



Boy Scout Mountain

2017 Lincoln National Forest Botanical Survey

Including the Agua Chiquita, Aragon, Boy Scout Mountain, Bridge Canyon
Cora Dutton, Eagle, Hightower, Sacramento Canyon, and Reventon
Forestry Units

Prepared by Sagebrush Advisors
September 2017



Prepared for the Lincoln National Forest

Alamogordo, New Mexico

Aurora Roemmich, Forest Botanist

Under Contract AG-7512-P-17-0024

September 2017

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Introduction

In support of ongoing fuels-reduction activity on the Lincoln National Forest (LNF), Sagebrush Advisors (Sagebrush) conducted a botanical baseline inventory and targeted rare plant survey of nine forestry stands dispersed throughout the LNF, including the Sacramento, Sierra Blanca, Santa Cruz, Jicarilla, and Capitan Mountains.

Methodology

Between July 23rd and August 5th 2017, Sagebrush conducted a two-person pedestrian, *Intuitive-Controlled* botanical survey of nine forestry stands. Prior to fieldwork, botanists compiled a list of target species based on their habitat requirements. Special-status species for which the survey stands potentially provide suitable habitat are discussed in Table 1. Through aerial interpretation, survey routes (or transects) with the highest potential for target-species observation were defined during desktop review. In the field, botanist's targeted drainages, relatively mesic habitats, and undisturbed areas. Transects are illustrated as blue lines in Appendix C.

All plants, including target species, were identified in the field and photodocumented using a digital camera-mounted macro lens capable of capturing millimeter-sized diagnostics. For plant identification, botanists referenced dichotomous keys including *Flora of New Mexico* (Wooten and Standley, 1972), *Colorado Flora: Western Slope* (Weber and Wittman, 2001) and botanical guides including *Mountain Wildflowers of the Southern Rockies* (Dodson and Dunmire, 2007) *Wildflowers of the Sandia and Manzano Mountains of Central New Mexico* (Littlefield and Burns, 2011), and *A Field Guide to the Grasses of New Mexico* (Allred, 2005). A comprehensive list of plants observed during the 2017 survey is included in Appendix B.

Botanists carried Trimble Geoexplorer 6000 GPS units equipped with ArcPad and Trimble Positions software allowing for sub-meter accurate data post-processing.

Target Species

1. Special-status species potentially occurring in the survey areas.

Scientific	Common	Status	Habitat	Occurrence Potential
<i>Argemone pleiacantha</i> ssp. <i>pinnatisecta</i>	Sacramento prickly poppy	E	Canyon bottoms and slopes of Chihuahuan desert scrub, and coniferous and mixed woodlands at 4,800-7,000 feet, in the Sacramento Mts.	Yes. <i>A. pleiacantha</i> may occur in the Sacramento Canyon and Bridge Canyon stands positioned on the western escarpment of the Sacramento Mountains. However, suitable habitat was not identified within these stands. The absence of streambeds and habitat identified during the 2017 SPP survey makes this species' presence unlikely.
<i>Cirsium vinaceum</i>	Sacramento Mountains thistle	T	Travertine deposits and outflows of natural springs within montane coniferous forest habitats and riparian areas at 7,400-9,000 ft., in the Sacramento Mountains	Yes. Sacramento Mountains thistle was a primary target during survey of the Agua Chiquita stand where springs within montane coniferous forest occur at the appropriate elevation for this species.
<i>Hedeoma todsenii</i>	Todsen's Pennyroyal	E	Endemic to the loose, gypseous-limestone soils associated with the Permian Yeso Formation found in the San Andres and Sacramento Mountains. Found on north-facing slopes at elevations of 6,200-7,400 ft.	Yes. Suitable habitat for this species is present in the Bridge and Sacramento Canyon stands.
<i>Echinocereus fendleri</i> var. <i>kuenzleri</i>	Kuenzler's Hedgehog Cactus	E	Limestone ledges and hills of coniferous and mixed woodlands at 5,200-6,900 feet.	Yes. Elevation and required habitat present in all survey stands except Agua Chiquita in the High Sacramento Mountains.

<i>Cirsium wrightii</i>	Wright's marsh thistle	P	Wet, alkaline soils in spring seeps and marshy edges of streams and ponds at elevations of 3,450-8,500 feet.	Yes. Suitable hydrology and elevation is found in the Agua Chiquita and Eagle stands. Both stands have narrow riparian corridors.
<i>Allium gooddingii</i>	Goodding's onion	RFS	Occurring in moist, shaded canyons at 8,000-9,500 ft. throughout its range. Found on north-facing, partially-shaded slopes among the montane and subalpine coniferous forest habitats (9,300-11,250 ft.) of the Smokey Bear District, LNF.	Yes. Habitat for this high-altitude endemic is found in the Agua Chiquita stand in the High Sacramento Mountains. The canyon formed by Agua Chiquita Creek is north facing with low-evaporative stress. <i>A. gooddingii</i> was a primary target species in this stand.
<i>Astragalus altus</i>	Tall milkvetch	RFS	Endemic species found in limestone soils on steep slopes, openings and road cuts in lower montane coniferous forest habitats (6,500-8,200 ft.) of the Sacramento Mountains.	Yes. Suitable habitat for this vetch is present in the Agua Chiquita, Bridge and Sacramento Canyon, and Eagle stands.
<i>Astragalus kerrii</i>	Kerr's milkvetch	RFS	Sandy soils within drainages and along roadsides at about 5,420 – 7,520 feet in elevation.	Yes. Suitable habitat for this vetch is present in all stands except Agua Chiquita in the High Sacramento Mountains.
<i>Crataegus wootoniana</i>	Wooton's hawthorn	RFS	Riparian areas of canyon bottoms and forest understory at elevations of 6,500-8,000 feet.	Yes. The Agua Chiquita and Eagle stands have narrow riparian corridors at sufficiently high elevations.
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Yellow lady's slipper	RFS	Full sun to partial-shade in bogs, meadows, stream	Yes. Mesic areas of the Agua Chiquita stand in the High Sacramento

			banks, drainages, seepages, and damp woods or higher elevations (8,000-11,000 ft.).	Mountains were thoroughly surveyed for this conspicuous orchid.
<i>Escobaria villardii</i>	Villard pincushion cactus	RFS	Loamy soils of desert grassland on broad limestone benches in the western slopes of the Sacramento Mountains (4,500-6,500 feet).	Unlikely. The Sacramento Mountain stands, Agua Chiquita, Bridge Canyon, and Sacramento Canyon do not support desert grassland or have limestone benches.
<i>Geranium dodecatheoides</i>	Shootingstar geranium	RFS	Andesitic boulders and outcrops near the edge of canyon-bottom riparian forest at elevations of 7,550-9,900 feet.	Yes. The Agua Chiquita and Eagle stands contain narrow riparian corridors at a suitable elevation. However, this species is known to the Capitan Mountains. The Boy Scout Mountain stand does not have suitable mesic or riparian habitat for <i>G. dodecatheoides</i> .
<i>Heuchera woodsiiaphila</i>	Capitan Peak alumroot	RFS	Moist soil pockets on stable granitic, north-facing slopes in montane coniferous forests. 8,300-9,510 feet.	Yes. Suitable habitat for this species occurs in the High Sacramento stand of Agua Chiquita, however this species is believed confined to the Capitan Mountains.
<i>Heuchera wootonii</i>	Wooton's alumroot	RFS	Mountain slopes and, typically, north-facing rock outcrops, or Gamble oak thickets in piñon-juniper woodland and montane-coniferous forest in the White and Sacramento Mountains (7,000-12,000 feet).	Yes. Suitable habitat is found in the Eagle, Bridge Canyon, Sacramento Canyon, and Agua Chiquita stands.

<i>Hexalectris nitida</i>	Glass Mountain crested Coralroot	NME	Oak-leaf litter in deep canyons. Known population in Otero County occurs at 4,300 feet.	Marginal. Deep canyons with oak-leaf litter are not found in any of the survey stands.
<i>Hexalectris revoluta</i>	Chiso's Mountain crested coralroot	RFS	Under canopy of trees and shrubs at the edge of canyon bottoms and in heavy leaf litter under oaks or in thin humus soils among rock outcrops at elevations of 4,100-8,000 feet.	Marginal. Canyons with tree-shrub canopies are largely absent except a narrow riparian corridor along Little Creek in the Eagle stand.
<i>Hexalectris spicata</i> var. <i>arizonica</i>	Arizona coralroot	RFS	Oak woodlands, wooded side canyons, and canyon bottoms of lower elevation range (5,400 feet.). Hidden along the drip-line of oaks, pine, and companion shrubs at higher elevation range (6,500 feet).	Yes. Suitable habitat is found within all stands except Agua Chiquita positioned at an elevation of 9,000 feet.
<i>Lepidospartum burgessii</i>	Gypsum scalebroom	NME	Stabilized gypsum dunes with Chihuahuan desert scrub and arid grassland. 3,500-3,700 feet.	No. All survey stands occur at elevations too high for this species' requisite desert scrub-shrub, arid grassland habitat.
<i>Lilium philadelphicum</i>	Wood lily	RFS	Wetlands and wet meadows associated with open, mature coniferous forests at 7,000-10,000 ft. elevation.	Yes. Suitable habitat for this lily occurs in the montane stands, Agua Chiquita and Eagle, where wetlands and wet meadows with mature coniferous forest are present.

<i>Microthelys rubrocallosa</i>	Ladies' tresses	RFS	General habitat includes light-to-moderately wooded south facing pine forests at 8,100 ft. elevation.	Yes. Habitat for this orchid is present in the Agua Chiquita stand where suitable elevation and pine forest is present.
<i>Penstemon alamosensis</i>	Alamo penstemon	RFS	Rocky, limestone bottoms and cool aspect slopes of canyons along the western slopes of the Sacramento Mountains (4,500-6,300 feet.).	Unlikely. The Bridge Canyon, Sacramento Canyon, and Agua Chiquita stand occur in the high Sacramento Mountains, uphill from the canyons of the western slopes (e.g. Dog, Alamo, and Caballero Canyons). This species was observed in Alamo and Caballero Canyons during a separate survey
<i>Phacelia cloudcroftensis</i>	Cloudcroft scorpionweed	RFS	Disturbed sites, arroyo channels, or along roads in mixed conifer forest down to upper piñon-juniper woodlands in the Sacramento Mountains (6,500-7,700 feet.).	Yes. Suitable habitat is found in the Bridge and Sacramento Canyon stands falling within the piñon-juniper zone of the Sacramento Mountains.
<i>Sedum integrifolium</i> ssp. <i>neomexicana</i>	New Mexican stonecrop	RFS	Found on windswept areas with thin soil or rocky outcrops in subalpine-montane grassland habitats of the Sacramento Mountains (8,100-11,975 ft.).	Marginal. The Agua Chiquita stand falls within this species' elevation range, but grassy areas are mesic to wetland with soils composed of high organic material.
<i>Soligado wrightii</i> var. <i>guadalupensis</i>	Guadalupe Mtns. Goldenrod	RFS	Limestone outcrops and substrates, most commonly associated with <i>acacia</i> , <i>juniperus</i> -	No. Associated vegetation communities are not present within any of the survey stands. Also, species not known to the

			<i>dasyllirion</i> , lechuguilla, oak, oak-maple, and yellow pine-maple hophorn beam- madrone habitats at elevations of 4,300-7,100 feet.	Sacramento, Capitan, Vera Cruz, or Jicarilla Mountains where surveys were conducted.
<i>Sophora gypsophila</i> var. <i>guadalupensis</i>	Guadalupe mescal bean	RFS	Outcrops of pink, limy, fine-grained sandstone that is 1-2% gypsum in Chihuahuan desert scrub and juniper savanna of the Guadalupe Mountains (5,000-6,650 ft.).	Marginal. Juniper savanna present in several stands including Cora Dutton, Aragon, and Boy Scout Mountain. However, requisite substrates, pink sandstone outcrops not observed. Species not known to mountain ranges in the survey area.
<i>Streptanthus sparsiflorus</i>	Guadalupe jewelflower	RFS	Endemic to the limestone gravel and boulders, found in the canyon bottoms and montane scrub of the Guadalupe Mountains (4,000-5,000 ft.).	Unlikely. Canyon bottoms largely absent from survey stands. Species not known to the mountain ranges surveyed.
<i>Synthris oblongifolia</i>	Sierra Blanca kittentails	RFS	Endemic to the alpine meadows of the Sacramento Mountains (11,000-12,000 ft.)	No. This alpine endemic requires elevations much higher than those found in the Sacramento Mountain stands: Agua Chiquita, Eagle, Sacramento Canyon, and Bridge Canyon.

P=Proposed for federal protection

NME=New Mexico Endangered

RFS=Regional Forester Sensitive Species List

T=Federal Threatened

E=Federal Endangered

Results

Survey Area Descriptions

Forestry stands without names, such as those in the Sacramento Mountains, have been assigned labels based on their proximity to geographically defining features (i.e. Agua Chiquita named for the adjacent stream)

Agua Chiquita

This stand lies in the High Sacramento Mountains at elevations ranging from 8,700 to over 9,000 feet. *Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland* is the dominant community. Low-evaporative stress slopes and high elevation facilitates mesic, montane conditions. Englemann spruce (*Picea engelmannii*), aspen (*Populus tremuloides*), Douglas fir (*Pseudotsuga menziesii*) and to a lesser extent, ponderosa pine (*Pinus ponderosa*) form the canopy. Rocky Mountain maple (*Acer glabrum*), dogwood (*Cornus sericea*), Gambel oak (*Quercus gambelii*), mountain spray (*Holodiscus dumosus*), and honeysuckle (*Lonicera involucrata*) compose the sparse (<20%) shrub stratum. The herbaceous stratum is composed of Kentucky bluegrass (*Poa pratensis*), especially in meadows, Richardson's brome (*Bromus richardsonii*), false Solomon's seal (*Maianthemum stellatum*), strawberry (*Fragaria* spp.), and osha (*Ligusticum porteri*).

Due to the mesic, montane habitat of Agua Chiquita, botanists focused their survey on Goodding's onion, Sacramento Mountains thistle, Wright's marsh thistle, tall milkvetch, wood lily, and yellow lady's slipper. Habitat for these species occurs in this stand, though these, nor other special-status plants, were observed.

Although grazing is evident in this stand, it remains largely intact. Seeps and springs distributed throughout, and uphill from, the stand, provide sub-irrigation for mesic plants. Small portions of the stand have been thinned or otherwise disturbed. These portions, lacking dense canopy cover, support dense Gambel oak thickets.

Aragon

The Aragon stand is tucked between the eastern Santa Cruz and northern Capitan Mountains at an average elevation of 6,500 feet. *Madrean Juniper Savanna* constitutes the vegetative community. Alligator juniper (*Juniperus deppeana*), the dominant tree in Aragon, is a diagnostic species of this community. One-seed juniper (*Juniperus monosperma*) is also present in the shrub stratum, along with mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush (*Purshia tridentata*), cholla (*Cylindropuntia imbricata*), rabbitbrush (*Chrysothamnus* spp.), and shrub oaks (*Quercus* spp.). Dominant graminoids include James' galleta (*Pleuraphis jamesii*), blue gramma (*Bouteloua gracilis*), and New Mexico feathergrass (*Hesperostipa neomexicana*).

Botanists focused surveys on Kuenzler's hedgehog cactus, Kerr's milkvetch, and Arizona coralroot. Although some of these species are not presently known to the Santa Cruz or Capitan Mountains, suitable habitat is present in Aragon. No special-status plants were observed.

The stand is actively grazed, though shows little indication of overgrazing. Invasive species such as musk thistle (*Carduus nutans*), cheatgrass, and silverleaf nightshade (*Solanum elaeagnifolium*) are present but not in large populations.

Boy Scout Mountain

This stand lies in the arid, eastern foothills of the Capitan Mountains at 5,500 feet. It's location between the Capitan Mountains to the west and semi-desert grassland approximately one-quarter mile to the east places it in a transitional zone. A sparse canopy cover (<20%) of alligator juniper defines the ecological community as a *Madrean Juniper Savanna*, though the stand exhibits grasses indicative of *Chihuahuan Semi-Desert Grassland*. Black grama (*Bouteloua eriopoda*) and mesa dropseed (*Sporobolus flexuosus*) co-dominate the herbaceous stratum, with purple three-awn (*Aristida purpurea*), blue grama (*Bouteloua gracilis*), New Mexico feathergrass (*Hesperostipa neomexicana*), James' galleta (*Pleuraphis jamesii*), and alkali sacaton (*Sporobolus airoides*) also present. Shrubs include sand sagebrush (*Artemisia filifolia*), four-wing saltbrush (*Atriplex canescens*), and cholla (*Cylindropuntia imbricata*).

Botanists focused surveys on Kuenzler's hedgehog cactus, Chisos Mountain crested coralroot, Alamo penstemon, and Arizona coralroot. Particular emphasis was given to Kerr's milkvetch, a species located during a 2016 survey in similar habitat of the Capitan Mountains. Habitat for these species is present in Boy Scout Mountain, though no special-status plants were observed.

The vegetative community appears to be transitioning to grassland. Approximately half of the stand's junipers are drought stressed or dead. Shrubs, too, are drought stressed or desiccated. This could be due to drought, altered hydrology, or a shrinking aquifer. Surveys of the Capitan Mountains in previous years yielded similar observations. Savannas below 6,000 feet (approximately) are transitioning to grassland as the woody strata struggle and fail to recruit.

Bridge Canyon

The Bridge Canyon stand is perched on the western escarpment of the Sacramento Mountains at an elevation of approximately 7,300 feet. The stand's vegetation consists of a *Southern Rocky Mountain Ponderosa Pine Woodland* community. Ponderosa forms the entire tree stratum. Gambel oak comprises a majority of the shrub canopy, particularly where thinning has reduced canopy cover. In shaded areas a diversity of shrubs, including mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush (*Purshia tridentata*). On cooler slopes, chokecherry (*Prunus virginiana*), and snowberry (*Symphoricarpos oreophilus*) grow. On the forest floor, kinnikinnick (*Arctostaphylos uva-ursi*), Fendler's bluegrass (*Poa fendleriana*), prairie junegrass (*Koeleria macrantha*), and white sage (*Artemisia ludoviciana*) are prominent.

Sacramento prickly poppy, Alamo penstemon, and Cloudcroft scorpionweed were of particular concern in Bridge Canyon, as the species are known to the canyons of the Sacramento Mountains western escarpment. Botanists observed Alamo penstemon in nearby Alamo and Caballero Canyons during the course of a separate botanical survey. Additional species of interest were, Todsens' pennyroyal, tall milkvetch, Villard's pincushion cactus, and Wooton's

alumroot. Although potential habitat for aforementioned species occurs in Bridge Canyon, no special-status species were observed.

Cora Dutton/Capitan Mastication

The Cora Dutton/Capitan Mastication stands lie on a rolling plateau east of the Capitan Mountains, ranging between 6,800 and 7,200 feet in elevation. *Madrean Juniper Savanna* constitutes the vegetative community. Alligator juniper, the dominant tree, is a diagnostic species of this community type. Perhaps due to elevation, sparse ponderosa occur in the canopy. One-seed juniper is also present in the shrub stratum, along with mountain mahogany, antelope bitterbrush, cholla, rabbitbrush, and shrub oaks (*Quercus* spp.). Dominant graminoids include James' galleta, blue gramma (*Bouteloua gracilis*), and New Mexico feathergrass along with crested wheatgrass (*Agropyron cristatum*).

Species of interest in Cora Dutton included Kuenzler's hedgehog cactus, Todsen's pennyroyal, Kerr's milkvetch, and Arizona coralroot. Habitat for these species is present in Aragon, however no special-status species were observed.

Opposed to other stands supporting savanna habitats, such as Boy Scout, Cora Dutton is not drought stressed. This may be due to its relatively high elevation receiving greater precipitation.

Eagle

This stand is positioned on the eastern slope of the Sierra Blanca at 7,600 feet in elevation. It supports a *Southern Rocky Mountain Ponderosa Pine Woodland* community. Below the mature ponderosa canopy a robust, a regenerated herbaceous stratum, with immature shrubs, appears to be the result of a recent fire. Charring is visible on the ponderosa bark. First year's growth rabbitbrush, rose (*Rosa* sp.), Gambel oak, and Rocky Mountain juniper (*Juniperus scopulorum*) constitute the majority of shrubs. A diverse herbaceous stratum is composed of native and exotic species, including yarrow (*Achillea millefolium*), mullein (*Verbascum thapsus*), lupine (*Lupinus sericeus*), prairie coneflower (*Ratibida columnifera*), cheatgrass, blue grama, redtop (*Agrostis stolonifera*), and purple prairie clover (*Dalea purpurea*). Cheatgrass, prairie coneflower, lupine, and yarrow populations benefit from and expand in post-fire regeneration (Menke, 2003).

Little Creek, which flows through Eagle, forms a narrow riparian band with wetland margins. Box elder (*Acer negundo*), mixed willows (*Salix* spp.) and sedges (*Carex* spp.) grow along the creek. Due to the presence of the creek and narrow wetlands, botanists focused on Sacramento Mountains thistle, Wright's marsh thistle, Goodding's onion (though elevation is likely too low), Wooton's hawthorn, shootingstar geranium, and wood lily. Upland species with occurrence potential include tall milkvetch, Wooton's alumroot, and Sierra Blanca cliff daisy. The high degree of anthropogenic and vegetative disturbance may preclude the presence of any of the aforementioned special-status plants.

Most of the Eagle stand serves as a dispersed campground. Fire rings and informal campsites are scattered throughout. Camping combined with a recent fire appear to be vectors for invasive and noxious weeds.

Hightower North

This stand lies at the northern flank of the Jicarilla Mountains, climbing from 6,100 to 6,500 feet in elevation. Although alligator juniper occurs on two north-facing slopes, the majority of this 1,400-acre stand is un-forested semi-desert grassland. Diagnostic species indicate a *Chihuahuan Sandy Plains Semi-Desert Grassland* community. Blue and black gramma co-dominate the herbaceous stratum along with James' galleta and alkali sacaton. A sparse shrub canopy includes cholla, sand sagebrush, saltbrush, and banana yucca (*Yucca baccata*).

Unique among the 2017 survey stands in being a semi-desert grassland, botanists focused on Kerr's milkvetch, Villard's pincushion cactus, and Chisos Mountain crested coralroot. Villard's pincushion was of particular interest as it is endemic to grasslands in the area. None of these, or other special-status plants, were observed.

Reventon

The Reventon stands lie in the southern Jicarilla Mountains at approximately 6,800 feet in elevation. Although these stands are surrounded by grassland and savanna habitats, a combination of elevation and slope aspect create relatively low-evaporative stress conditions able to support a dense alligator juniper canopy with scattered ponderosa. The dominance of alligator juniper is a diagnostic characteristic of a *Madrean Pinyon-Juniper Woodland*. Below the juniper canopy, sumac (*Rhus trilobata*), mountain mahogany, and shrub oak form the shrub stratum. On the forest floor, blue grama and sideoats grama (*Bouteloua curtipendula*) figure prominently in the herbaceous stratum.

Botanists placed particular focus on Kerr's milkvetch, Guadalupe rabbitbrush (though not known outside the Guadalupe Mountains), Chisos Mountain crested coralroot, and Arizona coralroot. The absence of mesic soils and aquatic features preclude the presence of many special-status species known to the area. No special-status species were observed.

Sacramento Canyon

This stand is positioned on a ridge separating Sacramento and Hornbuckle Canyons at an elevation of approximately 8,500 feet. With a south-southwest exposure, the stand receives considerable evaporative stress. Despite its location in the High Sacramento Mountains, the stand's vegetative community constitutes a *Southern Rocky Mountain Ponderosa Pine Woodland*. Beneath the ponderosa canopy, creeping juniper (*Juniperus communis*), kinnikinnick, rose, wax currant (*Ribes cereum*), Gambel oak, mountain mahogany, mountain snowberry, and antelope bitterbrush compose a diverse shrub stratum. Small groves of aspen occur in cool microclimates. The herbaceous stratum is similar to that of the Bridge Canyon stand, however considerably sparser due to the lack of sunlight reaching the forest floor. Fendler's bluegrass, prairie junegrass, and white sage are prominent.

As is the case with nearby Bridge Canyon, Sacramento prickly poppy, Alamo penstemon, and Cloudcroft scorpionweed were of particular concern, as these species are known to the canyons of the Sacramento Mountains' western escarpment. Botanists observed Alamo penstemon in nearby Alamo and Caballero Canyons during the course of a separate botanical survey. Additional species of interest were, Todsens' pennyroyal, tall milkvetch, Villard's pincushion cactus, and Wooton's alumroot. Although potential habitat for aforementioned species occurs in Bridge Canyon, no special-status species were observed.

Target Species

No target species were observed in the nine survey area stands. However, Alamo penstemon was located in Alamo Canyon during the course of a separate survey. These population occur along the pack trail near the aqueduct in the upper, forested portion of the canyon.

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Appendix A: Photographs

1. *Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland* is the dominant community found in the high Sacramento Mountains where Agua Chiquita is located.



2. *Madrean Juniper Savanna* habitat in Aragon stand. Vera Cruz Mountains in background.



3. Representative *Madrean Juniper Savanna* habitat in Boy Scout Mountain stand. Capitan Mountains in background



4. *Southern Rocky Mountain Ponderosa Pine Woodland* community defines the Bridge Canyon stand on the western escarpment of the Sacramento Mountains.



5. Representative *Madrean Juniper Savanna* habitat in the Cora Dutton/Capitan Mastication stands.



6. *Southern Rocky Mountain Ponderosa Pine Woodland* community defines the Eagle stand. Sierra Blanca Mountains in the background.



7. *Chihuahuan Sandy Plains Semi-Desert* Grassland community dominates the Hightower North stand on the northern flank of the Jicarilla Mountains.



8. *Madrean Pinyon-Juniper* habitat in the Reventon stands on the southern flank of the Jicarilla Mountains.



9. Disturbed *Southern Rocky Mountain Ponderosa Pine Woodland* community in the Sacramento Canyon stand on a slope above the Sacramento River.



Appendix B: Plant Inventory

Non-Vascular

Family	Species
Ganodermataceae	<i>Ganoderma tsugae</i>
Parmeliaceae	<i>Xanthoparmelia caperata</i> <i>Hypogymnia austerodes</i> <i>Pseudevernia</i> sp. <i>Xanthoparmelia chlorochroa</i> <i>Usnea arizonica</i> <i>Usnea hirta</i> <i>Usnea scabrata</i>
Psoraceae	<i>Psora cerebriformis</i>
Russulaceae	<i>Russula</i> sp.
Umbilicariaceae	<i>Umbilicaria deusta</i>

Ferns and Fern Allies

Family	Species
Aspleniaceae	<i>Asplenium trichomanes</i>
Dryopteridaceae	<i>Woodsia neomexicana</i>
Equisetaceae	<i>Equisetum hymale</i> <i>Equisetum laevigatum</i>

Gymnosperms and
Angiosperms

Anacardiaceae	<i>Rhus trilobata</i> <i>Toxicodendron rydbergii</i>
Apiaceae	<i>Ligusticum porteri</i> <i>Osmorhiza berteroi</i>
Apocynaceae	<i>Apocynum androsaemifolium</i>
Asclepiadiaceae	<i>Asclepias latifolia</i>
Asteraceae	<i>Achillea millefolium</i> <i>Amaranthus spp.</i> <i>Antennaria parvifolia</i> <i>Artemisia dracunculus</i> <i>Artemisia filifolia</i> <i>Artemisia ludoviciana</i> <i>Bahia dissecta</i> <i>Brickellia grandiflora</i> <i>Carduus nutans</i> <i>Conyza canadensis</i> <i>Erigeron eximius</i> <i>Erigeron flagellaris</i> <i>Grindelia squarrosa</i> <i>Helianthus annuus</i> <i>Heterotheca villosa</i> <i>Iva xanthifolia</i> <i>Lactuca serriola</i> <i>Melampodium leucanthum</i> <i>Packera cardamine</i> <i>Packera fendleri</i> <i>Ratibida columnifera</i> <i>Senecio sp.</i> <i>Solidago sp.</i> <i>Symphoytrichum falcatum</i>

	<i>Tragopogon dubius</i>
	<i>Xanthium strumarium</i>
	<i>Ericameria nauseosa</i>
	<i>Hymenopappas filifolius</i>
	<i>Solidago canadensis</i>
	<i>Hymenoxys richardsonii</i>
	<i>Carduus nutallii</i>
Berberidaceae	<i>Berberis haematocarpa</i> or <i>repens</i>
Betulaceae	<i>Alnus incana</i>
Boraginaceae	<i>Lappula occidentalis</i>
Brassicaceae	<i>Capsella bursa-pastoris</i>
	<i>Chorispora tenella</i>
	<i>Erysimum capitatum</i>
	<i>Lepidium perfoliatum</i>
	<i>Lepidium</i> sp.
	<i>Rorippa nasturtium</i>
Cactaceae	<i>Coryphantha macromeris</i>
	<i>Cylindropuntia imbricata</i>
	<i>Escobaria vivipara</i>
	<i>Opuntia phaeacantha</i>
	<i>Opuntia polyacantha</i>
Caprifoliaceae	<i>Lonicera involucrate</i>
	<i>Symphoricarpos oreophilus</i>
Chenopodiaceae	<i>Atriplex canescens</i>
Comaceae	<i>Cornus sericea</i>
Convolvulaceae	<i>Convolvus arvensis</i>
	<i>Cuscuta</i> sp.
Cucurbitaceae	<i>Cucurbita foetidissima</i>

Cupressaceae	<i>Juniperus deppeana</i> <i>Juniperus monosperma</i>
Cyperaceae	<i>Carex geyeri</i> <i>Carex rossii</i> <i>Cyperus esculentus</i>
Ericaceae	<i>Arctostaphylos pungens</i> <i>Arctostaphylos uva-ursi</i>
Fabaceae	<i>Astragalus nuttallianus</i> <i>Dalea candida</i> <i>Hoffmanseggia drepanocarpa</i> <i>Lathyrus sp.</i> <i>Melilotus albus</i> <i>Melilotus officinalis</i> <i>Robinia neomexicana</i>
Fagaceae	<i>Quercus emoryi</i> <i>Quercus gambelii</i>
Fumariaceae	<i>Corydalis aurea</i>
Gentianaceae	<i>Frasera speciosa</i>
Geraniaceae	<i>Erodium cicutarium</i> <i>Geranium dodecatheoides</i>
Grossulariaceae	<i>Ribes leptanthum</i>
Hydrophyllaceae	<i>Phacelia neomexicana</i>
Lamiaceae	<i>Dracocephalum parviflorum</i> <i>Marrubium vulgare</i> <i>Teucrium laciniatum</i>
Linaceae	<i>Linum lewisii</i>
Loasaceae	<i>Mentzelia pumila</i>

Malvaceae	<i>Sidalcea candida</i> <i>Sphaeralcea ambigua</i> <i>Sphaeralcea coccinea</i>
Martyniaceae	<i>Proboscidea parviflora</i>
Oleaceae	<i>Fraxinus velutina</i>
Onagraceae	<i>Epilobium angustifolium</i> <i>Oenothera caespitosa</i> <i>Oenothera elata</i>
Orchidaceae	<i>Goodyera oblongifolia</i>
Orobanchaceae	<i>Castilleja integra</i>
Papaveraceae	<i>Eschscholzia glyptosperma</i>
Pinaceae	<i>Picea engelmannii</i> <i>Pinus edulis</i> <i>Pinus ponderosa</i> <i>Pseudotsuga menziesii</i>
Plantaginaceae	<i>Plantago patagonica gnaphalioides</i>
Poaceae	<i>Agropyron smithii</i> <i>Agrostis gigantea</i> <i>Andropogon gerardii</i> <i>Aristida purpurea</i> <i>Blepharoneuron tricholepis</i> <i>Bouteloua curtipendula</i> <i>Bouteloua eriopoda</i> <i>Bouteloua gracilis</i> <i>Bromus ciliatus</i> <i>Bromus richardsonii</i> <i>Bromus tectorum</i> <i>Descampsia caespitosa</i> <i>Echinocloa crus-galli</i>

Elymus longifolius
Elymus trachycaulus
Hilaria jamesii
Koeleria pyramidata
Muhlenbergia montana
Muhlenbergia virescens
Nolina microcarpa
Panicum obtusum
Poa pratensis
Pseudoroegneria spicata
Schizachyrium cirratum
Festuca arizonica
Agropyron trachycaulum
Aristida longista
Bothriochloa barbinodis
Bouteloua barbata
Bouteloua hirsuta
Lycuris phleoides
Sporobolus airoides

Polemoniaceae

Ipomopsis aggregata

Polygonaceae

Eriogonum jamesii
Eriogonum racemosum
Polygonum aviculare
Polygonum lapathifolium
Rumex acetosella
Rumex crispus

Portulacaceae

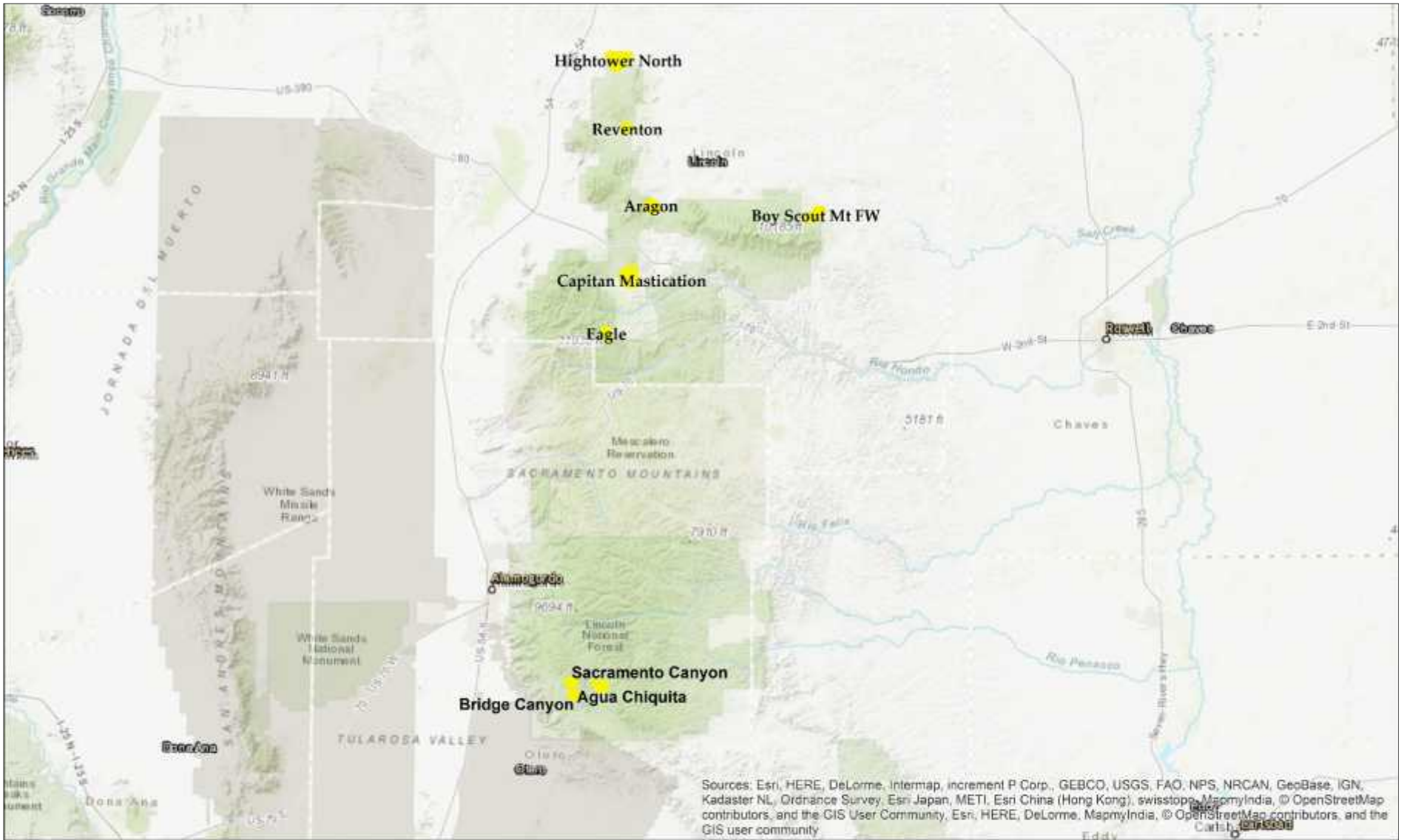
Montia perfoliata
Portulaca oleraceae

Ranunculaceae

Actea rubra
Anenome canadensis
Delphinium nuttallianum
Pulsatilla patens
Thalictrum fendleri
Thalictrum occidentale

Rosaceae	<i>Cercocarpus montanus</i> <i>Dasiphora fruticosa</i> <i>Fallugia paradoxa</i> <i>Frageria ovalis</i> <i>Frageria bracteata</i> <i>Fragaria virginiana</i> <i>Holodiscus dumosus</i> <i>Prunus virginiana</i> <i>Purshia stansburiana</i> <i>Purshia tridentata</i> <i>Rosa woodsia</i>
Rubiaceae	<i>Galium aparine</i>
Salicaceae	<i>Populus tremuloides</i> <i>Salix exigua</i>
Sapindaceae	<i>Acer glabrum</i> <i>Acer grandidentatum</i> <i>Acer negundo</i>
Scrophulariaceae	<i>Linaria dalmatica</i> <i>Penstemon whippleanus</i> <i>Verbascum thapsus</i>
Solanaceae	<i>Datura wrightii</i> <i>Solanum dulcamara</i> <i>Solanum elaeagnifolium</i>

Appendix C: Survey Maps





2017 LNF Botanical Survey Survey Area Regional View

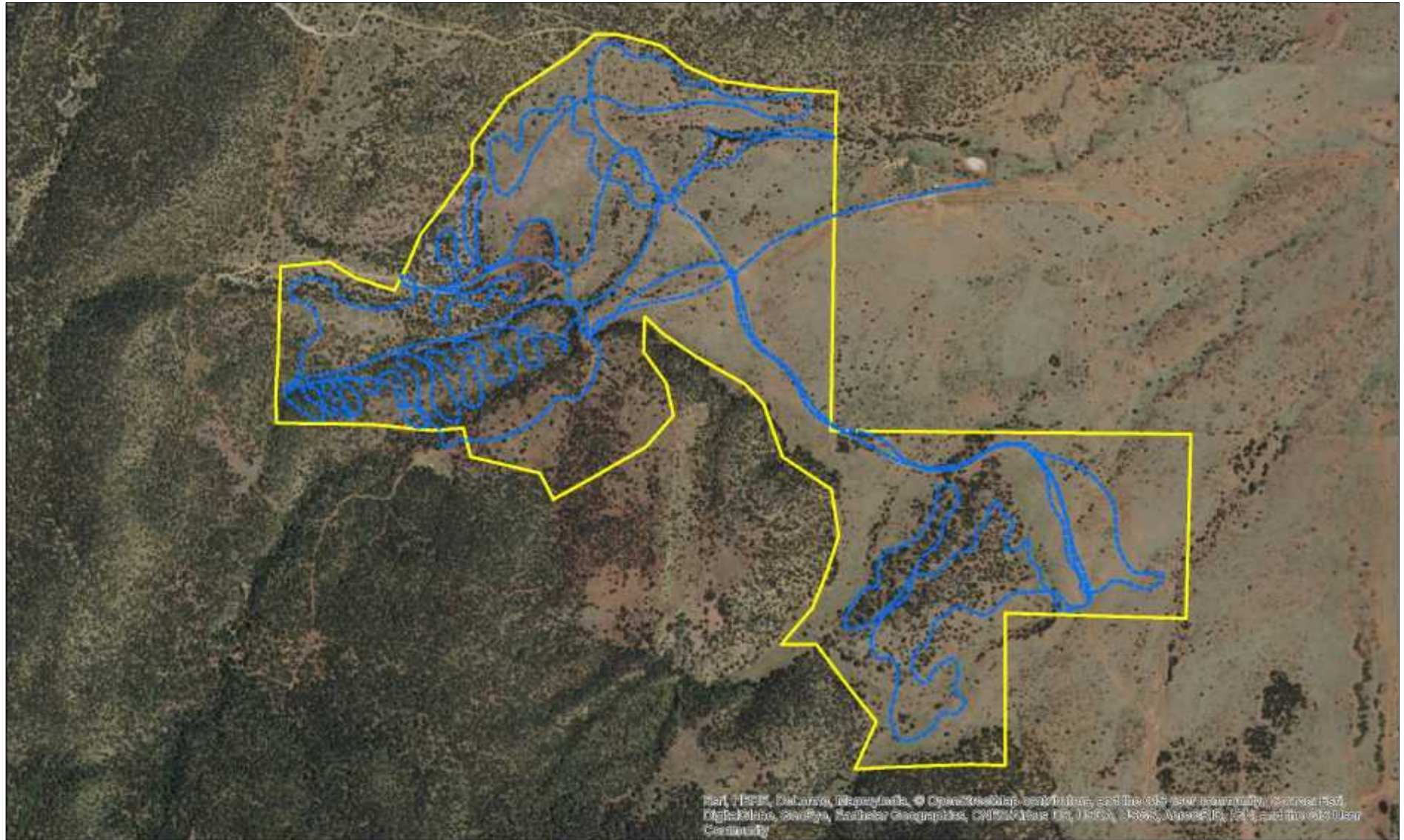




2017 LNF Botanical Survey Agua Chiquita



-  Survey Boundaries
-  Transects





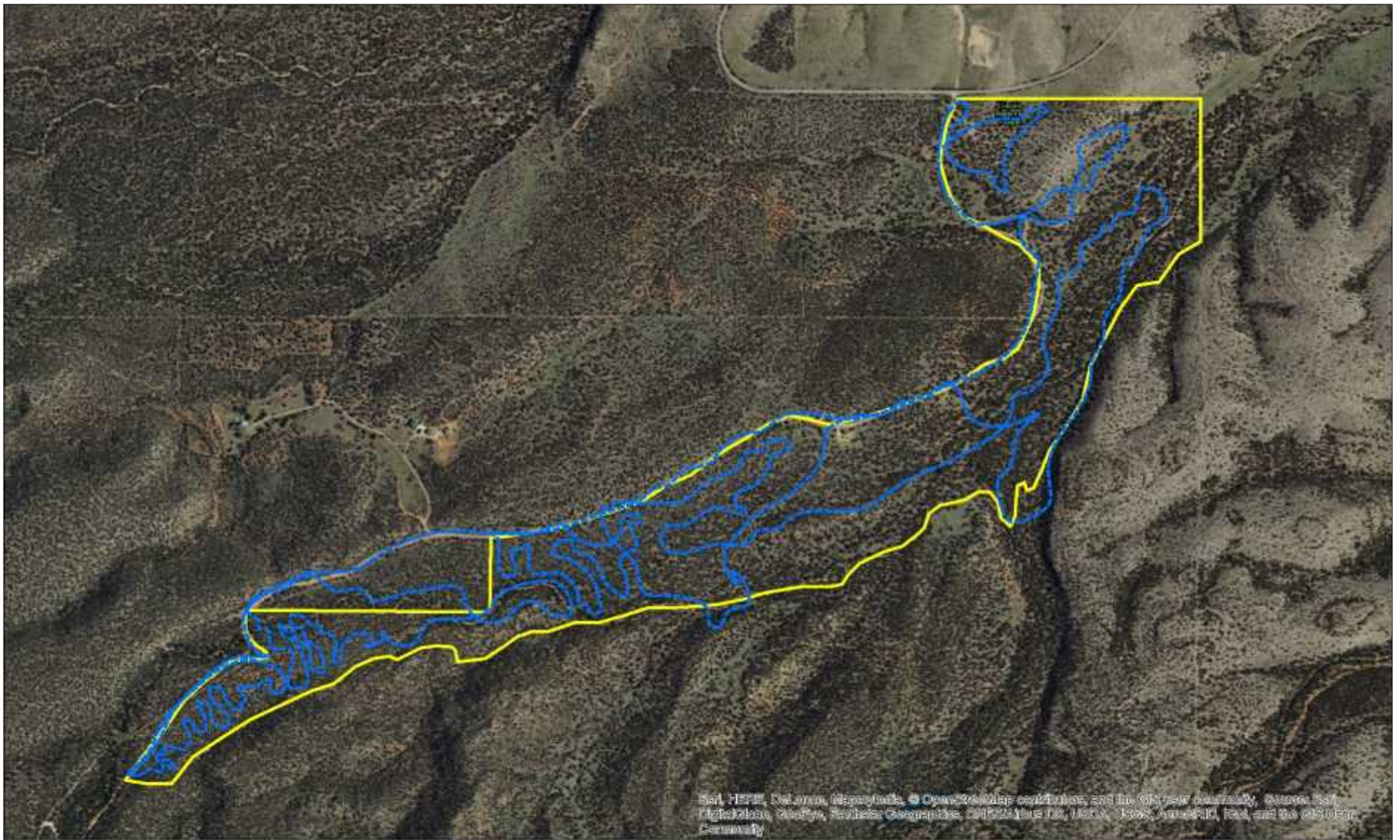
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2017 LNF Botanical Surveys Aragon



-  Survey Boundaries
-  Transects





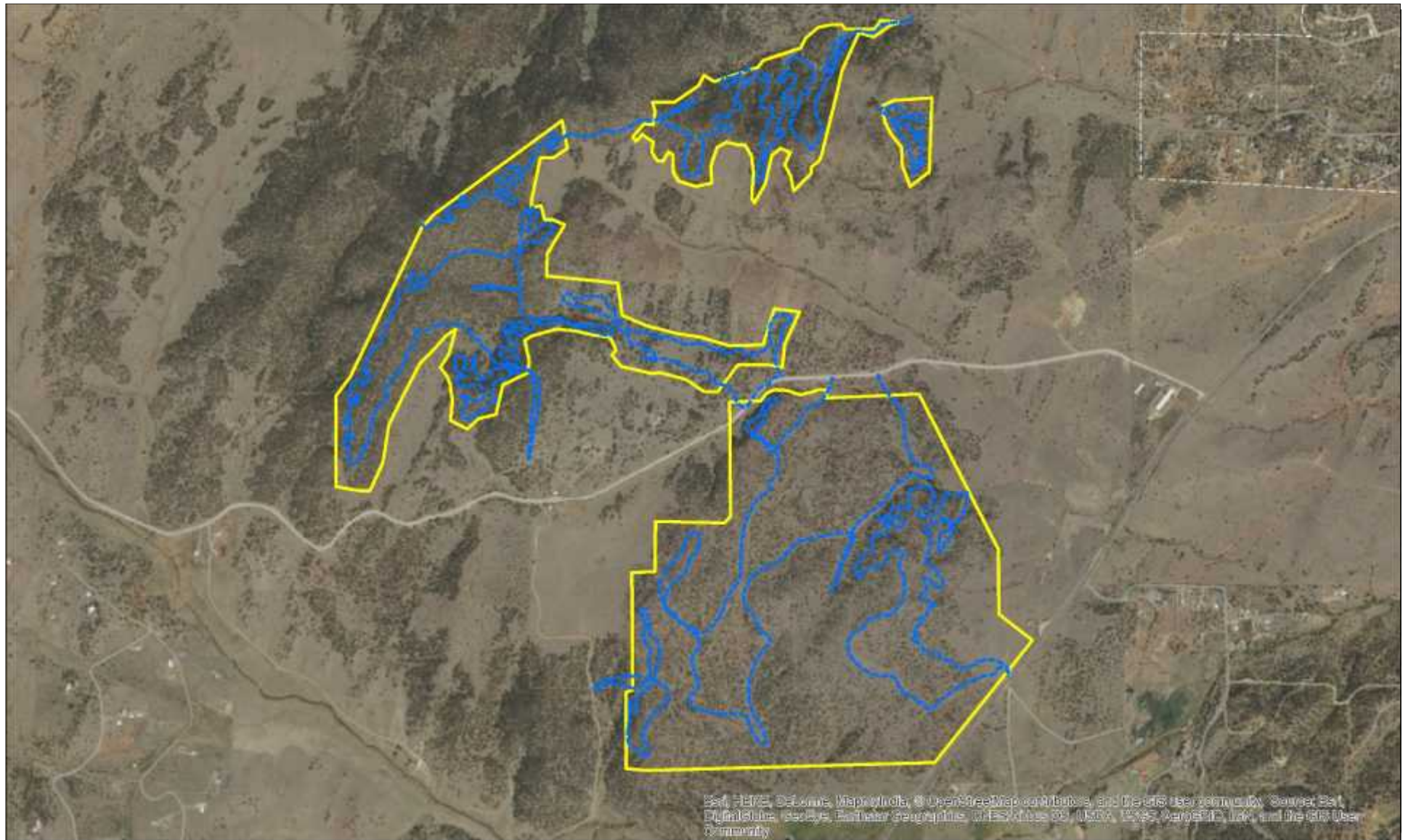
Map, HERE, DeLorme, Mapbox, © OpenStreetMap contributors, and the GIS user community, © Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNR/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community



2017 LNF Botanical Survey Boy Scout Mountain



-  Survey Boundaries
-  Transects





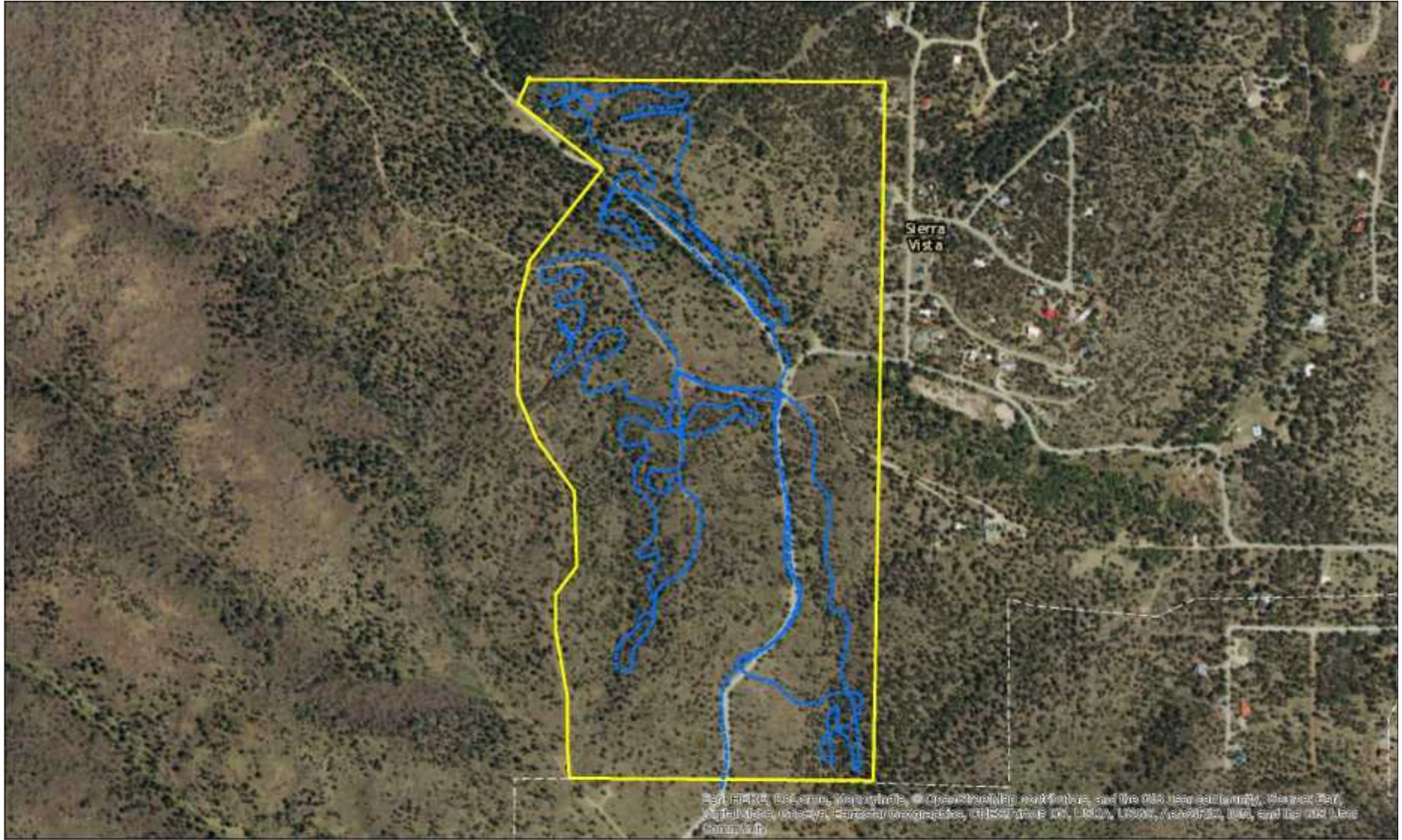
Esri, HERE, DeLorme, Mapbox, OpenStreetMap contributors, and the GIS user community. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community



2017 LNF Botanical Survey Cora Dutton & Capitan Mastication



-  Survey Boundaries
-  Transects

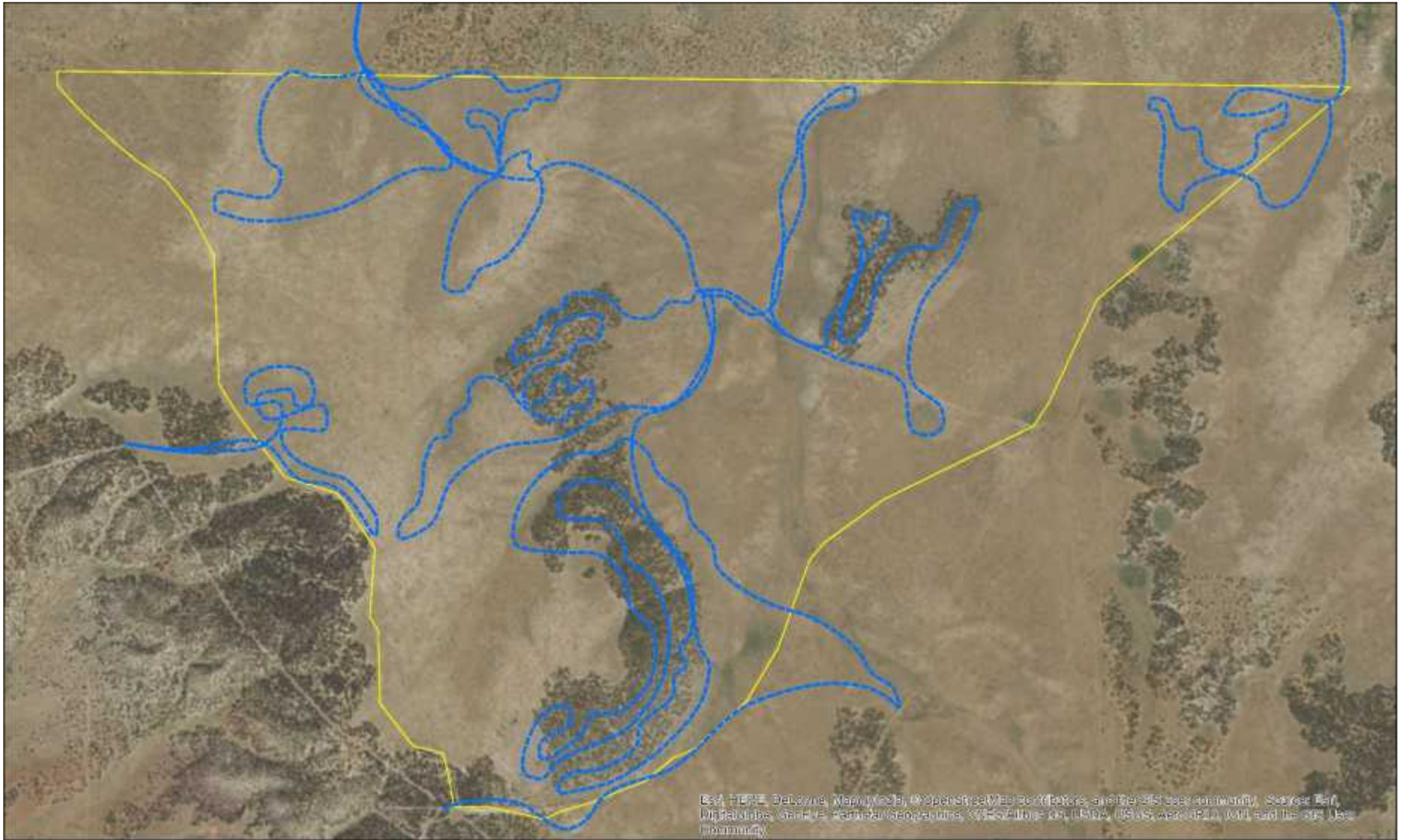


2017 LNF Botanical Survey
Eagle



 Survey Boundaries

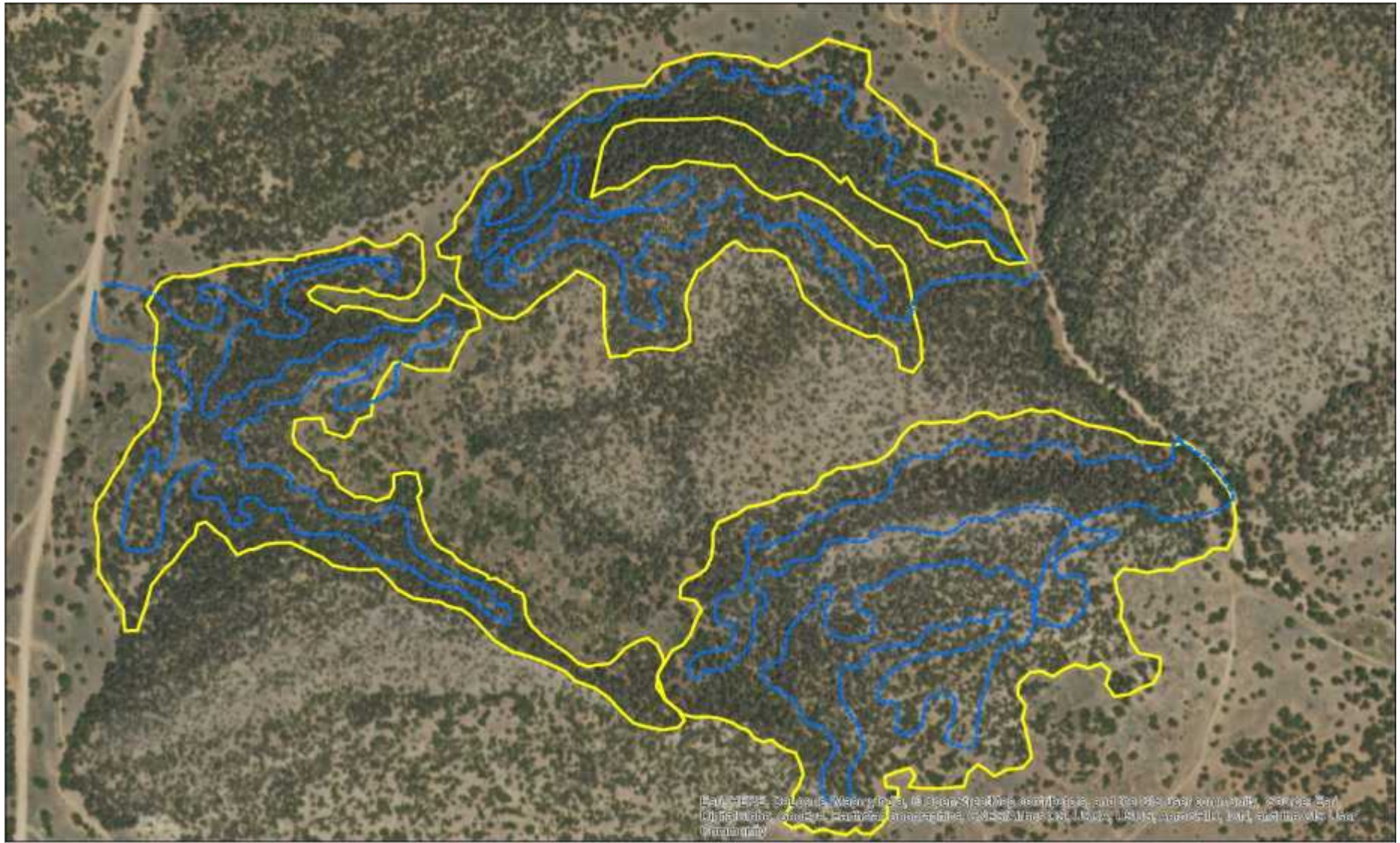
 Transects



2017 LNF Botanical Survey Hightower North



- Survey Boundaries
- Transects



ERIN HEPPLE, Geologist, West Virginia, at 08:00:39 AM on 09/01/2017. Thanks to the US Forest Service, National Geographic, and other partners in the field. © 2017. All rights reserved. All other trademarks and registered trademarks are the property of their respective owners.

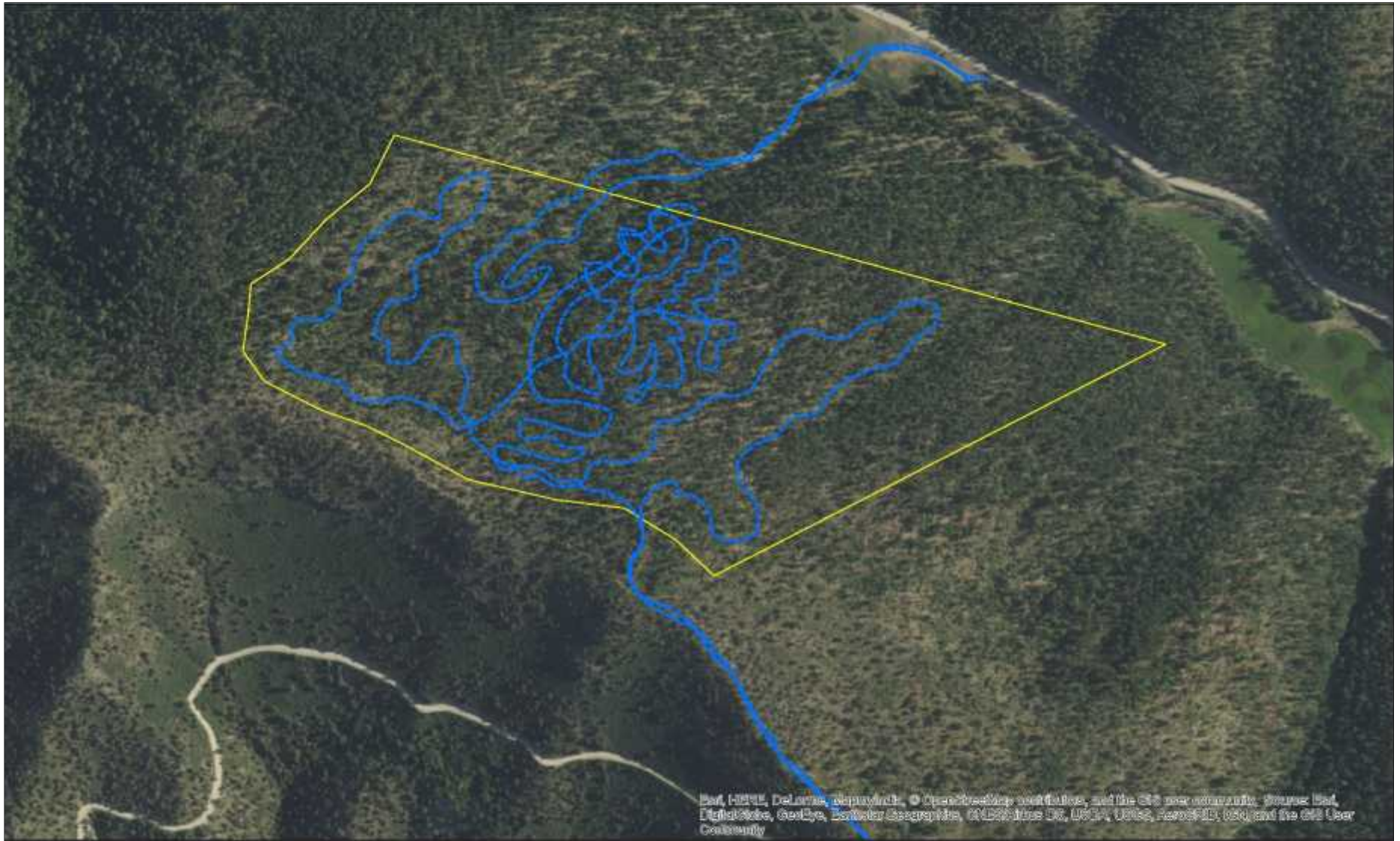


**2017 LNF Botanical Surveys
Reventon**

Survey Boundaries



Transects





2017 LNF Botanical Survey Sacramento Canyon



-  Survey Boundaries
-  Transects