear with great frequency. At these times, it is easy to find oneself alone and beyond the reach of sights and sounds generated by other people, on or within very short distances of SC56. In addition, there is a prominent knob, an incised creek with a robust stand of riparian vegetation, as well as several intervening thick clumps of Joshua trees that help isolate hikers and equestrians on the north side of the canyon from vehicle activity along SC56 on the south side.

No, not on holiday weekends during the cool weather OHV season, i.e., not on Halloween, Thanksgiving, New Years, Presidents Day, and Easter (<20/360 days per year). The amount of off-road vehicle use, the large number and frequency of riders, during these excepted times precludes any opportunity for solitude in the canyon, be it inside or outside of designated wilderness. There can be as many as 50-100 dirt bike and quad users riding up and down SC56 (or off-route and into wilderness) on any given day during these times. That amounts to a rider every 3-6 minutes within one-two miles in the excluded area and within 3-4 miles in adjacent wilderness areas between the daylight hours of 10 a.m.- 3 p.m. The noise from these vehicles travels long distances and the dust plumes can be visible for miles.

(4) Outstanding opportunities for primitive and unconfined recreation

Yes. Outstanding opportunities for primitive and unconfined recreation exist when OHV-users are not in the canyon in great numbers and with great frequency, i.e., outside of the Halloween, Thanksgiving, New Years, Presidents Day, and Easter weekends. Hikers and equestrians can start in Horse Canyon and go over an easy saddle to the middle of the excluded area in Sage Canyon. Or they can start at the mouth of Sage Canyon and go up SC56 through the excluded area to the old, indefinite BLM/USFS boundary where they can pick up the closed vehicle route on the opposite (north) side of the creek to loop back down the canyon bottom, with little to no interference from vehicles.

One must cross the excluded area to reach side canyons on the north side of the creek that are within wilderness. These areas contain additional springs and are tucked away behind intervening ridgelines.

(5) Supplemental values

Yes.

The units fall within the Jawbone-Butterbrecht Area of Critical Environmental Concern. This ACEC was established to protect biological, Native American, and cultural resource values. The area contains some of the most productive wildlife habitat in the California desert, including an important migratory bird stopover and a major raptor and vulture migratory corridor. It also contains important Desert tortoise, yellow-eared pocket mouse, Bendire's Thrasher and Mohave ground squirrel habitat.

Cultural resource values include: prehistoric habitation locales, lithic reduction sites, and extensive pictograph and petroglyph rock art sites. Historic resources identified throughout the area include: the Los Angeles Aqueduct and associated labor camps; stage coach stops; railroad sidings; mining features; and Civilian Conservation Corp camps and projects. Historically significant routes of travel such as Bird Springs Pass used by the Fremont Expedition, Walker Pass, a National Historic Landmark identified as one of the first overland routes into California, and the Pacific Crest National Scenic Trail traverse the area. During the CDCA Plan, the Kawaiisu identified several traditional resource gathering sites, ceremonial locations, and religious areas within this area.

Vegetation: This unit contains Joshua tree woodland, riparian stream habitat, desert wash, and creosote desert scrub. Mojave Desert species such as creosote bush (*Larrea tridentata*) and Joshua tree (*Yucca brevifolia*) occupy lower elevations, scattered pinyon pine (*Pinus monophylla*) appear at higher elevations in the unit. Desert needlegrass (*Achnatherum speciosum*) and sagebrush (*Artemisia tridentata*) are also important plant species that occur in the unit. The riparian area along the drainage has willows (*Salix* spp.) and cottonwoods (*Populus fremontii*). In years of adequate precipitation, annual wildflowers cover the slopes in stunning displays of color. Annual species grow densely here when spring rainfall is sufficient. Charlotte's phacelia (*Phacelia naschiana*) is a BLM special status plant species that occur in the area on decomposed granite.

Wildlife: Large mammals include mule deer, coyotes, badgers, bobcats, kit foxes, and lagomorphs such as black-tailed jackrabbit and desert cottontail. Bears and mountain lions occasionally pass through the area. The unit contains suitable habitat for the pallid bat, spotted bat, and Townsend's big-eared bat. The riparian areas in the canyon bottoms are excellent foraging habitat for these BLM special status bat species. Mohave ground squirrel, a BLM special status species and a California state listed species, occurs throughout this unit. The yellow-eared pocket mouse, a BLM special status species, has been documented in Sage and Horse Canyons along the riparian areas. An extensive area of habitat occurs along both drainages and is shown in the California Natural Diversity Data Base. The unit provides prime foraging habitat for raptors, including golden eagles, prairie falcons, northern harriers, cooper's hawks,

red-tailed hawks, and great horned owls. The unit contains riparian habitat, including areas with large cottonwoods (Sage Canyon). These riparian areas provide essential habitat for both resident and migrant birds. Nesting golden eagles have been documented in these canyons in the spring of 2012. Other special status bird species found in this area include the burrowing owl, Le Conte's thrasher, loggerhead shrike, and the California horned lark. In July 2011 a burrowing owl burrow and family was observed in Sage Canyon within this unit on the north side of SC56, but the burrow has since been crushed by OHV use. Important upland game species are also present: dove, chukar, mountain quail, and California quail. Cactus wrens, loggerhead shrikes, ladder-back woodpeckers, sage sparrows, black-throated sparrows, horned larks, and ash-throated flycatchers are some of the resident species that nest in this unit. The lower elevations, within the eastern portion of the unit, provide suitable habitat for the desert tortoise, a federally and California state listed species.

Cultural Resources: Virtually all of the excluded area in the bottom of Sage Canyon is culturally sensitive and has a high probability of being eligible for listing to the National Register of Historic Places. The area falls within Kawaiisu territory. The Kawaiisu lived in small groups and moved into the canyon on a seasonal basis to take advantage of the resources there. Some sites still live within the memories of modern Kawaiisu people.

Most cultural resource inventory work by BLM archaeologists has been limited to corridors related to routes of travel, authorized or otherwise. BLM archeologists have identified 3 polygons of high cultural sensitivity within the excluded area along SC56 corridor. These polygons have been drawn around several prehistoric sites with rock shelters, milling features, pictographs, petroglyphs, habitation sites and middens, as well as lithic scatters. Route restoration within these polygons has been restricted to applications of horizontal as opposed to vertical mulch.

In addition, Dr. Mark Allen of Cal Poly Pomona has been investigating cultural resources in Sage Canyon for over 7 years as part of his field school program. Over the course of five field seasons, Dr. Allen and his students recorded an additional 43 new archeological sites (42 prehistoric and 1 historic) in Sage Canyon; raising the total number of known sites to 65. With the exception of Bee Flat, most of these sites are located on BLM land within the excluded area at the bottom of the canyon. The sites span more than 2,000 years of Native American occupation and use of the canyon. They are characterized by explosions in rock art, obsidian projectile point production and trade, and in ground stone artifacts and ground stone milling features. The sites still have much to tell us about changing survival strategies over time, moving from a reliance on hunting large game (deer, bighorn, antelope) to smaller prey (rabbits and pack rats) and nut and seed processing, as the climate changed, temperatures rose, rainfall dropped, and the land became increasingly more arid.

The results of these investigations have been recently published in "*Living on the Edge: The Archeology of Two Western Mojave Desert Landscapes*," Maturango Museum Publication No. 25 (September 2013).