Lake Pleasant HMA Appropriate Management Level

Introduction

As provided in the Bureau of Land Management (BLM) Wild Horses and Burros Management Handbook (H-4700-1), the appropriate management level (AML) shall be expressed as a population range within which wild burros, in this case, can be managed for the long term. The AML upper limit shall be established as the maximum number of wild burros which results in a thriving natural ecological balance and avoids a deterioration of the range. The AML lower limit shall normally be established at a number that allows the population to grow (at the annual population growth rate) to the upper limit over a 4-5 year period, without any interim gathers to remove excess wild burros.

The following is an assessment of resource conditions and public safety to consider for AML of the Lake Pleasant Wild Burro Herd Management Area (HMA).

Vegetation and Soil Monitoring

The Lake Pleasant HMA is located within the Major Land Resource Area (MLRA) 40X Sonoran Basin and Range. The Natural Resource Conservation Service (NRCS) describes the topography, geology, soils, climate, and range sites of MLRAs. MLRA information is continually updated as new data becomes available. Ecological sites are identified within MLRAs. Available Ecological Site Description[1] (ESD) sheets describe ecological potential and ecosystem dynamics of land areas. Information provided in ESDs can be used to compare with field data to determine if a site is within a state given a natural range of variability or in a degraded/ing state due to some disturbance (prolonged drought, wildfire, noxious weed invasion).

The HMA boundary falls within several grazing allotments in which key area monitoring plots have been established. Data from key areas are used to build trend over periods of years and provide an indication of current or changing ecological conditions. Additionally, the Assessment, Inventory, and Monitoring (AIM) strategy was implemented within areas of the HMA. The following table (Table 1) and map (Figure 1) provides a breakdown of those dominant ecological sites the Lake Pleasant HMA encompasses (BLM public lands only).

Table 1: Lake Pleasant HMA, BLM Acres, Ecological Site Breakdown

Dominant Ecological Site	Acres	% of Each Eco. Site Within The HMA
Basalt Hills 10"-13" p.z.	952.08	1.56%
Clay Loam Upland 10"-13" p.z.	540.59	0.89%
Clay Loam Upland 7"-10" p.z.	1,601.93	2.62%
Clayey Upland 10"-13" p.z.	278.32	0.46%

[1] https://edit.jornada.nmsu.edu/

Dominant Ecological Site	Acres	% of Each Eco. Site Within The HMA
Clayey Upland 7"-10" p.z.	63.22	0.10%
Granitic Hills 10"-13" p.z.	213.59	0.35%
Granitic Hills 12-16" p.z.	8,304.55	13.60%
Limestone Hills 10"-13" p.z.	177.39	0.29%
Limy Slopes 10"-13" p.z.	178.54	0.29%
Limy Upland 10"-13" p.z.	79.05	0.13%
Limy Upland 7"-10" p.z.	210.82	0.35%
Limy Upland, Deep 7"-10" p.z.	69.11	0.11%
Loamy Slopes 10"-13" p.z.	186.46	0.31%
Loamy Slopes 7"-10" p.z.	40.60	0.07%
Loamy Swale 10"-13" p.z.	244.72	0.40%
Loamy Upland 10"-13" p.z.	1,069.81	1.75%
Loamy Upland 12-16 p.z.	25.09	0.04%
Saline Swale 3"-7" p.z.	5,335.04	8.74%
Sandy Bottom 16-20	58.00	0.09%
Sandy Loam, Deep 7"-10" p.z.	35.30	0.06%
Sandy Wash 7"-10" p.z.	82.98	0.14%
Schist Hills 10"-13" p.z.	9,866.50	16.16%
Schist Hills 7"-10" p.z.	4,527.11	7.41%
Shallow Hills 10"-13" p.z.	628.17	1.03%
Volcanic Hills 10"-13" P.Z.	19,944.52	32.67%
Volcanic Hills 7"-10" p.z.	1,344.23	2.20%
No Data	4,998.74	8.19%

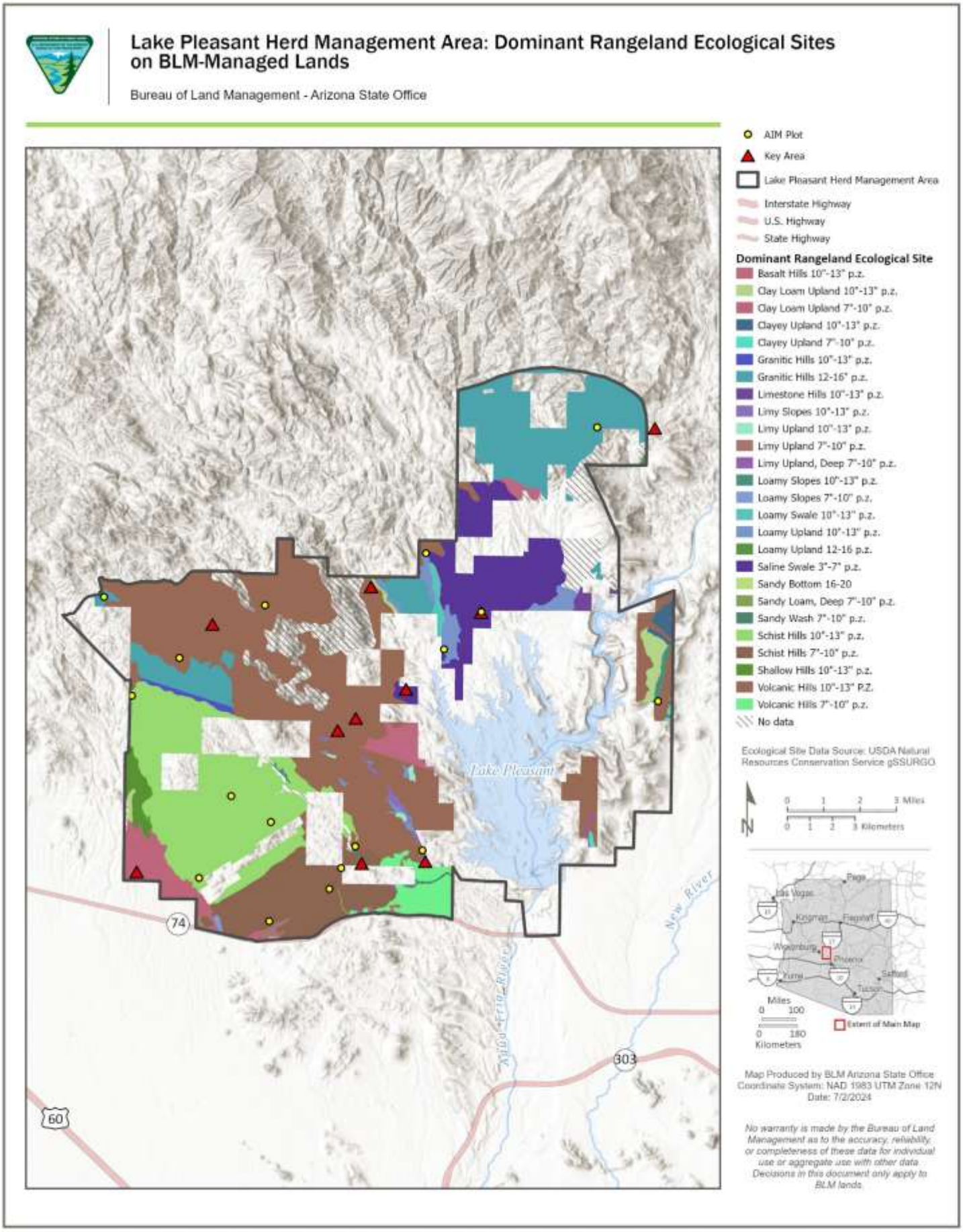


Figure 1. Map of the Ecological Sites within the HMA on BLM Managed Lands

AIM Data

Assessment, Inventory, and Monitoring (AIM) data was collected in and around the HMA in 2022. These plots were randomly generated with the purpose of capturing overall rangeland health data on public lands and support multiple management decisions. AIM data can be used to compare current conditions against ESDs and the rangeland health reference sheets (if available). However, multiple years of data are needed to establish trend. AIM data has also been collected throughout the rest of the MLRA 040X, within different BLM field offices, at different points in time. In comparison, the following box and whisker statistical charts showcase how site conditions within the HMA compare to similar or equally described ecological sites located elsewhere throughout MLRA 040X (outside the HMA). The "X" within each box indicates the mean.

Volcanic[2], Granitic, and Basalt Hill 10-13" p.z. Ecological Sites

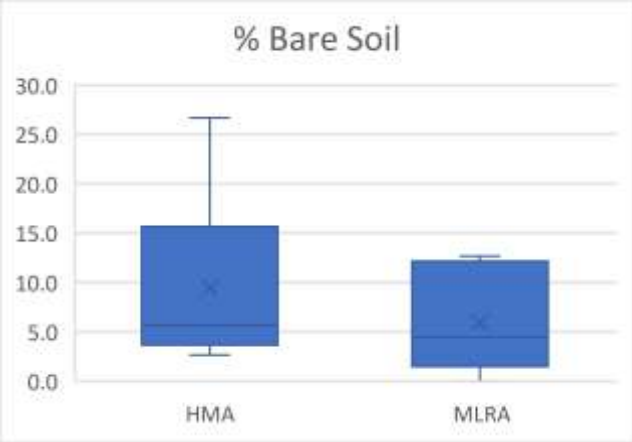


Chart 1**.** In general, the amount of bare soil, un-protected soils, was similar within the HMA and plots outside the HMA. However, when looking at the Volcanic Hills 10-13" p.z. (R040XA123AZ) ESD, the amount of bare soil on these sites should be 1-2%. Although the amount of bare ground was similar inside and outside the HMA, the total amount of bare ground was greater than expected based on the ESDs and reference locations.

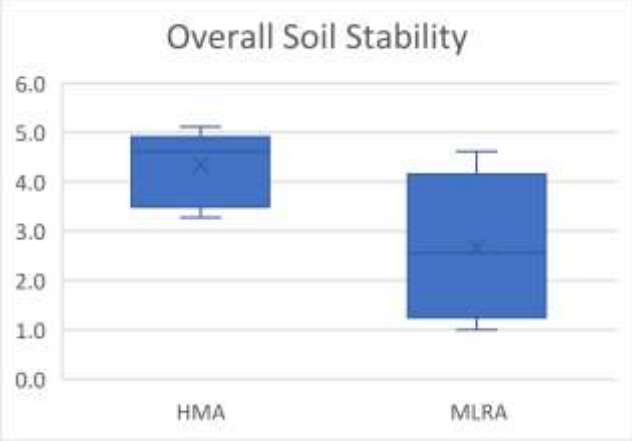


Chart 2. Soil Stability is given a 1-6 rating with 1 being low and 6 being high stability. Though some plots within the HMA resulted in higher stability ratings, all plots in and outside the HMA were found within expected ranges as provided in the Volcanic Hills 10-13" p.z. (R040XA123AZ).

[2] Granitic Hills and Basalt Hills 10-13" p.z. Reference Sheets are currently not available. Therefore, Volcanic Hills 10-13" p.z. (R040XA123AZ) was used for comparing ecological site potential.

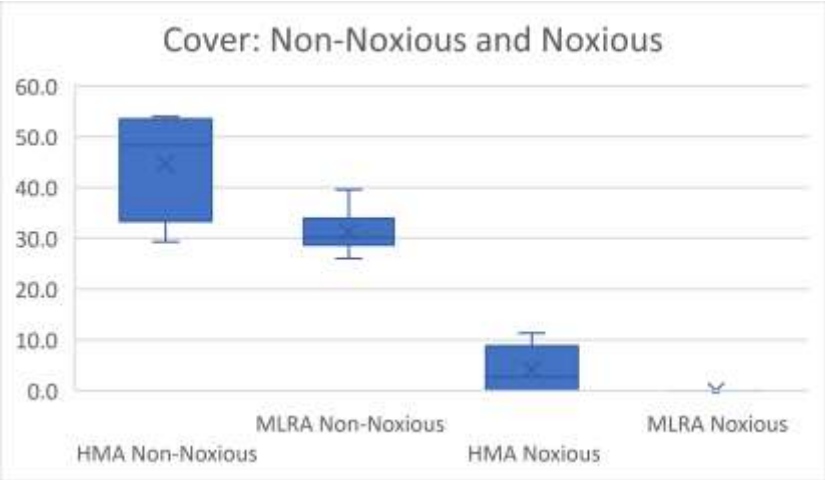


Chart 3. Using the plots available, foliar cover of non-noxious (native) plants within the HMA were found with higher cover than outside the HMA. AIM plots outside the HMA did not exhibit noxious weeds where plots inside the HMA did.

Schist Hills 10-13" p.z. Ecological Site

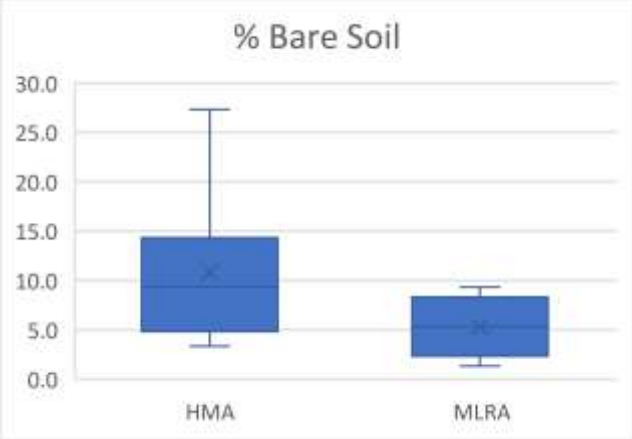


Chart 4. Within the HMA, a portion of the plots showed a higher percentage of bare soil, un-protected soils, compared to outside the HMA. The range of variability for bare soil provided in the Schists Hills 7-10" ESD reference is 1-2%. Therefore, except for one plot outside the HMA, all plots exceed the range of variability.

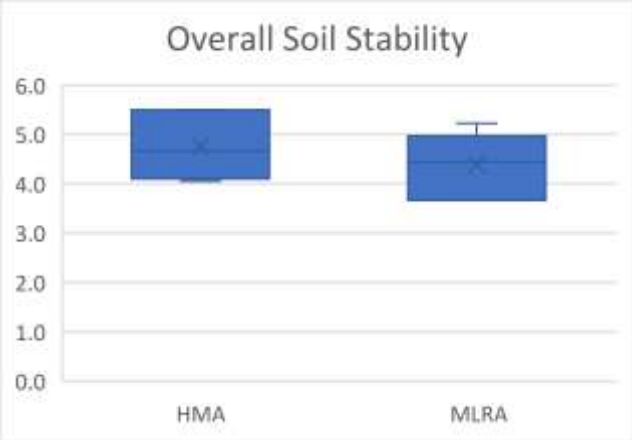


Chart 5. Soil stability for all plots was found within expectation.

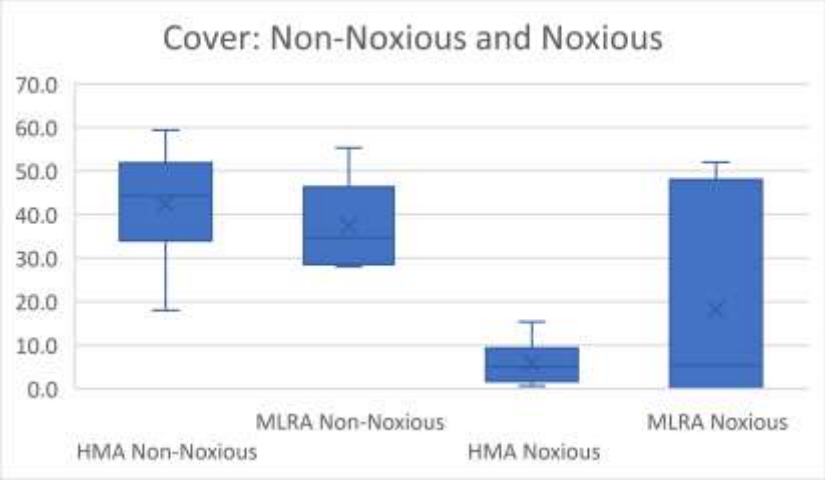


Chart 6. All plots within the HMA exhibited noxious weeds while only half outside the HMA exhibited noxious weeds.

Comparison of available AIM plots between the HMA and the rest of the MLRA did not highly differ. However, some individual sites within the HMA were outside of the normal range of variability identified by the ESDs, including increase of bare soil and the presence of noxious plants. The presence of noxious plants can contribute to higher levels of overall plant cover but should not be considered as positive. Noxious plants could mean a degraded native plant community and thereby lower habitat quality. The Volcanic Hills, Granitic Hills, and Schist Hills ecological sites represent a large makeup of the ecological sites within the HMA as a whole and are representative of areas with less desirable burro habitat. Less available are areas of high vegetation density that are more desirable by burros, livestock, and other wildlife as well.

Key Area Data

Key areas are established in areas of interest and represent a much larger area. Key areas are established for the targeted ability to reflect the impact of wild burros on the larger area.

In late 2023 and early Spring of 2024, ten key areas previously established within the HMA were re-visited. Quantitative data was gathered to assess bare soil, herbaceous canopy, and invasive/noxious presence. Interpreting Indicators of Rangeland Health[3] (IIRH), a qualitative assessment of current conditions, was also conducted. IIRH rates 17 indicators of soil, hydrological, and biotic components of a site from none to slight, slight to moderate, moderate, moderate to extreme, extreme to total departure from expectation or acceptable ranges. Conditions of those soil, hydrological, and biotic components are held against available reference sheets provided in ESDs.

Bare soil at all 10 key areas was within the expected range of variability identified in the corresponding ESD. Soils were protected mainly by gravel/cobble. Canopy cover was lower than expected conditions identified in the ESD at three of the 10 key areas. Invasive and or noxious

[3] BLM Technical Reference 1734-6, Version 5

weeds were present at all 10 key areas. The noxious invasive annual grass, Red brome (*Bromus madritensis*), was found in all sites.

IIRH conducted at all key areas indicated that overall ranking for soil and hydrological process is within the expected range of variability. Different levels of compaction and erosion, due to off-highway vehicles, livestock, and wild burros was observed at some sites, but was not significant enough to warrant a higher departure rating. For biotic integrity, seven out of 10 sites were observed to have a slight to moderate departure from the expected range of variability. Though perennial grasses and forbs are a small component of species within the overall plant community, they were found impacted (e.g. high use, limited annual growth, and recruitment) by current and previous grazing. Additionally, all plant communities have an increased presence of invasive and/or noxious species, increased site litter, changes in relative dominance of plant type, increased dead or dying plants, and a decrease in plant vigor and reproductive capabilities. Two similar studies, one in and around the Lake Havasu HMA and the other in and around the Lake Pleasant HMA, documented decreases in plant cover, density, size, and recruitment associated with burro herbivory, especially closer to water (Rubin et. al. 2024).

One key area site is located within a Sandy Wash 7-10" p.z. ecological site. The site is located on the southern area of the HMA. Wash sites tend to exhibit higher plant densities than any other sites within the HMA. They are typically preferred areas for livestock, wild burros, and other wildlife. This site was found at a slight to moderate departure from the expected range of variability. Departure from expected conditions include low plant canopy cover values, presence of invasive and/or noxious species, decreased relative plant dominance, increased erosion, increased compaction, and soil surface loss along banks. Impacts at this site are evident from off-road use, livestock, and wild burros. This site is representative of areas of the HMA that consist of washes and drainages and is indicative of more wet areas such as springs, creeks, and other riparian areas along Lake Pleasant.

Typical plants in a wash site consist of trees and shrubs (browse species) in the Pea (Fabaceae) family such as mesquite (*Prosopis* spp.), palo verde (*Parkinsonia* spp.), ironwood (*Olneya tesota)*, and acacia for example. Maximum productivity occurs around spring and early mid-summer. In a study by Hanley and Brady (1977), *Feral Burro Impacts on Sonoran Desert Range*, located south of Lake Havasu City Arizona (east side of the Colorado River), found higher levels of utilization in washes. Another study conducted at the Chemehuevi Mountains in California (across Lake Havasu City, west side of the Colorado River) by Woodward and Ohmart (1976) observed burros spending around 60 to 80% of the time in interfluves mainly during the winter months. Habitat use then shifted to the washes in the spring and early summer (June) with greening perennials. By July, burros were rarely seen on interfluves after dawn. With high temperatures, burros sought shade near the mouths of the washes by mid-morning. During the Summer, burros were more restricted in their movements and primarily utilized the riparian habitat and washes within 3 km from the river.

Recently, Esmaeili et. al. (2023) conducted a burro diet study within the Lake Pleasant HMA. Fifty fresh fecal samples were randomly collected mainly along the shoreline of Lake Pleasant between June and July 2019. After analysis, results provided that the most abundant summer diet of burros were those in the Pea family with 44.11% of total read abundance, followed by grass (Poaceae) family (18.24%) and mustard (Brassicaceae) family (8.19%). In other past studies, Browning (1960) determined burros in Death Valley, CA, annual diet consisted of 10.0% grasses, 39.0% forbs, and 51.0% browse. Hansen and Martin (1973) revealed burros in the lower Grand Canyon, AZ, annual diet consisted of 61.0% grasses, 11.5%forbs, and 27.5% browse species. Woodward and Ohmart (1976) annual diet of burros in the Chemehuevi Mountains, CA, consisted of 3.9% grasses, 30.1% forbs, 61.1% browse, and 4.9% of unknown species. All these studies provide an illustration into the versatility of burro diet dependent on ecological region and time of year. With plant composition at the Lake Pleasant HMA consisting mainly of browse types and in concentration along wash and riparian sites, it can be reasonably expected for such areas to exhibit higher impacts by current and increasing populations of burros during summer seasons of use.

Lake Pleasant Burro Herd Distribution

During the years 2017-2020 a Global Positioning System (GPS) locations of free-roaming burros study approved by the BLM and conducted by the United States Geological Survey (USGS) and concurrently by the Arizona Game and Fish Department (AGFD) took place in the Lake Pleasant HMA. This was part of a larger comparative study taking place between 2016-2020 at the Lake Pleasant HMA and Sinbad HMA in Utah. For the purpose of this document, only the Lake Pleasant HMA GPS points are discussed.

GPS telemetry collars were used to locate burros every 2 hours continuously for Lotek collars and every 13 hours continuously for Vectronic Aerospace collars (Schoenecker et. al. 2024). The study was conducted at the Lake Pleasant HMA over a four-year period: 24 burros were collared in 2017, 50 in 2018, 43 in 2019, and 28 in 2020. Map 1 (attachment A) shows the compilation of all the points for all four years of the study, providing insight into the distribution of burros despite the relatively small number of collared burros compared to population estimates.

Within the HMA, GPS data showed a high concentration of burros around Lake Pleasant and the southwest area. Burros residing in the southwest area is likely due to water and potential feed sources at the private Quintero Golf Club within the HMA and a private gravel mining operation just outside the HMA boundary. South of the HMA boundary (outside the HMA), burros were found concentrating near areas north and south of the Arizona State Route 303, respectively, along the Agua Fria River, and along New River (more of an ephemeral wash in this particular area) west of Interstate 17. Burros can move between these areas due to roadway underpasses and holes in fencing. Ponds, dirt tanks, and troughs scattered outside the HMA also allow burros the opportunity to reside outside the HMA; with confirmed burro presence reported by callers, incident reports, and field observations by BLM personnel.

West of the HMA boundary (outside the HMA), GPS points showed burros concentrating near residential areas in Morristown AZ along Trilby Wash. The GPS study also tracked burros outside of the HMA in the northwest area where more mining operations take place and may provide access to water. North of the HMA, burros were tracked moving in and out along Castle Creek, French Creek, and Cow Creek. Maps 2-5 (attachment A) provide a year-by-year summer (June-September) breakdown. Comparing Maps 2-5 to Map 1 shows how the collared burros were more tightly concentrated during the warm season near water and washes where higher densities of vegetation are present.

Maps provided in attachment B, showcasing census flights that took place in April 2014, June 2017, and May 2023 provide a snapshot into burro distribution during those surveys. These flight surveys provided further insight into burro distribution across the HMA during late spring early summer. All flight surveys captured burros utilizing areas mainly near Lake Pleasant and along creeks and ephemeral washes, similar to the GPS data.

Both the collaring study and the flight surveys showed that burros concentrate their use along areas closer to water and where higher densities of vegetation are present, particularly during the summer months. This is expected of any livestock, wildlife, and burro, as all these animals require the same or similar resources. As populations continue to grow, these areas of concentration will continue to be used at higher rates. Groups of burros are also known to visit and reside near surrounding communities such as Vistancia and New River, Arizona, to utilize more readily available resources. Karish et. al. (2023) found similar distribution patterns where collared female burros selected areas closer to water in all seasons and visited waters more frequently during the summer season. Additionally, when available, those collard burros strongly selected for areas closer to urban areas. Urban areas can provide for multiple resources and where forage can be greener than the surrounding desert.

The Lake Pleasant HMA consists of multiple ecological sites contributing varying amounts of forage availability and habitat types to support all animal types. The HMA is not uniform, and therefore, use and impacts will vary based on available resources.

The availability of annual forage is dependent on favorable winter precipitation, which may influence burro use onto upland sites or areas further from primary sources of water. Wash communities provide both perennial and annual forage species during years of favorable precipitation. However, during years of poor precipitation, forage provided by annuals in any location may be insignificant, and the major source of forage will be perennial vegetation in wash sites. Management, therefore, should primarily be concerned with the carrying capacity of the wash communities, as they are the greatest forage resource and consequently suffer the greatest burro impact (Hanley and Brady 1977).

Climate Conditions

Weather patterns for the past 25 years have been characterized by periods of prolonged drought with very short periods of average or above average precipitation. In the Agua Fria watershed

(HUC8, Agua Fria 15070102) (1,755,996.12 acres)[4] which encompasses the HMA, the United States Drought Monitor[5] (5/7/2025) characterized conditions from abnormally dry to extreme drought through the entirety of the watershed area for several years (Figure 2). Within the last few years, after periods of extreme drought in 2018 there was a short period between 2019 and mid-2020 that was not considered drought conditions. However, this short period of time was again followed by varying levels of drought conditions into year 2025 with the exception of the majority of 2023.

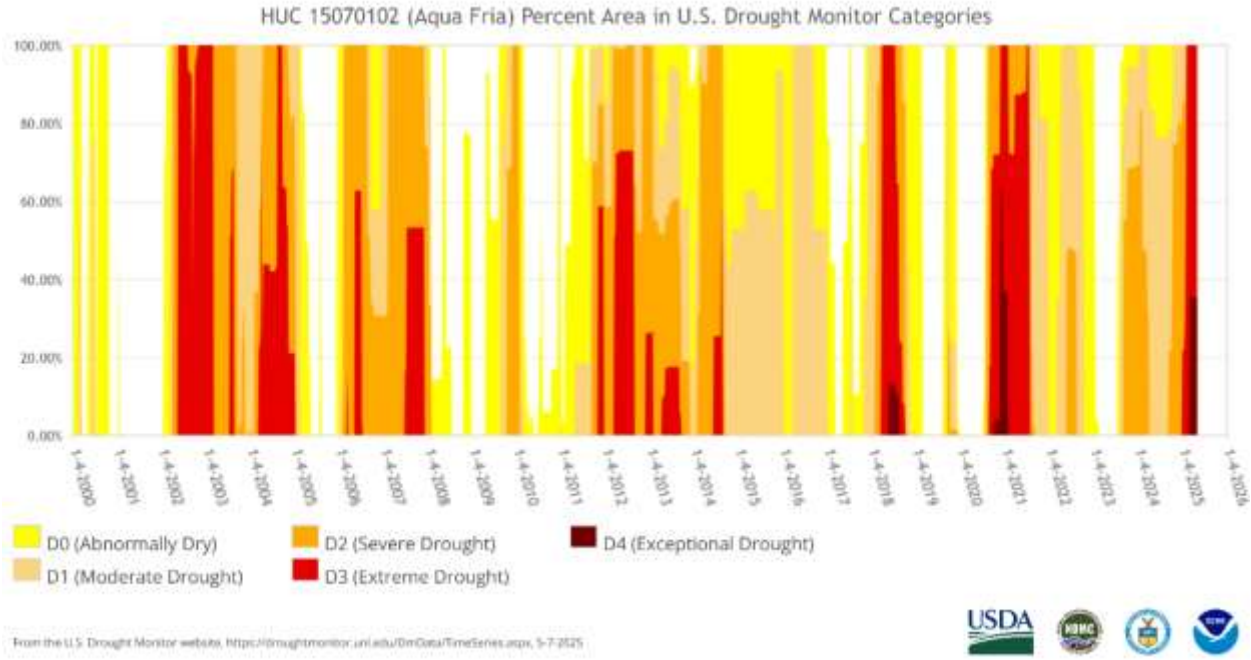


Figure 2. Percent Area of the Auga Fria watershed experiencing drought

Drought conditions, in general, have a significant impact on the natural environment. Recent field monitoring and observations have documented how plant communities have been affected by a combination of drought and grazing impacts. During the recent vegetative data collection in the HMA, results and observations from IIRH indicate that plant communities lacked vigor and had impaired reproductive capability due to drought conditions and continuous use. Dieback of plant parts and mortality, though difficult to quantify, was observed in the form of dry and decaying parts. In general, perennial grass are missing completely or underrepresented in the plant communities. Where present, grasses and subshrubs showed signs of current herbivory.

Drought and other factors have led to an increase in annual species and decrease in perennial species. Because of growth patterns and life cycle, annual plant species are only a viable forage source for a short period of time where the perennial species are needed to support grazing animals throughout the year. As the perennial species have decreased, wild burros, and other grazing animals, concentrate longer periods of time in the desert wash systems where higher density of perennial species remain. Woodward and Ohmart's study (1976) in the Chemehuevi Mountains found that, rather than shifting use towards interfluves as the weather cooled, burros

[4] Data from: https://apps.nationalmap.gov/viewer/
[5] Data from: https://droughtmonitor.unl.edu/CurrentMap.aspx

abandoned riparian zones for the washes instead. This was observed due to two years of drought and the subsequent removal of cured annuals. Burros were therefore seen spending less time in the interfluves than in previous winters. When a sparse cover of winter annuals sprouted in March and April in 1975, burros were again observed over 60% of the time on the interfluves.

Rangeland Analysis Platform Model

Vegetative cover data of the Lake Pleasant HMA (federal lands only) was compiled from Rangeland Analysist Platform[6] (RAP), which provides annual estimates of cover and biomass ranging back to 1986 (Robinson et al., 2019; Jones et al., 2021). RAP combines satellite imagery with thousands of ground vegetation measurements collected by BLM, NRCS, and National Park Service to map fractional vegetation cover and biomass across the United States.

Based on RAP analysis beginning in 1986, biomass of perennial forbs and grasses have decreased while annual forb and grass biomass has increased. All while overall herbaceous biomass has also increased (Figure 3). Average production (lbs/ac) of perennial forbs and grasses have decreased by almost half since the year 2000 (1986-2000: 176 lbs/ac; 2001-2023: 85 lbs/ac). Annual forbs and grasses increased during these same periods from 148 lbs/ac to 384 lbs/ac. RAP estimates do not differentiate between native and non-native/noxious species, but based on field observations and data, the increase in annual plant production is likely attributed to the increase in non-native/noxious plants.

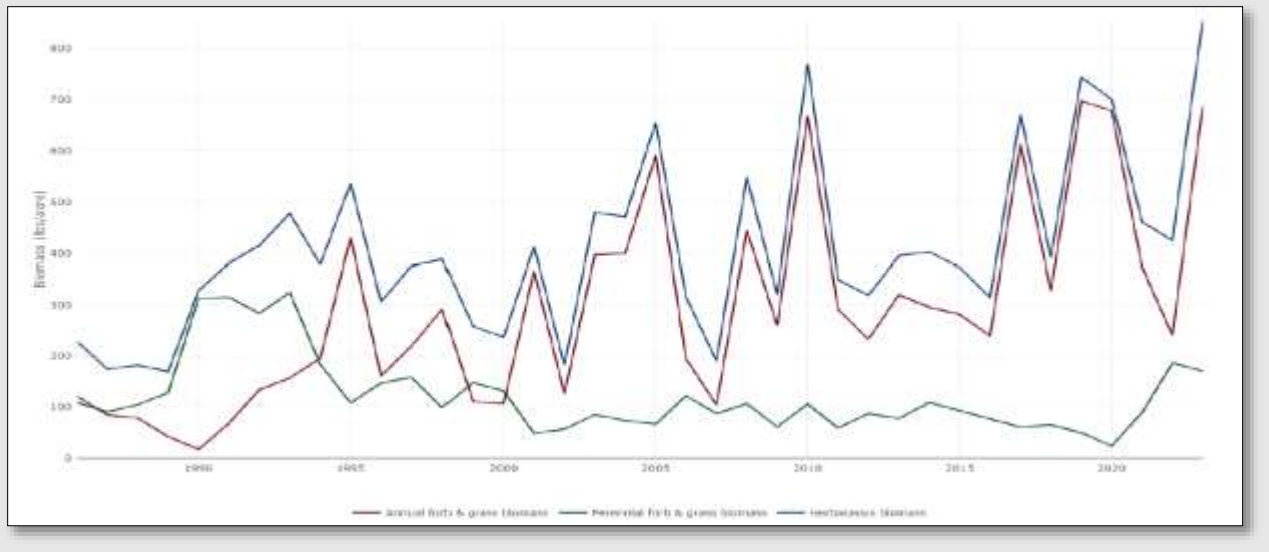


Figure 3. Biomass Trend Model for Federal Lands within the HMA

In a similar trend, ground cover (soil protection) provided by perennial forb and grasses has slowly decreased while ground cover from annual forbs and grasses has increased overtime (Figures 4 and 5). Data shows that while cover from annual plants increases, percent of bare ground decreases. Though a decrease in bare ground may appear positive, this does not represent the natural potential of these plant communities. Again, RAP does not differentiate between native and non-native/noxious species, but it is likely that increases of non-native/noxious

[6] Data from: https://rangelands.app/

species are contributing to the overall increase of annual forb and grass cover, therefore, causing a decrease in bare ground.

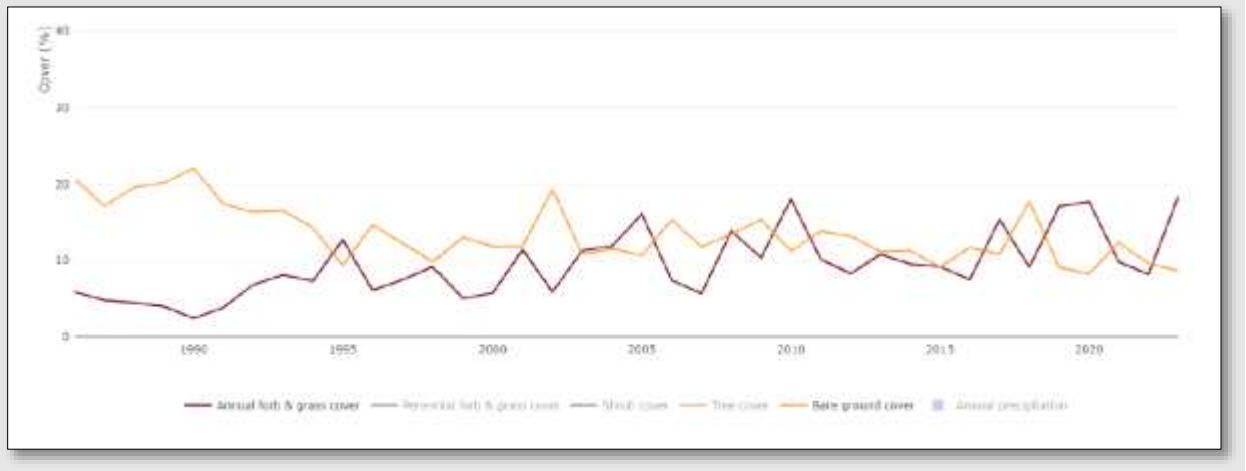


Figure 4. Annual Forb and Grass Cover compared to Bare Ground Cover

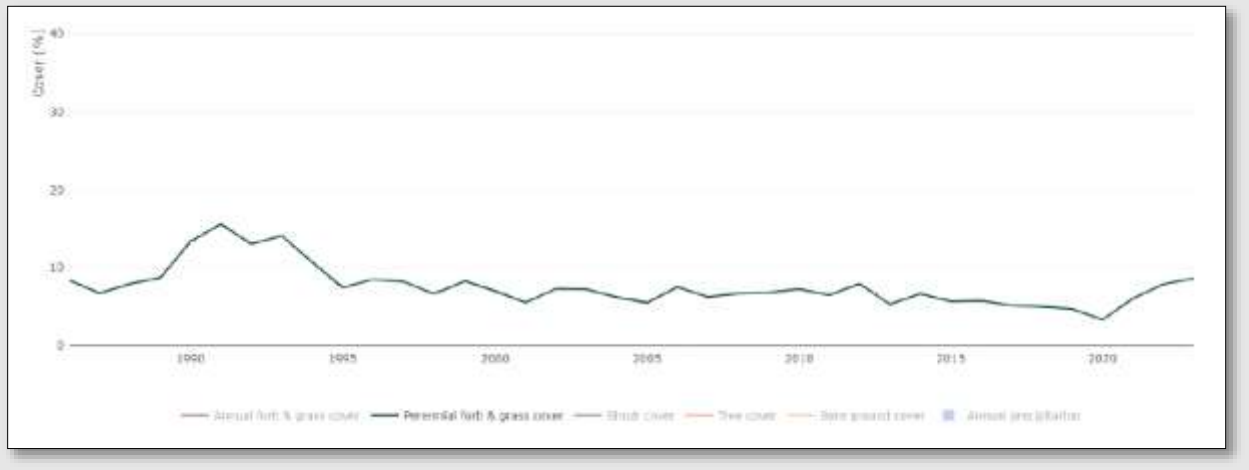


Figure 5. Perennial Forb and Grass Cover showing a decrease

Though not highlighted in figures 4 and 5, tree and shrub cover has remained relatively static over the years based on RAP models. This can be expected since woody species are hardier and more tolerant of less than desirable climate conditions. That is not to say that such plant types are not impacted by browsing use and drought conditions.

When calculating stocking rates, using production values from perennial plants is ideal as perennial plants are likely to stay more static compared to annual fluctuations of precipitation influencing the presence of annual plants. Though different ecological sites found within the HMA will vary in production values, RAP data provides for an average (years 1896-2023) annual production value of perennial forbs and grass at 121 lbs/ac for federal lands within the HMA. The following exercise, though not ideal for setting an actual stocking rate as it will be discussed, provides for assessing and considering an AML range.

Considerations for this exercise:

- Wild horses, one year of age or older, count as one (1) Animal Unit (AU) and burros one year of age and older count as 0.5 AU. One Animal Unit Month (AUM) is the amount of forage necessary to sustain one adult horse or two adult burros for one month (or approximately 800 pounds of air-dried forage per month) (BLM 2010).
- According to GIS, 61,031 acres within the HMA boundary are managed by the BLM.
- Studies and practices establish that an AU calculation requires a 2-3% of the body weight air dry forage daily intake. Though weight will vary, a burro might weigh around 400 lbs. 3% of 400lbs is 12 lbs of air-dry forage daily intake.
- Average days in a month is 30.4 days. 12 lbs of air dry multiplied by 30.4 days is 365 lbs a burro consumes based on monthly intake.
- Harvest efficiency is also considered. Harvest efficiency is the portion of current years forage production that is consumed by the grazing animals. Or it is the desired limit to provide for future plant health and production. For this exercise, no more than 30% of use.

Stocking Rate Exercise:

- 12 1lbs/acre/year (RAP average) × 61,031 acres (BLM) = 7,384,751 lbs (perennial forbs and grasses in a given year on 61,031 acres)

- 7,384,751 lbs ÷ 12 months = 615,396 lbs (lbs. available in a given month on 61,031 acres)

- 615,396 lbs × .30 harvest efficiency = 184,619lbs

- 184,619 lbs ÷ 365 lbs (burro monthly intake (12 lbs × 30.4 days)) = 505 burros year-round stocking rate.

Conclusion of exercise:

Based on this stocking rate exercise, 500 burros could be sustained on perennial forbs and grasses. Because RAP does not calculate lbs/acre for trees and shrubs, they are not included in this calculation and would result in a higher stocking rate of burros. Yet even if values of trees and shrubs were included, raising the number of burros to be stocked, it does not yet consider other factors such as current livestock management, wildlife, ecological processes like drought, and access limitation (distance from water, elevation/slope, barriers, etc.). The purpose of this exercise is to consider that even if all available forage was allocated to burros only, the current estimated and rising population (see table 4 of the Environmental Assessment, DOI-BLM-AZ-P010-2025-0019-EA) is not conducive for rangeland health.

Though some populations of burros are permanently residing outside of the HMA (in of itself an issue) the amount of burros utilizing resource in the HMA is not sustainable. Additionally, burros are not utilizing all areas of the HMA, rather, they are concentrating near riparian/wash areas.

Public Health and Safety Hazards

Burro and human interface are common both in and outside of the Lake Pleasant HMA. The majority of burro-vehicle incidents occur south of the HMA boundary along Hwy 74, N New River Rd., N. Lake Pleasant Pkwy, W. Lone Mountain Pkwy, and along State Route 303. Within the HMA, burro-vehicle incidents mainly occur along N. Castle Hot Springs Rd. (attachment C).

Other incidents involve burros causing property damage, chasing domestic dogs, and people being bitten and chased in some cases. Part of the issues associated with this behavior is public visitors attending recreational sites within or near the HMA and stopping to feed burros from vehicles along roads or walking up to burros in an attempt to touch and feed. Residents outside the HMA may provide feed and water to burros which alters behavior such as the “gentling” of burros who become less fearful of humans resulting in approaching people/vehicles and residential areas. Mining operations for example are also one of many activities located outside the HMA where water is present for operations and will attract burros.

In the springs of 2024 and 2025, a combined total of 861 wild burros were removed from private and state land areas due to numerous burro vs vehicle incidents, constant risk to public safety, and damage to private property. Burro issues have continued to occur well outside of the HMA due to burro overpopulation and growing urban communities. Between the nuisance removal gather that concluded in the spring of 2024 (401 burros removed) and the 2025 nuisance gather that concluded May 2 (460 burros removed), over 80 documented burro deaths occurred because of vehicle incidents.

Burros for several years have been found to be a nuisance and or a road hazard outside the HMA. Similar issues being faced today have been document since at least the last decade and a half with burro incidents mainly involving struck burros along the same roadways.

The wild horse and burro program records system provides approximately 1,182 animals have been gathered and removed since 2009. With the exception of the 2024 and 2025 gather and removal of 400 plus burros at each gather, previous gathers have mainly consisted of the removal of less than 100 animals at a time. The more recent removals of burros from the 2024 and 2025 nuisance gathers, though beneficial in addressing areas of concern, did not address the fact that there continue to be burros outside the HMA with burro's strikes being reported shortly after the gathers concluded.

The 2023 population survey compared to the 2017 survey is evident of burro growth and distribution further from the HMA. Cities like Peoria and Phoenix continue to grow by building communities, parks, roadways, and centers. These areas still consist of continuous desert accessible by livestock, burros, and wildlife. Routes normally trekked by burros have recently

been built on, cutting routes. Yet burros will seek alternative ways which often lead to crossing roads.

In 2022, a report published by the Arizona Department of Transportation (ADOT), *Strategies to Reduce Burro-Vehicle Collisions in the Lake Pleasant Area*, utilized multiple forms of data to understand burro behavior regarding where and how burros were accessing right-of-way's. The increasing number of collisions warranted the need to understand burro behavior and their access to roadways to determine effective and focused preventive measures that mitigate burro roadway access and reduce collisions, specifically in the Lake Pleasant area (ADOT 2022). In addition to recommendations for improving fencing, gates, and highway crossing, the study concluded that while burro populations within the study area were concentrated within the Lake Pleasant HMA, the burro range extended far beyond Lake Pleasant HMA's boundaries. From 2014 to 2019, collisions outside of the HMA accounted for 72.8 percent of total collisions along ADOT roads and 55.9 percent of collisions within the study area. Thus, restricting the burro range outside of HMA could significantly reduce burro-vehicle collisions (ADOT 2022).

Outreach and cooperative efforts between the BLM, ADOT, and other entities have occurred in the past and continue to address burro incidents and impacts. However, the most burro-vehicle collision and human interface effective mitigation method would be burro population management. Though burros can be expected to occasionally leave the HMA, achieving an AML range is expected to reduce impacts to human health.

Recommended AML

Based on the most reliable data and information, alongside considerations for human health and safety, an AML range of 140-250 burros is deemed suitable for effectively managing herd health while protecting natural resources.

Applying a 15% growth rate from the low AML of 140 is projected to increase the population to approximately 250 within five years. Maintaining a population range of no less than 140 is believed to be necessary for the successful growth and sustainability of the herd. A range of 140-250 is anticipated to maintain balance with other resources such as wildlife and wildlife conservation efforts, recreation, and livestock grazing,

The ever-increasing competition has caused many burros to reside outside the HMA and therefore create public safety issues. Consistent management of a population of 140-250 burros will lessen the current negative impacts to both the public and rangeland resources found within and outside the HMA.

Maintaining a population of at least 140 will also ensure that burros can thrive and reproduce without encountering genetic risk or issues related to inbreeding, thereby supporting herd health. Monitoring of herd health, resources, and human safety once at AML would continue to provide for future management evaluations (i.e. AML assessments).

References

Arizona Department of Transportation Research Center. 2022. Strategies to reduce burro-vehicle collisions in the Lake Pleasant Area. Report SPR-753 of the Arizona Department of Transportation, Phoenix, Arizona.

Bureau of Land Management. 2010. H-4700-1 Wild Horses and Burros Management Handbook. Washington D.C., US Department of the Interior, Bureau of Land Management.

Browning, B. 1960. Preliminary report of the food habits of the wild burro in the Death Valley National Monument. *Desert Bighorn Council Transactions*, *18*, 88-90.

Esmaeili, S., King, S. R., & Schoenecker, K. A. 2023. Browsers or grazers? New insights into feral burro diet using a non-invasive sampling and plant DNA metabarcoding approach. *Animals*, *13*(16), 2683.

Gagnon, J. W., Beach, C. A., Sprague, S. C., Nelson, H. P., & Loberger, C. D. 2022. *Strategies to Reduce Burro-Vehicle Collisions in the Lake Pleasant Area* (No. FHWA-AZ-22-753). Arizona. Department of Transportation.

Hanley, T. A., & Brady, W. W. 1977. Feral burro impact on a Sonoran Desert range. *Rangeland Ecology & Management/Journal of Range Management Archives*, *30*(5), 374-377.

Hansen, R. M., & Martin, P. S. 1973. Ungulate diets in the lower Grand Canyon. *Rangeland Ecology & Management/Journal of Range Management Archives*, *26*(5), 380-381.

Jones, M. O., Robinson, N. P., Naugle, D. E., Maestas, J. D., Reeves, M. C., Lankston, R. W., & Allred, B. W. 2021. Annual and 16-day rangeland production estimates for the western United States. *Rangeland Ecology & Management*, *77*, 112-117.

Karish, T., Roemer, G. W., Delaney, D. K., Reddell, C. D., & Cain III, J. W. 2023. Habitat selection and water dependency of feral burros in the Mojave Desert, California, USA. *The Journal of Wildlife Management*, *87*(6), e22429.

Pellant, M., P.L. Shaver, D.A. Pyke, J.E. Herrick, N. Lepak, G. Riegel, E. Kachergis, B.A. Newingham, D. Toledo, and F.E. Busby. 2020. Interpreting Indicators of Rangeland Health, Version 5. Tech Ref 1734-6. U.S. Department of the Interior, Bureau of Land Management, National Operations Center, Denver, CO.

Rubin, E. S., Conrad, D., Harding, L. E., & Russo, B. M. 2024. Associations between a feral equid and the Sonoran Desert ecosystem. *Wildlife Monographs*, *215*(1), e1083.

Robinson, N. P., Jones, M. O., Moreno, A., Erickson, T. A., Naugle, D. E., & Allred, B. W. 2019. Rangeland productivity partitioned to sub-pixel plant functional types. *Remote Sensing*, *11*(12), 1427.

Schoenecker, K. A., King, S. R., Hennig, J. D., Cole, M. J., Scasta, J. D., & Beck, J. L. 2024. Effects of telemetry collars on two free-roaming feral equid species. *Plos one*, *19*(5), e0303312.

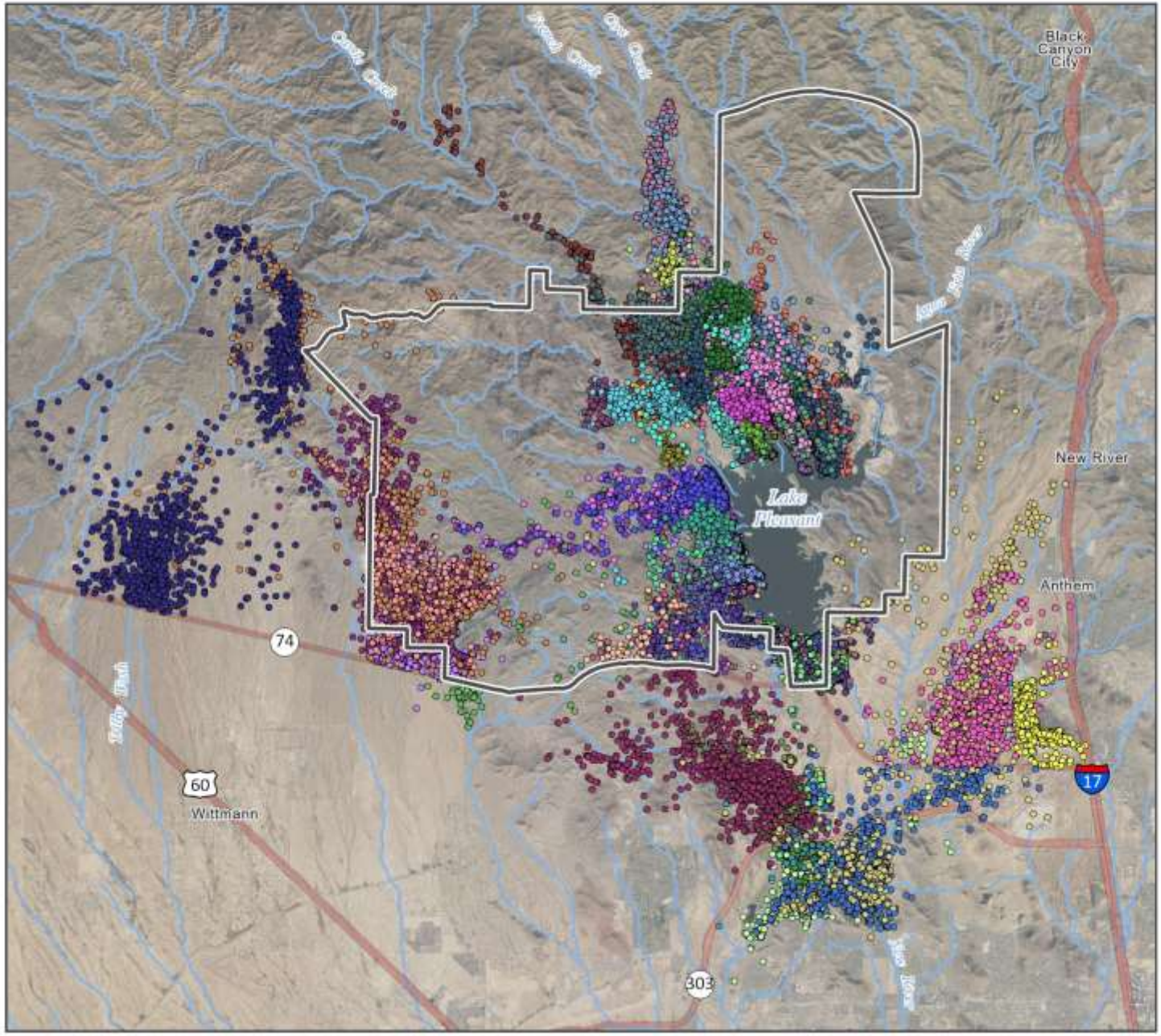
Woodward, S. L., & Ohmart, R. D. 1976. Habitat use and fecal analysis of feral burros (Equus asinus), Chemehuevi Mountains, California, 1974. *Rangeland Ecology & Management/Journal of Range Management Archives*, *29*(6), 482-485.

Websites Referenced:
Ecosystems Dynamics Interpretive Tool: https://edit.jornada.nmsu.edu/
Rangeland Analysis Platform: https://rangelands.app/
United States Drought Monitor: https://droughtmonitor.unl.edu/

Attachment A: GPS Locations Maps 1-5

Map 1. GPS Locations of Free-roaming Burros in Lake Pleasant Study Area, 2017 to 2020

Bureau of Land Management - Arizona State Office



Lake Pleasant Herd Management Area

Intermittent Stream/River

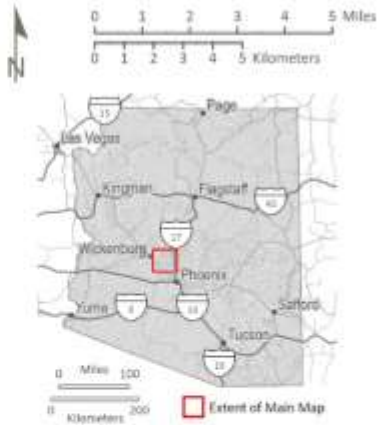
Interstate Highway

U.S. Highway

State Highway

The GPS point colors on this map are symbolized by Animal ID.

Burro GPS Data Credit: U.S. Geological Survey, Rocky Mountain Region

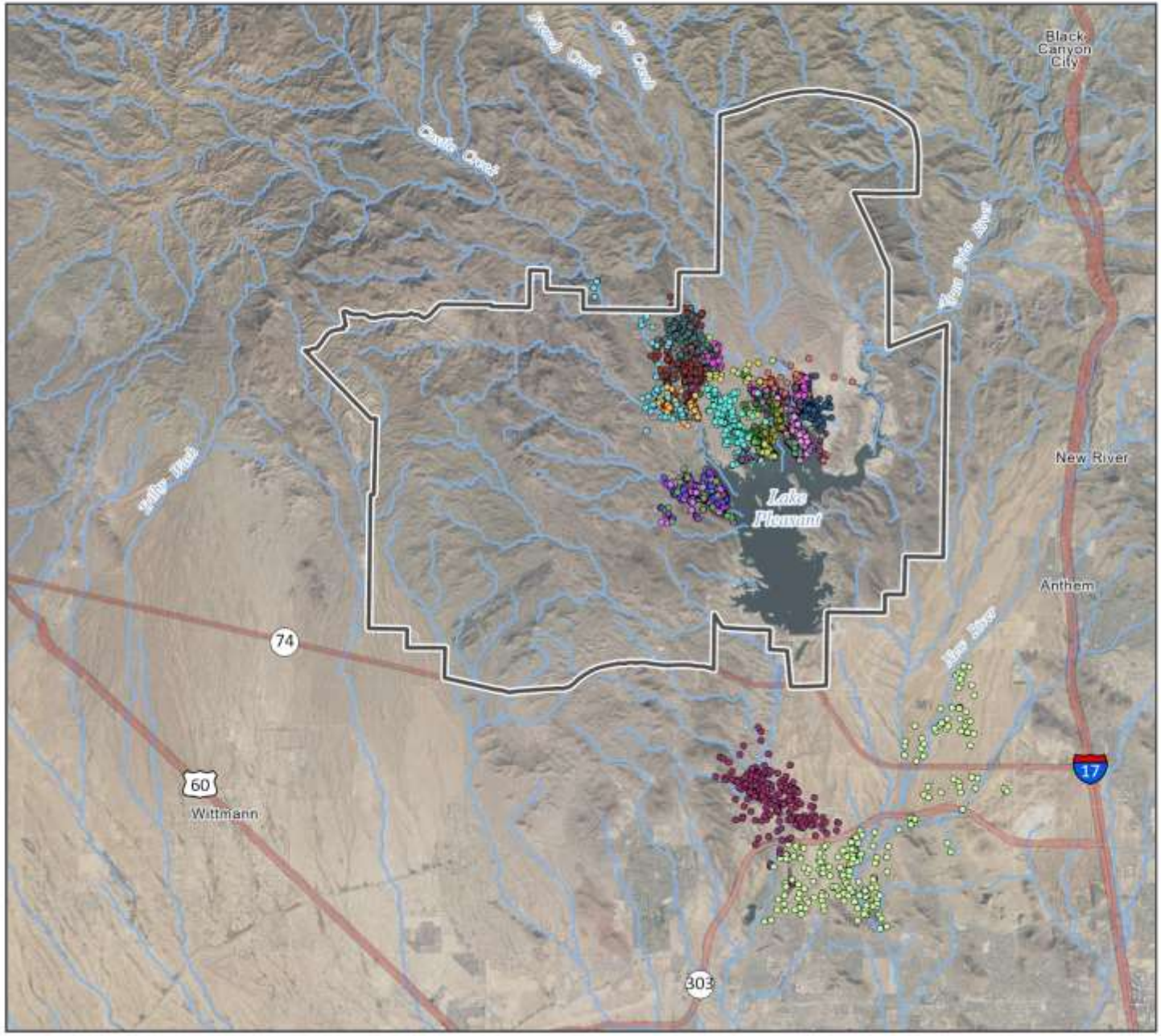


Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 6/5/2024

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Decisions in this document only apply to BLM lands.

Map 2. GPS Locations of Free-roaming Burros in Lake Pleasant Study Area, Summer 2017

Bureau of Land Management - Arizona State Office



Lake Pleasant Herd Management Area

Intermittent Stream/River

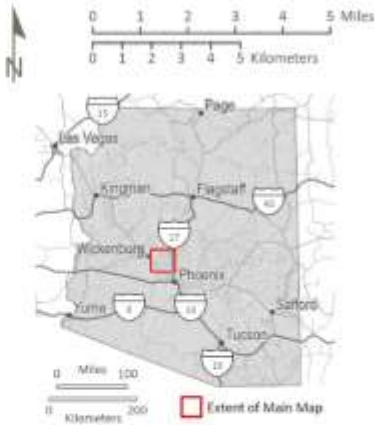
Interstate Highway

U.S. Highway

State Highway

The GPS point colors on this map are symbolized by Animal ID.

Burro GPS Data Credit: U.S. Geological Survey, Rocky Mountain Region

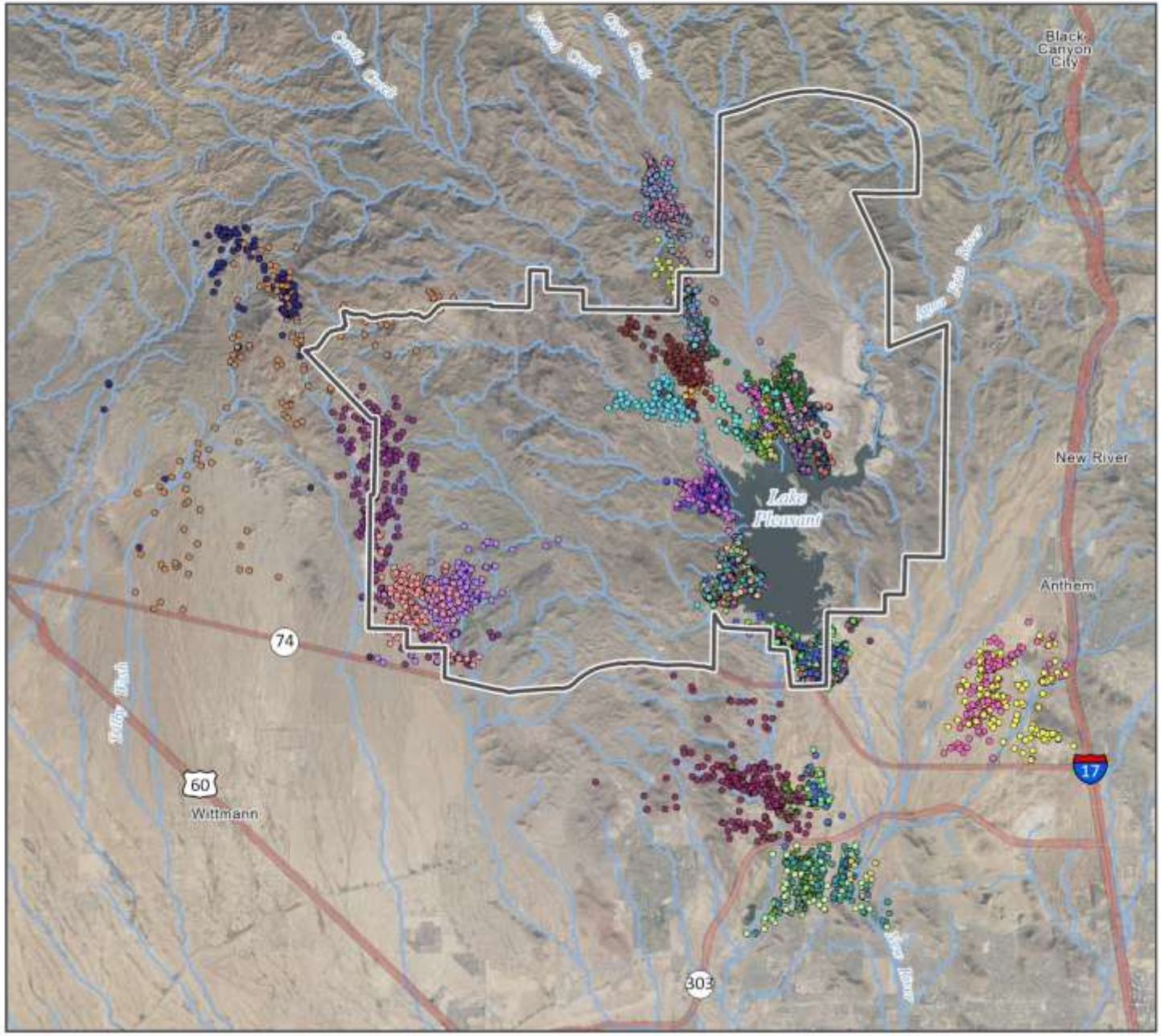


Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 6/13/2024

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Decisions in this document only apply to BLM lands.

Map 3. GPS Locations of Free-roaming Burros in Lake Pleasant Study Area, Summer 2018

Bureau of Land Management - Arizona State Office



Lake Pleasant Herd Management Area

Intermittent Stream/River

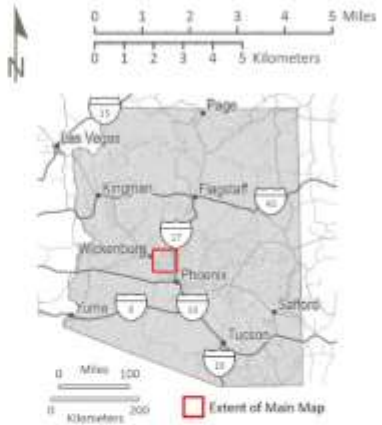
Interstate Highway

U.S. Highway

State Highway

The GPS point colors on this map are symbolized by Animal ID.

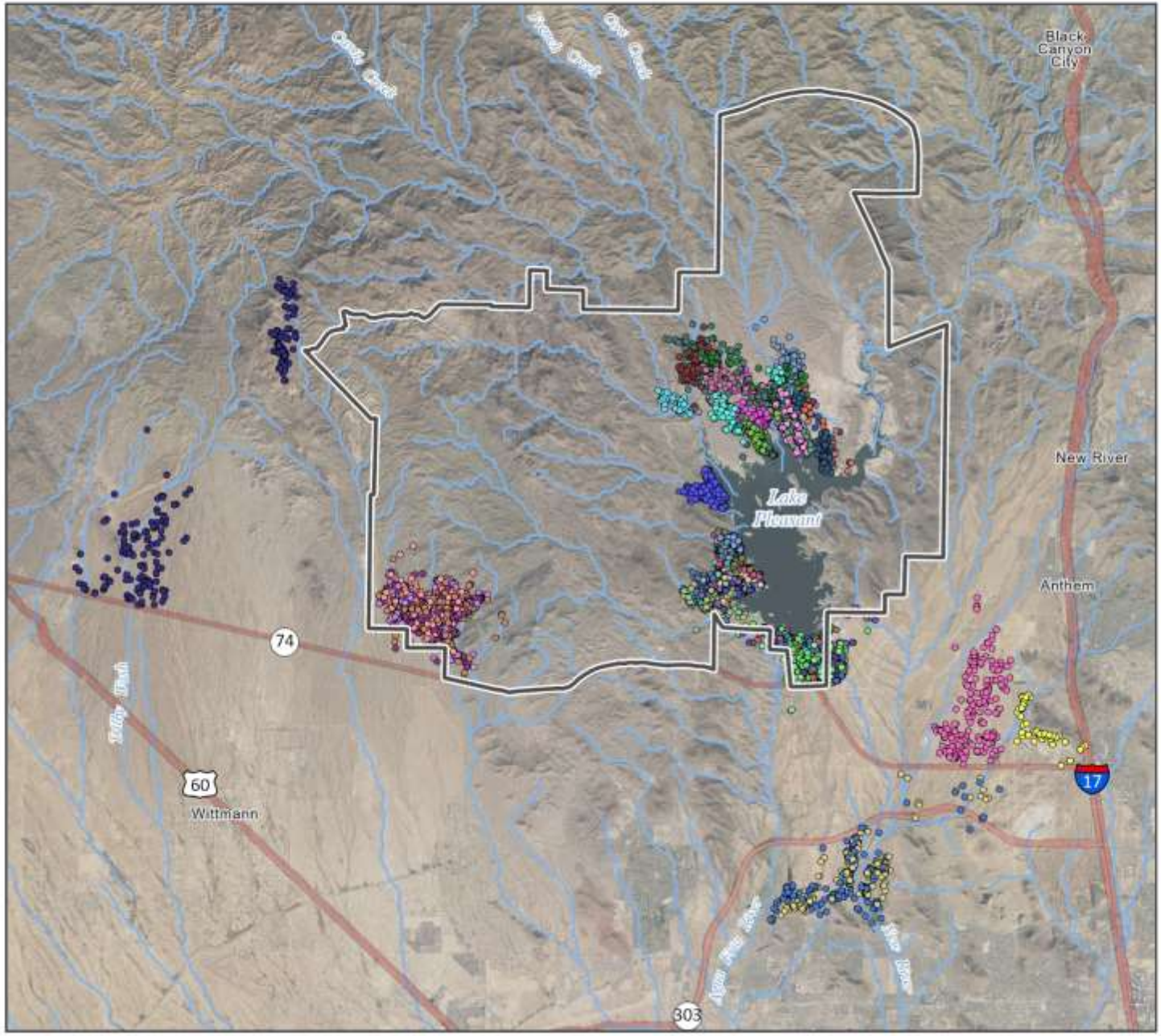
Burro GPS Data Credit: U.S. Geological Survey, Rocky Mountain Region



Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 6/13/2024

Map 4. GPS Locations of Free-roaming Burros in Lake Pleasant Study Area, Summer 2019

Bureau of Land Management - Arizona State Office



Lake Pleasant Herd Management Area

Intermittent Stream/River

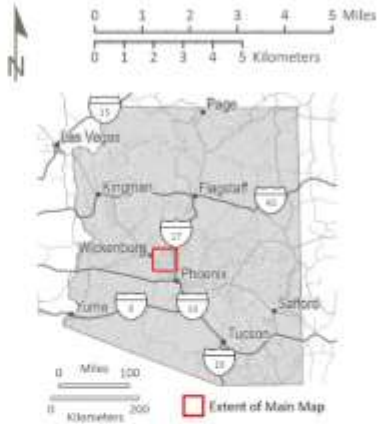
Interstate Highway

U.S. Highway

State Highway

The GPS point colors on this map are symbolized by Animal ID.

Burro GPS Data Credit: U.S. Geological Survey, Rocky Mountain Region

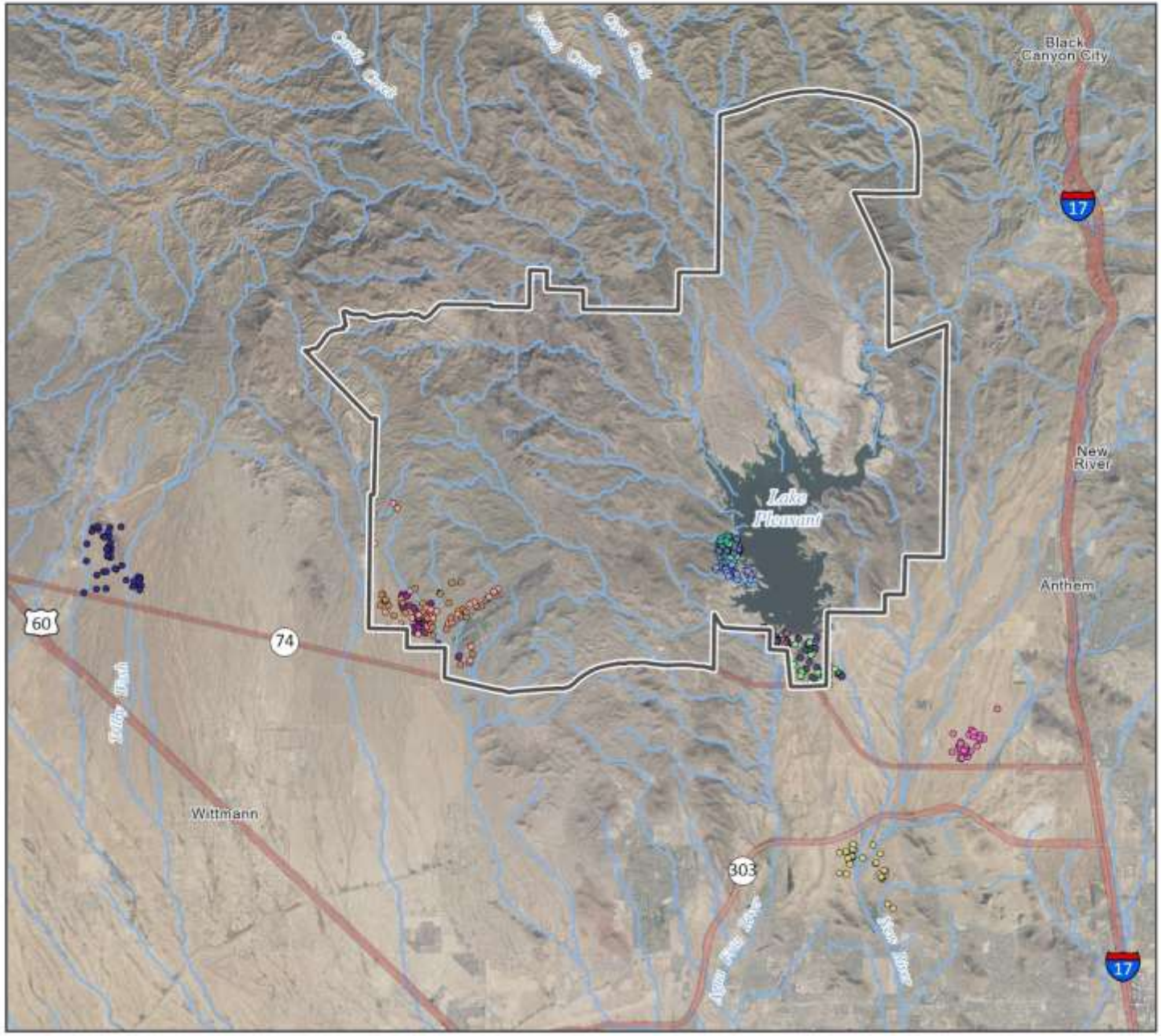


Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 6/13/2024

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Decisions in this document only apply to BLM lands.

Map 5. GPS Locations of Free-roaming Burros in Lake Pleasant Study Area, Summer 2020

Bureau of Land Management - Arizona State Office



Lake Pleasant Herd Management Area

Intermittent Stream/River

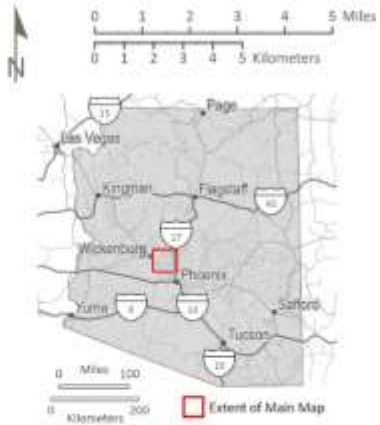
Interstate Highway

U.S. Highway

State Highway

The GPS point colors on this map are symbolized by Animal ID.

Burro GPS Data Credit: U.S. Geological Survey, Rocky Mountain Region

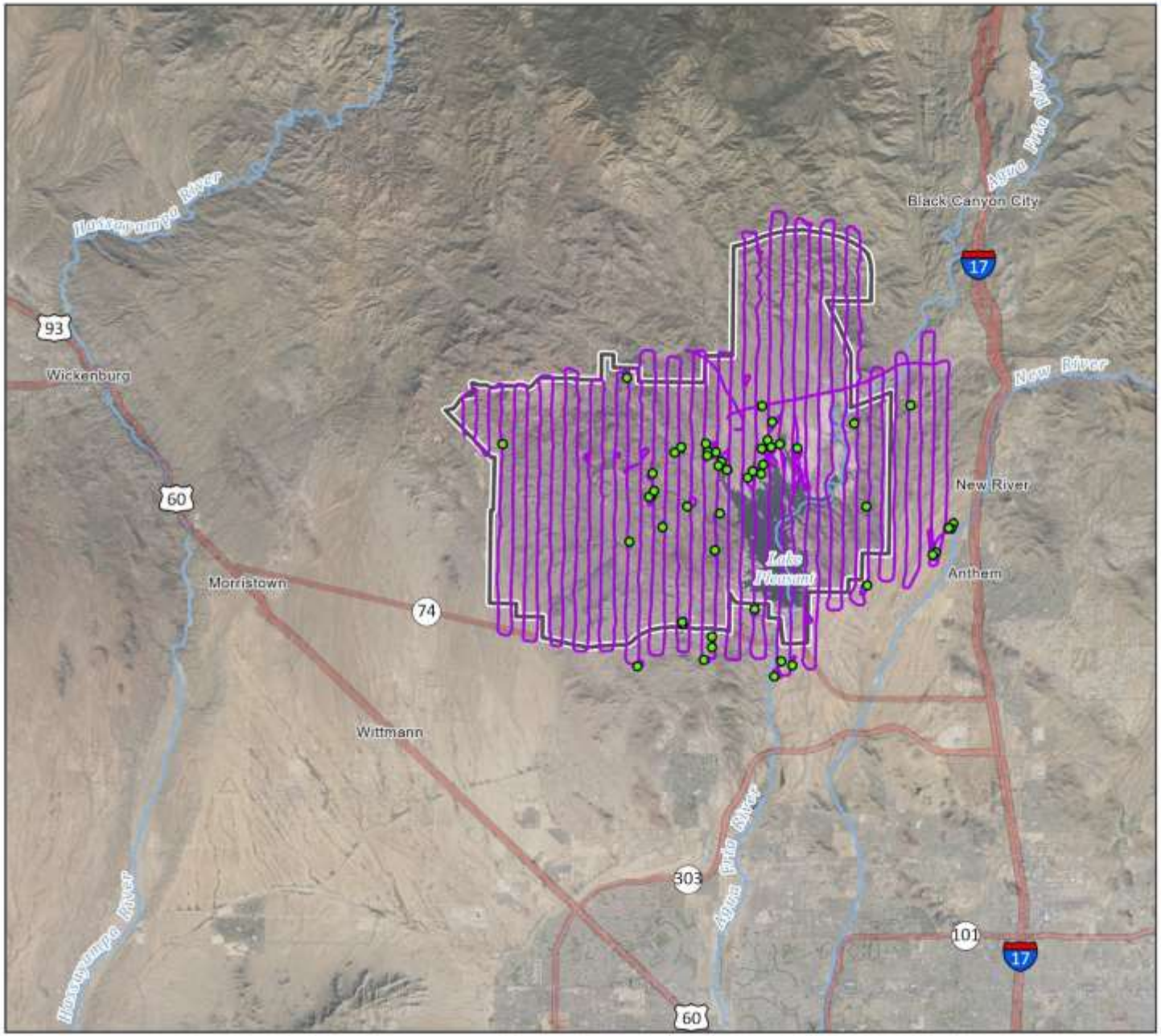


Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 6/13/2024

Attachment B: Flight Line and Burro Point Maps

Lake Pleasant Herd Management Area: Flight Line and Burro Group Locations, 2014

Bureau of Land Management - Arizona State Office



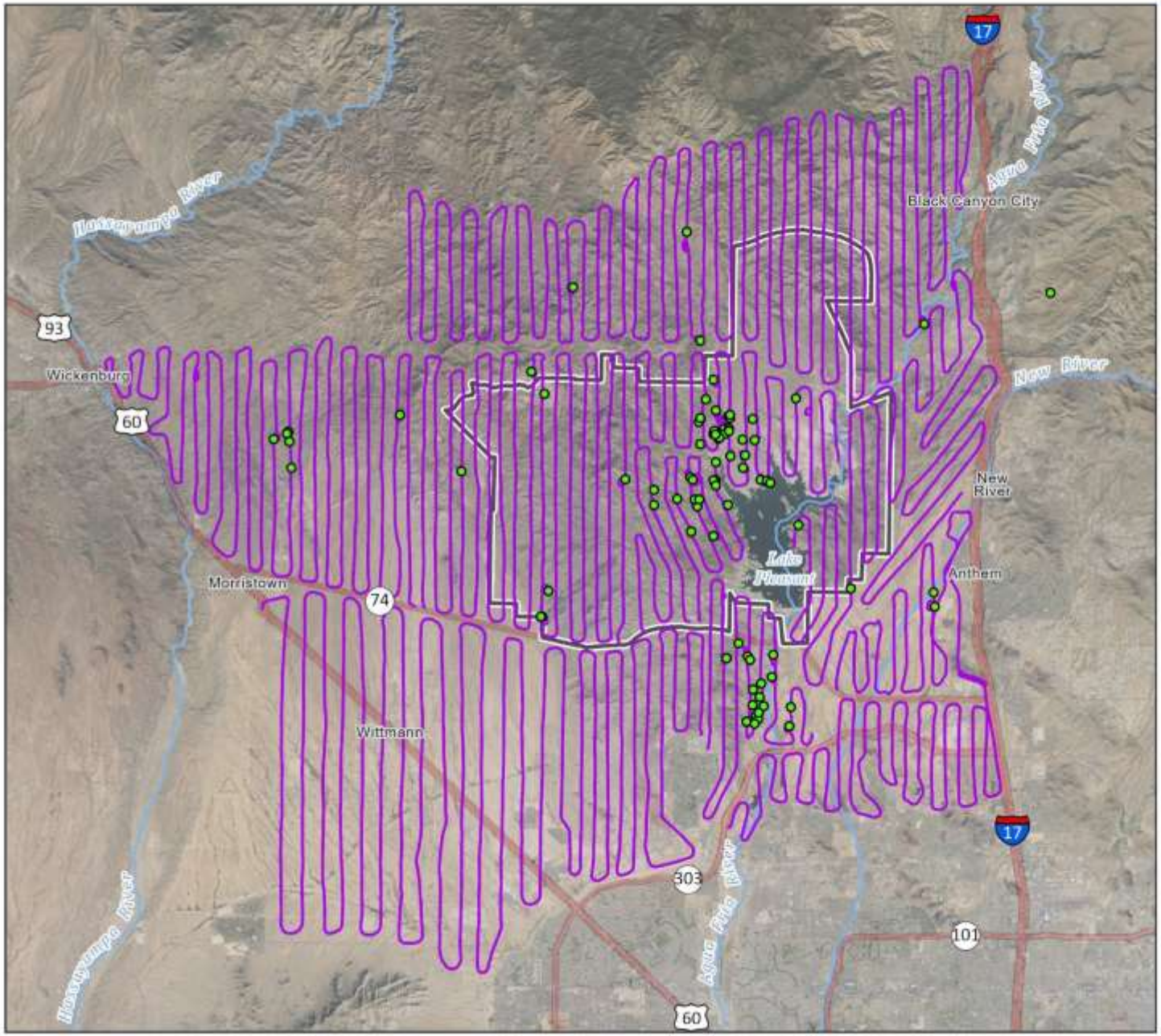
- Approximate Burro Group Location
- Flight Line
- Lake Pleasant Herd Management Area
- Interstate Highway
- U.S. Highway
- State Highway

Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 7/2/2024

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Decisions in this document only apply to BLM lands.

Lake Pleasant Herd Management Area: Flight Line and Burro Group Locations, 2017

Bureau of Land Management - Arizona State Office



Approximate Burro Group Location

Flight Line

Lake Pleasant Herd Management Area

Interstate Highway

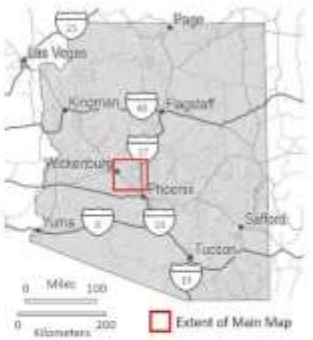
U.S. Highway

State Highway

N

0 1 2 3 4 5 6 7 Miles

0 1 2 3 4 5 6 7 Kilometers

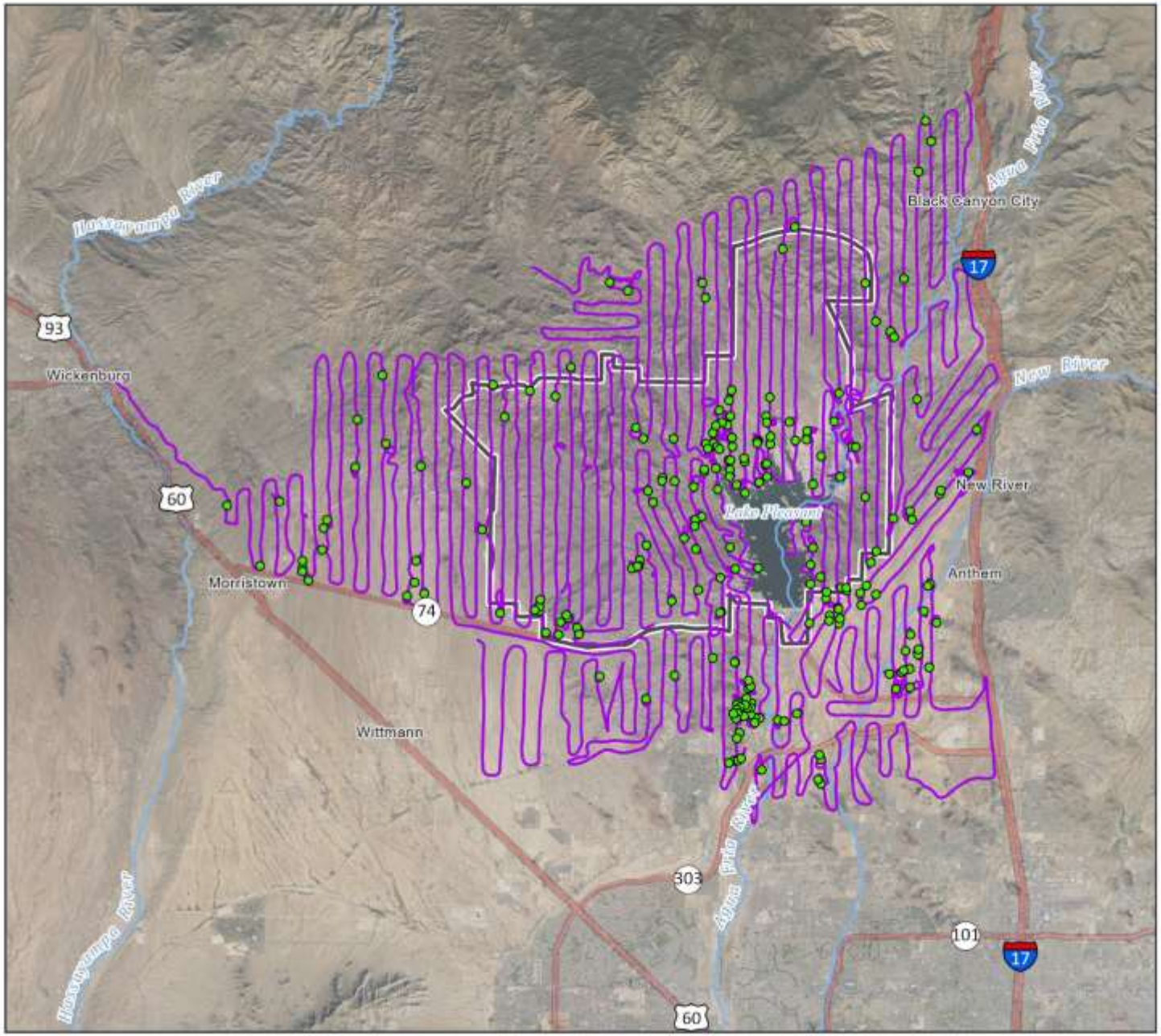


Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 7/2/2024

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Decisions in this document only apply to BLM lands.

Lake Pleasant Herd Management Area: Flight Line and Burro Group Locations, 2023

Bureau of Land Management - Arizona State Office



Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 7/2/2024

Attachment C: Burro-Vehicle High Density Area Map

Lake Pleasant Herd Management Area: Burro-Vehicle High Density Areas

Bureau of Land Management - Arizona State Office

Lake Pleasant Herd Management Area

Burro-Vehicle High Density Area

Interstate Highway

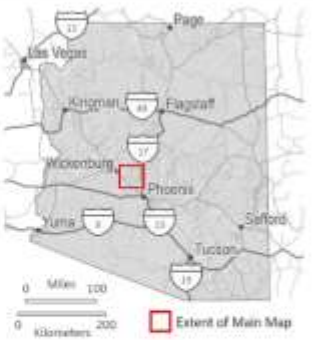
U.S. Highway

State Highway

N

0 1 2 3 4 5 Miles

0 1 2 3 4 5 Kilometers



Map Produced by BLM Arizona State Office
Coordinate System: NAD 1983 UTM Zone 12N
Date: 6/5/2024

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Decisions in this document only apply to BLM lands.