AN ANNOTATED VASCULAR FLORA AND FLORISTIC ANALYSIS OF THE SOUTHERN HALF OF THE NATURE CONSERVANCY DAVIS MOUNTAINS PRESERVE, JEFF DAVIS COUNTY, TEXAS, U.S.A.

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ABSTRACT

The Nature Conservancy Davis Mountains Preserve (DMP) is located 24.9 mi (40 km) northwest of Fort Davis, Texas, in the northeastern region of the Chihuahuan Desert and consists of some of the most complex topography of the Davis Mountains, including their summit, Mount Livermore, at 8378 ft (2554 m). The cool, temperate, "sky island" ecosystem caters to the requirements that are needed to accommodate a wide range of unique diversity, endemism, and vegetation patterns, including desert grasslands and montane savannahs. The current study began in May of 2011 and aimed to catalogue the entire vascular flora of the 18,360 acres of Nature Conservancy property south of Highway 118 and directly surrounding Mount Livermore. Previous botanical investigations are presented, as well as biogeographic relationships of the flora. The numbers from herbaria searches and from the recent field collections combine to a total of 2,153 voucher specimens, representing 483 species and infraspecies, 288 genera, and 87 families. The best-represented families are Asteraceae (89 species, 18.4% of the total flora), Poaceae (76 species, 15.7% of the total flora), and Fabaceae (21 species, 4.3% of the total flora). The current study represents a 25.44% increase in vouchered specimens and a 9.7% increase in known species from the study area's 18,360 acres and describes four endemic and fourteen non-native species (four invasive) on the property. The subsequent analysis of the results, compared to those of previous regional-flora catalogues, presents the flora of the DMP as one that is unique to the higher elevations and igneous substrates of western Texas and the northern Chihuahuan Desert. Multiple influences from overlapping and neighboring ecoregions, including the Great Plains, Madrean, and Sonoran provinces, are all seen to have varying degrees of authority in regards to the shaping of the modern-day vegetation.

Key Words: Chihuahuan Desert, Texas, Davis Mountains, vascular flora, floristics, sky islands

RESUMEN

La Reserva de Conservación de la Naturaleza Davis Mountains (DMP) está localizada 24.9 mi (40 km) al noroeste de Fort Davis, Texas, en la región noreste del desierto de Chihuahua y consta de alguna de las más complejas topografías delas Montañas Davis, incluyendo la más alta, Mount Livermore, a 8378 ft (2554 m). El ecosistema frío, templado, "sky island" provee de los requerimientos que se necesitan para acomodar un amplio rango de diversidad único, endemismo, y patrones de vegetación, que incluye herbazales de desierto y sabanas montanas. El presente estudio comenzó en mayo de 2011 y pretendía catalogar la flora vascular completa de los 18,360 acres de la Nature Conservancy al sur de la autopista 118 y rodeando directamente Mount Livermore. Se presentan las investigaciones botánicas previas, así como las relaciones biogeográficas de la flora. Los números de las búsquedas en herbarios y de recolecciones de campo recientes combinan un total de 2,153 especímenes testigo, que representan 483 especies y categorías infraspecíficas, 288 géneros, 87 familias. Las familias mejor representadas son Asteraceae (89 especies, 18.4% del total de la flora), Poaceae (76 especies, 15.7% del total de la flora), and Fabaceae (21 especies, 4.3% del total de la flora). El presente estudio representa 25.44% de incremento en especímenes testigo y un 9.7% de incremento en especies conocidas del área de estudio de 18,360 acres y describe cuatro especies endémicas y catorce exóticas (cuatro invasivas) de la propiedad. El análisis subsecuente de los resultados, comparado con los catálogos previos de la flora regional, presenta la flora de DMP como única para las altas elevaciones y substratos ígneos del oeste de Texas y el norte del Desierto de Chihuahua. Múltiples influencias de las ecorregiones que se solapan y de las vecinas, que incluyen las provincias Great Plains, Madreanas, y Sonoraena, se ve que tienen grados variables teniendo en cuenta el modelado de la vegetación en los tiempos presentes.

INTRODUCTION

The Davis Mountains Preserve (DMP) is one of the largest areas of land protected and owned by The Nature Conservancy (TNC) in Texas and includes one of the most unique and irreplaceable ecosystems in the state. The nearly 40,000 hectares (98,842 acres) protected by TNC are home to some of the most topographically distinctive and complex features in all of the Davis Mountains, including its summit, Mount Livermore, which rises to over 8378 ft (2554 m), making the Davis the second highest range in Texas, behind the Guadalupe Mountains in Culberson County. These mountains rise to an elevation high enough above the surrounding

grass and scrublands to receive a sufficient amount of precipitation and are cool enough in climate to harbor one of North America's most pristine examples of "sky islands," ecosystems that are scattered occasionally throughout a true desert "sea" region that support a vast biological diversity. This is influenced by increasing aridity over the past 9,000 years that contributes to extreme biological isolation and endemism, where species in unique micro-niches adapt independently (The Nature Conservancy 2008b).

Located in the heart of Jeff Davis County in the north-eastern region of the Chihuahuan Desert in Trans-Pecos, Texas, the Davis Mountains are in an area of large-scale ecological overlap (Fig. 1). Evidence of phytogeographic connections with several other surrounding floristic areas is abundant, with influences from the Rolling Plains, High Plains, Edwards Plateau, and Southern Plains of Texas, and southern Chihuahuan Desert links reaching northward from Mexico's Sierra Madre Oriental and Sierra Madre Occidental (Larke 1989). Rocky Mountain species, far south from their normal distribution, illuminate a small, northerly connection, with the significant graminoid flora reflecting a close proximity of the range to the Great Plains grasslands (Powell 2000; Christie 2006). The higher Davis Mountains create a rugged skyline and topography and have been the target of many previous biological and ecological studies, but it is also very well known that its complex landscape provides for many still-unvisited microhabitats, possibly exhibiting floral and faunal species far out of their normal distribution ranges as well as many endemic, rare, and extremely localized species. Uncovering new information regarding rare plant species is one objective of the current study, as well as increasing baseline knowledge of the flora of the higher Davis Mountains, specifically TNC's conserved property of Mount Livermore and its adjacent areas, in general. Additional objectives in the scope of this study include cataloguing the known species of the DMP and placing the range and its floristics into a larger geographic context. To aid in placing this area into a regional context, several other Trans-Pecos floras will be used to compare and contrast with the results from the DMP. These efforts should help to identify patterns of distribution and abundance, which should prove beneficial in elucidating the evolution and establishment of the present-day flora.

In order to enhance the understanding of intelligent and effective management practices in these types of ecosystems, it is important for managers to understand what they are trying to protect from a various array of factors, such as response to climate change and human impact. The primary aim of this study was to construct a collective body of work on the vascular floral composition of the DMP by documenting all vascular plants through herbarium records, field collection of voucher specimens, and the construction of species lists at various transect locations. Regional patterns of species diversity, both in regards to regions within Texas and as compared to southwestern North America, can be illuminated through subsequent analysis of these results.

Study area description.—The Davis Mountains are located primarily in Jeff Davis County but have significant reaches into neighboring Presidio and Brewster Counties. In roughly the shape of a 'V' they extend about 60 mi (97 km) in a northwest-southeast fashion from north to west central Jeff Davis County, with the point to the southeast at Fort Davis, with the approximate center of the range about 10 mi (16km) north of Fort Davis at 30°43' N, 104°00' W (Texas State Historical Association 2010). The main entrance to the DMP is 25 mi (40 km) northwest of Fort Davis, Texas, on Highway 118 and is approximately 7 mi (11 km) northwest from the University of Texas McDonald Observatory. The area of focus for the current study was the nearly 18,360 acres (7430 hectares) of TNC owned property west and south of Highway 118, encompassing Mount Livermore, Pine Peak, the third highest peak in the Davis Mountains at 7710 ft (2350 m), and nearly 10 km of Upper Madera Canyon. This area is bordered on the southeast and southwest corners by easement properties donated by private ranches (Fig. 2), and the Davis Mountains Resort subdivisions.

Obvious topographic features include the study area's higher vantage points such as the distinctive Baldy Peak of Mount Livermore (Fig. 3) in the southwest corner of the property and Laura's Rock, a distinctive east-west trending intrusive uplift that rests directly north of the summit about 0.2 air-miles. The area's other taller peaks include McDaniel Mountain at 7235 ft (2205 m) at the northwest end of the property, Whitetail Mountain on the western boundary at 7485 ft (2281 m), and the aforementioned Pine Peak on the east. The remaining acreage of TNC-conserved property is northeast trending in its orientation, following Madera

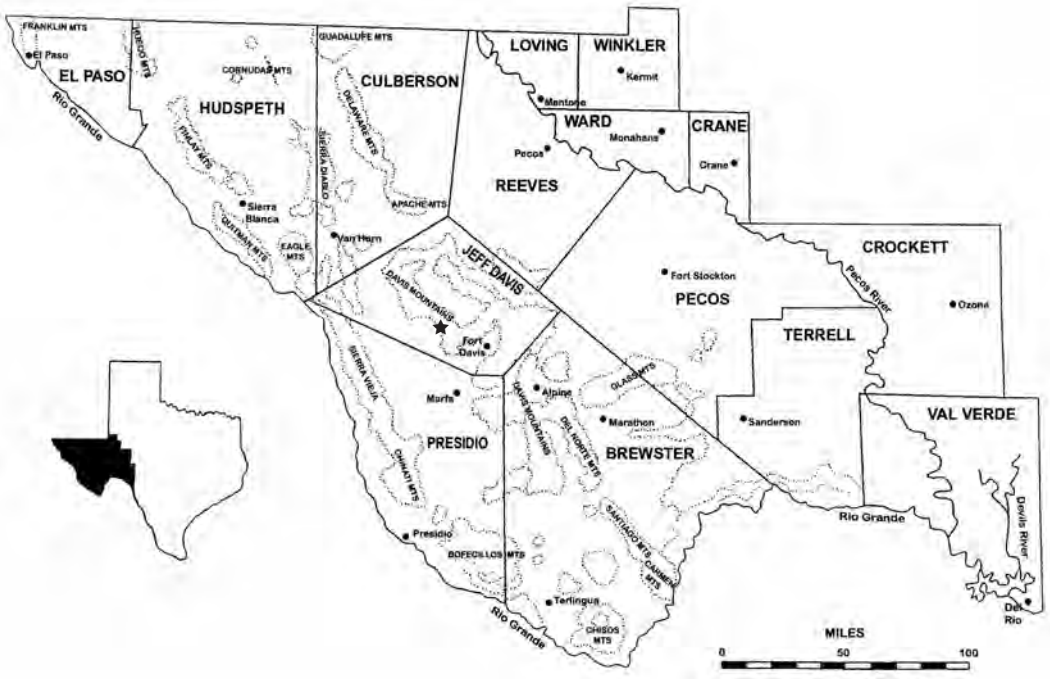

Fig. 1. Schematic map of Trans-Pecos mountain ranges with a ★ at the approximate location of the Davis Mountains Preserve study area. Originally created by Michael Nickell for use in the Sul Ross Department of Biology and used with permission, with modifications.

Canyon for about another 5.5 air-miles, splitting the Caldwell and Eppenauer Ranches. Drought and time limitations placed this section of the DMP out of the scope of the current study.

The DMP is described as having a cool-temperate climate with average lows of 32°F (0°C), highs of 90°F (32°C), and an average annual precipitation between 11–22 in (28–57 cm), with the majority of the rainfall occurring during the late summer monsoonal months, June through September (Soil Conservation Service 1977). A steep vertical elevation gradient corresponds with an increase in precipitation and a decrease in temperature. Climate data are available from four weather stations near the study area. The Balmorhea station, elevation 3220 ft (981 m), is located on the plains and is approximately 31 mi (50 km) northeast of the study site. These climate conditions affect the desert scrub vegetation at the lower elevations of the Davis Mountains. The Fort Davis station, 4880 ft (1487 m), is 16 mi (26 km) to the southeast represents an intermediate climate occurring between the plains and the higher montane environment. The McDonald Observatory station, 6790 ft (2070 m), is approximately 5 mi (8 km) to the northeast. This station and the Elbow Canyon weather station, 5990 ft (1825 m), are similar in proximity and direction to the study site, providing data on climate conditions in and around the higher elevations of the DMP. The average monthly precipitation for the same four stations shows that more than 70% occurs during the months from May through September. Average annual precipitation varies from 17.5 in (44.45 cm) at Fort Davis (110 year period) to 13.6 in (34.5 cm) at Balmorhea (81 year period), 13.9 in (35.3 cm) at Elbow Canyon (6 year period), and 21 in (53.3 cm) at the McDonald Observatory (62 year period). Data from the Elbow Canyon weather station, which is the closest in proximity to the DMP, shows a rise in precipitation levels over the course of the study period from 6.6 in (16.9 cm) in 2011 to 20.0 in (50.7 cm) in 2013.

Annual high and low monthly temperature data were compiled for these four stations. Average annual temperatures for the four stations were 60.3°F (15.7°C) at Fort Davis, 17.7°C (63.8°F) at Balmorhea, 13.1°C (55.5°F) at Elbow Canyon, and 14.1°C (57.4°F) at McDonald Observatory. These weather data, annual

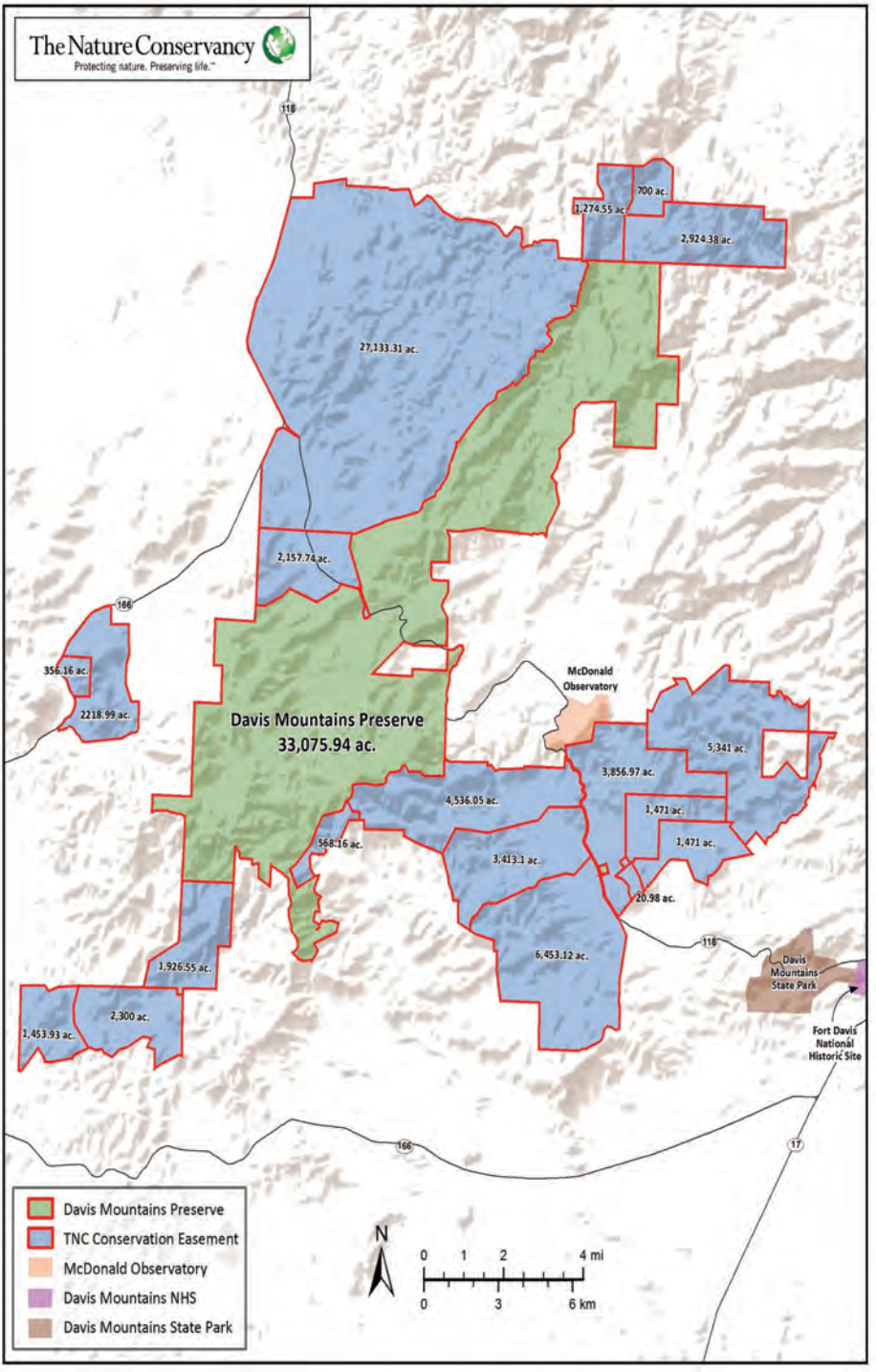

Fig. 2. Detailed map of the West Texas Conservation Plan for Jeff Davis County. Created by The Nature Conservancy GIS Department and used with permission.

Fig. 3. Baldy Peak (8378 ft), summit of Mount Livermore, in the southwest corner of the Davis Mountains Preserve study area.

temperatures, and precipitation values, meet the climatic criteria set for defining the Chihuahuan Desert region (Morafka 1977). Freezing temperatures for the higher Davis Mountains can potentially occur any time between mid to late September and mid to late April.

The Davis Mountains are the largest single part of the Trans-Pecos Texas volcanic field, one of several regions of primarily silicic, mid-Cenozoic volcanism in the eastern reaches of the North American Cordillera (Turner 1977; Henry et al. 1991; Henry et al. 1994; James & Henry 1991). The Davis Mountains are between 35–39 million years old and form part of the northern most extension of the Sierra Madre Oriental, which stretches over 930 mi (1500 km) southward to the states of Puebla and Querétaro in Mexico (Turner 1977). During these Eocene and Oligocene epochs, the Davis Mountains were formed by periodic eruptions from numerous vents and fissures, and subsequent faulting and weathering have resulted in the present-day, massively broken terrain (Parker 1972; Larke 1989). The central Davis Mountains consist of a series of lava flows and silicic pyroclastic units that were intruded by stocks, sills, and dikes during the latter stages of volcanic activity. The volcanic rock types share a uniting chemical characteristic in that they are all rich in sodium and potassium (Anderson 1968). According to Anderson (1968), exposed rocks in the central Davis Mountains range in age from Cretaceous to Quaternary. The rocks representing the Cretaceous age are metamorphosed limestone and sandstone and are found just west of the DMP proper in only about one square mi (two square km) of H.O. Canyon south of Sawtooth Mountain. Igneous intrusive and extrusive rocks constitute the Tertiary age, and the Quaternary age is represented by terrace gravel, alluvium, and colluvium rocks. The geology of the study area consists of only Quaternary (Q) and Tertiary (T) deposits and formations. Since the end of volcanic activity, the Davis Mountains have been extensively eroded by water, forming subradial drainage patterns around the higher peaks, such as Mount Livermore and Sawtooth Mountain, as is evidenced by the Quaternary alluvial stream deposits stretching northeast of Mount Livermore.

Soils on the DMP can be divided into two, general groups, as described by the United States Department of Agriculture, Natural Resource Conservation Service's (USDA, NRCS 2013) Soil Survey of Jeff Davis County (Soil Conservation Service 1977): soils of the hills and mountains and soils of the valleys, plains, and basins. The soils of the hills and mountains are shallow, hilly to steep, not suitable for crops or pasture, and utilized for range, recreation, and wildlife habitat, whereas those of the valleys, plains, and basins are generally deep and nearly level to hilly and mostly could be suitable for irrigated crops and pasture. The most prominent soil type on the study area is the Puerta-Rock outcrop-Madrone association, described as shallow to moderately deep, steep, noncalcareous soils and rock outcrop of semiarid and subhumid hills and mountains. Puerta and Madrone soils have north-facing slopes and surface layer of dark grayish-brown, neutral gravelly silt loam about 4–5 inches thick, with acidic gravelly clay underneath, while the Rock outcrop consists of breaks, hills, steep peaks, scarps, canyon walls, and bluffs that are mainly rock surfaces (Soil Conservation Service 1977).

Vegetation associations.—The plant communities in a site are shaped by that area's climate, which is largely shaped by elevation. Plants reveal exactly what soil conditions are present (amount of minerals and organic matter, water capacity, soil temperature, and root-zone depth) by the habits and the types of species growing in a particular zone. These ecological zones correlate to elevation and what soil association they occur on. The soil units of the DMP follow the general elevation divisions in the USDA's (2013) concept of regional plant communities (Table 1). These units can also be correlated with the vegetation associations of the Chihuahuan Desert Region set by Henrickson and Johnston (1986), which are categorized into four general groups: the desert scrub and woodlands, grasslands, chaparral, and montane woodlands. With many subcategories, Henrickson and Johnston (1986) describe twenty associations, six of which apply to the study area within the DMP: Sandy Arroyo Scrub, Grama Grassland, Montane Chaparral, Juniper-Pinyon Woodland, Oak Woodland, and Pine Woodland. These subcategories can be related to the USDA's regional plant communities and will be compared and addressed later in the discussion.

History and previous work.—Evidence of human occupation and activity in the Davis Mountains is believed to be traced back to the Paleondian era (ca. 10000–6500 B.C.), and more specifically, to the Folsom culture of the later era (Mallouf 2000). Indigenous populations began to change during the 1600s and continued through the 1700s with the arrival of Spanish explorers, introduction of European diseases, and the arrival of the Apache and Comanche Indians, finally resulting in the indigenous population's displacement (Cloud 2004). Still today, traits from American, Mexican, and Indian cultures blend together to create a culture unique to the old border that still relies upon farming and ranching lifeways (Keller & Cloud 2006).

The first botanical collections of the Davis Mountains were made in 1849 by Charles Wright, first with a military survey expedition and then later, in 1851, with the Boundary Commission, accompanied by John Bigelow. Plantae Wrightianae Parts I and II (Gray 1852, 1853) identify nearly all of Wright's collections, which appear to have been made primarily in lower Limpia Canyon, close to Fort Davis. The earliest known botanical work of the Livermore area are unpublished notes left at UT Austin by Dr. Mary S. Young, dealing with mostly taxonomic and ecologic studies of the vegetation from the year 1914 to 1918 (Hinckley 1944; Todzia 1998). Palmer (1929) infers that the colonies of the ligneous plants are relics of a once more or less continuous flora which covered most of western North America in a publication wholly concerned with the vegetation of the Davis Mountains that is included with an annotated list of 149 species in 39 families. Hinckley (1944) was next to publish on the flora of the Davis Mountains and focuses on the higher elevations surrounding the Mount Livermore area, making this survey the most comparable to the current effort. The unique vegetation descriptions include the tendencies toward a Petran subalpine forest association represented by species such as *Populus tremuloides* (quaking aspen) and *Pinus strobiformis* (southwestern white pine), as well as Petran montane forests, represented by large populations of *Pinus ponderosa* (ponderosa pine). Northern connections such as these, combined with other influences from neighboring ecoregions such as the Great Plains of Texas and the Tamualipan Thorn-Scrub to the east and the Sonoran Desert to the west have all found haven in the Davis Mountains, with many micro-habitats with their own characteristic vegetation. Hinckley (1944) collected extensively from the slopes of the peak, as well as in Madera and Short Pine Canyons and through other canyons originating from Mount Livermore, whose lengths either stretch out of DMP property very quickly or are

TABLE 1. Ecological sites on the DMP, with corresponding elevations, associated with soil types (USDA, NRCS 2013).

Ecological Site	Elevations	Soil Type
Mountain Loam, Mountain Savannah	6200–7800 ft (1890–2380 m)	Puerta-Madrone association, steep (PmK)
Igneous Hill & Mountain, Mountain Savannah	5000–6500 ft (1520–1980 m)	Liv-Mainstay-Rock outcrop association, steep (LrF)
Igneous Hill & Mountain, Mixed Prairie	4000–6500 ft (1220–1980 m)	Mainstay-Brewster association, hilly (MbE)
Igneous Divide, Mountain Savannah	2500–7750 ft (760–2360 m)	Sproul-Mainstay association, gently sloping (SnB)
Canyon, Mountain Savannah	6000–7500 ft (1830–2290 m)	Loghouse association, rolling (LsD)
Foothill Slope, Mountain Savannah	5000–6500 ft (1250–1980 m)	Hurds-Friends association (HuD)
Draw, Mixed Prairie	3100–5500 ft (940–1680 m)	Rockhouse-Bigetty association (Rk)
Loamy Swale, Mixed Prairie	4000–6000 ft (1220–1830 m)	Musquiz association (Mu)

outside of the boundaries entirely, such as Goat, Merrill, and HO Canyons. Hinckley's (1944) list, which consists of 548+ species in 78+ families, was later amended by Sikes and Smith (1975) and included property around Sawtooth Mountain, none of which is on the current TNC property; they conclude that both of these areas contain possibly the last remaining pristine montane woodland in Texas. Sikes and Smith's (1975) list is represented by 493 species in 89 families.

Notable species.—The Davis Mountains are home to many rare, endemic, and localized plant species, several of which occur on TNC DMP property. *Arenaria livermorensis* (Livermore sandwort) is one endemic that is known to occur only in the highest elevations of Mount Livermore and Sawtooth Mountain. It has a Global and State rank of G1S1, indicating its high vulnerability to extinction, with less than six known occurrences (Poole et al. 2007). *Quercus depressipes* (Mexican dwarf oak) is another endangered species that occurs only high on the west and northwest facing slopes of Mount Livermore in the United States, as well as high in the mountains of the Mexican states of Chihuahua, Durango, Jalisco, and Zacatecas. It is ranked as G3S1 with only 6–20 known occurrences globally and less than six in Texas, also being very vulnerable to extirpation from these ranges (Poole et al. 2007). Another Global and State ranked plant on the DMP is *Osmorhiza bipatriata* (Livermore sweet-cicely), synonymous with *O. mexicana* var. *bipatriata* with a conservation status of G5T1S1. Thus, recognizing *bipatriata* at the species level would result in a rank of G1S1. Other rare species include *Brickellia hinckleyi* var. *hinckleyi* (G2T2S2), *Draba standleyi* (G2G3S1), and *Polemonium pauciflorum* subsp. *hinckleyi* (G3T2QS1).

Disturbance regimes, conservation, and study objectives.—This ecosystem is one that plays a vital and crucial role to the environment and ecosystems directly and indirectly proximate to the Mount Livermore study area. With its rugged canyon systems and mountainous savannahs, it serves as a lifeblood to the surrounding, extremely arid, desert flats for which the Chihuahuan Desert is generally known. Areas like these, where natural watersheds, such as the ones originating at Bridge and Tobe Gap on Mount Livermore, seem so ample, initially, are subject to excessive, man-made disturbances, and as human population increases, so does the threat. Over-utilization of water resources, habitat fragmentation through ranch subdivision, and overgrazing are all observable disturbances throughout much of the Davis Mountains, recognized by TNC and landowners alike. These unique, desert-forest ecosystems are evolutionarily adapted to natural processes, such as drought and fire, and are generally quick to recover from them; however, it is these human impacts that have a more lasting and harmful effect on the health of the environment (The Nature Conservancy, 2008a). Fire suppression is another potentially dangerous regime that has been highly misunderstood, especially by the general public. At the end of the 19th century, stocking rates for cattle and livestock were extremely high in West Texas at 4.1 to 12.3 acres per animal, compared to the present-day rate of 75 to 200+ per animal (Downey 1978; Clayton 1993), and this is presumed to have had a major influence on increased fire suppression throughout the region (Leopold 1924; Arnold 1950). With the removal of fine fuels, which are needed for ignition and spread, the natural ecosystem and order were drastically altered. Particularly in forested areas like the higher Davis Mountains, the risk of severe, high-intensity fires has increased with the build-up of dead and live fuels that can serve as a ladder for fire to the tree canopies, causing a very different and devastating impact compared to

that of the frequent, low-intensity fires of historical times before fire cessation (Poulos et al. 2007). TNC purchased the core preserve of the former U-up U-down Ranch in December 1997, and there had been no cattle on the ranch for two to three years prior, resulting in nearly twenty years of non-grazing on the property (Karges pers. comm.). With techniques such as forest thinning and prescribed burning, managers of TNC and the DMP are dedicated to active management of the area to maintain ecosystem structure and function and, if possible, to help restore the conditions of these properties to what they were before land and water utilization and fire-suppression practices. During the study, two fires occurred on the property, the first beginning in Tejano Canyon in 2011 and the second in 2012 on the north face of Livermore.

Building upon previous research is one of the objectives that will aid in establishing trends of floral associations within the DMP and surrounding ecosystems. With information like this, the conservation management techniques of the core preserve of TNC property in the higher Davis Mountains can be maintained and, if possible, improved. This also provides the opportunity for TNC staff to help work with other landowners and conservation-minded buyers in the area to improve upon land-management practices needed to sustain both a viable ranching economy and the natural ecosystem components at the lower- to mid-elevations (The Nature Conservancy 2008b). Through the collection of voucher specimens, along with the attainment of previous records through herbaria searches and the construction of species lists from transect sites, the objectives of this study were reached, including the establishment of a collective body of information on the floral composition of the DMP that can be included into analysis with supplementary floras to increase knowledge of the property's regional context within the Trans-Pecos, the Chihuahuan Desert Region, and the larger Southwest in general.

MATERIALS AND METHODS

Herbaria possibly holding specimens collected from the DMP were contacted and electronically searched, if a database was available. Since the DMP property was not obtained by TNC until 1997, previous attempts at floral exploration were rather limited, as a result of restricted access. These criteria are likely to result in few herbaria with a significant number of voucher specimens from collection sites believed to be on the DMP proper and most herbaria, in Texas and elsewhere, with few, if any, vouchers from the study area. Herbaria attempted to be contacted and searched would include the herbaria at Angelo State University (SAT), the Botanical Research Institute of Texas (BRIT), Texas A&M (TAES and TAMU), University of Texas at Austin (TEX-LL), University of Texas at El Paso (UTEP), and New York Botanical Garden (NYBG). A manual search of the A. Michael Powell herbarium at Sul Ross State University (SRSC) was conducted while the UT Flora of Texas Database (Plant Resources Center, University of Texas at Austin 2012) was accessed for an online search. All Jeff Davis County specimens were investigated in regards to their exact locality, and then it was determined whether or not they were collected on the DMP property. Criteria and terms used to clarify these collection sites include elevation > 5800 ft (1728 m), if available; Mount Livermore; Upper Madera Canyon; Madera Canyon Preserve; Tobe Gap; Pine Peak; Don McIvor Ranch; Baldy Peak; U Up U Down Ranch; and The Nature Conservancy's Davis Mountains Preserve. Any specimens with vague locality descriptions (e.g. "Davis Mountains") were not counted in the final flora. The specimens at institutions other than SRSC were assumed to be identified correctly and to occur in the higher Davis Mountains unless they were not supported by Turner et al. (2003).

Field research began September 2011 and continued through October 2013. An attempt was made to collect year round and throughout the majority of the 18,360 acres. Since the boundary of the DMP is sometimes difficult to visualize in the field, caution and restraint were emphasized so as to avoid making any collections outside of the study area, on adjacent private ranch properties. Search methodology was a directed meander (Goff et al. 1982) at collection sites that varied from along the major road sides to the trails and their buffer areas, as well as sites selected according to their intricacy of topography (Fig. 4). Sample areas such as these have a high probability of being unique, but unvisited, microhabitats and include the higher peaks as well as sinuous, seemingly inaccessible canyons across the study area. Field notes and resulting label data were made to

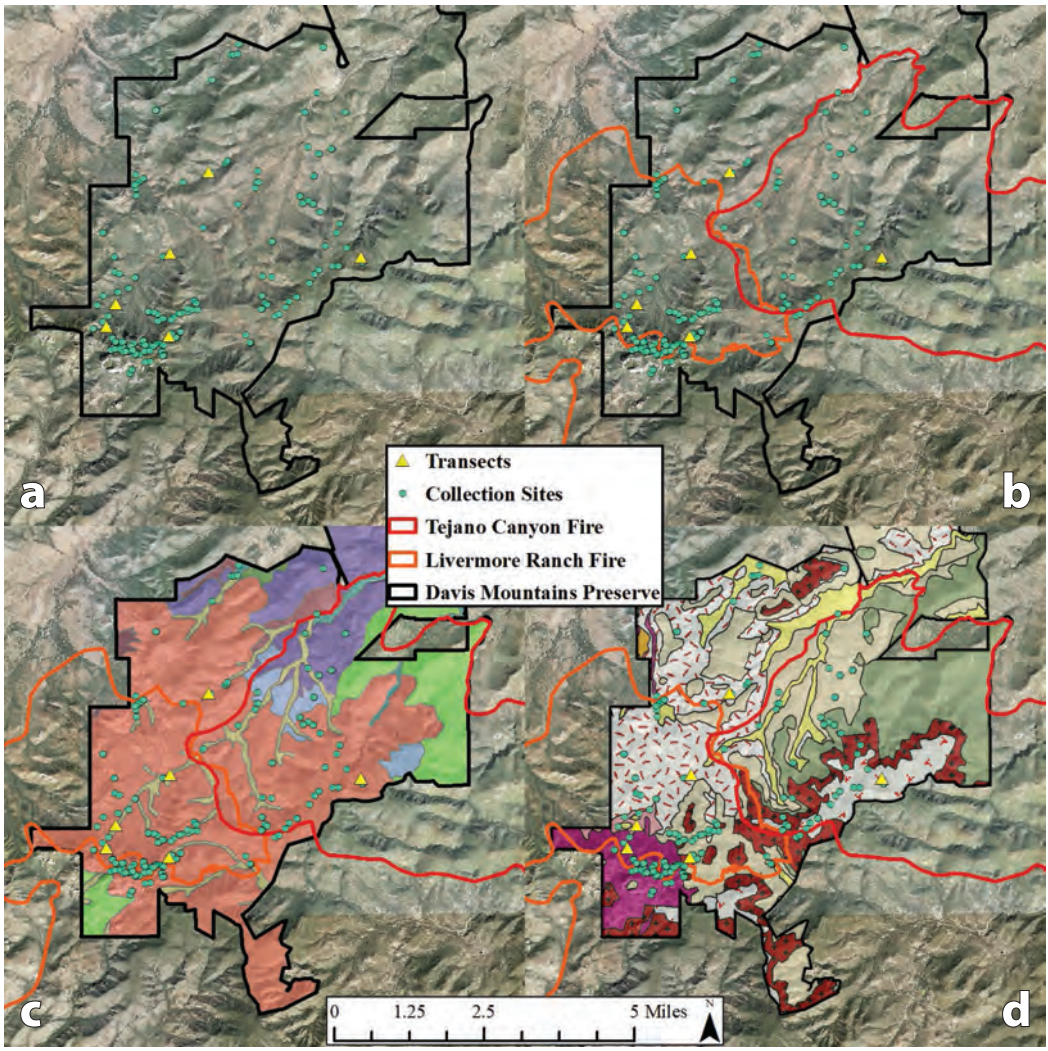

Fig. 4. Study area collection and transect locations on the DMP with maps showing a. locations within Davis Mountains Preserve boundary, b. locations within fire boundaries, c. locations within soil associations (USDA, NRCS 2013), and d. locations within rock types (Texas Natural Resources Information System 2014).

include collection location (e.g. the trail/road/canyon name as it appears on TNC and USGS 1:24,000 topographic maps), habitat, associated species, elevation, and GPS coordinates taken with a Garmin eTrex. The majority of the photographs were taken with a Canon Rebel XTi, documenting general plant associations, most of the species seen and collected, and transect sites and are archived at Sul Ross State University. Collection effort was increased during the late summer monsoonal months between July and September 2012. Sources referenced for identification and current nomenclature were many and included Correll and Johnston (1970), *Flora of North America* Asteraceae and Poaceae volumes (FNA 2003, 2006, 2007), Powell (1998, 2000), Powell and Weedin (2004), Yarborough and Powell (2002), and Tropicos.org (2014). Personal communication with Dr. A. Michael Powell at SRSC and access to his unpublished manuscript on the flowering plants of the Trans-Pecos (Powell & Worthington in prep.) was of invaluable assistance. Additional sources for

Table 2. Comparison of physical characteristics of six transects within the DMP study area, Jeff Davis County, Texas.

Transect Number and Location	Elevation (m/ft)	Ecological Zone/Soil Association	Substrate
1 ~ N30°40'43.86", W104°9'5.76"	1955 m/6415 ft	Mountain Loam, Mountain Savannah/Puerta-Madrone (PmK)	Sheep Pasture formation
2 ~ N30°39'33.06", W104°9'45.36"	1935 m/6345 ft	Canyon, Mountain Savannah/Loghouse (LsD)	Sheep Pasture formation
3 ~ N30°39'23.80", W104°6'33.23"	2200 m/7220 ft	Mountain Loam, Mountain Savannah/Puerta-Madrone (Pmk)	Goat Canyon formation
4 ~ N30°38'49.32", W104°10'40.19"	2060 m/6760 ft	Canyon, Mountain Savannah/Loghouse (LsD)	(Q) Landslide deposits
5 ~ N30°38'29.64", W104°10'50.23"	2160 m/7080 ft	Mountain Loam, Mountain Savannah/Puerta Madrone (PmK)	Intrusive igneous rocks
6 ~ N30°38'21", W104°9'47"	2275 m/7465 ft	Canyon, Mountain Savannah/Loghouse (LsD)	Barrel Springs formation

identification and nomenclature include Jones et al. (2003) and Warnock (1970, 1974, 1977). Author abbreviations follow Brummit and Powell (1992). Dr. A. Michael Powell verified specimen identifications.

Six transects were also set within the DMP for collection of species lists (Fig. 4). Representing habitat variations across the study site, these points vary in aspect, slope, substrate and soil types, elevation, and fire activity (Table 2). Belt transects were used to record the species present in a site, as Smith (1980) suggests as the most objective method possible. At each site, a tape measure was stretched over the terrain for fifty meters in all of the cardinal directions. The species were then recorded if they fell within one meter of either side of that tape. The establishment of these transects makes available baseline data and the opportunity to revisit in future studies. Observations of these sites were recorded once after the summer rainy season and before the first freezes, to ensure the highest species yield, in early November 2012 and again in early October 2013. Resulting data were compiled into species lists for each transect (Appendix A).

RESULTS AND DISCUSSION

Herbaria Search.—BRIT, holding approximately one million collections, cannot be accessed by an online database and was, therefore, not searched for the inclusion of the current project. A search of the online NYBG database returned 33 DMP collections (NYBG 2006). A tab-delimited file was sent containing 6,129 Jeff Davis County (JDC) specimens from Tom Wendt at the UT Austin's TEX-LL and is represented by 111 families, 497 genera, and 1,063 species. An online search of TEX-LL's database housing over 6,000 collections from Jeff Davis County alone was conducted by searching all the known vascular plant families from the county and the Davis Mountains and was combined with a manual search of every Jeff Davis County collection at SRSC. A large majority of the early DMP collections in TEX-LL are duplicates of vouchers in SRSC, sampled by the study area's two most prominent collectors, Leon Hinckley and Barton Warnock. Combining these historical records results in a list of 1,673 voucher specimens (not including duplicates) representing 430 species, 263 genera, and 82 families estimated to have been found on present-day TNC DMP property. An additional list was constructed of 82 voucher collections, primarily Hinckley's (1944) from the Goat Canyon area, of 78 species that are considered potential or unlikely representatives of the study area based upon habitat similarities, as well as additional voucher's proximity to the study area, due to the fact there is only one or zero successive collections. This list represents 40 families that were not found when observing localities during the herbarium search and were not observed by the author during the current study. Most of these species are found to in habit the lower and more disturbed areas of the Chihuahuan Desert

Without records from BRIT and other regional herbaria being electronically inventoried, along with the author not being able to access or return any Davis Mountain Preserve collections from SAT, TAES, or TAMU, the combination of TEX-LL's online database search and the manual search of SRSC provides the majority of the historical DMP collections for this study. While there are most certainly other DMP collections at BRIT and

other herbaria, SRSC and TEX-LL, along with the several returned from NYBG, house enough voucher records to sufficiently establish a baseline flora of 430 species that the current study could improve upon. Of those 430 species, 101 of them were not encountered during the current effort. Leon Hinckley's collections from the 1940 dissertation on the vegetation of Mount Livermore account for 339 species that were collected solely by him and 95 species he collected with Barton H. Warnock, 84 of which are the same species. Warnock also collected 128 species independently, and A.M. Powell has 157 vouchers that represent 112 species. Other prominent collectors in the area during this time include D.S. Correll and M.C. Johnston. Because this property was a private ranch until 1997, these collections made by botanists for Sul Ross State University and the University of Texas at Austin represent the significant majority of 20th-century vouchers from the study area. Since the turn of the millennium and the acquisition of the property by TNC, many species have been found, by numerous collectors, which had previously not been documented for the area. However, there are also several species that have not been rediscovered on the property since those early collections. The herbaria search for this study represents an important step in refining a catalogued species list for the area, as well as improving researchers' estimations of what potential species may be found on additional easement properties in the Davis Mountains.

Vegetation associations.—The six vegetation communities on the DMP have a floral assemblage consisting of species both agreeable to those described by Henrickson and Johnston (1986) and, in the case of several, unique to the composition of the higher Davis Mountains.

Sandy Arroyo Scrub.—The first and least prominent community on the DMP is the Sandy Arroyo Scrub, of the Desert Scrub and Woodland category, at the lower elevations of the study area (Fig. 5). It is found along sandy margins of arroyos, intermittent and perennial streams of the DMP, and includes a distinctive assemblage of species such as *Agastache micrantha* (white gianthyssop); *Baccharis salicifolia* (seepwillow baccharis); *Clematis pitcheri* (purple leatherflower); *Cosmos parviflorus* (southwestern cosmos); *Cyperus esculentus* (yellow nutsedge); *Echinochloa crus-galli* (barnyardgrass); *Fallugia paradoxa* (apache plume); *Juglans major* (Arizona walnut); *Muhlenbergia rigens* (deergrass); *Polanisia uniglandulosa* (Mexican clammyweed); *Salix lasiolepis* (arroyo willow); *Vernonia marginata* (plains ironweed); and the occasional stand of *Persicaria pensylvanica* (nodding smartweed). Other species, characteristic to Chihuahuan Desert Scrub, include *Aloysia gratissima* (whitebrush); *Aristida* spp. (three-awn); *Bouteloua* spp. (grama); *Bothriochloa* spp. (bluestem); *Brickellia* spp. (brickellbush); *Eragrostis* spp. (lovegrass); *Juniperus deppeana* (alligator juniper); *Mimosa aculeaticarpa* var. *biuncifera* (catclaw mimosa); *Muhlenbergia* spp. (muhly); *Setaria* spp. (bristlegrass); *Quercus emoryi* (Emory oak); *Q. gravesii* (Chisos red oak); and *Q. grisea* (gray oak). This species assemblage, along with the other to follow, is partially adapted from Henrickson and Johnston (1986) along with observations made by the author during the study period. Characteristics of this community seem to compare most similarly with those of the Draw, Mixed Prairie ecological sites (USDA, NRCS 2013). The Sandy Arroyo Scrub tends to grade upward into the Juniper-Pinyon, Oak, and Pine Woodland communities within the higher elevations of the Davis Mountains.

Grama Grassland.—The next and second-to-least prominent community on the DMP is the Grama Grassland. This is a community that is most extensive in zones west of the Chihuahuan Desert Region along the lower eastern margin of the Sierra Madre Occidental between 4265 and 6230 ft (1300–1900 m), but it reappears, at the same altitudinal level, on the island-like igneous mountain masses, such as the Davis Mountains. Grama grasslands cover large, somewhat moderate slopes of coarse sandy soils, derived from extrusive igneous rocks comprised of rhyolite (Henrickson & Johnston 1986). The main grasses on the DMP of this community (Fig. 6) are *Aristida* spp. (three-awn); *Bouteloua gracilis* (blue grama); *B. curtipendula* (side-oats grama); *B. hirsuta* (hairy grama); *Bothriochloa* spp. (bluestem); *Eragrostis* spp. (lovegrass); *Leptochloa dubia* (green strangletop); and *Muhlenbergia* spp (muhly). Other species include *Aloysia floribunda* (whitebrush); *Cylindropuntia imbricata* (cane cholla); *Eryngium heterophyllum* (Wright eryngo); *Mimosa aculeaticarpa* var. *biuncifera* (catclaw mimosa); *Juniperus deppeana* (alligator juniper); *Pinus cembroides* (Mexican pinyon); *Opuntia* spp. (pricklypear); *Quercus grisea* (gray oak); and *Zinnia grandiflora* (plains zinnia). The characteristics of this community resemble those of the Draw, Mixed Prairie, the Loamy Swale, Mixed Prairie, and the Foothill Slope; Mountain Savannah ecological zones (USDA, NRCS 2013).

Fig 5. Example of Sandy Arroyo Scrub vegetation community (Henrickson & Johnston 1986) on the Davis Mountains Preserve, Jeff Davis County, Texas. Dominant trees and shrubs pictured include *Pinus cembroides, Juniperus deppeana, Baccharis salicifolia,* and *Juglans major*.

Montane Chaparral.—The Grama Grasslands tend to grade upward to the species-rich Montane Chaparral community on the middle and upper slopes of the higher mountains and canyons of the Chihuahuan Desert Region (CDR). The Montane Chaparral community (Fig. 7) is found on the upper slopes of the mid-to-high elevations of the DMP. Depending on exposure, this association can be very dense, consisting of shrubs and low trees, 1–2 m tall, or very open, with a grass-dominated understory. Species include most of the mesic and xeric grasses previously discussed, *Adolphia infesta* (Texas adolphia); *Agave havardiana* (Havard agave); *Aloysia floribunda* (whitebrush); *Amaranthus palmeri* (Palmer amaranth); *Bouvardia ternifolia* (scarlet bouvardia); *Cercocarpus breviflorus* (mountain mahogany); *Cyclanthera dissecta* (cutleaf cyclanthera); *Echinocereus viridflorus* var. *weedinii* (Weedin's smallflower hedgehog cactus); *Eremogone fendleri* (Fendler sandwort); *Eriogonum* spp. (buckwheat); *Dysphania graveolens* (ragleaf goosefoot); *Fendlera rupicola* (cliff fendlerbush); *Heliomeris longifolia* (annual goldeneye); *Heterotheca viscida* (goldenaster); *Holodiscus discolor* (rush rock-spires); *Juniperus deppeana* (alligator juniper); *Linum lewisii* (Lewis flax); *Muhlenbergia alopecuroides* (wolftail); *Nolina texana* (sachuista); *Quercus gambelii* (Gambel oak), *Q. grisea* (gray oak); *Opuntia* spp. (pricklypear); *Pericome caudata* (tailleaf pericome); *Pinus cembroides* (Mexican pinyon); *Phacelia rupestris* (white curls); *Sicyos* spp. (bur-cucumber); *Silene laciniata* var. *greggii* (Mexican campion); *Solidago wrightii* (Wright goldenrod); *Symphoricarpos palmeri* (Palmer snowberry); *Tecoma stans* (trumpetflower); *Tetraneuris linearifolia* var. *linearifolia* (slenderleaf bitterweed); *Thelypodium wrightii* (Wright thelypody); and *Urtica gracilente* (stinging nettle). This community compares most closely with characteristics of the Mountains Loam; Mountain Savannah ecological zones (USDA, NRCS 2013). The Montane Chaparral component species extend into the Juniper-Pinyon zones, and many of them continue upward to the Pine and Oak Woodlands (Henrickson & Johnston 1986).

Juniper-Pinyon Woodland.—The most prominent category of the Montane Woodlands described by Henrickson and Johnston (1986) is the Juniper-Pinyon Woodland, occurring on higher mountains spread

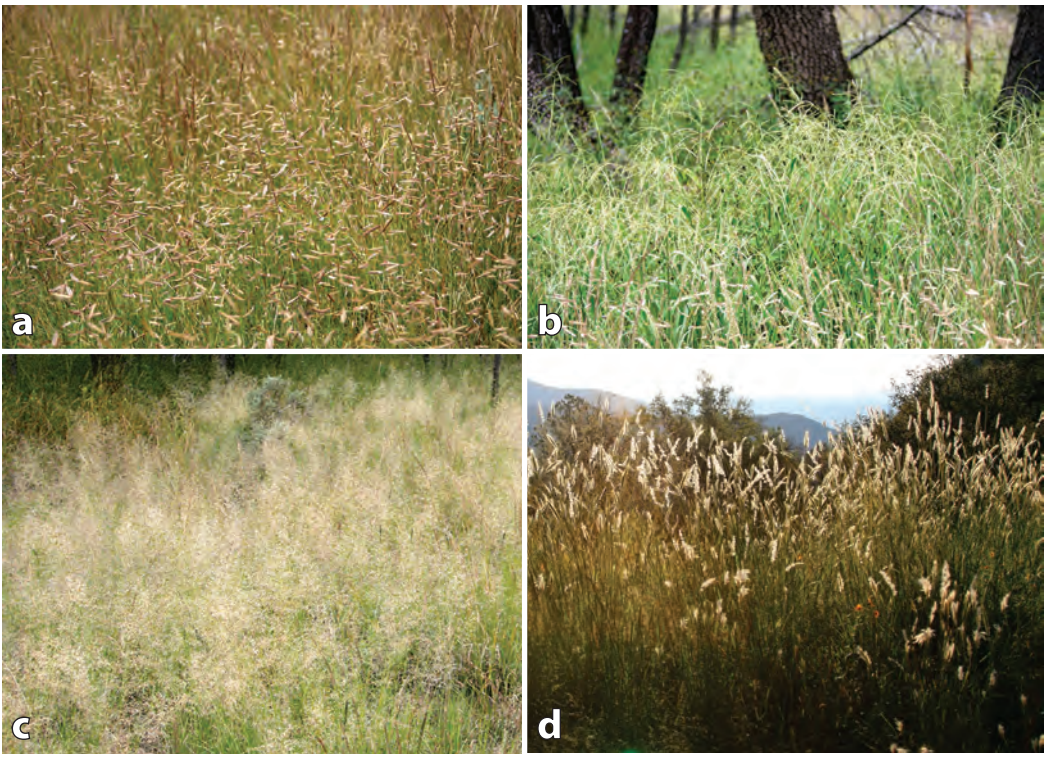

Fig. 6. Dominant grasses associated with Grama Grassland vegetation community (Henrickson & Johnston 1986) on the Davis Mountains Preserve, Jeff Davis County, Texas: **a.** *Bouteloua gracilis,* **b.** *Leptochloa dubia* and *Bouteloua curtipendula,* **c.** *Eragrostis mexicana* and *E. intermedia,* and **d.** *Bothriochloa barbinodis*.

throughout the Chihuahuan Desert, mostly above the Montane Chapparal zone and, in some instances, at the same altitudinal level on drier, exposed slopes. These areas on the DMP are dominated by *Juniperus deppeana* (alligator juniper) and *Pinus cembroides* (Mexican pinyon) (Fig. 8). Other associate species include *Acalypha neomexicana* (New Mexico copperleaf); *Artemisia ludoviciana* (western mugwort); *Bouteloua* spp. (grama); *Bothriochloa* spp. (bluestem); *Bidens bigelovii* (Bigelow beggar's ticks); *Carminatia tenuiflora* (plumeweed); *Cercocarpus breviflorus* (mountain mahogany;) *Cologania angustifolia* (longleaf cologania); *Commelina dianthifolia* (birdbill dayflower); *Dichondra brachypoda* (New Mexico ponyfoot); *Desmodium grahamii* (Graham tickseed), *D. neomexicanum* (New Mexico tickseed); *Dysphania graveolens* (ragleaf goosefoot); *Dyssodia papposa* (Mayweed dogweed); *Eragrostis* spp. (lovegrass); *Glandularia pubera* (Davis Mountains mock vervain); *Hedeoma plicata* (dwarf hedeoma); *Heliomeris longifolia* (annual goldeneye); *Heterosperma pinnatum* (fineleaf heterosperma); *Hieracium carneum* (Huachuca hawkweed); *Ipomoea* spp. (morning glory); *Ipomopsis aggregata* (standing cypress); *Lotus plebeius* (Pine deervetch); *Muhlenbergia emersleyi* (bull muhly), *M. rigida* (purple muhly); *Nolina texana* (sacahuista); *Opuntia* spp. (pricklypear); *Penstemon barbatus* subsp. *torreyi* (beardlip penstemon); *Phlox nana* (Santa Fe phlox); *Physalis hederifolia* (heartleaf groundcherry); *Psilactis tenuis* (machaeranthera); *Oxalis latifolia* (largeleaf wood-sorrel); *Quercus gravesii* (Chisos red oak), *Q. grisea* (gray oak); *Sida neomexicana* (New Mexico sida); *Solanum douglasii* (Douglas nightshade); *Tetraneuris linearifolia* var. *linearifolia* (slenderleaf bitterweed); and *Tragia amblyodonta* (noseburn). Most of the understory consists of more xeric-tolerant Chaparral species and grasses. Characteristics of this community compare closely with those of the Igneous Divide, Mountain Savannah and the Foothill Slope, Mountain Savannah ecological sites (USDA, NRCS 2013).

Fig. 7. Example of Montane Chaparral vegetation community (Henrickson & Johnston 1986) on the Davis Mountains Preserve, Jeff Davis County, Texas. Trees and shrubs include *Juniperus deppeana, Artemisia ludoviciana, Cerocarpus breviflorus, Dysphania graveolens, Echinocereus viridiflorus* var. *weedini, Heliomeris longifolia, Muhlenbergia emersleyi, Phacelia rupestris, Salvia arizonica,* and *Solidago wrightii.*

Oak Woodland.—Next is the Oak Woodland community (Fig. 9), which is found at about the same altitudinal zone as the Juniper-Pinyon Woodland (Henrickson & Johnston 1986) but restricted to more sheltered canyons or relatively mesic northern slopes. The dominant oak species of the DMP include *Quercus gravesii* (Chisos red oak); *Q. emoryi* (Emory oak); *Q. hypoleucoides* (silverleaf oak); *Q. gambelii* (Gambel oak); and *Q. grisea* (gray oak). Other associate species include *Arbutus xalapensis* (Texas madrone); *Bidens bigelovii* (Bigelow beggar's ticks); *Frangula betulifolia* (indian cherry); *Juniperus deppeana* (alligator juniper); *Nolina texana* (sacahuista); *Pinus cembroides* (Mexican pinyon); *Prunus serotina* (southwestern chokecherry); *Salvia arizonica* (Arizona sage); and mesic grasses. Characteristics of this community compare with those of the Igneous Hill and Mountain, Mixed Prairie, the Igneous Hill and Mountain, Mountain Savannah, and the Mountain Loam, Mountain Savannah ecological sites (USDA, NRCS 2013). This community's species intergrade often with the adjacent and lower Chaparral and Juniper-Pinyon associations as well as upward with the Mixed Conifer Woodland (Henrickson & Johnston 1986).

Pine Woodland.—Lastly is the Pine Woodland community (Fig. 10) that occurs only in a few locations of the Chihuahuan Desert Region at the higher flats and slopes of the tallest mountain ranges. In the majority of these sites on the DMP, these associations can be considered a mixed Pine-Oak Woodland (Henrickson & Johnston 1986). The species that dominate these areas are *Pinus cembroides* (Mexican pinyon); *P. ponderosa* (ponderosa pine); *P. strobiformis* (southwestern white pine); and *Quercus hypoleucoides* (whiteleaf oak). Associate species on the DMP of Pine-Oak Woodland vegetation community are many and include *Achillea millefolium* (yarrow); *Allium cernuum* (nodding onion); *Arenaria ludens* (Tran-Pecos sandwort); *Arbutus xalapensis* (Texas madrone); *Artemisia ludoviciana* (western mugwort); *Ageratina* spp. (thoroughwort); *Asclepias texana* (Texas milkweed); *Baccharis bigelovii* (Bigelow baccharis); *Bahia bigelovii* (Bigelow bahia); *Bidens*

Fig. 8. Example of Juniper-Pinyon Woodland vegetation communities (Henrickson & Johnston 1986) on the Davis Mountains Preserve, Jeff Davis County, Texas. Understory consisting of *Aristida* spp.; *Bouteloua curtipendula, B. gracilis, B. hirsuta; Bothriochloa* spp.; *Commelina dianthifolia; Eragrostis* spp.; *Muhlenbergia alopecuroides, M. rigida;* and *Panicum hallii*.

bigelovii (Bigelow beggar's ticks); *Bothriochloa* spp. (bluestem); *Brickellia* spp. (brickellbush); *Campanula rotundifolia* (bellflower); *Carminatia tenuiflora* (plumeweed); *Cercocarpus breviflorus* (mountain mahogany); *Commelina dianthifolia* (birdbill dayflower); *Corydalis curvisiliqua* var. *curvisiliqua* (curvepod fumewort); *Desmodium grahamii* (Graham tickseed), *D. mexicanum* (New Mexico tickseed); *Dysphania graveolens* (ragleaf goosefoot); *Echinocereus viridflous* var. *weedinii* (Weedin's smallflower hedgehog cactus); *Erysimum capitatum* (wallflower); *Frangula betulifolia* (indian cherry); *Ipomopsis aggregata* (standing cypress); *Heliomeris longifolia* (annual goldeneye); *Hesperidanthus linearifolius* (mountain mustard); *Hieracium carneum* (Huachuca hawkweed); *Galinsoga parviflora* (quickweed); *Galium* spp. (bedstraw); *Geranium caespitosum* (tufted geranium); *Juniperus deppeana* (alligator juniper); *Mirabilis linearis* (linearleaf four o'clock); *Monarda pectinata* (plains beebalm); *Muhlenbergia* spp. (muhly); *Laennecia* spp. (horseweed); *Lathyrus graminifolius* (grassleaf peavine); *Lithospermum multiflorum* (manyflower gromwell); *Oxalis latifolia* (largeleaf wood-sorrel); *Packera millelobata* (manybract groundsel); *Panicum bulbosum* (bulb panicum); *Penstemon barbatus* var. *torreyi* (beardlip penstemon); *Phacelia rupestris* (whitecurls); *Physalis hederifolia* (heartleaf groundcherry); *Piptochaetium* spp. (ricegrass/needlegrass); *Pseudocymopterus montanus* (mountain parsley); *Pseudognaphalium* spp. (cudweed); *Prunus serotina* (southwestern chokecherry); *Ptelea trifoliolata* (skunkbush); *Quercus gambelii* (Gambel oak); *Salvia arizonica* (Arizona sage); *Sicyos* spp. (bur-cucumber); *Silene laciniata* var. *greggii* (Mexcian campion); *Solanum douglasii* (Douglas nightshade); *Solidago* spp. (goldenrod); *Thalictrum fendleri* (Fendler meadow-rue); *Stellaria cuspidata* (Mexican starwort); *Verbesina oreophila* (mountain crownbeard); and *Vitis arizonica* (Arizona grape). The characteristics of this zone tend to resemble those of the Mountain Loam, Mountain Savannah and the Canyon, Mountain Savannah ecological sites (USDA, NRCS 2013). Species associated with this community often intergrade downward into the mesic north-facing slopes of the higher mountain

Fig. 9. Example of Oak Woodland vegetation communities (Henrickson & Johnston 1986) on the Davis Mountains Preserve, Jeff Davis County, Texas: a. A forest of *Quercus gambelii* in upper Tobe Canyon with an understory consisting of *Ageratina herbacea, Frangula betulifolia,* and the climbing *Sicyos laciniatus* and *S. microphyllus*.

canyons. Prevailing moisture-carrying winds are an important factor that harbors these types of forests, although human impact has had a significant effect on the present-day composition in recent history (Henrickson & Johnston 1986).

Field collections.—Between September 2011 and October 2013, approximately 285 hours in 34–35 days were spent in the field. The 570 voucher specimens taken during this time represent 68 families, 209 genera, and 285 species. The herbaria search encountered 18 families, 71 genera, and 182 species that were not vouchered during the study, although many of them were observed. New taxa to the historic baseline flora include 2 additional families, 25 additional genera, 47 additional species, and one new variety of a known species. The 47 additional species, some of which are rather common and have been most likely observed, but never collected, were compared to the 2005 draft of the Preliminary List of the Vascular Plants of the Davis Mountains (Carr 2005), along with TEX-LL's online data base (PRC 2012) and SRSC. This search revealed that four of the 47 appear to be new vouchers for Jeff Davis County and the Davis Mountains, two species are new to Texas, and 15 of them are additional species to Carr (2005). The current study represents a 25.44% increase in vouchered specimens and a 9.7% increase in known species from the study area's 18,360 acres. Much of the study area was sampled during the collection period, but there are still areas within this boundary that have received little-to-no botanical attention and, perhaps, even microhabitats that have never been discovered by humans. In 2011, the entire southwestern US was hit by record-breaking drought conditions (Schiermeier 2011). With only 6.7 inches of rainfall recorded at the Elbow Canyon weather station, a substantial growing season in the higher Davis Mountains was essentially nonexistent. By the end of July 2012, nearly 7 inches of rain had been recorded providing for the significant majority of species documented during the study. By November 2013, nearly 18 inches of rainfall had been recorded (www.davismountains.com).

Fig. 10. Example of Pine-Oak Woodland vegetation communities (Henrickson & Johnston 1986) on the Davis Mountains Preserve, Jeff Davis County, Texas. Overstory and understory include *Arbutus xalapensis, Bidens bigelovii, Commelina dianthifolia, Chenopodium neomexicanum, Erysimum capitatum, Frangula betulifolia, Hesperidanthus linearifolius, Ipomoea cristulata, Juniperus deppeana, Heliomeris longifolia, Monarda fistulosa* var. *menthifolia, Oxalis latifolia, Pinus ponderosa, Quercus hypoleucoides, Salvia arizonica, Sicyos laciniatus, S. microphyllus,* and *Verbesina oreophila*.

The 101 species that were not encountered during the study (21.4% of the entire flora) could possibly be due to the drought conditions or misidentification of certain species, but also might be due to under collecting of additional areas located on the property. The lack of encounter for some species, especially those with only historic documentation on the DMP, such as *Pteridium aquilinum* (western brackenfern), can be explained possibly by the transformation this ecosystem has seen in the past century, with a shift from mesic to more xeric conditions. In Hinckley's (1944) flora over the Mount Livermore area, 109 species are documented to be found only in the Goat Canyon area, 28 of which have been rediscovered by previous collectors. The current study found an additional 24 species of those 109 on DMP property, previously only known by the one historic collection in proximity to the study area. As the flora extends into the Juniper-Pinyon Woodland exhibited in the higher Davis Mountains (i.e. where *Juniperus deppeana* is seemingly the only juniper), it is observed that many of the species that utilize lower, more xeric, and more disturbed habitats are not represented (Powell pers. comm.). Goat Canyon, being, both historically and currently, privately ranched, is an excellent example of how the floral composition and overall ecosystem have been, and are being, altered. Combining the current and historical records, specimens, and observations, the total known flora of the DMP, to date, consists of 84 families, 288 genera, and 483 species and infraspecies (484 total taxa). The flora includes 48 taxa recognized at the subspecific or varietal level and one *Quercus* hybrid. An annotated catalogue includes a list of all known species of every taxon, common name, synonymy, life form, abundance, and habitat notes.

In the DMP, the most prominent family is Asteraceae, with 89 species in 59 genera (18.4% of the flora). Other important families are the Poaceae (77 species, 15.9%), Fabaceae (21 species, 4.3%), Euphorbiaceae (18

species, 3.7%), Brassicaceae (12 species, 2.5%), Caryophyllaceae (12 species, 2.5%), Pteridaceae (12 species, 2.5%), Convolvulaceae (8 species, 1.7%), Cyperaceae (8 species, 1.7%), Fagaceae (8 species, 1.7%), and Lamiaceae (8 species, 1.7%). The six most well represented families make up more than 50% of the total flora, while there are 23 species that are the only representatives of their families.

Phylum Anthophyta represents 94% of the total flora with 106 monocot species and infraspecies (22.0% of the total flora) and 348 eudicot species and infraspecies (72.0% of the total flora). The phylum Polypodiophyta has 21 representative species (4.4% of the total flora), while Coniferophyta and Lycopodiophyta are represented by only five and three species and infraspecies, respectively. No members of Gnetophyta seem to occur within the current study area.

Perennial herbs are the most prominent life form of vascular plants on the DMP at 265 species and infraspecies, translating to 54.9% of the entire flora. Following are annual herbs with 99 species and infraspecies (20.5%) and then shrubs with 35 species and infraspecies (7.2%). The remaining quarter percentage of life forms range from the sub-shrubs at 25 species and infraspecies (5.2%), 19 species and infraspecies of trees (3.9%), 19 species of herbaceous vines (3.9%), 19 species and infraspecies of succulents and semi-succulents (3.9%), to the woody perennial vines at 2 species. Many of the species can exhibit multiple habit types (NRCS 2007) and were selected based upon which habit they best portray in the study area. Thirty-six of these herb/forb species' duration are listed as annual or perennial and are divided evenly between these two groups.

Noteworthy collections.—Many of the plants on the DMP are considered species of concern and are associated with a global, federal, and/or state ranking, several of which were encountered during the current study. Noteworthy observations and collections include *Osmorhiza bipatriata* (Livermore sweet-cicely; Fig. 11a) and the discovery of two new occurrences. Further interesting collections include *Polemonium pauciflorum* subsp. *hinckleyi* (Hinckley Jacob's-ladder; Fig. 11c; *JJK 193*), observed from three locations from the Tobe Canyon area, as well as one in Road Canyon. Populations were substantial from all locations, with 15 or more individuals from each site. *Draba standleyi* (Standley draba; Fig. 11b; *JJK 111*, *167*) was observed from several occurrences, all from above 7900 ft (2410 m) on the north face of Mount Livermore, with over 20 individuals observed throughout the study. *Solanum davisense* (Davis Mountains nightshade; Fig. 11d; *JJK 50*) was found in two locations during the study, and *Aquilegia longissima* (longspur columbine; Fig. 11e; *JJK 140*) was found in 4 locations, including one individual growing at approximately 6330 ft (1930 m) in Madera Canyon, approximately 1.5 mi from the next closest population. The endemic *Perityle rupestris* var. *rupestris* was observed and collected in upper Tobe Canyon, along with *Galium wrightii* (Wright bedstraw; Fig. 11f; *JJK 276*, *175*) just downslope.

Other collections that are apparently secure globally but considered at risk of extirpation from Texas include *Antennaria marginata* (whitemargin pussytoes; Fig. 12a; *JJK 417*), which has not been collected in Texas since 1947, found in one location (Hinckley 1944); *Oenothera texensis* (Texas primrose; Fig. 12b; *JJK 148*), known from only Jeff Davis County in Texas, was observed in two locations on the DMP and *Muhlenbergia brevis* (short muhly; Fig. 12c; *JJK 282*), is an annual grass found in Arizona, New Mexico, and Colorado but only known from the higher reaches of the Davis Mountains in Texas (Turner et al. 2003). *Astragalus giganteus* (giant milkvetch; *JJK 22*) was found in two locations high on Mount Livermore as well as along the Tobe Spring Trail. *Sedum cockerellii* (Cockerell stonecrop; *JJK 62*, *283*, *394*) and *Hackelia pinetorum* var. *pinetorum* (Livermore stickseed; *JJK 178*, *216*) also have an S1 ranking in Texas and can be found rather frequently in the higher reaches of the Davis Mountains.

One of the more notable finds on the DMP was *Geranium seemannii* (Seemann geranium; Fig. 12d; *JJK 268*, *409*), first found in August 2012 in Short Pine Canyon on the south-facing slopes of Mount Livermore, from which there are very few historical collections. Known in the United States from only one voucher from an unknown location in Goat Canyon in 1935 (Powell pers. comm.), this species is not followed and is tracked by neither The Nature Conservancy nor TPWD. This location and another found in August 2013 in Tobe Canyon most likely represent the northernmost distributions of this Mexican—South American species. *Dicromanthus michuacanus* (Michoacan ladies' tresses), one of the rarest orchids in the U.S. (Powell &

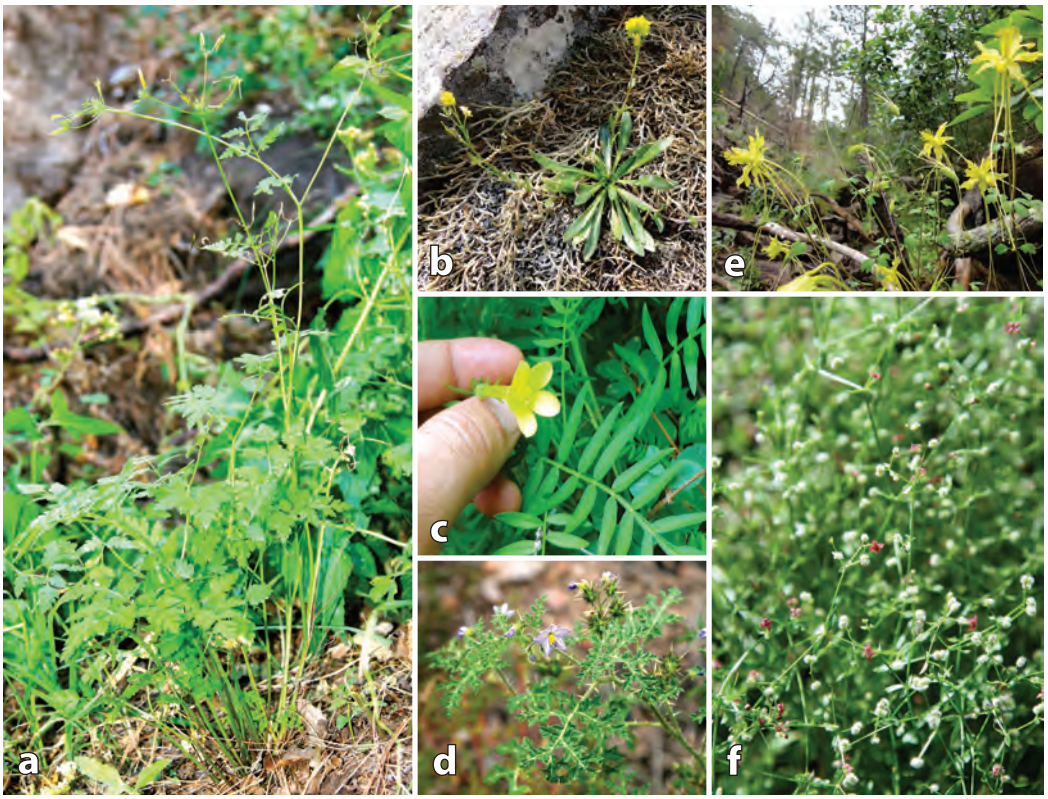

Fig. 11. Species collected/observed with a global ranking of G3 or higher on the Davis Mountains Preserve: a. ***Osmorhiza bipatriata,*** **b.** ***Draba standleyi,*** **c.** ***Polemonium pauciflorum*** **subsp.** ***hinckleyi,*** **d.** ***Solanum davisense,*** **e.** ***Aquilegia longissima,*** **and f.** ***Galium wrightii.***

Worthington in prep.), was documented for the third time ever in Jeff Davis County. Other interesting finds include *Senecio crassulus* (Rocky Mountain goldenrod; Fig. 12f; *JJK 404*) of the Rocky Mountains and the Pacific Northwest and *Laennecia schiedeana* (pineland horseweed; Fig. 12e; *JJK 404*) of New Mexico, Arizona, and Colorado, both collected for the first time in Texas. Both of these species may be increasing their distribution southward by way of bird migration patterns, as well as possibly being brought in by fire crews.

Endemic and Non-native species.—As documented in 2007 by the Texas A&M Bioinformatics Working Group (TAM-BWG), two species are endemic to the Davis Mountains, including *Potamogeton clystocarpus* (Little Aguja pondweed), which is known from Little Aguja Canyon 13 mi north of the study area and was not encountered on the DMP. Two species that are endemic to the Trans-Pecos region occur on the DMP (*Perityle rupestris* var. *rupestris* and *Bahia bigelovii*), along with one that is endemic to Texas (*Corydalis curvisiliqua* var. *curvisiliqua*). As documented by USDA (2013), there are fourteen non-native species occurring on the DMP, including four species that are considered invasive in Texas (Texasinvasive.org 2008): *Eragrostis lehmanniana* (Lehmann lovegrass), *Salsola tragus* (Russian thistle), *Taraxacum officinale* (common dandelion), and *Xanthium spinosum* (spiny cocklebur). Non-native species make up nearly 3% of the total flora.

Taking into account the floristic knowledge of the Davis Mountains that has been accumulating over the past century and a half, this study is beneficial for increasing the knowledge of the floral composition on one of the most unique and diverse "sky islands" in the Chihuahuan Desert Region. Other regional floras (Table 3) completed in the Trans-Pecos provide an opportunity to compare results to the DMP flora, which can then be further compared to those of the Southwestern US.

Fig. 12. Otherwise noteworthy collections on the Davis Mountains Preserve: **a.** *Antennaria marginata,* **b.** *Oenothera texensis,* **c.** *Muhlenbergia brevis,* **d.** *Geranium seemannii,* **e.** *Dicromanthus michuacanus,* **f.** *Laennecia schiedeana,* **g.** *Senecio crassulus.*

Floristic analysis and Phytogeographic Context of the DMP.—The flora over the Forbidden Mountain Area (FMA; Larke 1989) is the closest in proximity to the DMP. The 1,063 species housed at TEX-LL from Jeff Davis County (JDC) can be used to broaden the scope at the local level, and significant changes in importance of taxonomic groups and families can be further observed. The vascular flora of the Dead Horse Mountains (DH; Fenstermacher et al. 2008) and the vascular flora of Big Bend National Park (BB; NPS 1996) provide for a more southern Trans-Pecos comparison, while Plants of the Guadalupe Mountains and Carlsbad Cavern National Parks (GM; Burgess & Northington 1981) provides for northern comparison, outside of the Chihuahuan Desert's range. McLaughlin (1986) floristically characterized the Southwestern US (SW) based upon data from 50 floras in western Texas, western New Mexico, western Colorado, Utah, Nevada, Arizona, and southeastern California, and subsequent similarity indices were also calculated among all of the studies. When the results of DMP are examined in a regional context alongside the lists from these local and regional areas, trends in the taxonomic composition become apparent (Tables 4, 5). The DH flora returned results that can be compared to DMP, due to the extremely large study area covered (176,800 acres/71,548 hectares), its high elevation (1700–7854 ft; 518–2394 m), and its comparable, complex topography, which provides for a diverse range of habitat and micro-niches similar to those found on the DMP. Ferns and fern allies make up 5.0% of the entire flora on the DMP (Table 4), the highest percentage seen when comparing to the other six lists. The next closest in comparison is BB with 3.9% likely due to its large area with microniches that are conducive to fern diversity.

Table 3. Floras and lists compared to the southern half of the Davis Mountains Preserve (DMP) with directional reference to DMP, area, elevation range, climate, vegetation type, and predominant geology/soils.

Forbidden Mountain Area (FMA)	Jeff Davis County (JDC)	Guadalupe Mountains and Carlsbad Caverns National Park (GM)	Dead Horse Mountains (DH)	Big Bend National Park (BB)
16 mi (26 km) NE 15 mi^2 (39 km^2); 9600 ac (3885 ha) 4200 ft (1280 m)–6500 ft (1981 m)	N/A 2259 mi^2 (5850 km^2); 1637760 ac (662778 ha) 3300 ft (1005 m)–8382 ft (2555 m)	100 mi (160 km) NNW 208 mi^2 (539 km^2); 133120 ac (53872 ha) 3595 ft (1095m)–8777 ft (2675 m)	110 mi (177 km) SE 276 mi^2 (715 km^2); 176640 ac (71484 ha) 1800 ft (549 m)–5480 ft (1780 m)	100mi (160 km) SE 1252 mi^2 (3242 km^2); 801280 ac (324267 ha) 1800 ft (548 m)–7825 ft (2385 m)
Cool temperate *Quercus grisea/Pinus cembroides/Juniperus deppeana* park/woods	**Cool temperate** *Quercus grisea/Pinus cembroides/Juniperus deppeana* park/woods; *Larrea tridentata / Agave lechuguilla* scrub	**Cool temperate** *Pinus ponderosa/ Pseudotsuga menzeisii* parks/woods; *Blepharoneuron tricholeps/Bouteloua eriopoda* grassland	**Warm temperate** *Larrea tridentata/ Agave lechuguilla* scrub	**Warm temperate** *Larrea tridentata/Agave lechuguilla* scrub
Extrusive igneous/ acidic soils	Extrusive igneous/ acidic soils	Dolomite, limestone/ gypsiferous, calcareous soils	Cretaceous limestone/ calcareous soils	Cretaceous limestone/ calcareous soils

Table 4. Taxonomic breakdown of regional and local floras Davis Mountains Preserve (DMP; 483 species and infraspecies), Forbidden Mountain area (FMA; Larke 1989; 452 species and infraspecies), Jeff Davis County (JDC; tab delimited file from TEX-LL; 1,063 species and infraspecies), the Guadalupe Mountains and Carlsbad Caverns National Parks (GM; Burgess & Northington 1981; 877 species and infraspecies), Dead Horse Mountains (DH; Fenstermacher et al. 2008; 662 species and infraspecies), Big Bend National Park (BB; NPS 1996; 1,419 species and infraspecies), and the Southwestern U.S. (SW; McLaughlin 1986; 5,458 species).

Taxonomic Group	DMP	%	FMA	%	JDC	%	GM	%	DH	%	BB	%	SW	%
	Families													
Ferns and fern allies	7	8.0	4	4.9	7	6.4	4	4.5	3	3.3	4	4.0	9	7.0
Gymnosperms	2	2.3	2	2.4	3	2.7	3	3.4	3	3.3	3	3.0	3	2.4
Monocots	9	10.3	8	9.8	3	11.7	10	11.2	10	11.0	11	10.9	10	7.9
Eudicots	69	79.3	68	82.9	86	77.4	72	80.9	75	82.4	83	82.2	105	82.7
	Species													
Ferns and fern allies	24	5.0	14	3.1	38	3.6	22	2.6	23	3.5	55	3.9	120	2.2
Gymnosperms	5	0.8	4	0.9	9	0.8	7	0.8	7	1.1	13	0.9	36	0.7
Monocots	106	21.8	77	17.1	218	20.5	174	20.5	107	16.2	175	12.3	723	13.2
Eudicots	348	72.3	356	79.1	798	75.1	647	76.1	525	79.3	1176	82.9	4579	83.9

JDC follows next with 3.6% almost certainly due to a much higher monocot importance, but it also includes 16 species and two families not documented on the DMP. On the DH, ferns and fern allies make up 3.5% of the flora, including seven species also found on the DMP, whereas there are four families and 18 species on the DMP not documented for DH. The FMA fern and fern ally importance is next down the list at 3.1% likely due to smaller area and less elevation range. The GM, which is large in area and has a vast elevation range, returned an importance of 2.6% for ferns and fern allies. This number is likely lessened due to a higher monocot percentage, but can also reflect the need for a more thorough investigation into the fern diversity of this area. The percentage continues to decrease when comparing to the SW to 2.2% due to the larger scope of the area. The DMP, JDC, DH, and BB are are areas of vast fern diversity, isolated in the higher elevations, where more precipitation occurs. Gymnosperm percentages coincide very well across all of these areas, with a range of only 0.4. The DH shows a slight increase in percentage (1.1%), most likely due to overlapping ranges of *Pinus* spp. and *Juniperus* spp. that do not generally occur together in other parts of the Southwest US. Those of the DMP, FMA, JDC, GM

Table 5. Comparison of family percentage of total flora between Davis Mountains Preserve (DMP; Co = Convoluvlaceae; Cy = Cyperaceae; F = Fagaceae; L = Lamiaceae; S = Solanaceae; 483 species and infraspecies), Forbidden Mountain area (FMA; Larke 1989; 452 species and infraspecies), Jeff Davis County (JDC; tab delimited file from TEX-LL; 1,063 species and infraspecies), the Guadalupe Mountains and Carlsbad Caverns National Parks (GM; Burgess & Northington 1981; 877 species and infraspecies), Dead Horse Mountains (DH; Fenstermacher et al. 2008; 662 species and infraspecies), Big Bend National Park (BB; NPS 1996; 1,419 species and infraspecies), and the mean of 50 southwestern U.S. floras (SW; McLaughlin1986; 443.8 species and infraspecies average across 50 floras).

DMP/%	FMA/%	JDC/%	GM/%	DH/%	BB/%	SW/%
Asteraceae 18.4%	Asteraceae 17.7%	Asteraceae 16.2%	Asteraceae 17.4%	Asteraceae 12.0%	Asteraceae 13.7%	Asteraceae 17.1%
Poaceae 15.9%	Poaceae 11.8%	Poaceae 13.7%	Poaceae 14.5%	Poaceae 11.3%	Poaceae 11.6%	Fabaceae 9.0%
Fabaceae 4.3%	Fabaceae 7.6%	Fabaceae 7.1%	Fabaceae 6.5%	Fabaceae 7.8%	Fabaceae 6.2%	Poaceae 6.6%
Euphorbiaceae 3.7%	Euphorbiaceae 3.3%	Euphorbiaceae 3.8%	Euphorbiaceae 3.4%	Euphorbiaceae 5.1%	Cactaceae 5.0%	Scrophulariaceae 5.1%
Brassicaceae 2.5%	Cactaceae 3.1%	Brassicaceae 2.7%	Cactaceae 3.1%	Cactaceae 4.7%	Euphorbiaceae 3.5%	Brassicaceae 3.8%
Caryophyllaceae 2.5%	Lamiaceae 2.7%	Cyperaceae 2.2%	Brassicaceae 2.8%	Pteridaceae 3.0%	Solanaceae 2.7%	Polygonaceae 3.2%
Pteridaceae 2.5%	Brassicaceae 2.4%	Lamiaceae 2.1%	Nyctaginaceae 2.8%	Boraginaceae 3.0%	Brassicaceae 2.6%	Boraginaceae 3.0%
Amaranthaceae 1.7%	Pteridaceae 2.4%	Malvaceae 2.0%	Boraginaceae 2.6%	Brassicaceae 2.4%	Pteridaceae 2.6%	Polemoniaceae 2.6%
Cactaceae 1.7%	Solanaceae 2.0%	Pteridaceae 2.0%	Liliaceae 2.4%	Nyctaginaceae 2.3%	Nyctaginaceae 2.2%	Cactaceae 2.0%
Co,CY,F,L,S 1.7%	Convolvulaceae 2.0%	Solanaceae 2.0%	Lamiaceae 2.2%	Solanaceae 2.2%	Boraginaceae 1.9%	Rosaceae 2.0%

and SW show a slightly lower percentage, likely due to the smaller study area of, and the absence of Gnetophtya (i.e., no *Ephedra* spp.), within the DMP and FMA, and the large scope of the JDC, GM, and SW list, where large, non-forested areas decrease gymnosperm importance. BB returns the lowest percentage of monocots at 12.3%. An increasing trend in monocot importance begins with the SW list at 13.2% likely due, again, to the larger scope of the area, and less of a fern and fern ally importance. The trend continues with the DH jumping up to 16.2%, the FMA at 17.1%, JDC at 20.5%, the GM at 20.5%, and finally, to the DMP at 21.8%. As habitat variability increases and shrub encroachment becomes less pronounced, along with the presence of permanent water, the condiditions that support the level of the diversity of monocot families, which contain species that require cooler, more mesic environments, are more fulfilled (Powell & Worthington in prep.).

Eudicot percentages are inversely correlated with monocot percentages. From the highest eudicot percentage in the SW list (83.9%), the number falls to 82.9% in BB, 79.3% in DH, 79.1% in FMA, 76.1% in the GM, 75.1% in JDC, and 72.1% on the DMP. The FMA's small area, lesser elevation range, and low monocot importance likely increase eudicot importance on the property. The significant decrease of this percentage in the DMP is likely due to the igneous nature of the higher Davis Mountains that is not as susceptible to the establishment of the limestone flora that is well represented elsewhere in the Chihuahuan Desert and the Trans-Pecos along with the fact that the 18,360 acres of the DMP study area may not be a size sufficient enough to appropriately place the Davis Mountains into a regional floristic context. Observing the data of these areas under consideration, one can infer that the overall composition of the southern half of the DMP is one that is somewhat unique to igneous, cooler, higher-elevation areas holding natural watersheds in the more northern portion of the Chihuahuan Desert.

Asteraceae is the only family that shares a rank clear across the areas under review, and it is definitively

the most well represented family (Table 5). With an importance ranging from 18.4% on the DMP, it gradually declines down the lists to 12.0 % in the DH. In all other areas, Poaceae ranks second, with the exception of the SW (Fabaceae), and, often, just slightly behind Asteraceae in terms of importance. In the DMP, the number of Asteraceae species is 13.5% higher than that of the Poaceae, and the range in overall importance percentage is 2.3. The next closest comparison to this result is JDC, where it is found that Asteraceae species top Poaceae species by 15.1%, with a range of 2.5 in their overall percentages, and the two families constitute only 29.9% of the total flora, compared to 34.3% on the DMP. In the GM, species of Asteraceae top Poaceae by 16.9% with a difference of 2.9 in their overall percentages, together making up 31.9% of the total flora. A decline in their co-dominant importance is further observed in BBNP, where composites top graminoids by 11.9% with an overall percentage difference of 1.7 and represent 26% of the total when combined. Interestingly, the FMA results are the second-to-most inconsistent with the DMP in regards to the codominance of Asteraceae and Poaceae. While together they still comprise 29.5% of the total flora, the range between their overall percentages is 5.9, while the Asteraceae species yield is 33.8% greater than Poaceae. These results appear to be drifting in the direction of being more comparable with those of the SW, with the lowest importance of Poaceae. This may reflect the FMA's lower elevation, lack of permanent water, or the possibility that the study area is too small to effectively represent an accurate Poaceae count in regards to a regional context. The decline continues once more to the broadest scope at the regional level, where, in the SW, Asteraceae trumps Poaceae by 469 species (59.9%), with a range of 10.5 between their overall percentages, and these two constitute only 23.7% of the total flora together. In locations such as BB and DH, it seems apparent that the reduced importance of Asteraceae can be correlated with a proportional increase in Poaceae, illuminating the influence of the Great Plains grasslands that move west through Texas from the Panhandle region (Powell 1994). The importance of Cactaceae is another percentage that is noticeably reduced on the DMP (1.7%) as compared to GM (3.1%), FMA (3.1%), and BBNP (5.2%), but not so much when compared with those of JDC and SW. Cactaceae is ranked in the seventeenth position in JDC at 1.3% and at the ninth position in the SW at 2.0%. Since Cactaceae is a desert-oriented family, it is reasonable to consider that this reduction is observed because of the unique, seemingly non-desert-like characteristics found on the DMP. Boraginaceae is a family of significant importance in all of the DH and BB, as well as the SW at 3.0%, but constitutes only 0.8% of the DMP list. On the GM, Cactaceae, Boraginaceae, and Nyctaginaceae are well represented, indicating a strong correlation with the BB results, which is likely due to the prominent limestone substrates in the Guadalupe Mountains. Shreve (1922) and Whitaker and Niering (1965) both note that many desert species reach higher elevations on limestone, and taxa with distributions centered on the Chihuahuan Desert can become more prominent in a limestone flora.

The paleoclimate while the Davis Mountains were forming, 39–35 million years ago, was much cooler, drier, and more variable (Wolfe 1978), and as arid conditions increased throughout the Neogene, along with the rapid formations of steep mountain slopes during these periods of active tectonism, sclerophyllous scrubland extended throughout much of western and southwestern North America (Axelrod 1979; Axelrod & Raven 1985). In the early Quaternary, these arid conditions continued to increase, causing this once-dominant scrubland to be dissimilated into climatic subregions as the conditions began to favor the spread of both desert grassland and scrub vegetation (Axelrod 1975). The Davis Mountains might still support more of this sclerophyllous shrub vegetation if the prehistoric fire regimes were still in place (Larke 1989). During the Pleistocene epoch, fluctuations in the climate, along with glacial expansion and contraction, continued to reshape the vegetation, and moister conditions began to become more prevalent in the desert belts as climatic zones shifted south toward the equator (Brown & Gibson 1983). Pollen records from 22,500 to 14,000 years ago imply that conifers expanded throughout Texas due to the enduring mesic conditions, establishing forest communities at higher elevations and transforming the grassland steppes into heavily wooded communities. In the past 10,000 years, conifers have become constrained to the higher elevations, particularly to those exhibiting topographic complexity, leaving behind relictual populations of other genera, such as *Acer*, *Fraxinus*, *Juglans*, *Populus*, and *Salix*, that once had a more extended distribution across southwest North America. An increase in the prevalence of pollen from Poaceae, Asteraceae, and Chenopodiaceae is correlated with a decrease in that of conifers, along with the increase of drier, warmer weather patterns (Bryan & Holloway 1985). In the past

Table 6. Comparisons of top ten genera of six Trans-Pecos (TP) lists and floras (DMP, FMA, JDC, GM, DH, and BB) showing mean number of species, with the Chihuahuan Province (CP), Madrean Province (MP), Great Plains Province (GPP), and Sonoran Province (SP) of the Southwestern Region (McLaughlin 2007), showing mean number of species per local flora.

TP Genus		CP Genus		MP Genus		GPP Genus		SP Genus	
Euphorbia	17.3	*Opuntia*	9.6	*Quercus*	9.5	*Carex*	11.4	*Eriogonum*	12.5
Muhlenbergia	14.3	*Dalea*	9.4	*Muhlenbergia*	9.5	*Astragalus*	9.1	*Cryptantha*	9.7
Dalea	9.8	*Euphorbia*	8.4	*Salvia*	9.3	*Asclepias*	5.7	*Phacelia*	8.3
Quercus	9.2	*Muhlenbergia*	8.2	*Cyperus*	8.8	*Muhlenbergia*	5.1	*Opuntia*	7.9
Bouteloua	8.0	*Acacia*	7.2	*Dalea*	7.1	*Juncus*	5.0	*Camissonia*	6.8
Cheilanthes	7.8	*Polygala*	6.8	*Solanum*	6.5	*Erigeron*	4.7	*Euphorbia*	6.7
Opuntia	7.5	*Bouteloua*	6.6	*Stevia*	6.4	*Penstemon*	4.7	*Gilia*	6.6
Aristida	7.3	*Quercus*	6.4	*Desmodium*	6.2	*Oenothera*	4.6	*Astragalus*	4.7
Oenothera	7.0	*Heliotropium*	5.2	*Ipomoea*	6.1	*Artemisia*	4.6	*Atriplex*	4.7
Linum	6.3	*Brickellia*	5.2	*Ageratina*	5.6	*Euphorbia*	4.4	*Mentzelia*	4.6

8,000 years, the climate has become significantly more arid, with the juniper-oak vegetation being replaced by grasslands at lower elevations, according to radio-carbon-dated packrat midden fossils, and just in the past 4,000 years, a shift towards the current Chihuahuan Desert scrub vegetation is observed (Van Devender et al. 1987). In the Trans-Pecos, both plains grassland and desert grassland communities are prevalent (Powell 1994), but the Davis Mountains share the majority of their characteristics with the plains grasslands. Most of the grass species found are definitive indicators of this community, such as the gramas (*Bouteloua* spp.), bluestems (*Bothriochloa* spp.), lovegrass (*Eragrostis* spp.), three-awns (*Aristida* spp.), little bluestems (*Schizachyrium* spp.), and muhly (*Muhlenbergia* spp.). This community connects at an elevation of approximately 5200 ft (1585 m) with the juniper-oak-pinyon woodlands. More evidence of the plains grassland community is the now-altered state of these areas with their being heavily invaded by woody shrubs and semi-succulents such as *Mimosa aculeaticarpa* var. *biuncifera* (catclaw mimosa), *Ziziphus obtusifolia* (lotebush), *Koeberlina spinosa* (allthorn), *Condalia ericoides* (javelina bush), *Nolina* spp. (sachuista), and *Gutierrezia sarothrae* (snakeweed), and the lack of the presence of shrubs that are characteristic of invading desert grasslands, such as *Larrea tridentata* (creosote bush), *Ephedra trifurca* (longleaf jointfir), *Acacia greggii* (catclaw acacia), *Acacia constricta* (viscid acacia), *Berberis trifoliolata* (algerita), *Fouquieria splendens* (ocotillo), *Opuntia* spp. (prickly pear), and *Dasylirion leiophyllum* (sotol). *Prosopis glandulosa* (honey mesquite) is another shrub encroaching upon desert grasslands, and while it can be observed rather frequently throughout much of Jeff Davis County, it is very uncommon within the study area (pers. obs.). Though these communities do contain parallel species, there is a strict delineation among them, particularly for the DMP.

Turner (1959) states that even though species occurring in the Davis Mountains are about equally divided between those characteristic of the Chihuahuan Province and those characteristic of the Rocky Mountain Province, in terms of frequency and dominance, the vegetation is more emblematic of that of the southern Rockies. Taking this into consideration, it seems that the Davis Mountains represent a point of intergradation between these two regions, with the Chisos Mountains to the south exhibiting strong relation with Chihuahuan Province elements and the Guadalupe Mountains to the north, exhibiting strong relation with the southern Rocky Mountain Province.

A recent biogeographic treatment, carried out by McLaughlin (2007), used principal components analysis (PCA), of a sample of 245 floras from Canada, the U.S, and Mexico, to delimit specific floristic elements and areas, resulting in four floristic regions in twelve provinces, ten of which are distinct, and two that are split into smaller subprovinces. In addition to endemism, provinces are characterized by distinct assemblages of species (Takhtajan 1986); however, identification of these assemblages can be problematic, considering the vast number of plant taxa and the lack of comprehensive data regarding their distributions (McLaughlin 2007). The fact that very few plant taxa are spread throughout a large geographic range, and the observation of these

restrictions at the species, genus, or family level are crucial factors in delimiting floristic areas. The PCA of the genus matrix produced results that were calculated using Pearson correlation coefficients between log-transformed (log ($S_{i,k}$ +1)) number of species in each genus $_k$ in each flora. This places southwestern Texas, a small portion of southern New Mexico, eastern Chihuahua, Nuevo Leon, and the Chihuahuan Desert region of Coahuila within the distinct Chihuahuan Province. The most indicative genera for the province include (Table 6) *Opuntia* (pricklypear), *Dalea* (dalea), *Euphorbia* Subgenus *Chamaesyce* (spurge), *Muhlenbergia* (muhly), *Acacia* (acacia), *Polygala* (milkwort), *Bouteloua* (grama), *Quercus* (oak), *Heliotropium* (heliotrope), and *Brickellia* (brickellbush), as well as many succulents and semi-succulents including *Agave* (agave), *Coryphantha* (pincushion cactus), *Echinocereus* (pitaya/hedgehog cactus), and *Yucca* (yucca) (McLaughlin 2007). The most prominent genera in this study area were *Muhlenbergia,* with 17 species, *Euphorbia* (9), *Aristida* (8), *Quercus* (8), *Eragrostis* (6), *Bouteloua* (5), *Brickellia* (5), *Cheilanthes* (5), *Ipomoea* (5), and *Oenothera* (5). Table 6 shows the mean species per flora between the DMP's top genera along with the top genera of FMA, JDC, GM, DH, and BB. Even more specifically, data analyzed from computed Otsuka's Index (OI) for all pairs of local floras, where OI is calculated as the number of shared species between local floras and divided by geometric mean of the number of species in the smaller flora and the larger (McLaughlin 2007), produces resulting similarity indices that range from 0.9 to 0.1, extremely similar to less similar. These are represented by radiating contour lines on a range map, with the higher index being the smallest and closest to the core of each subprovince. Among shared species composition of local flora, the DMP, western Texas, southern New Mexico to Nuevo Leon, northern San Luis Potosi and the Chihuahuan Desert in Coahuila, into the Chihuahuan Subprovince, there is a similarity index in the Davis Mountains of approximately 0.45.

Additional influences of the vegetation on the DMP are also observed spreading east from the Madrean Province, which is centered on the mountains of Mexico from the Sierra Madre Occidental and the Sierra Madre del Sur. More specifically, these influences originate from the neighboring Apachian Subprovince, which extends from central to southeastern Arizona to western New Mexico, northeastern Sonora, and northwestern Chihuahua. The Sierra Madre Occidental Subprovince, centered on the Sierra Madre Occidental of eastern Sonora, western Chihuahua, and western Durango, is also included in the Madrean Province and is actually closer in proximity to the Davis Mountains but appears to have a less emphasized influence. The Apachian subprovince shows a similarity index in the Davis Mountains of approximately 0.35 and an index of approximately 0.1 in the Sierra Madre Occidental Subprovince, placing the Davis Mountains on the some of the northern most peripheral boundaries of the latter element.

The Great Plains Provincial element, centered on the Great Plains and extending south from Alberta and Manitoba through Montana and the Dakotas to New Mexico and the Texas Panhandle, is also seen to have a significant influence on the vegetation of the DMP. The two subprovinces of the Great Plains element that appear to have influence on the DMP and Trans-Pecos are known as the Comanchian Subprovince, centered to the east on the Edwards Plateau of central Texas and extending north into central Oklahoma and south into northeastern Mexico, and the Kansan Subprovince to the north, centered on the southern Great Plains of the Texas Panhandle, eastern New Mexico, and western Oklahoma. The similarity index with the Comanchian Subprovince and the Davis Mountains is approximately 0.12, compared to nearly 0.3 with the Kansan Subprovince. The Colorado Plateau Subprovince is a far-reaching element that is centered on the Colorado Plateau of Utah, northern Arizona, northwestern New Mexico, and southeastern Colorado, and it extends south to the Rio Grande Valley in central New Mexico. This element is also observed to have an influence in Texas, as well, but only very slightly, at the highest elevations, showing a similarity index in the Davis Mountains less of than 0.1.

Lastly, the Sonoran Province, which was once more broadly defined, including the Chihuahuan Desert and the Tamaulipan areas of northern Mexico (Cronquist 1982), now only includes both the Sonoran and Mojave Deserts of southern Nevada, southeastern California, southwestern Arizona, most of Baja California, and western Sonora. Observable elements from this region seem to be more apparent in the southern region of the Trans-Pecos, since it and the DMP share only the genus *Euphorbia* within their top ten genera. While

results from McLaughlin's (2007) PCA on the genus matrix show a correlation of 0.3 or higher in the Trans-Pecos from this province at the genus level, the contour lines representing similarity indices in species composition end at the western border of Chihuahua and the Sierra Madre Occidentals, essentially representing the easternmost extent of the Sonoran Subprovince.

In summary, results and analyses show the flora of the DMP as a unique and eclectic combination of plant taxa from various ecoregions that could not have formed the assemblage present without the exact qualities that the ecosystem in the Davis Mountains exhibits. Based on the results showed by McLaughlin (2007), the study area shows that the majority of its influences in the vegetation derive from elements that have moved north from the Chihuahuan Subprovince (Fig. 13), the core of which radiates outward from south central, eastern Coahuila in the Sierra Madre Oriental Mountains, nearly 275 miles (460 km) to the southeast. From the peak closest to the epicenter of this element, Sierra la Madera (9940 ft/3030 m) in the Sierra Madre Orientals to Mount Livermore, the elevation decreases 1560 ft (475 m). Following in importance is the Madrean Province's Apachian subprovince, centered 365 mi (588 km) to the northwest in southeastern Arizona. Mount Baldy is the seventh highest mountain in Arizona (11,420 ft/3480 m) and is the closest peak to the epicenter of the Apachian Subprovince, surpassing Mount Livermore by 3040 ft (925m). These first two elements, though not the closest in proximity, have the most comparable topography and elevation to that of the DMP and, therefore, appear to have had the most influence in constructing the floral composition seen on the property today. The next subprovince with the most influence is the Kansan Subprovince of the Great Plains Provincial element, which is 250 mi (400 km) to the northeast in the High Plains of the Texas Panhandle, making it the closest subprovincial element to the DMP, which is approximately 4700 ft (1430 m) higher in elevation. Increasing evidence of this connection is also observed when compared to JDC, which shows that in addition to the three genera previously discussed, *Asclepias* and *Astragalus* are also shared within the top ten genera, demonstrating how this element shows more pronounced influence on the lower elevations of Jeff Davis County and the surrounding Chihuahuan Desert. The Comanchian Subprovince of the Great Plains Province and the Sierra Madre Occidental Subprovince of the Madrean province show both that the Davis Mountains are on the periphery of the similarity index contour lines, on the western most boundary for the Comanchian and the northernmost for the Sierra Madre Occidental. The Comanchian Subprovince core is 340 mi (547 km) to the east on the Edwards Plateau and sees a rise in elevation of more than 7200 ft (2195 m), whereas the Sierra Madre Occidental's core is centered in southwestern Chihuahua 295 mi (435 km) to the southwest, and the Cerro Mohinora (10,827 ft/3300 m) is the highest peak in the Sierra Madre Occidentals, surpassing Mount Livermore by 2450 ft (746 m). The Sonoran Province element has a slight influence as well, with its core centered over 500 mi (805 km) west southwest between western Sonora and Baja California. The influences from this element are less emphasized on the DMP, likely due to its longer distance away and the fact that migration to the Trans-Pecos requires traversing the northern extent of the Sierra Madre Occidentals, over 8000 ft (2440 m) higher than the average elevation of its epicenter, some of which is below sea level. The primary igneous nature of the Davis Mountains seems to have an effect on this decreased emphasis, as well, when observing that the limestone flora of the GM (Burgess & Northington 1981) share five of the top ten genera with the Sonoran Province (*Eriogonum*, *Cryptantha*, *Opuntia*, *Euphorbia*, and *Astragalus*). The species found on the property that typically have more northern distributions (e.g. *Populus tremuloides*, *Laennecia schiedeana*, *Solidago* spp., *Senecio* spp.) appear to have migrated by way of the Colorado Plateau Subprovince element, approximately 600 mi (970 km) to the northwest, centered in southeast Utah. Radiating to the south through northwestern New Mexico and crossing the San Mateo and the Sierra Blanca Mountains, it is understandable why evidence of this element, such as *Pinus ponderosa* and *Quercus gambelii* populations, is usually only observed at the highest elevations of the Guadalupe, Davis, and Chisos Mountains of the Trans-Pecos in Texas.
Again, the paleoenvironment of the Davis Mountains must also be taken into account when considering how the current, diverse assemblage of plants was established. Geographical affinity analysis by Rzedowski (1973) shows a higher similarity coefficient between the Chihuahuan Province and the southern Central Mexican Highlands Province than to the former with the Sonoran Province, which potentially is due to the absence of significant dispersal barriers to the south but, more importantly, due to the development of a cooler and more

Fig. 13. McLaughlin's (2007) provincial and subprovincial elements of the Southwestern Region observed in the Davis Mountains Preserve, Jeff Davis County, Texas, converging at the site of the study area in the Davis Mountains. The end of each line shows the approximate epicenter of each unit. Image Landsat Source: "Southwestern United States and Northern Mexico." N 32°03'03.43" and W 103°49'10.58." Google Earth. Imagery date: April 9, 2013. Accessed March 30, 2014.

arid climate in the Chihuahuan Desert. Evidence of a once stronger influence by McLaughlin's (2007) Madrean Province and Sonoran Province, both once included in the encompassing Madrean Region (Cronquist 1982), in the Davis Mountains flora is the number of genera found that are endemic to these regions, such as *Carphochaete*, *Chrysactinia*, *Dasylirion*, *Fallugia*, *Magaranthus*, *Nolina*, and *Pericome* (Takhtajan 1986). With the phytogeographic connections observed from every direction, it can be concluded that natural selection over geologic time in a transitional zone between xeric and mesic conditions, such as the Davis Mountains, produces a flora exhibiting migratory influences, of shifting and varying importance, from multiple surrounding ecoregions. The mesic, montane ecosystem of the higher Davis Mountains acts as a refuge for the species selected for cooler, moister climates, some with populations that have persisted there since the late Tertiary period, that exponentiate the diversity recognized on the property. However, this unique biota may be at risk of becoming increasingly quarantined and potentially less diverse, should geographic isolation and desertification continue (Larke 1989).

The two local floras of the Trans-Pecos used in McLaughlin's (2007) analysis are the vascular flora of Big Bend National Park (NPS 1996) and plants of the Guadalupe Mountains and Carlsbad Caverns National Parks (Burgess & Northington 1981). Not included are any lists compiled from the Chinati Mountains to the northwest of the Chisos. These primarily igneous mountains reach an elevation of over 7700 ft (2350 m), giving rise to oak woodlands and montane savannahs, and most assuredly harbor additional species that would further elucidate how these patterns have evolved. As TNC conservation property increases in the Davis Mountains, more floristic studies will be carried out over larger study areas that possibly contain previously undiscovered

micro-niche communities, and a more complete picture of the overall flora of the mountain range can be established, and, subsequently, can be more accurately placed into the larger regional picture that is the Southwestern Region. Additional research and the discovery of new taxa on the property will be essential in increasing the understanding of the biogeographic relationships and the influential elements that have authority in this ecosystem.

ANNOTATED SPECIES LIST OF THE DAVIS MOUNTAINS PRESERVE FLORA

The annotated species list of the DMP is arranged phylogenetically following Raven et al. (2013), with Phylum Anthophyta divided into Monocotyledones and Eudicotyledones. Within each hierarchical grouping, taxa are listed alphabetically by family, genus, species, and infraspecific rank, when applicable. All collections of the author cited in the list are stored at SRSC, with duplicates sent to the herbaria previously mentioned.

The taxa that have been previously collected on the DMP, documented by voucher specimens from SRSC and TEX-LL, but were not collected during the current effort are included in the list with herbarium and collector information. Taxa observed but not collected during the study are also included in the list and noted accordingly, along with the field notes regarding the author's observations.

Sources for identification and nomenclature include unpublished manuscripts from A.M. Powell, Correll and Johnston (1970), Powell (1994, 1998), Powell and Weedin (2004), Powell et al. (2008), Yarborough and Powell (2002), Liggio and Liggio (1999), and the *Flora of North America* volumes for Poaceae and Asteraceae (FNA 2003, 2006, 2007). Online databases were also reviewed for currency, authorities (abbreviations from Brummit & Powell 1992), and synonomy (Tropicos.org 2014; Natural Resource Conservation Service 2007).

Each species includes details such as scientific name, authorship, common name, nativity, abundance, elevation, life form, habitat comments (if the species is uncommon or rare in the study area, more specific localities are included), and previous collections. Common names were taken from Hatchet al. (1990) and Warnock (1970, 1974, 1977), as well as the United States Department of Agriculture's PLANTS Database (Natural Resource Conservation Service 2007), from which the life form types were also taken. Notations for status for invasive species tracked by the texasinvasives.org (2008) are included as well as notations for endemic species tracked by the Texas A&M Bioinformatics Working Group (2007), along with additional preceding symbols (Table 7) indicating general notes regarding the species. Species tracked by The Nature Conservancy (NatureServe 2013) with state or federal ranks are in bold.

To describe abundance, a descriptive outline adapted from Palmer et al. (1995) was utilized. Previously collected species not encountered during the current study are described using label data comments, if available, and included within quotations, and the rest were described based on field observations during the current study. Several species have an "uncommon" or "rare" abundance within the DMP but are not tracked by TPWD or TNC and generally have increased distributions elsewhere.

Abundance designations used to describe species occurrences in the annotated species list for the Davis Mountains Preserve flora include: **abundant** = dominant or co-dominant in one or more habitats and found throughout the study area and/or in great numbers; **common** = found in one or more common habitats but not dominant in any common habitat; **occasional** = found in widely scattered locations but not difficult to find; **uncommon** = difficult to find with few individuals or populations in few unique locations; **rare** = extremely difficult to find and limited to one or very few locations or uncommon habitats.

The vegetation communities previously discussed (Henrickson & Johnston 1986) are abbreviated and included with each species that was collected by the author and, when available from label data, with species previously collected. In some cases one designation is not sufficient if that species was found in multiple communities, with the first being the most typical. The acronyms for vegetation types in the Davis Mountains Preserve are: **SAS** = Sandy Arroyo Scrub; **GGR** = Grama Grassland; **MCH** = Montane Chaparral; JPW = Juniper-Pinyon Woodland; and **POW** = Pine-Oak Woodland.

Collector names were abbreviated and listed alphabetically by the first initial (Table 8) followed by the collection number and the corresponding herbarium. When duplicates are shared by multiple herbaria, multiple abbreviations are used (e.g., TEX-LL & SRSC).

Table 7. Symbols used in association with species entries denoting nativity and status designations for the Davis Mountains Preserve flora.

≠ = introduced non-native
⃠ = invasive non-native
❖ = both introduced and native within the state
★-TX = endemic to Texas
★-TP= endemic to Trans-Pecos
★-DM = endemic to Davis Mountains
§ = reaffirmed Hinckley's Goat Canyon species on the DMP
√ = first documentation of a common or expected taxon on the DMP
◊ = newly documented taxon for the DMP

Table 8. Index to collectors who have made vouchers within the Davis Mountains Preserve, Jeff Davis County, Texas.

Initials	Collector						
AFJ	A.F. Jenkins	DM	D. Milner	JW2	J. Wen	RM	R. Martin
AMB	A.M. Bataineh	DSC	D.S. Correll	KB	K. Bryan	RM2	R. McVaugh
AMP	A.M. Powell	EFM	E.F. McRae	KC	K. Craig	RPA	R.P. Adams
AR	A. Rountree	EJP	E.J. Palmer	KL	K. Lund	RS	R. Sanders
ATK	A. Treur-Kuehn	GW	G. Webster	LCH	L.C. Hinckley	RSF	R.S. Ferris
BC	B. Campbell	HJC	H.J. Cottle	LH	L. Hinckley	SAR	S.A. Roberts
BCT	B.C. Tharp	IMJ	I.M. Johnston	LH2	L. Hedges	SC	S. Cheatham
BF	B. Fulginit	JAK	J.A. Klingman	LV	L. Venable	SCB	S.C. Bartel
BHW	B.H. Warnock	JB	J. Bacon	MCJ	M.C. Johnston	SCC	S.C. Chu
BJW	B.J. Wickersham	JB2	J. Bilsky	ME	M. Eason	ST	S. Truman
BW	B. Wagner	JCZ	J.C. Zech	ML	M. Lockwood	TC	T. Cook
CD	C. Durden	JJK	J.J. Keeling	MPG	M.P. Griffith	TLS	T.L. Steigler
CDD	C.D. Duncan	JLB	J.L. Baur	MSY	M.S. Young	TM	T. Mangrem
CHM	C.H. Muller	JLN	J.L Neff	OES	O.E. Sperry	TOH	T.O. Hernandez
CLK	C.L. Koenneke	JM	J. Martin	PG	P. Guth	TS	T. Siegenthaler
CN	C. Newman	JMM	J.M. Miller	PRM	P.R. Manning	TW	T. Wendt
DA	D. Atha	JMP	J.M. Poole	PZ	P. Zelazny	WAS	W.A. Silveus
DF	D. Flyr	JPK	J.P. Karges	RDW	R.D. Worthington	WRC	W.R. Carr
DK	D. Kolle	JW	J. Weedin	RER	R.E. Rintz		

LYCOPODIOPHYTA

Selaginellaceae

Selaginella mutica Eaton ex Underwood var. *limitanea* Weatherby—Blunt spikemoss—Common perennial herb/forb, rocky slopes; JPW, MCH, above 6300 ft); DSC 13514, MSY s.n., EJP 31951 (TEX-LL); BHW 23099, 23078, 7612, 23321, PRM 1045, LCH 1155, 1158, AMP, SAP & JMP5263, LCH & BHW 7476 (SRSC).

Selaginella peruviana (Milde) Hieron.—Spikemoss—Common perennial herb/forb, rocky slopes; JPW, MCH; above 6000 ft; MSY s.n., LCH 1157, BHW 7477 (TEX-LL); LCH 1157, PG 251, PZ 213, 206, 214, SCB & DM 484, BHW 7610, LCH & BHW 7477, AMP, SAP & JMP 5264, PRM 1044 (SRSC).

Selaginella underwoodii Hieron.—Underwood spikemoss—Perennial herb/forb, igneous soils; JPW, MCH, above 6000 ft; *DSC 13513* (TEX-LL); *LCH 1011*, *BHW 7476*, *7586*, *7611*, *7612*, *7613*, *23102*, *23025*, *PG 250* (SRSC).

POLYPODIOPHYTA

Aspleniaceae

Asplenium resiliens Kunze—Blackstem spleenwort—Uncommon perennial herb/forb, shaded outcrops in Madera Canyon; JPW, MCH, 6200 ft; *LCH 1109, WRC 19099* (TEX-LL); *LCH s.n.* (SRSC).

Dennstaedtiaceae

Pteridium aquilinum (L.) Kuhn—Western brackenfern—Rare perennial herb/forb, fertile banks and beds along mountain streams on north side of Mount Livermore; JPW, POW, 7500 ft; known from one collection in 1926; *EJP 32010* (TEX-LL).

Dryopteridaceae

Cystopteris reevesiana Lellinger—Southwestern brittlefern—Occasional perennial herb/forb, shaded, north facing slopes; POW, 7000–7800 ft; *LCH s.n.* (TEX-LL); *LCH s.n.*, *BHW 23095*, *23030*, *JJK 381* (SRSC).

Dryopteris filix-mas (L.) Schott—Male fern—Uncommon perennial herb/forb, found only in Tobe Canyon at the source of the spring and at the very base of the canyon; POW, 7100–7500 ft; *BHW 23077*, *23094*, *23020*, *LCH s.n.*, *173* (TEX-LL); *PRM, JCZ, KC & JAK 3395*, *LCH & BHW 7454*, *JJK 74* (SRSC).

Woodsia neomexicana Windham—New Mexico cliff fern—Occasional perennial herb/forb, shaded slopes; POW, 6500–7500 ft; *DSC 13544* (TEX-LL) *PG 261*; *BHW 23064*, *23030*, *JJK 205*, *223* (SRSC).

Woodsia phillipsii Windham—Phillip's cliff fern—Rare (G2G4) perennial herb/forb, cliffs and rocky slopes, igneous soils of Madera Canyon; POW, MCH, 7500 ft; *BHW 23027* (TEX-LL), *BHW 22893*, *PG 258*, *254* (SRSC).

Woodsia plummerae Lemmon—Plummer's cliff fern—Perennial herb/forb, shaded ledges and slopes; *LCH s.n., 1121*(TEX-LL), *BHW 23019*, *23322*, *EJP 32026* (SRSC & TEX-LL).

Marsileaceae

Marsilea vestita Hook. & Grev.—Hairy Pepperwort—Uncommon perennial herb/forb, found at creek crossing on Madera Canyon Road and in Pine Peak Tank; JPW, SAS, 6000–7250 ft; *LCH s.n.* (TEX-LL), *JJK 406* (SRSC).

Polypodiaceae

Pleopeltis riograndensis (T. Wendt) E.G. Andrews & Windham—Polypody—Rare perennial herb/forb, documented in 1914 from one collection at "bare of bluff near the summit of Mount Livermore"; *MSY s.n.* (TEX-LL).

Pteridaceae

Astrolepis sinuata (Lag. ex Sw.) D.M. Benham & Windham—Wavyleaf cloakfern—Uncommon to occasional perennial herb/forb, less shaded, rocky slopes; JPW, 7000 ft; *SCB & DM 481* (TEX-LL) *SCB & DM 514*, *PZ 216, JJK 230* (SRSC).

Bommeria hispida (Mett. ex Kuhn) Underw.—Hairy bommeria—Uncommon to occasional perennial herb/forb, rocky soils; JPW, POW, up to 7300 ft; *LCH 225*, *WRC, TW & BF 26263*, (TEX-LL); *PZ 212* (SRSC).

Cheilanthes bonariensis (Willd.) Proctor—Slender cloakfern—Uncommon to occasional perennial herb/forb, rocky soils; JPW, 6000 ft; *LCH s.n.*, *WRC, TW & BF 26275* (TEX-LL); *PZ 218*, *SCB & DM 480* (SRSC).

Cheilanthes eatonii Baker—Eaton lipfern—Occasional perennial herb/forb, rocky soils; JPW, POW, 7000–7400 ft; *DSC 33726*, *EJP 32041* (TEX-LL). *PZ 208, 215, 221, PG 259, 260, SCB & DM 548, BHW 7397, 23026*, *LCH & BHW 7402*, *AMP & SAP 4933*, *JJK 390* (SRSC).

Cheilanthes fendleri Hook.—Fendler lipfern—Occasional perennial herb/forb, shallow soils; JPW, MCH, POW; 6300 ft; *LCH s.n.*, *354*, *DSC 13522*, *13510*, *33728*, *WRC 28425* (TEX-LL); *PG 298*, *256* (SRSC).

Cheilanthes tomentosa Link—Woolly lipfern—Occasional perennial herb/forb, shaded, rocky soils; JPW, POW; *PG 249*, *257*, *JJK 315* (SRSC).

Cheilanthes wrightii Hook.—Wright cloakfern—Perennial herb/forb; JPW; *PZ 207* (SRSC).

Notholaena standleyi Maxon—Star cloakfern—Uncommon perennial herb/forb, rocky slopes; JPW, up to 7400 ft; *LCH 226* (TEX-LL); *SCB & DM 514* (SRSC).

Pellaea atropurpurea (L.) Link—Purple cliffbrake—Uncommon perennial herb/forb, photographed along Tobe Canyon Trail, shaded slopes; JPW, POW, 6800 ft; *LCH s.n.* (TEX-LL), *PZ 220* (SRSC).

Pellaea cordifolia (Sessé & Moc.) A.R. Sm.—Arrowleaf cliffbrake—Occasional perennial herb/forb, rocky slopes; JPW, POW, 6100–7500 ft; *MSY s.n.*, *LCH s.n.*, *DSC 33759, AMP & SAP 4915* (TEX-LL) *SCB & DM 472*, *490*, *AMP, SAP & JMP 5261*, *AMP & SAP 4915*, *BHW 23318*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 231*, *PG 299*, *JJK 314* (SRSC).

Pellaea intermedia Mett. ex Kuhn—Creeping cliffbrake—Rare to uncommon perennial herb/forb, collected on east face of McDaniel Mountain, rocky slopes; JPW, 6600 ft; *LCH s.n.* (TEX-LL); *PG 255*, *PZ 209*, *SCB & DM 546*, *JJK 365* (SRSC).

Pellaea wrightiana Hook.—Wright cliffbrake—Occasional perennial herb/forb, rocky slopes; JPW, POW, 6200–6500 ft; *LCH s.n.* (TEX-LL); *SCB & DM 482*, *JJK 319*, *337* (SRSC).

CONIFEROPHYTA

CUPRESSACEAE

Juniperus deppeana Steud.—Alligator juniper—Abundant tree; *RSF & CDD 2610, TLS 83* (NYBG); *LCH 971, EJP 32024* (TEX-LL); *CLK 1, 2, CN s.n., SCB, DM & BW 391, 392, 393* (SRSC).

Juniperus deppeana f. *sperryi* (Correll) R.P. Adams—False cypress—Rare tree, Bridge Spring, Brown Mountain; *JPK & LH2 s.n.*, *JPK s.n.*, *RPA 10626*, *10629* (SRSC).

Pinaceae

Pinus cembroides Zucc.—Mexican pinyon-pine—Abundant tree; *LCH s.n.* (NYBG); *MSY s.n.* (TEX-LL); *PRM 5013*, *CLK 14*, *SCB & DM 467*, *536*, *JB 153*, *LCH 2653*, *CN s.*n (SRSC).

Pinus ponderosa P. Lawson & C. Lawson—Ponderosa Pine—Occasional to common tree, deep soils, canyons and north facing slopes; POW, 6200–7800 ft; *TLS 69*, *RSF & CDD 2609* (NYBG); *DSC & IMJ 18431*, *LCH s.n.*, *MSY s.n.* (TEX-LL); *CLK 15* (SRSC).

Pinus strobiformis Engelm.—Southwestern white pine—Occasional tree, deep soils and north facing slopes, occurs with *Pinus ponderosa*; POW, 7200–7800 ft; *MCJ & CD 12398*, *LCH s.n.* (TEX-LL); *CLK 26*, *LCH 2653*, *LCH & BHW 7428*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 284* (SRSC).

ANTHOPHYTA -Monocotyledones

Asparagaceae

Agave havardiana Trel.—Havard century plant—Rare semi-succulent, observed from a few individuals 0.5 miles north of the McIvor Conservation Center, moderate slope; GGR, JPW, 6020 ft; *CLK 10* (SRSC).

√*Dasylirion leiophyllum* Engelm. ex Trel.—Sotol—Uncommon semi-succulent, exposed, rocky soils, Wolf Den Canyon; JPW, 6800 ft; *JJK s.n.*, photographic record.

Nolina texana S. Watson—Texas sacahuista—Occasional shrub; JPW, POW, GGR, 5800–7500 ft; LCH s.n. (TEX-LL); *AMP, SAP & JMP 527 (SRSC).*

Yucca torreyi Shafer—Torrey yucca—Uncommon semi-succulent, exposed, rocky soils, upper Limpia Canyon; *LCH s.n.* (TEX-LL); *JJK s.n.*, photographic record.

Commeliniaceae

Commelina dianthifolia Delile—Birdbill dayflower—Common to abundant perennial herb/forb; JPW, POW, GGR, MCH; *AMP & SAP 4893*, *LCH s.n.* (TEX-LL); *CLK 25*, *PG 253, 269, 277*, *LCH & BHW 7415*, *AMP, SAP & JMM 3517*, *AMP & SAP 4893*, *JJK 61* (SRSC).

Commelina erecta L.—Dayflower—Uncommon perennial herb/forb, observed in Tobe Canyon; POW, 7080 ft; *LCH s.n.* (SRSC & TEX-LL).

Cyperaceae

Carex athrostachya Olney—Sedge—Uncommon perennial herb/forb, *LCH 555* (TEX-LL).

◊*Carex hystericina* Muhl. ex Willd.—Bottlebrush sedge—Rare perennial herb/forb, found from one location at Limpia Spring; POW, 6400 ft; *JJK 153* (SRSC). Also documented on Forbidden Mountain area (Larke 1989).

Cyperus esculentus L.—Yellow nutsedge—Occasional perennial herb/forb, near intermittent or perennial streams or springs; JPW, POW, SAS, up to 7500 ft; *LCH s.n.*, (TEX-LL); *BHW 13506*, *23207*, *AMP & SAP 4937* (SRSC).

Cyperus fendlerianus Boeck.—Fendler flatsedge—Uncommon perennial herb/forb, drainage sites; POW, up to 7500 ft; *BHW 23057*, *23206*, *AMP & SAP 3938*, *SCB & DM 539* (SRSC).

Cyperus sphaerolepis Boeck.—Flatsedge—Occasional perennial herb/forb, drainage sites; JPW, POW, 6000–7500 ft; *LCH s.n.*, *1077* (TEX-LL); *BHW 23010*, *23217*, *SCB & DM 465* (SRSC).

Cyperus squarrosus L.—Bearded flatsedge—Uncommon perennial herb/forb, found in Madera Creek, sandy soils near perennial stream; POW, SAS, 6300 ft; *LCH s.n., BHW 13498*, *WRC 19100* (TEX-LL); *BHW 13498*, *23062*, *23214*, *PRM, JCZ & JW2 3282*, *JJK 339* (SRSC).

◊*Eleocharis montevidensis* Kunth—Spikesedge—Uncommon perennial herb/forb, moist soils of perennial Madera Creek, growing with E. palustris; POW 6300 ft; *JJK 419* (SRSC).

Eleocharis palustris (L.) Roemer & Schultes—Largespike spikesedge—Uncommon to occasional perennial herb/forb, moist soils near springs and perennial streams; POW, up to 7100 ft; *WRC 19131* (TEX-LL), *AMP & SAP 3933*, *JJK 162*, *185* (SRSC).

Iridaceae

Nemastylis tenuis (Herb.) S. Watson—Slender shellflower—Rare perennial herb/forb, observed once at junction of Limpia Spring and Crest Trail and in moist soils near perennial Madera Creek; *LCH s.n.* (only voucher in TEX-LL); *LCH s.n.*, *PRM, ME & TM 4037*, *AMP, SAP & JMM 3518*, *JJK 211* (SRSC).

Sisyrinchium cernuum (E.P. Bicknell) Kearney—Powell blue-eyed grass—Rare perennial herb/forb, but described frequent locally close to peak of Mount Livermore; GGR, MCH, 8000 ft; *MCJ 12447* (TEX-LL), BHW 23199 (SRSC). First described as a new species, *S. powellii* (Warnock 1977), and was thought to be a narrow endemic, also found in Arizona and northern Mexico. (Powell pers. com.)

Sisyrinchium demissum Greene—Blue-eyed grass—Rare perennial herb/forb, moist soils at Limpia Spring; JPW, POW, 6200 ft; *AMP, SAP & JMM 3519, JJK 184* (SRSC). Several SRSC collections from Culberson County, only two from Jeff Davis County.

Juncaceae

Juncus ensilifolius Wikstr.—Rocky Mountain rush—[*Juncus saximontanus* A. Nelson] Uncommon perennial herb/forb, shallow to deep soils of intermittent stream in Bridge Canyon; POW, 7000 ft; *LCH s.n.*, *JJK 200* (SRSC).

Juncus interior Wiegand—Inland Rush—Occasional perennial herb/forb, sandy soils of perennial Madera Creek; POW 6300–7500 ft; *AMP & SAP 4938*, *3932* (TEX-LL); *AMP & SAP 4938*, *3932, SCB & DM 562*, *JJK 118, 186* (SRSC).

Juncus torreyi Coville—Torrey rush—Uncommon perennial herb/forb, moist soils near Bridge Spring; POW, 7000 ft; *JJK 199* (SRSC).

Liliaceae

Allium cernuum Roth—Nodding onion—Occasional perennial herb/forb, very common in deep soils of Limpia Chute Trail, POW 5800–7200 ft; *DSC 13520, 33758*, *LCH s.n.*, *MSY s.n.* (TEX-LL); *PG 252*, *SCB & DM 567*, *AMP, SAP, JW & BC 3212*, *AMP, SAP & JMM 3510, KL, SAR, BJW, JCZ, LH2, JPK & PRM 250*, *AMP, SAP & JMP 5262*, *LCH & BHW 7483*, *HJC s.n.*, *PRM, JCZ & JW2 3291*, *JJK 2, 49, 232* (SRSC).

Allium glandulosum Link & Otto—Rhizome onion—[*Allium rhizomatum* Wooton & Standl.] Uncommon to occasional perennial herb/forb, shaded soils under *Pinus ponderosa*; POW, 6300–7200 ft; *BHW 23051* (TEX-LL), *BHW 23051, JJK 15, 238* (SRSC).

Echeandia flavescens (Schult. & Schult. f.) Cruden—Torrey craglily—[*Anthericum torreyi* Baker] Uncommon to occasional perennial herb/forb, moderately sloping, shallow soils of higher mountain savannah; JPW, POW, 5800–7000 ft; *WRC 28403, 28450* (TEX-LL), *PG 268*, *276*, *LCH & BHW 7383*, *SCB & DM 488*, *BHW 23311*, *JJK 59* (SRSC).

Maianthemum racemosum (L.) Link—Solomon's seal—Rare perennial herb/forb, igneous, rocky soils; MCH, POW 7200–7800 ft; *LCH s.n.*, *MSY s.n.*, *WRC 26317*, *AMP, SAP & JMP 5289* (TEX-LL); *LCH s.n.*, *PRM 3536*, *AMP, SAP & JMP 5289* (SRSC).

Orchidaceae

◊*Dicromanthus michuacanus* (LaLave & Lex.) Salazar & Soto Arenas—Michoacan ladies' tresses—[*Stenorrhynchos michuacanum* (LaLave & Lex.) Hemsl.] Rare perennial herb/forb; one individual observed on west facing slope west of Madera Canyon Road; JPW, 6300 ft; *JJK s.n.*, photographic record. In Texas, known only from the Davis, Chinati, and Chisos Mountains, based on voucher specimens.

Hexalectris grandiflora (A.Rich. & Galeotti) L.O.Williams—Giant coralroot—Rare perennial herb/forb, less shaded soils, south facing slope of Madera canyon; JPW, 6800 ft; *BHW 23303*, *7506*, *JJK 241* (SRSC).

Malaxis soulei L.O. Williams—Mountain malaxis—Rare perennial herb/forb; POW, 6500 ft; *SCB & DM 545*, *ML 304*, *LCH & BHW 7409*, *BHW 23304*, *AMP, SAP & JMP 5255* (SRSC).

Schiedeella parasitica (A.Rich & Galeotti) Schltr.—Ladies'-tresses—[*Spiranthes parasitica* A. Rich & Galeotti] Rare perennial herb/forb, "North face of Mount Livermore; 7200 ft"; *KB s.n.* (SRSC).

Poaceae

Agrostis hyemalis (Walter) Britton, Sterns, & Poggenb.—Winter bentgrass—Uncommon perennial herb/forb; steep northern slopes of Mount Livermore; POW, 5800–7700 ft; *BHW 12205, 7433*, *LCH s.n.*, *MSY s.n.*, *WRC 19093* (TEX-LL), JJK 222 (SRSC).

Agrostis scabra Willd.—Rough bentgrass—Occasional perennial herb/forb, shaded, moist soils on northern slopes of Mount Livermore; 6500–7500 ft; *LCH 618, LCH & BHW 7433*, *BHW 12303*, *PRM, JCZ & JW2 3298* (SRSC).

Andropogon gerardii Vitman var. *chrysocomus* (Nash) Fernald—Golden bluestem—Perennial herb/forb, "Limpia Canyon near Mount Livermore"; JPW, POW; *LCH 1221* (TEX-LL & SRSC). No successive collections.

Aristida adscensionis L.—Sixweeks threeawn—Occasional to common annual herb/forb, rocky, moderately sloping soils; JPW; *LCH s.n.* (SRSC).

Aristida arizonica Vasey—Arizona threeawn—Uncommon perennial herb/forb; POW, MCH; 5500–8250 ft; *BHW 22894* (SRSC & TEX-LL); *SCB & DM 512* (SRSC). The only collections in Texas come from the Guadalupe Mountains (Culberson County), Davis Mountains (Jeff Davis County), and Chisos Mountains (Brewster County).

Aristida divaricata Willd.—Poverty threeawn—Perennial herb/forb; *LCH s.n.*; (TEX-LL & SRSC).

Aristida havardii Vasey—Havard threeawn—Perennial herb/forb, "Limpia Canyon" and "Mount Livermore"; *LCH 496*, *s.n.*, *WAS 744* (TEX-LL).

Aristida pansa Wooton & Standl.—Wooton threeawn—Perennial herb/forb; "Mount Livermore" *LCH s.n.* (SRSC). No successive collections.

Aristida purpurea Nutt. var. *wrightii* (Nash) Allred—Wright threeawn—Uncommon to occasional, annual or perennial herb/forb, *WRC 28405*, *28456* (TEX-LL), *SCB & DM 455* (SRSC).

Aristida schiedeana Trin. & Rupr.—Singleawn threeawn—Uncommon to occasional perennial herb/forb; JPW, 5800–7200 ft; *LCH s.n.* (TEX-LL); *SCB & DM 518*, *54*, *AMP, SAP & JMP 5257*, *AMP 6054*, *LCH s.n.*, *345*, *JJK 246* (SRSC).

Aristida ternipes Cav. var. *ternipes*—Spidergrass—Perennial herb/forb, "Frequent in grama-dominated grasslands, ca. 5900 ft"; JPW, GGR; *WRC, JP & LH2 16843*.

Bothriochloa alta (Hitchc.) Henrard—Tall bluestem—Occasional to common perennial herb/forb, wide range of elevation; JPW, GGR, POW, 5800–7400 ft; *WRC 28406* (TEX-LL); *PRM 5028* (SRSC).

Bothriochloa barbinodis (Lag.) Herter var. *barbinodis*—Cane bluestem—Occasional to common perennial herb/forb; JPW, GGR up to 7000 ft; *LCH s.n.*, *WRC 28407* (TEX-LL), *LCH s.n.*, *SCB & DM 476* (SRSC).

Bothriochloa laguroides (DC.) Herter subsp. *torreyana* (Steud.) Allred & Gould—Silver bluestem—Occasional to common perennial herb/forb; JPW, GGR; *LCH s.n.* (TEX-LL); *LCH s.n.*, *998*, *MCJ 3210* (SRSC).

Bouteloua chondrosioides (Kunth) Benth. ex S.Watson—Sprucetop grama—Rare (G4S1) perennial herb/forb, rocky, exposed slope at north origin of Pine Canyon Trail; JPW, GGR, 6000–6400 ft; *LCH s.n.* (TEX-LL); *WRC 28455*, *JJK 17* (SRSC).

Bouteloua curtipendula (Michx.) Torr. var. *caespitosa* Gould & Kapadia—Sideoats grama—Abundant perennial herb/forb; JPW,GGR; *LCH s.n.*, *BHW 7616* (SRSC & TEX-LL) ; *JJK 83* (SRSC).

Bouteloua gracilis (Kunth) Lag. ex Steud.—Blue grama—Abundant perennial herb/forb; GGR, JPW, up to 7400 ft; *LCH s.n.*, *WRC 16837*, *28431*, *28432*, *28472* (TEX-LL); *SCB & DM 493*, *AMP & SAP 4903*, *LCH 2*, *JJK 86* (SRSC).

Bouteloua hirsuta Lag.—Hairy grama—Common perennial herb/forb; JPW, GGR; *WRC, JMP &LH2 16838* (TEX-LL); *DK 1385* (SRSC).

Bouteloua simplex Lag.—Mat grama—Rare annual herb/forb, "Madera Canyon, Mount Livermore"; 6000 ft; *LCH s.n.* (SRSC & TEX-LL); *BHW 23305* (SRSC).

Bromus carinatus Hook. & Arn. var. *carinatus*—Polyanthus brome—[Bromus polyanthus Scribn. ex Shear] Occasional annual or perennial herb/forb, *BHW 23096*, *SCB & DM 564*, *LCH s.n.*, *WRC 19092* (TEX-LL); *BHW 23096*, *LCH s.n.*, *602*, *123*, *509*, *1071*, *MCJ 3225*, *3223*, *JJK 195* (SRSC).

Bromus ciliatus L.—Fringed brome—Occasional perennial herb/forb, shaded, deep soils in Madera Canyon; POW, 7900 ft; *LCH 1125*, *s.n.*, *LCH & BHW 7749* (SRSC & TEX-LL).

Bromus lanatipes (Shear) Rydb.—Woollysheath brome—Occasional to common perennial herb/forb, *LCH s.n.*, *AMP, SAP & JMM 3506*, *WRC 28468* (TEX-LL); *LCH 607*, *s.n.*, *LCH & LH 122*, *LCH & BHW 7413*, *AMP & SAP4905*, *PRM 5015*, *JJK 218*, *331* (SRSC).

≠*Digitaria sanguinalis* (L.) Scop.—Crabgrass—Non-native, annual herb/forb, sandy soils; JPW, SAS, up to 7500 ft; *LCH & BHW 7471*, *LCH 102*, *s.n.* (TEX-LL & SRSC).

≠*Echinochloa colona* (L.) Link—Junglerice—Non-native, perennial herb/forb, near intermittent and perennial streams; SAS, JPW, POW; *BHW 13499* (SRSC).

≠*Echinochloa crus-galli* (L.) P.Beauv.—Barnyardgrass—Non-native, uncommon to occasional perennial herb/forb, near intermittent and perennial streams, springs and tanks, sandy soils; JPW, SAS, up to 7200 ft at Pine Peak Tank; *AMP & SAP 3940* (SRSC).

Echinochloa muricata (P.Beauv) Fernald—Barnyardgrass—Uncommon perennial herb/forb, "Upper spring in Madera Canyon ca. 7500 ft"; *LCH & BHW 7469* (SRSC & TEX-LL). Also at lower elevations in the Davis Mountains.

Elymus arizonicus (Scribn. & J.G. Sm.) Gould—Arizona wheatgrass—[*Agropyron arizonicum* Scribn. & J.G. Sm.] Occasional perennial herb/forb, "northeast slopes of Mount Livermore, common locally"; POW, ca. 7200 ft; *LCH s.n*, *LCH & BHW 7482*, (TEX-LL & SRSC); *LCH 531*, *PRM, JCZ & JW2 3294* (SRSC).

Elymus elymoides (Raf.) Swezey—Squirreltail—Uncommon perennial herb/forb; JPW, POW, 7200–7800 ft; *MCJ & CD 12394* (TEX-LL), *JJK 312* (SRSC). Two vouchers, both from Pine Peak.

≠*Eragrostis barrelieri* Daveau—Mediterranean lovegrass—Non-native, uncommon annual herb/forb, "ENE of Locke's Gap" and "north slopes of Mount Livermore"; 6000–7500 ft; *WRC 28417* (TEX-LL); *BHW 23056* (SRSC).

Eragrostis erosa Scrib. ex Beal—Chihuahua lovegrass—Common perennial herb/forb, "ENE of Locke's Gap, Elev. 6080–6100 ft"; JPW, GGR, POW; *WRC 28430*, *28433* (TEX-LL).

Eragrostis intermedia Hitchc.—Plains lovegrass—[*Eragrostis lugens* Nees] Common perennial herb/forb; GGR, JPW, 5800–6200 ft; *LCH 588*, *s.n.*, *WRC 28408*, *28409* (TEX-LL); *MCJ 3219*, *SCB & DM 513*, *495*, *LCH 588*, *JJK 127* (SRSC).

⃠*Eragrostis lehmanniana* Nees—Lehmann lovegrass—Invasive, abundant perennial herb/forb; GGR, JPW, 5800–6500 ft; *WRC 28424* (TEX-LL), *JJK 262* (SRSC).

Eragrostis mexicana (Hornem.) Link—Mexican lovegrass—Common annual herb/forb; GGR, JPW, 5800–6500 ft; *LCH & BHW 7378*, *LCH s.n.* (TEX-LL); *LCH 606*, *AMP & SAP 4926*, *JJK 261*, *311* (SRSC).

Eragrostis pectinacea (Michx.) Nees—Carolina lovegrass—Occasional annual herb/forb, in shaded stream and spring fed habitats, i.e. Madera and Tobe Canyon; POW, 6300–7300 ft; *WRC 19102* (TEX-LL); *MCJ 3214, JJK 273* (SRSC).

❖*Eriochloa acuminata* (J. Presl) Kunth—Southwestern cupgrass—Both introduced and native, rare annual herb/forb, "in moist sand and igneous soil on exposed banks of Madera Canyon; ca. 6300 ft"; *WRC 19096* (TEX-LL).

Festuca arizonica Vasey—Arizona fescue—Occasional perennial herb/forb, rocky soils near summit of Mount Livermore; MCH, up to 8000 ft; *BHW 7440*, *7503* (TEX-LL); *LCH s.n., 81, LCH & BHW 7440*, *BHW 23100*, *23065*, *7494*, *7503*, *7505*, *23324*, *23065*, *22895*, *LCH & LH 124*, *AMP & SAP4925*, *AMP, SAP & JMP 5294*, *JJK 207* (SRSC).

Hilaria swallenii Cory—Swallen curlymesquite—Common perennial herb/forb, "east of Locke's Gap, elev. 6150–6170 ft"; GGR, JPW; *WRC 28441* (TEX-LL).

Hopia obtusa (Kunth) Zuloaga & Morrone—Vinemesquite—[*Panicum obtusum* Kunth] Rare perennial herb/forb; disturbed, exposed soils; JPW, 7200 ft; *LCH s.n.* (SRSC & TEX-LL); *JJK s.n.*, photographic record. Observed once at Pine Peak Tank.

Koeleria macrantha (Ledeb.) Schult.—Junegrass—Occasional perennial herb/forb, shaded, deep soils, generally on north facing slopes; POW, 6000–8250 ft; *BHW 22888*, *LCH s.n.* (SRSC & TEX-LL); *SCB & DM 565*, *PRM, JCZ & JW2 3296*, *MCJ 3209*, *AMP & SAP4906*, *4929*, *LCH & BHW 7438*, *JJK 215* (SRSC).

Leptochloa dubia (Kunth) Nees—Green sprangletop—Occasional to common perennial herb/forb, shallow, less shaded soils and rocky slopes; GGR, JPW, 5800–6500 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 501*, *LCH 7* (SRSC).

Leptochloa fascicularis (Lam.) A. Gray—Salt sprangletop—Annual herb/forb; "Mount Livermore"; *LCH s.n.* (TEX-LL).

Melica nitens (Scribn.) Nutt. ex Piper—Shining melic—Perennial herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL).

Melica porteri Scribn.—Porter melic—Uncommon perennial herb/forb, "shaded, moist soils on north face or near the summit of Mount Livermore"; POW, MCH, 7500–8000 ft; *LCH & LH 120*, *LCH s.n.*, *BHW 7332* (SRSC & TEX-LL); *LCH 436*, *988*, *LCH & BHW 7432* (SRSC). Also documented in Limpia Canyon, just north of Fort Davis.

Muhlenbergia alopecuroides (Griseb.) P.M. Peterson & Columbus—Wolftail—[*Lycurus setosus* (Nutt.) C. Reeder] Occasional to common perennial herb/forb, rocky, less shaded soils at all elevations; JPW, MCH; *WRC 28465* (TEX-LL); *LCH & LH s.n.*, *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 508*, *AMP & SAP3941*, *JJK 85*, *258* (SRSC).

Muhlenbergia arenicola Buckley—Sand muhly—Perennial herb/forb, "Locally abundant in one spot at summit of Mount Livermore, ca. 8000 ft"; MCH; *WRC, JMP & AT* 29207 (TEX-LL).

Muhlenbergia brevis C.O. Goodd.—Short muhly—Rare (G4S1) annual herb/forb, unshaded, dry rocky soils near the summit of Mount Livermore; MCH, above 7200 ft; *MCJ & CD 12407* (TEX-LL); *BHW 7492*, *LCH s.n.* (TEX-LL & SRSC); *LCH 523*, *JJK 282* (SRSC).

Muhlenbergia dubia E. Fourn.—Pine Muhly—Perennial herb/forb, "infrequent in upper Madera Canyon above upper springs on Mount Livermore, alt. 7500 ft"; *LCH s.n.* (TEX-LL & SRSC); *BHW 7616* (SRSC).

Muhlenbergia eludens C. Reeder—Muhly—Uncommon annual herb/forb, shaded, north slopes of Mount Livermore; POW, 6500–7500 ft; *BHW 23208*, *JJK 335* (SRSC).

Muhlenbergia emersleyi Vasey—Bull Muhly—Abundant perennial herb/forb, ubiquitous; *SCB & DM 463*, *LCH s.n.*, *JJK 84* (SRSC).

Muhlenbergia fragilis Swallen—Delicate muhly—Uncommon annual herb/forb, "Mount Livermore"; JPW, POW, 6100 ft; *LCH 526*, *JJK 300* (SRSC). Found along west road to Pine Peak.

Muhlenbergia glauca (Nees) B.D. Jacks.—Desert Muhly—Occasional perennial herb/forb, moist, shaded soils near intermittent/perennial streams and springs; POW, 5800–7600 ft; *LCH s.n., EJP 32021* (TEX-LL & SRSC); *AMP, SAP & JMM 3511*, *LCH & LH 119*, *BHW 7615*, *7609*, *SCB & DM 516*, *JJK 75*, *271* (SRSC).

Muhlenbergia minutissima (Steud.) Swallen—Least muhly—Uncommon annual herb/forb, moist, shaded soils near perennial streams; POW, 6300–7500 ft; *EJP 32017* (TEX-LL); *LCH s.n., AMP & SAP4928* (TEX-LL & SRSC); *PRM 4018*, *LCH & BHW 7470*, *7389*, *BHW 13511*, *23221*, *JJK 382* (SRSC).

Muhlenbergia montana (Nutt.) Hitchc.—Mountain muhly—Uncommon to occasional perennial herb/forb, rocky, exposed soils at higher elevation on Mount Livermore; MCH, above 7000 ft; *LCH & BHW 7394*, *7443*, *BHW 22889*, *LCH s.n.* (TEX-LL & SRSC); *LCH 24*, *BHW 21517*, *AMP & SAP4930*, *LCH & BHW 7401*, *893*, *SCB & DM 538* (SRSC).

Muhlenbergia pauciflora Buckley—New Mexico muhly—Occasional perennial herb/forb, shaded, moist soils in upper Madera Canyon; POW, up to 7500 ft*; LCH s.n.* (TEX-LL); *LCH 368*, *PRM, JCZ & JW2 3300*, *LCH & BHW 7441* (SRSC).

Muhlenbergia polycaulis Scribn.—Cliff muhly—Occasional to common perennial herb/forb, rocky, exposed soils; JPW, MCH, found on the summit; *LCH s.n.*, *BHW 7614*, *LCH & BHW 7417*, *SCB & DM 499* (TEX-LL & SRSC); *BHW 22892*, *7620*, *7618*, *LCH 119*, *JJK 206*, *264*, *330*, *370* (SRSC).

Muhlenbergia rigens (Benth.) Hitchc.—Deergrass—Occasional perennial herb/forb, moist, shaded soils near intermittent and perennial streams; SAS, POW, 6300 ft; *LCH s.n.*, (TEX-LL & SRSC); *LCH 187* (SRSC).

Muhlenbergia rigida (Kunth) Kunth—Purple muhly—Occasional to common perennial herb/forb, rocky, less shaded soils with slight to no sloping; GGR, JPW, 6500 ft; *WRC 28443*, *28442* (TEX-LL); *LCH 4602* (SRSC).

Muhlenbergia spiciformis Trin.—Longawn muhly—[*Muhlenbergia parviglumis* Vasey] Occasional perennial herb/forb, shaded, rocky soils; POW, JPW, up to 8000 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 500*, *LCH 601*, *JJK 395* (SRSC).

Muhlenbergia tenuifolia (Kunth) Kunth—Mesa muhly—Annual or perennial herb/forb, "common on the slopes of Mount Livermore, alt. 7800 ft"; *LCH s.n.* (TEX-LL); *LCH s.n.*, *384*, *1074* (SRSC).

Muhlenbergia tricholepis (Torr.) Columbus—Hairy dropseed—[*Blepharoneuron tricholepis* (Torr.) Nash] Uncommon to occasional perennial herb/forb, utilizes wide range of habitat at most elevations; JPW, GGR, POW, MCH; *MCJ & CD 12395* (TEX-LL); *LCH 505*, *125*, *LCH & BHW 7418* (SRSC & TEX-LL); *LCH 505*, *LCH & BHW 7390*, *PRM 4017*, *AMP & SAP 4940*, *3925*, *JB2 s.n.*, *JJK 393* (SRSC).

Panicum bulbosum Kunth—Bulb panicum—Occasional perennial herb/forb, shaded, shallow to deep soils; POW, 6000–7500 ft; *WRC, JMP & LH2 16831*, *WRC 19091*, *28426* (TEX-LL); *LCH s.n.*, *SCB & DM 457* (TEX-LL & SRSC); *MCJ 3207*, *3212*, *PRM, JW2 & JCZ 3297*, *3299*, *GW 4499*, *JJK 89*, *188* (SRSC).

Panicum capillare L.—Witchgrass—Occasional annual herb/forb, "steep, rocky igneous slopes and bottom of mesic, fairly high elevation canyon, Limpia Canyon Trail, ca. 6160–6280 ft"; POW; *WRC 19123* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH 373* (SRSC).

Panicum hallii Vasey—Hall panicum—Uncommon perennial herb/forb, shallow soils with slight or no sloping; JPW, GGR, up to 6100 ft; *WRC 28402* (TEX-LL); *JJK 156* (SRSC).

◊*Pascopyrum smithii* (Rydb.) Barkworth & D.R. Dewey—Western wheatgrass—Rare perennial herb/forb, shallow, less shaded soils; JPW, up to 7200 ft; *JJK 399* (SRSC). Seemingly localized to Pine Peak Tank. Next closest known location 6.5 miles southeast on Blue Mountain; *WRC*, *JPK*, *TC* & *JMP 16963*, *16986* (TEX-LL) and north on HWY 118 towards Kent; *PRM 913* (SRSC).

Piptochaetium fimbriatum (Kunth) Hitchc.—Pinyon ricegrass—Occasional perennial herb/forb, "local in shade, various trees in open woodland, nearly level topography, elev. ca. 5900 ft"; JPW, POW; *WRC, TW & BF 26279*, (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH 439*, *SCB & DM 464* (SRSC).

Piptochaetium pringlei (Beal) Parodi—Pringle needlegrass—Occasional perennial herb/forb, utilizes wide range of habitats in most vegetation communities; GGR, SAS, JPW, POW; up to 7800 ft; *LCH s.n.*, *LCH & BHW 7461* (TEX-LL & SRSC); *BHW 7504*, *LCH 125*, *AMP & SAP3935*, *JJK 191*, *341* (SRSC).

Poa bigelovii Vasey & Scribn.—Bigelow bluegrass—Uncommon annual herb/forb, "infrequent near top of Mount Livermore; 8000 ft"; *BHW 23067* (SRSC).

Poa fendleriana (Steud.) Vasey—Muttongrass—Uncommon to occasional perennial herb/forb, shaded, shallow soils; JPW, POW, 6200–8000 ft; *BHW 16749*, *14002*, *JJK 94, 101* (SRSC). Found on Wolf Den Canyon Trail and near Limpia Spring.

Pleuraphis mutica Buckley—Tobosagrass—[*Hilaria mutica* (Buckley) Benth.] Perennial herb/forb, "Mount Livermore"; LCH s.n. (TEX-LL & SRSC).

Schizachyrium cirratum (Hack.) Wooton & Standl.—Texas beardgrass—Uncommon to occasional perennial herb/forb, shaded, rocky soils; JPW, POW; 6000–7500 ft; *LH & LCH 368* (TEX-LL) *SCB & DM 460*, *AMP, SAP & JMM 3512*, *JJK 287* (SRSC).

Schizachyrium scoparium (Michx.) Nash var. scoparium—Little bluestem—Occasional to common perennial herb/forb, rocky, less shaded soils with slight to no sloping; JPW, POW, 6200 ft; *WRC 28412* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *JJK 234* (SRSC).

Schizachryium scoparium var. *neomexicanum* (Nash) Hitchc.—New Mexico bluestem—Occasional perennial herb/forb; *LCH s.n.*, *LCH & BHW 7405*, *AMP & SAP3937* (SRSC).

Setaria grisebachii E. Fourn.—Grisebach bristlegrass—Common annual herb/forb, observed in most vegetation communities at all elevations, mostly sandy soils near intermittent and perennial streams; JPW, POW, MCH, SAS; *MCJ 3216*, *3217* (SRSC); *BHW 13497*, *SCB & DM 502*, *LCH s.n.* (TEX-LL & SRSC).

Setaria parviflora (Poir.) Kerguelen—Knotroot bristlegrass—Perennial herb/forb, "Mount Livermore"; LCH s.n. (SRSC).

Setaria scheelei (Steud.) Hitchc.—Southwestern bristlegrass—Perennial herb/forb, "Occasional in shade of scattered trees in open juniper-oak woodland on gravelly soils on gentle slope, elev. 5920–5960 ft"; *WRC 28410* (TEX-LL).

≠*Setaria viridis* (L.) P. Beauv.—Green bristlegrass—Non-native, annual herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL & SRSC).

◊*Sphenopholis obtusata* (Michx.) Scribn.—Prairie wedgescale—Uncommon annual or perennial herb/forb, moist, shaded soils at Limpia Spring and Bridge Canyon; POW, 6200–6900 ft; *JJK 183*, *196* (SRSC).

Pontederiaceae

◊*Heteranthera limosa* (Sw.) Willd.—Blue mud plantain—Uncommon annual herb/forb, aquatic, growing in standing bodies of water; JPW, up to 7200 ft; *JJK 407* (SRSC). Location found at intermittent stream southeast of Locke's Gap and at Pine Peak Tank.

ANTHOPHYTA -Eudicotyledones

Acanthaceae

§*Dyschoriste linearis* (Torr. & A. Gray) Kuntze var. *cinerascens* (Henrickson & Hilsenb.) B.L. Turner—Snake herb—Uncommon perennial herb/forb, rocky, less shaded soils; GGR, JPW, 6400 ft; *LCH s.n.* (TEX-LL & SRSC) *JJK 16*, *353* (SRSC). Reaffirmed at north origin of Pine Canyon Trail.

Justicia pilosella (Nees) Hilsenb.—Hairy tubetongue—Uncommon perennial herb/forb, "Mount Livermore"; LCH s.n. (TEX-LL & SRSC).

Amaranthaceae

Amaranthus bigelovii Uline & W.L. Bray—Bigelow amaranth—[*Amaranthus torreyi* (A. Gray) A. Gray ex. S. Watson] Uncommon to occasional annual herb/forb, less shaded, rocky soils with moderate sloping; JPW, GGR, 6300 ft; *LCH s.n.*, (TEX-LL & SRSC); *JJK 345* (SRSC).

Amaranthus palmeri S. Watson—Palmer amaranth—Occasional to common annual herb/forb, generally less shaded, rocky soils with moderate to steep sloping; JPW, MCH, POW, up to 8200 ft; *LCH s.n.* (TEX-LL & SRSC), *JJK 305*, *402* (SRSC).

Amaranthus powellii S. Watson—Powell amaranth—Uncommon annual herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL & SRSC).

Amaranthus retroflexus L.—Redroot amaranth—Uncommon annual herb/forb, "Mount Livermore", *LCH 44-3* (TEX-LL & SRSC).

Froelichia gracilis (Hook.) Moq.—Slender snakecotton—Uncommon annual herb/forb, shaded soils near intermittent and perennial streams; POW, up to 6500 ft; *EJP 30655* (TEX-LL); *KL, SAR, BJW, JCZ, LH2, JPK & PRM 232*, *JJK 180* (SRSC).

Gomphrena nitida Rothr.—Pearly globe amaranth—Uncommon annual herb/forb, shaded soils near intermittent and perennial streams; POW, up to 6500 ft; *WRC 19095*, *28454* (TEX-LL), *LCH s.n.*, (TEX-LL & SRSC) *PRM 4052*, *BHW 13512*, *ML 318*, *JJK 236* (SRSC).

§*Guilleminea densa* (Humb. & Bonpl. Ex Schult.) Moq. var. *aggregata* Uline & W.L. Bray—Cottonflower—Uncommon perennial herb/forb, less shaded, rocky soils with light or moderate sloping; JPW, POW, 6200 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK s.n.*, photographic record. Limpia Spring Trail.

Iresine heterophylla Standl.—Bloodleaf—Occasional perennial herb/forb, dry, rocky slopes; JPW, up to 7000 ft; *WRC, TW & BF 26267* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *JJK 369* (SRSC).

Anacardiaceae

Rhus aromatica Aiton var. *pilosissima* (Engl.) Shinners—Fragrant sumac—Uncommon to occasional shrub, sandy, gravelly soils, gentle to moderate sloping, less shaded; GGR, JPW, up to 7500 ft; *CLK 7*, *JJK 26*, *27* (SRSC).

Apiaceae

Cymopterus hallii (A. Gray) B.L. Turner—Hall's stemless indian-parsley—[*Seseli hallii* A. Gray; see *Aletes acaulis* (Torr.) J.M. Coult. & Rose in Correll and Johnston, 1970] Uncommon perennial herb/forb, crevices of rock faces at high elevations; MCH, 8200 ft; *EJP 30773* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *RDW 3357*, *3491*, *AMP, SAP & JMM 3516*, *BHW 23008*, *OES T199*, *JJK 112* (SRSC). Documented as low as 5000 ft in the Davis Moutains.

Eryngium heterophyllum Engelm.—Wright eryngo—Uncommon to occasional perennial herb/forb, flat, shallow soils in less shaded, open forest; GGR, JPW, 5900 ft; *LCH s.n.* (TEX-LL & SRSC), *KL, SAR, BJW, JCZ, LH2, JPK & PRM 288* (SRSC).

Pseudocymopterus montanus (A. Gray) J.M. Coult. & Rose—Mountain parsley—[Cymopterus lemmonii (J.M. Coult. & Rose) Dorn] Uncommon to occasional perennial herb/forb, deep, shaded soils, north facing slopes of Mount Livermore; POW, 6800–7800 ft; *LCH s.n.* (TEX-LL & SRSC), *LCH 3496*, *LCH & BHW 7431, AMP, SAP & JMP 5295, SCB & DM 569*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 244*, *JJK 44*, *87* (SRSC). In Texas, only known from Mount Livermore and ranked as S1 by NatureServe (2013). Also known from New Mexico, Arizona, Colorado, Utah, Nevada, and Wyoming.

Osmorhiza bipatriata Constance & Shan—Livermore sweetcicely—[*Osmorhiza mexicana* Griseb. var. *bipatriata* (Constance & Shan) B.L. Turner] Rare (G5S1) perennial herb/forb, shaded, moist soils near Tobe Spring; POW, 7100 ft; *BHW 7479*, *LCH 408* (SRSC & TEX-LL); *LCH 3489*, *LCH & BHW 4147*, *BHW 23015*, *JJK 387*, *418* (SRSC). Two new higher elevation individuals located, up to 7400 ft.

Apocynaceae

Apocynum androsaemifolium L.—Spreading dogbane—Perennial herb/forb, "rare in shady protected area around mouth of Wolf Den Cave, elevation ~7080 ft"; *SCB & DM 491* (SRSC).

Apocynum cannabinum L.—Dogbane—Uncommon perennial herb/forb, "Madera Canyon, Mount Livermore"; *LCH s.n.* (TEX-LL & SRSC).

Araliaceae

Aralia bicrenata Wooton & Standl.—American spikenard—[*Aralia racemosa* L.] Rare shrub, crevices of rock faces or very rocky soils; MCH, 7600–8200 ft; *LCH s.n.*, *AMP & SAP 3921* (TEX-LL & SRSC); *CLK 24*, *BHW 7511*, *21518*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 263*, *JPK 2002-08095-6*, *JJK 7*, *182*, *272* (SRSC). Two new locations found at north base of Laura's Rock and the bottom of Tobe Canyon.

Asclepidiaceae

Asclepias glaucescens Kunth—Nodding milkweed—Uncommon perennial herb/forb, dry, rocky soils, less shaded; JPW, 5900–7000 ft; *LCH 587* (TEX-LL & SRSC) *SCB & DM 471*, *LCH s.n.*, *JJK 411* (SRSC).

Asclepias subverticillata (A. Gray) Vail—Horsetail milkweed—Rare perennial herb/forb, fine, unshaded soils; JPW, 5800–7200 ft; *WRC 16849*, *28438*, *28404*, *28460*, *LCH s.n.* (TEX-LL); *JJK 398* (SRSC). One population observed the entire study at Pine Peak Tank.

Asclepias texana A. Heller—Texas milkweed—Uncommon to occasional perennial herb/forb, rocky, shaded soils, generally near intermittent or perennial streams; JPW, POW, SAS, up to 7600 ft; *LCH s.n.*, *EJP 30749* (TEX-LL); *PRM, JCZ & JW2 3289*, *SCB & DM 541*, *AMP & SAP 4939*, *JJK 29*, *55*, *247* (SRSC).

◊*Cynanchum pringlei* (A. Gray) Henrickson—Pringle milkvine—Rare herbaceous vine, perennial, rocky soils under large boulders; JPW, 6600 ft; *JJK 367* (SRSC). Found on east side of McDaniel Mountain in short overstory of *Pinus cembroides* and *Quercus grisea*.

◊*Funastrum crispum* (Benth.) Schltr.—Wavyleaf twinevine—[*Sarcostemma crispum* Benth.] Rare herbaceous vine, perennial, rocky soils under large boulders; JPW, 6600 ft; *JJK 366* (SRSC). Found on east side of McDaniel Mountains in short overstory of *Pinus cembroides* and *Quercus grisea.*

Matelea producta (Torr.) Woodson—Milkvine—Uncommon herbaceous vine, perennial, less shaded, rocky soils; JPW, 6400–6800 ft; *LCH s.n.* (TEX-LL & SRSC); *RER 2006-2*, *JJK 239*, *349* (SRSC).

Asteraceae

Achillea millefolium L.—Yarrow—Uncommon to occasional perennial herb/forb, shaded, north slopes of Mount Livermore; POW, 7200–8200 ft; *LCH s.n.* (TEX-LL & SRSC), *AMP & SAP3214*, *LCH & BHW 7435*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 257* (SRSC).

§*Acourtia wrightii* (A. Gray) Reveal & R.M.—Pink perezia—Uncommon perennial herb/forb, flat, shallow, unshaded soils; JPW, GGR, 6300 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 25* (SRSC). Found near north Cherry Canyon Road.

Ageratina herbacea (A. Gray) R.M. King & H. Rob.—Thoroughwort—Occasional to common shrub, shaded, deep soils on north facing slopes of Mount Livermore; POW, 6300–7500 ft; *DSC 33748* (TEX-LL); *LCH & BHW 7474A*, *LCH s.n.* (TEX-LL & SRSC); *JJK 214*, *280*, *347* (SRSC).

Ageratina rothrockii (A. Gray) R.M. King & H. Rob—Rothrock thoroughwort—Uncommon to occasional sub-shrub, shaded,

deep soils on north facing slopes of Mount Livermore; POW, 6000–7500 ft; *DSC 13545*, *33757*, *33733*, *EJP 32053*, *SCB & DM 561* (TEX-LL); *AMP, SAP, JW & BC 3221*, *AMP & DF 1491*, *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 525*, *AMP, SAP, JW & BC 3494*, *PRM 5017*, *BHW 7426A*, *7410*, *7607*, *23204*, *22896*, *DK 1448*, *LCH & BHW 7410*, *7474*, *JJK 142*, *403* (SRSC).

Amauriopsis dissecta (A. Gray) Rydb.—Bahia—[*Bahia dissecta* (A. Gray) Britton] Uncommon to occasional annual or perennial herb/forb, rocky, gravelly soils, less shaded slopes; JPW, POW, 6000–7500 ft; *LCH s.n.* (SRSC) *JJK 213* (SRSC).

Antennaria marginata Greene—Whitemargin pussytoes—Rare (G4S1) perennial herb/forb, shaded, rocky slopes; LCH 534 (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *JJK 417* (SRSC). Observed along Limpia Chute Trail.

Artemisia carruthii Alph. Wood ex Carruth—Carruth sagewort—Uncommon to occasional perennial herb/forb, flat, less shaded soils; GGR, JPW, 6000 ft; *WRC, TW & BF 26285* (TEX-LL).

Artemisia dracunculus L.—Broom snakeweed—Uncommon perennial herb/forb, rocky, less shaded soils; MCH, above 7800 ft; *LCH s.n.*, *AMP & SAP 3904* (TEX-LL); *JJK 263* (SRSC).

❖*Artemisia ludoviciana* Nutt.—Western mugwort—Both introduced and native, occasional to common perennial herb/forb, mostly shaded soils on north facing slopes; POW, JPW, MCH, 6000–8200 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 462*, *BHW 7484*, *JJK 326* (SRSC).

Baccharis bigelovii A. Gray—Bigelow baccharis—Uncommon to occasional sub-shrub, shaded slopes, soils variable; POW, JPW up to 6500 ft; *WRC 28420*, *LCH s.n.*, *AMP 3205* (TEX-LL); *BHW 13501*, (TEX-LL & SRSC); *JJK 253* (SRSC).

Baccharis salicifolia (Ruiz & Pav.) Pers.—Seepwillow baccharis—Uncommon to occasional shrub, moist, sandy soils near perennial or mostly perennial streams; SAS, POW, JPW, up to 6300 ft; *LCH s.n.* (TEX-LL & SRSC); *CLK 21*, *JJK 278* (SRSC).

★-TP *Bahia bigelovii* A. Gray—Bigelow bahia—Occasional to common annual herb/forb, less shaded, deep, igneous soils with slight to no sloping; JPW, POW, up to 8000 ft; *OES T371* (TEX-LL); *BHW 23066*, *SCB & DM 509*, *LCH s.n.*, *JJK 338*, *357* (SRSC).

Bidens bigelovii A. Gray—Bigelow beggar's ticks—Abundant annual herb/forb, generally more shaded soils, ubiquitous; *WRC 26269*, JLN *04-09-16-03* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH & BHW 7381*, *PRM 011*, *JJK 284* (SRSC).

Brickellia californica (Torr. & A. Gray) A. Gray—California brickellbush—Uncommon sub-shrub, rocky soils, wide range of habitats; JPW, MCH, POW, any elevation; *LCH s.n.* (TEX-LL); *JJK 323* (SRSC).

Brickellia eupatorioides L. Shinners var. *chlorolepis* (Wooton & Standl.) B.L. Turner—Brickellbush—Occasional sub-shrub, rocky, less shaded soils; JPW, GGR, up to 7500 ft; *WCR, TW & BF 26278*, *LCH s.n., AMP & DF 1501* (TEX-LL); *BHW 13496*, *AMP, SAP, JW & BC 3217* (TEX-LL & SRSC); *SCB & DM 528*, *LCH & BHW 7404*, *JJK 361* (SRSC).

Brickellia grandiflora (Hook.) Nutt.—Tasselflower brickellbush—Occasional to common sub-shrub, shaded, deep soils on northern facing slopes of Mount Livermore; POW, 6500–7800 ft; *WRC 19079*, *JMP 2595*, *LCH s.n.*, *1207* (TEX-LL); *AMP & DF 1492*, *BHW 23016*, *AMP 3220*, (TEX-LL & SRSC); *AMP, SAP & JMM 3520*, *SCB & DM 560*, *LCH & BHW 7422*, *7424*, *JJK 4* (SRSC).

Brickellia hinckleyi Standl var. ***hinckleyi*** (Flyr) B.L.Turner—Hinckley brickellbush—Rare (G2T2S2) sub-shrub, "common on steep, rocky slopes in *Pinus ponderosa–Quercus hypoleucoides* forest, elev. 6160–6280 ft"; *LCH* 1225 (NYBG); *WRC 19089* (TEX-LL); *LCH & BHW*, *7385*, *4136* (TEX-LL & SRSC); *LCH & BHW 7421*, *LCH 289*, *AMP & SAP 4941*, *AMP, SAP & JMP 5256* (SRSC).

√*Brickellia laciniata* A. Gray—Splitleaf brickellbush—Uncommon sub-shrub, dry, exposed, rocky soils on moderate slopes; GGR, JPW, 6200 ft; *JJK 416* (SRSC). Found throughout Jeff Davis County at lower elevations, disturbed areas.

Brickellia lemmonii A. Gray var. *conduplicata* (B.L. Rob.) B.L. Turner—Sandlot brickellbush—Occasional sub-shrub, rocky, shaded soils; JPW, POW; up to 7000 ft; *WRC 19090* (TEX-LL), *LCH 976*, *AMP, SAP, JW & BC 3219* (TEX-LL & SRSC); *DK 1446*, *SCB & DM 529*, *530*, *563*, *AMB 9*, *AMP, SAP & JMM 3504*, *JJK 317* (SRSC).

Brickelliastrum fendleri (A. Gray) R.M. King & H. Rob.—Fendler brickellbush—[*Steviopsis fendleri* (A. Gray) B. L. Turner] Sub-shrub, "common in shaded soils under pines 7000–8000 ft"; *DSC 33747* (TEX-LL); *BHW 23070*, *BHW & LCH 7453*, *AMP, SAP, JW & BC 3218* (TEX-LL & SRSC); *LCH s.n.*, *1228*, *608*, *BHW 7453*, *23022*, *AMP & SAP 3920*, *AMP, SAP & JMP 5284*, *ML 331* (SRSC).

Carminatia tenuiflora D.C.—Plumeweed—Occasional to common annual herb/forb, shaded, rocky soils; JPW, POW; up to 7300 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 507*, *BHW 13508*, *JJK 293* (SRSC).

Carphochaete bigelovii A. Gray—Bigelow bristlehead—Uncommon to occasional sub-shrub, shaded, rocky soils; JPW, POW, up to 7000 ft; *SCB & DM 517*, *LCH 535*, *JJK 99* (SRSC).

Cirsium ochrocentrum A. Gray—Yellowspine thistle—Uncommon perennial herb/forb, "occasional in grassland with *Juniperus deppeana* and *Pinus cembroides*, on gentle canyon slope, elev. 6080–6120 ft"; *WRC 28464* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC).

Cirsium undulatum (Nutt.) Spreng.—Wavyleaf thistle—Uncommon perennial herb/forb, unshaded, rocky soils near intermittent streams; JPW, POW, 6100 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 256* (SRSC).

§*Chaetopappa ericoides* (Torr.) G.L. Nesom—Rose heath—Uncommon perennial herb/forb, less shaded, rocky soils in Madera Canyon; JPW, 6100 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 128* (SRSC).

√*Chrysactinia mexicana* A. Gray—Damianita—Uncommon sub-shrub, unshaded rocky soils; JPW, 6700 ft; *JJK 228* (SRSC).

§*Conoclinium dissectum* A. Gray—Palmleaf boneset—Uncommon perennial herb/forb, less shaded, rocky soils with slight to no sloping; JPW, up to 6500 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 297* (SRSC).

Conyza canadensis (L.) Cronquist—Horseweed—Uncommon annual or perennial herb/forb, shaded, deep soils on north facing slopes of Mount Livermore; POW, 7400 ft; *LCH s.n.* (TEX-LL); *JJK 401* (SRSC).

◊*Coreopsis tinctoria* Nutt.—Golden tickseed—Rare annual or perennial herb/forb, fine, unshaded soils; JPW, 7200 ft; *JJK 308* (SRSC). Seemingly localized to Pine Peak Tank on the DMP, but found near McDonald Observatory as well.

Cosmos parviflorus (Jacq.) Pers.—Southwestern cosmos—Occasional annual herb/forb, generally in moist soils near perennial or intermittent streams, but also in shaded, deep soils of north facing slopes; SAS, POW, up to 7000 ft; *WRC 19101*, *WRC, TW & BF 26266*, *MSY 66*, *LCH 537* (TEX-LL); *LCH s.n., AMP, SAP & JMM 3505*, *AMP & SAP3934* (SRSC).

Dyssodia papposa (Vent.) Hitchc.—Mayweed dogweed—Occasional to common annual herb/forb, dry, unshaded soils; JPW, up to 6500 ft; *RS & LV 75095*, *WRC, TW & BF 26265* (TEX-LL); *BHW 7502*, *JJK 292*, *302*, *344* (SRSC).

Erigeron modestus A. Gray—Plains fleabane—Perennial herb/forb, "up Madera Canyon on north slope and summit of Mount Livermore in seepage"; *EJP 30855*, *DSC 33741*, *LCH s.n.* (TEX-LL).

§*Erigeron tracyi* Greene—Running fleabane—[*Erigeron colomexicanus* A. Nelson] Uncommon to occasional perennial herb/forb, shaded, rocky to fine soils; POW, up to 7200 ft; *LCH s.n.* (TEX-LL), *JJK 143*, *189*, *420* (SRSC).

Galinsoga parviflora Cav.—Quickweed—Occasional annual herb/forb, shaded, rocky soils with moderate sloping; POW, up to 7800 ft; *DSC 33727*, *WRC 19098*, *WRC, JPK, TW & BF 26310* (TEX-LL); *LCH s.n.*, *AMP & DF 1499*, *AMP, SAP, JW & BC 3500* (TEX-LL & SRSC); *PRM 5016*, *AMP & SAP 3929*, *JJK 173* (SRSC).

Gutierrezia microcephala (DC.) A. Gray—Broom snakeweed—Uncommon sub-shrub, "collected from east side of Mount Livermore on igneous cliffs in shade, elev. 7500 ft"; *DK 1450* (SRSC).

Gutierrezia sarothrae (Pursh) Britton & Rusby—Broom snakeweed—Uncommon to occasional sub-shrub, rocky, unshaded soils; MCH, up to 8200 ft; *JJK 333*, *364, 421* (SRSC). Found at the base of Baldy Peak and on the east face of McDaniel Mountain.

√*Gymnosperma glutinosum* (Spreng.) Less.—Tatalencho—Uncommon sub-shrub, less shaded, rocky soils; JPW, MCH up to 7200 ft; *SCB & DM 492* (TEX-LL); *SCB & DM 496*, *JJK 360* (SRSC). Found once atop McDaniel Mountain.

√*Helianthus annuus* L.—Common sunflower—Uncommon annual herb/forb, unshaded, rocky, gravelly soils; JPW, 6775 ft; *JJK 414* (SRSC). One individual observed on northeast face of Whitetail Mountain in intermittent stream.

◊*Helianthus ciliaris* D.C.—Blueweed—Uncommon perennial herb/forb, flat, unshaded, fine soils; JPW, GGR, 6300 ft; *JJK 413* (SRSC). One population observed north of Upper Madera Windmill.

Heliomeris longifolia (B.L. Rob. & Greenm.) Cockerell—Annual goldeneye—[*Viguiera longifolia* B.L. Rob. & Greenm.] Abundant annual herb/forb, JPW, POW, MCH, GGR; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 531*,*OES s.n.*, *LCH & BHW 7445*, *JJK 244*, *285*, *329* (SRSC). Covers entire hillsides within weeks after heavy rainfalls.

Heterosperma pinnatum Cav.—Fineleaf heterosperma—Occasional to common annual herb/forb, unshaded, dry, sandy to rocky soils; JPW, up to 7500 ft; *WRC 28457* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *BHW 7381a*, *JJK 122*, *233*, *291* (SRSC).

Heterotheca viscida (A. Gray) V.L. Harms—Goldenaster—Uncommon to occasional perennial herb/forb, crevices in rock faces at high elevations; MCH, generally well above 7000 ft; *EJP 35363*, *DSC 33760* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *PRM 4039*, *3540*, *JPK 2002-08093*, *AMP, SAP & JMP 5279*, *AFJ 59*, *JJK 327*.

Hieracium carneum Greene—Huachuca hawkweed—Common perennial herb/forb, generally shaded, less rocky soils; POW, JPW, up to 7500 ft; *JMP 2593*, *WRC 19081*, *AMP & DF 1500* (TEX-LL); *AMP & SAP 3939*, *PZ 219*, *LCH & BHW 7404*, *BHW 23053*, *LCH 4752*, *AMP, SAP & JMP 5296*, *JJK 41*, *179* (SRSC).

Hieracium schultzii Fr.—Roughstem hawkweed—[*Hieracium bulbisetum* Arv.-Touv.] Occasional to common perennial herb/forb, shaded, less rocky soils; POW, up to 7500 ft*; WRC 28422*, *28448* (TEX-LL); *SCB & DM 521*, *LCH 794x*, *BHW 7493*, *23054*, *JJK 136*, *181*, *313* (SRSC).

Lactuca graminifolia Michx. var. *arizonica* McVaugh—Wild lettuce—Uncommon perennial herb/forb, "Madera Canyon near Mount Livermore"; *LCH 1003* (TEX-LL).

≠*Lactuca serriola* L.—Prickly lettuce—Uncommon to occasional, annual/biennial herb/forb, less shaded, rocky soils near roads; JPW, up to 7200 ft; *JJK s.n.*, photographic record. Found on Road Canyon Road.

√*Laennecia coulteri* (A. Gray) G.L. Nesom—Coulter horseweed—[*Conyza coulteri* A. Gray] Occasional annual herb/forb, shaded, deep, less rocky soils on north facing slopes; POW, up to 8000 ft; *JJK 259*, *396* (SRSC).

◊*Laennecia schiedeana* (Less.) G.L. Nesom—Pineland horseweed—Uncommon annual herb/forb, shaded, deep, less rocky soils on north facing slopes of Mount Livermore; POW, 7400 ft; *JJK 404* (SRSC). First record for Texas. Found along Limpia Chute Trail.

Laennecia sophiifolia (Kunth) G.L. Nesom—Leafy horseweed—[*Conyza sophiifolia* Kunth] Occasional to common annual herb/forb, shaded, deep, less rocky soils on north facing slopes; POW, up to 7800 ft; *LCH s.n.* (TEX-LL & SRSC), *SCB & DM 526, BHW 23203, JJK 363, 392* (SRSC).

Melampodium strigosum Stuessy—Shaggy blackfoot—Occasional annual herb/forb, "occasional in grama-dominated grassland openings in woodland of *Quercus emoryi*, *Juniperus deppeana*, and *Pinus cembroides* in dry sandy-gravelly soil, elev. ca. 5900 ft"; *WRC, JMP & LH2 16827*, *WRC, TW & BF 26273* (TEX-LL); *BHW 13507*, *LCH s.n.*, *881*, *3293* (TEX-LL & SRSC); *BHW 23213*, *AMP, SAP & JM 3503* (SRSC). In Texas, only documented in Jeff Davis County. Also found in Arizona, New Mexico, and Colorado.

Packera millelobata (Rydb.) W.A. Weber & Á. Löve—Manybract groundsel—[*Senecio millelobatus* Rydb.] Occasional to common perennial herb/forb, generally shaded, rocky soils with steep to moderate sloping; JPW, POW, up to 8000 ft; *WRC 19088*, *28414* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 540*, *LCH & BHW 7400*, *AMP, SAP & JMM 3509*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 242*, *JJK 176* (SRSC).

§*Parthenium incanum* Kunth—Mariola—Uncommon shrub, less shaded, rocky soils; JPW, 7175 ft; *LCH s.n.* (TEX-LL); *JJK 362* (SRSC). One small population found atop McDaniel Mountain.

Pectis angustifolia Torr. var. *angustifolia*—Crownseed pectis—Annual herb/forb, "rare in grama-dominated grassland openings in woodland of *Quercus emoryi*, *Juniperus deppeana*, and *Pinus cembroides* in dry sandy-gravelly soil, elev. ca. 5900 ft"; *WRC, JMP & LH2 16844*, *LCH s.n.* (TEX-LL).

Pectis prostrata Cav.—Creeping pectis—Annual herb/forb, "occasional in herbaceous vegetation on sand and gravel among rhyolite rocks in dry bed of overflow channel of creek in bottom of rather broadly open woodland, elev. 5960–6060 ft"; *WRC, TW & BF 26262*, *WRC 28458* (TEX-LL); *BHW 23215* (SRSC).

Pericome caudata A. Gray—Tailleaf pericome—Occasional to common sub-shrub, rocky, less shaded soils at high elevations; MCH, POW, above 7800 ft*; MSY s.n.* (TEX-LL); *AMP, SAP, JW & BC 3193*, *LCH s.n.*, *AMP & DF 1494* (TEX-LL & SRSC); *BHW & BLT 180*, *DK 1447*, *AMP & SAP 4907*, *LCH & BHW 4144*, *BHW 7486*, *JJK 23* (SRSC).

★-TP *Perityle rupestris* (A. Gray) Shinners var. *rupestris*—Leafy rockdaisy—Uncommon sub-shrub, rocky soils or crevices in rock faces; MCH, up to 8000 ft; *MSY s.n.*, *LCH 356* (TEX-LL); *LCH s.n., 507, AMP, SAP & JMP 5278*, *LCH & BHW 7458*, *BHW 7619*, *23091*, *JJK 383* (SRSC).

Pseudognaphalium arizonicum (A. Gray) Anderb.—Arizona cudweed—Annual herb/forb, "infrequent on south side of Mount Livermore, rocky soil in oak-pinyon woodland, elev. 7500 ft"; *AMP & DF 1490*, *LCH s.n.* (TEX-LL & SRSC); *LCH & BHW 7408* (SRSC).

Pseudognaphalium canescens (DC.) Anderb.—Wright cudweed—Annual or perennial herb/forb, "scattered in patches in gray oak-pinyon/bull muhly-pinyon rice grass community, elev. 7070 ft"; *SCB & DM 533* (TEX-LL); *SCB & DM 519* (SRSC).

Pseudognaphalium pringlei (A. Gray) Anderb—Pringle cudweed—Annual herb/forb, "infrequent above upper springs in Madera Canyon on Mount Livermore, alt. 7800 ft"; *AMP & SAP 4931*, *MSY 265* (TEX-LL & SRSC), *LCH & BHW 7462*, *SCB & DM 550* (SRSC).

Pseudognaphalium stramineum (Kunth) Anderb.—Cottonbatting cudweed—Occasional annual or perennial herb/forb, less shaded, less rocky soils, sloping variable; JPW, POW, up to 7200 ft; *WRC 28436*, *28471* (TEX-LL); *JJK 226*, *288*, *307* (SRSC).

Pseudognaphalium viscosum (Kunth) Anderb.—Clammy cudweed—Occasional annual or perennial herb/forb, less shaded, rocky to gravelly soils, sloping variable; JPW, up to 7200 ft; *WRC, TW & BF 26284*, *WRC 28399* (TEX-LL); *JJK 257* (SRSC).

Psilactis tenuis S. Watson—Machaeranthera—Occasional to common annual herb/forb, generally shaded, rocky soils with steep

to moderate sloping; POW, JPW, up to 7800 ft; *DSC 33724*, *JLN 04-09-16-05*, *LCH 897*, *4457* (TEX-LL); *AMP, SAP, JW & BC 3203*, *LCH s.n.* (TEX-LL & SRSC); *PRM 5014*, *BHW 13509*, *23218*, *LCH & BHW 7382*, *AMP & SAP 4923*, *JJK 77* (SRSC).

Schkuhria pinnata (Lam.) Kuntze ex Thell. var. *wislizenii* (A. Gray) B.L. Turner—Groundsel—Occasional annual herb/forb, dry, less shaded, less rocky to sandy soils; JPW, up to 7200 ft; *WRC, JMP & LH2 16846*, *WRC, TW & BF 26274* (TEX-LL); *LCH s.n.*, *BHW 7501* (TEX-LL & SRSC); *JJK 227*, *289*, *303* (SRSC).

◊*Senecio crassulus* A. Gray—Thickleaf ragwort—Uncommon perennial herb/forb, shaded, fine, deep soils with moderate sloping; POW, 7300 ft; *JJK 400* (SRSC). First record for Texas. Found along Road Canyon Road.

√*Senecio flaccidus* Less.—Threadleaf groundsel—Occasional perennial herb/forb, less shaded, rocky to gravelly soils with slight to no sloping; JPW, POW, up to 7000 ft; *JJK 145*, *251* (SRSC).

Senecio wootonii Greene—Wooton groundsel—Rare (G4S1) perennial herb/forb, "Near Mount Livermore, rocky wooded slopes and banks, above 2200 m (7200 ft)"; *LCH 1043*, *EJP 30772* (TEX-LL). Only collections known in Texas (Turner et al. 2003).

Simsia calva (A. Gray & Engelm.) A. Gray—Bush sunflower—Uncommon annual or perennial herb/forb, less shaded, rocky soils with moderate sloping; JPW, GGR, 6300 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 352* (SRSC). One individual found on south face of hillside north of the MCC.

Solidago simplex Kunth var. *simplex*—Goldenrod—Uncommon perennial herb/forb, "forested crest of the mountain 1.6 km ESE of the top of Mount Livermore" (Worthington 1985); *RDW 3366* (UTEP). Only voucher from Texas.

Solidago velutina DC.—Fewhead goldenrod—Occasional perennial herb/forb, less shaded, rocky soils with moderate to no sloping; JPW, POW, 7200 ft; *LCH s.n.* (TEX-LL); *JJK 245* (SRSC).

Solidago wrightii A. Gray—Wright goldenrod—Occasional perennial herb/forb, shaded, deep soils of north facing slopes; POW, up to 7500 ft; *SC & RDW s.n.*, *EJP 32038* (TEX-LL) *AMP & DF 1493*, *LCH s.n.* (TEX-LL & SRSC); *LCH & BHW 7442*, *PM 5019*, *ML 335*, *AMP & SAP 4894*, *JJK 204*, *397*, *420* (SRSC).

Stevia serrata Cav. var. *serrata*—Sawtooth stevia—Uncommon to occasional perennial herb/forb, less shaded, rocky soils with slight to no sloping; JPW up to 7200 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 527*, *AMP, SAP, JW & BC 3204* (SRSC).

◊*Symphyotrichum ericoides* (L.) G.L. Nesom—Heath aster—Rare to uncommon perennial herb/forb, shaded, rocky soils with moderate sloping; POW, 7000 ft; *JJK 294* (SRSC). One population found along road going east to Pine Peak.

Symphyotrichum expansum (Poepp. ex Spreng) G.L. Nesom—Southwestern annual saltmarsh aster—Uncommon annual or perennial herb/forb, shaded soils with no slope near intermittent and perennial streams; POW, up to 6500 ft; *WRC 28463* (TEX-LL); *JJK 390* (SRSC). One individual found near perennial Madera Creek.

Tagetes micrantha Cav.—Little marigold—Uncommon to occasional annual herb/forb, shaded, rocky to sandy soils; POW, JPW, up to 7500 ft; *WRC 19097*, *WRC, TW & BF 26260* (TEX-LL); *BHW 23219*, *LCH & BHW 7388*, *JJK 47* (SRSC).

√❖*Taraxacum officinale* F.H. Wigg—Common dandelion—Both introduced and native, uncommon perennial herb/forb, shaded soils near intermittent streams; POW, 7000 ft; *JJK 201* (SRSC). Two individuals found: one in Bridge Canyon; one in Tobe Canyon.

Tetraneuris linearifolia (Hook.) Greene var. *linearifolia*—Slenderleaf bitterweed—Occasional to common perennial herb/forb, mostly shaded, fine to rocky soils; JPW, POW, up to 7200 ft; *WRC 16833*, *28427* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH & BHW 7403*, *PRM 4043*, *JJK 120*, *187*, *260*, *306*, *322* (SRSC).

√*Tetraneuris scaposa* (DC.) Greene—Slendstem bitterweed—Uncommon perennial herb/forb, unshaded, rocky soils with slight sloping; JPW, GGR, 6200 ft; *JJK 342* (SRSC). One individual found on south face of hillside directly north of the MCC.

Townsendia exscapa (Richardson) Porter—Stemless townsendia—Perennial herb/forb, "Infrequent dwarf perennial, igneous soil; Madera Canyon, elev. 6000 ft"; *LCH 3768* (TEX-LL & SRSC); *BHW 22885* (SRSC).

√≠*Tragopogon dubius* Scop.—Yellow salsify—Non-native, uncommon annual or perennial herb/forb, unshaded, rocky soils with slight sloping; MCH, JPW, 8000 ft; *JJK 166* (SRSC). One individual found on Mount Livermore Road nearing the summit.

Trixis californica Kellogg—American trixis—Uncommon sub-shrub, "West ridge, Mount Livermore"; *LCH s.n.* (SRSC).

§*Verbesina encelioides* (Cav.) Benth. & Hook. F. ex A. Gray—Cowpen daisy—Uncommon to occasional annual herb/forb, less shaded, less rocky soils with slight sloping; JPW, GGR, 5900 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 423* (SRSC). Observed near dry tank next to MCC.

Verbesina oreophila Wooton & Standl.—Mountain crownbeard—Occasional to common perennial herb/forb, generally less shaded, rocky soils at all elevations; JPW, POW, MCH; *WRC 19078*, *DSC 33764* (TEX-LL); *LCH s.n.*, *615* (TEX-LL & SRSC), *BHW 7444*, *JPK & KB s.n.*, *PRM 5027*, *AMP & SAP 4892*, *JJK 32* (SRSC).

Vernonia marginata (Torr.) Raf.—Plains ironweed—Rare perennial herb/forb, less shaded, sandy soils near intermittent streams; SAS, JPW, up to 6100 ft; *WRC 16826*, *28415* (TEX-LL); *JJK 254* (SRSC).

Viguiera cordifolia A. Gray—Roughleaf goldeneye—Occasional to common perennial herb/forb, shaded to unshaded, rocky to sandy soils at all elevations; JPW, POW, MCH; *WRC, JPK, TC & JMP 16958*, *WRC, TW & BF 26264*, *DSC 33738* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *JPK & KB s.n.*, *SCB & DM 532*, *JJK 328* (SRSC).

√*Viguiera dentata* (Cav.) Spreng—Plateau goldeneye—Uncommon perennial herb/forb, less shaded, rocky soils with moderate sloping; JPW, POW, 7100 ft; *JJK 371* (SRSC). One population found on east face of Whitetail Mountain.

Xanthisma gracile (Nutt.) D.R. Morgan & R.L. Hartm.—Slender goldenweed—Annual herb/forb, "frequent in grassland component of open woodland on gravelly soil on nearly level topography in bottom of broad canyon, elev. ca. 5900 ft"; *JLN 04-09-16-02*, *WRC, TW & BF 26283* (TEX-LL).

Xanthisma spinulosum (Pursh) D.R. Morgan & R.L. Hartm var. *spinulosum*—Spiny goldenweed—Occasional perennial herb/forb, less shaded, fine to rocky soils with moderate to no sloping; JPW, GGR, up to 6300 ft; *LCH s.n.* (goat canyon) (TEX-LL); *JJK 255*, *354* (SRSC).

◊⃠*Xanthium spinosum* L.—Spiny cocklebur—Invasive, rare annual herb/forb, unshaded, fine soils with no sloping; JPW, 7200 ft; *JJK 309* (SRSC). One population found seemingly localized to Pine Peak Tank on the DMP.

§*Zinnia grandiflora* Nutt.—Plains zinnia—Occasional perennial herb/forb, less shaded, rocky to gravelly soils with moderate to no sloping; JPW, GGR, up to 6500 ft; *LCH s.n.*, *JJK 299*, *358* (SRSC).

Berberidaceae

Berberis haematocarpa Wooton—Red barberry—Uncommon shrub, "North of Mount Livermore, alt. 2200 m (7200 ft), rocky banks of canyon"; *EJP 32057* (TEX-LL).

Bignoniaceae

§*Tecoma stans* (L.) Juss. ex Kunth—Trumpetflower —Uncommon shrub, less shaded, rocky soils with moderates sloping; JPW,

GGR, 6200 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK s.n.*, photographic record. One young population found on south facing hillside directly north of the MCC.

Boraginaceae

Hackelia pinetorum (Greene ex A. Gray) I.M. Johnst. var. ***pinetorum***—Livermore stickseed—Rare to uncommon (G4T4S1) perennial herb/forb, shaded, deep soils with steep to moderate sloping; POW up to 8000 ft; *DSC 33730*, *LCH 3495* (TEX-LL) *LCH s.n.*, *LCH & BHW 7446* (TEX-LL & SRSC); *AMP, SAP & JMP 5288*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 262*, *AMP & SAP 4920*, *JJK 178*, *216* (SRSC). In Texas, only found in Jeff Davis County, specifically high on Mount Livermore. Known in at least 14 mountain ranges in Arizona, New Mexico, and Texas and also in Baja California and Chihuahua in Mexico (NatureServe 2015).

Lappula redowskii (Hornem.) Greene—Cupseed—Annual or perennial herb/forb, "rare in *Pinus ponderosa–Quercus hypoleucoides* woodland on steep igneous slopes in header of mesic, high elevation canyon, elev. ca. 7100 ft"; *WRC 19071* (TEX-LL). No Jeff Davis collections at SRSC.

Lithospermum multiflorum Torr. ex A. Gray—Manyflower gromwell—Occasional perennial herb/forb, shaded, less rocky soils, slopes or bottoms of canyons; POW, up to 7500 ft; *MSY s.n.*, *WRC 19087* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *PRM, JCZ & KC 3460*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 274*, *AMP, SAP & JMP 5260*, *JJK 105* (SRSC).

Nama dichotoma (Ruiz & Pav.) Choisy—Nama—Annual herb/forb, "infrequent annual; north slope of Mount Livermore; elev. 7500 ft"; *DSC 33744*, *LCH s.n.* (TEX-LL) *AMP & SAP4889* (TEX-LL & SRSC) *BHW 23058*, *23307* (SRSC).

Brassicaceae

Descurainia adenophora (Wooton & Standl.) O.E. Schulz—Tansymustard—Annual or perennial herb/forb, "Mount Livermore"; *LCH s.n.*, *s.n.* (TEX-LL).

Descurainia incisa (Engelm. ex A. Gray) Britton—Mountain tansymustard—Uncommon annual or perennial herb/forb, shaded, deep, less rocky soils with moderate to steep sloping; POW, up to 7500 ft; *BHW 23315*, *LCH s.n.*, *LCH & BHW 4130*, *7398*, *JJK 217* (SRSC).

Draba standleyi J.F. Macbr. & Payson—Standley draba—Rare to uncommon (G2G3S1) perennial herb/forb, crevices of rock faces at high elevations on Mount Livermore; MCH, 7400–8100 ft; *RDW 5161* (TEX-LL); *LCH s.n.*, *BHW 7448* (TEX-LL & SRSC); *BHW 23320*, *23072*, *PRM 3538*, *AMP, SAP, JW & BC 3216*, *AMP, SAP & JMP 5282*, *AMP & SAP 4897*, *DK 1442*, *JJK 167*, *111* (SRSC). In Texas, only known from the highest elevations of Sawtooth Mountain and Mount Livermore, Jeff Davis County.

Erysimum capitatum (Douglas ex Hook.) Greene—Wallflower—[*Erysimum asperum* (Nutt.) DC. var. *elatum* (Nutt.) Torr.] Occasional to common perennial herb/forb, generally shaded, less rocky soils with moderate sloping; JPW, POW, up to 7500 ft; *DSC 13517*, *LCH s.n.* (TEX-LL); *LCH 139* (TEX-LL & SRSC); *PRM, JCZ & JW2 3295*, *LCH & BHW 7480*, *AMP & SAP 4890*, *JJK 82*, *104* (SRSC).

Halimolobos diffusa (A. Gray) O.E. Schulz—Diffuse halimolobos—Uncommon perennial herb/forb, generally less shaded, rocky slopes with moderate sloping; JPW, POW, GGR, up to 7800 ft; *BHW 7512* (TEX-LL & SRSC); *BHW 23086*, *JJK 274*, *348* (SRSC). Both author collections found on south facing slopes at 7800 ft and 6500 ft.

Hesperidanthus linearifolius (A. Gray) Rydb.—Mountain mustard—[*Streptanthus linearifolius* A. Gray; *Sisymbrium linearifolium* (A. Gray); *Schoenocrambe linearifloia* (A. Gray) Rollins; *Thelypodium linearifolium* (A. Gray) S. Watson] Occasional perennial herb/forb, variable habitat, shaded/unshaded, fine to rocky soils at all elevations; JPW, POW, MCH; *JLN 04-09-16-04*, *WRC 28469*, *SCB & DM 534* (TEX-LL); *BHW 7490*, *JJK 19*, *169*, *281*, *407* (SRSC).

Lepidium sordidum A. Gray—Sordid pepperweed—Occasional to common perennial herb/forb, "common ind dry sand and igneous gravel in bed of seasonally dry stock tank, elev. ca. 5920"; SAS, JPW; *WRC 16848* (TEX-LL); *PRM 4034* (SRSC).

◊*Lepidium virginicum* L.—Virginia pepperweed—Uncommon annual or perennial herb/forb, unshaded, deep soils near Fortyeight Tank; JPW, GGR, 6100 ft; *JJK 163* (SRSC). Locally frequent.

Noccaea fendleri (A. Gray) Holub—Fendler pennycress—[*Thlaspi montanum* L. var. *fendleri* (A. Gray) P.K. Holmgren] Uncommon perennial herb/forb, "Madera Canyon, Mount Livermore"; *LCH s.n* (TEX-LL & SRSC).

Pennellia longifolia (Benth.) Rollins—Pennellia—Uncommon perennial herb/forb, generally rocky, shaded soils with variable sloping; JPW, POW, 6000–8100 ft; *LCH s.n.* (TEX-LL & SRSC); *LCH 4751*, *PRM & ME 5018*, *PRM, JCZ & KC 3461*, *BHW 7509*, *JJK 408* (SRSC). In Texas, only known from the Davis Mountains. Also found in Colorado, New Mexico, and Arizona.

Pennellia micrantha (A. Gray) Nieuwl.—Pennellia—Uncommon to occasional perennial herb/forb, less shaded, less rocky soils with moderate sloping; JPW, POW; generally not past 7000 ft; *LCH & BHW 7384*, *JJK 385* (SRSC).

Thelypodium wrightii A. Gray—Wright thelypody—Uncommon to occasional perennial herb/forb; very rocky soils with slight to no sloping; MCH, up to 8100 ft; *MSY s.n.* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH & BHW 7407*, *ML 293*, *SCB & DM 523*, *JJK 219* (SRSC).

Cactaceae

Cylindropuntia imbricata (Haw.) F.M. Knuth var. *imbricata*—Tree cholla—Occasional succulent, unshaded, rocky soils with moderate sloping; JPW, GGR, up to 6500 ft; *CLK 20* (SRSC).

√*Echinocereus dasyacanthus* Engelm.—Rainbow cactus—Occasional succulent, generally more shaded, rocky soils with variable sloping; JPW, POW, MCH, up to 8000 ft; *JJK s.n.*, photographic records.

√*Echinocereus triglochidiatus* Engelm.—Claret cup—[*Echinocereus coccineus* Engelm.] Uncommon to occasional succulent, generally less shaded, rocky soils with moderate to no sloping; JPW, MCH, up to 8200 ft; *JJK s.n.*, photographic records.

Echinocereus viridiflorus Engelm var. *weedinii* A.D. Zimmerman—Weedin's smallflower hedgehog cactus—Occasional succulent, generally shaded, rocky, shallow soils; POW, MCH, up to 8200 ft; *DK, JM & RM 135*, *PRM 1048*, *JJK 168* (SRSC).

√*Mammillaria meiacantha* Engelm.—Nipple cactus—Uncommon succulent, mostly in rock cracks and crevices in shaded areas, generally near some water source; JPW, POW, up to 7000 ft; *JJK s.n.*, photographic records.

Opuntia engelmannii Salm-dyck ex Engelm. var. *engelmannii*—Engelmann pricklypear—Occasional succulent, less shaded, rocky soils with slight to no sloping; JPW, up to 6300 ft; *LCH s.n.* (TEX-LL), *JJK s.n.,* photographic records.

Opuntia phaeacantha Engelm.—Brownspine pricklypear—Uncommon succulent, less shaded, rocky soils with slight to no sloping; JPW up to 6600 ft; *LCH s.n.* (TEX-LL & SRSC); *CLK 6* (SRSC).

Opuntia polyacantha Haw. var. ***polyacantha***—Starvation cactus—Uncommon (G5T5S1) succulent, less shaded, rocky soils or crevices of rock faces; JPW, MCH, POW; up to 8000 ft; *LCH 195* (TEX-LL & SRSC); *JFW 912*, *PRM 1043*, *AMP 6052*, *JJK 106* (SRSC).

Campanulaceae

Campanula rotundifolia All. ex Steud.—Bellflower—Occasional perennial herb/forb, shaded, deep soils with steep to moderate sloping; POW, up to 7800 ft; *EJP 32012*, *DSC 33745*, *AMP & DF*

1495, *BCT s.n.*, *MSY s.n.* (TEX-LL); *AMP, SAP, JW & BC 3211*, *LCH s.n.*, *103* (TEX-LL & SRSC); *PG 272*, *PRM, JCZ & JW2 3293*, *SCB & DM 534*, *LCH & BHW 7377*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 241, *JJK 80*, *88*, *334* (SRSC).

Lobelia fenestralis Cav.—Leafy lobelia—Annual or perennial herb/forb, "occasional in grassland component of open woodland on gravelly soil on nearly level topography in canyons and valley flats, elev. 5900–5960 ft"; JPW; *LCH 1055*, *WRC, TW & BF 26282*, *WRC 28398* (TEX-LL); *PG 273*, *ML 305* (SRSC).

Cleomaceae

§*Polanisia uniglandulosa* (Cav.) DC.—Mexican clammyweed—Uncommon to occasional annual or perennial herb/forb, less shaded, sandy, gravelly soils near intermittent and perennial streams; SAS, JPW, up to 6100 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 24* (SRSC).

Caprifoliaceae

Lonicera albiflora Torr. & A. Gray—White honeysuckle—Rare shrub, "Madera Creek, near Mount Livermore"; *LCH s.n.* (TEX-LL &SRSC).

Sambucus nigra L. subsp. *cerulean* (Raff.) Bolli—Mexican elderberry—Uncommon shrub, unshaded, less rocky soils with moderate sloping; POW, MCH, 7200–7500 ft; *EJP 31033* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *AMP, SAP & JMP 5290*, *JPK 2002-08097-8*, *PRM 3534*, *JJK 175* (SRSC).

Symphoricarpos palmeri G.N. Jones—Palmer snowberry—Occasional to common shrub, unshaded rocky soils with moderate to steep sloping; MCH, mostly above 6000 ft; *EJP 30777*, *DSC 33732*, *CHM 8345* (TEX-LL); *LCH s.n.*, *AMP, SAP, JW & BC 3207*, *AMP & SAP 4900*, *AMP & SAP 3912* (TEX-LL & SRSC); *AMP, SAP & JMP 5281*, *BHW 7472*, *23325, ML 291*, *LCH & BHW 4133*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 269, *JJK 67* (SRSC).

Caryophyllaceae

Arenaria lanuginosa (Michx.) Rohrb.—Sandwort—Perennial herb/forb, "Frequent in woodland of *Quercus emoryi*, *Juniperus deppeana*, and *Pinus cembroides*, and occasional *P. ponderosa* in dry, sandy-gravelly soil on rocky igneous slopes, elev. ca. 5900 ft"; JPW, up to 7500 ft; *WRC 16825* (TEX-LL); *BHW 23201* (TEX-LL & SRSC); *BHW 13503*, *23198* (SRSC).

★-DM ***Arenaria livermorensis Correll***—Livermore sandwort—Rare (G1S1) perennial herb/forb, "Rare on north and south faces of mostly vertical, igneous boulders at the highest elevations of Mount Livermore"; MCH, above 7800 ft; *WRC, JMP & ATK 29198*, *WRC, TS & JPK 26316* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH 93*, *PRM 3542*, *BHW 7488* (SRSC).

Arenaria ludens Shinners—Trans-Pecos sandwort—Occasional annual herb/forb, shaded, rocky soils with moderate sloping; POW, 6500–8100 ft; *EJP 32047*, *WRC, JPK, TW & BF 26292*, *26291*, *DSC 33754* (TEX-LL); *BHW 13503*, *LCH s.n.* (TEX-LL & SRSC); *BHW 23023*, *23312*, *23197*, *LCH 4755*, *AMP, SAP & JMM 3514*, *LCH & BHW 7419*, *PRM 5026*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 255*, *JJK 134* (SRSC).

Cerastium axillare Correll—Mouse-ear chickweed—Uncommon annual herb/forb, less shaded, rocky soils with moderate sloping; MCH, up to 8000 ft; *DSC 33761*, *33753*, *WRC, TS & JPK 26315* (TEX-LL); *LCH & BHW 7437*, *BHW 23060* (TEX-LL & SRSC); *BHW 23331*, *LCH s.n.*, *593*, *JJK 114*, *177* (SRSC). Restricted to the Trans-Pecos in Texas. Also found in New Mexico.

Drymaria laxiflora Benth.—Trans-Pecos drymary—Perennial herb/forb, "Occasional on massive outcrops of igneous rock in open areas and forested, mesic canyons, elev. 7800–8100 ft"; *DSC 33743*, *WRC 26321*, *WRC, TW & BF 26302* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *BHW 23055*, *AMP, SAP & JMP 5270*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 260* (SRSC).

Drymaria leptophylla (Cham. & Schltdl.) Fenzl ex Rohrb.—Drymary—Annual herb/forb, "Infrequent annual on north slope of Mount Livermore, elev. 7500 ft"; *BHW 23216* (SRSC).

Drymaria molluginea (Ser.) Didr.—Drymary—Annual herb/forb, "Infrequent annual in igneous soil on upper Madera Canyon of Mount Livermore, elev. 7500 ft"; *LCH s.n.*, *BHW 23055* (TEX-LL & SRSC); *BHW 23009*, *23212* (SRSC)

Eremogone fendleri (A. Gray) Ikonn.—Fendler sandwort—[*Arenaria fendleri* A. Gray] Uncommon perennial herb/forb, less shaded, rocky soils with slight to no sloping; MCH, above 7800 ft; *MCJ 12446*, *MSY s.n.*, *DSC 33736* (TEX-LL); *BHW 23316*, *LCH & BHW 6459*, *EJP 32028*, *LCH s.n.*, *AMP & SAP 3923*, *AMP, SAP, JW & BC 3202* (TEX-LL & SRSC); *PRM 5025*, *3539*, *HGC s.n.*, *AMP & SAP 4908*, *4919*, *JJK 8*, *76*, *325* (SRSC). Seemingly confined to high elevations on Mount Livermore.

Paronychia jamesii Torr. & A. Gray—James nailwort—Perennial herb/forb, "Occasional in herbaceous vegetation on sand and gravel among rhyolite rocks in dry bed of overflow channel of creek in bottom of open wooded canyons, elev. 5900–6000 ft"; *WRC 16842*, *WRC, TW & BF 26271* (TEX-LL); *BHW 23211* (SRSC).

Paronychia monticola Cory—Livermore nailwort—Rare perennial herb/forb, unshaded, sparsely vegetated, bald, igneous rock; MCH, 8000–8100 ft; *WRC, JPK, TW & BF 26296* (TEX-LL); *JJK 379* (SRSC). One population found near the west-facing base of Baldy Peak Summit.

Silene laciniata Cav. var. *greggii* (A. Gray) S. Watson—Mexican campion—Occasional perennial herb/forb, generally less shaded, rocky soils with moderate sloping; MCH, POW; up to 8300 ft; *WRC 19070*, *RDW 3337*, *AMP & DF 1497*, *DSC 33737*, *MSY s.n.* (TEX-LL); *LCH & BHW 7481*, *EJP 32065*, *LCH s.n.* (TEX-LL & SRSC), *SCB & DM 552*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 249*, *JJK 52*, *78* (SRSC).

Stellaria cuspidata Willd. Ex D.F.K Schltdl.—Mexican starwort—Uncommon annual herb/forb, shaded, less rocky soils with moderate sloping; POW, up to 8000 ft; *WRC 19072*, *DSC 33752*, *EJP 32051* (TEX-LL); *LCH s.n., 633*, *LCH & BHW 7425* (TEX-LL & SRSC); *BHW 23018*, *23073*, *LCH & BHW 4148*, *JJK 172* (SRSC).

Celastraceae

Celastrus scandens L.—Climbing bittersweet—Rare herbaceous vine, "Elbow Canyon, near Pine Peak"; *LCH 3288x* (NYBG); *LCH s.n.* (TEX-LL & SRSC); *LCH 1108* (NYBG & SRSC).

Chenopodiaceae

◊*Chenodpodium fremontii* S. Watson—Fremont goosefoot—Uncommon annual herb/forb, mostly shaded, less rocky soils with slight sloping; POW, JPW, 7100 ft; *JJK 372* (SRSC). One individual found on east face of Whitetail Mountain.

√*Chenopodium desiccatum* A. Nelson—Thickleaf goosefoot—[*Chenopodium pratericola* Rydb.] Occasional annual herb/forb, less shaded, fine to rocky soils with moderate to no sloping; JPW, MCH, POW, 7800 ft; *JJK 164* (SRSC).

Chenopodium neomexicanum Standl.—New Mexico goosefoot—Uncommon to occasional annual herb/forb, mostly shaded, rocky soils with moderate sloping; POW, up to 7800 ft; *LCH s.n.* (TEX-LL). Observed at the highest elevation of the Pine-Oak Woodland (Henrickson & Johnston 1986) on the north side of Mount Livermore.

❖*Dysphania graveolens* (Willd.) Mosyakin & Clemants—Ragleaf goosefoot—[*Chenopodium graveolens* Willd.] Both introduced and native, occasional to common annual herb/forb, variable habitat, shaded/unshaded, less rocky soils with steep to moderate sloping; POW, MCH, 5800–8000 ft; *LCH s.n.*, *WRC 26311* (TEX-LL); *AMP, SAP & JMM 3499*, *AMP, SAP & JMM 5275*, *BHW 7495*, *LCH & BHW 7439* (SRSC).

√⃠ *Salsola tragus* L.—Russian thistle—Invasive, uncommon annual herb/forb, unshaded, fine to rocky soils with slight to no slop-

ing; JPW, up to 7200 ft; *JJK 249* (SRSC). Two populations found along Crest Trail, and one at Pine Peak Tank.

Convolvulaceae

Dichondra argentea Humb. & Bonpl. ex Willd.—Silver ponyfoot—Perennial herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL).

Dichondra brachypoda Wooton & Standl.—New Mexico ponyfoot—Occasional perennial herb/forb, generally more shaded, less rocky soils with slight to no sloping; JPW, POW, up to 7200 ft; *SCB & DM 461*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 229 (SRSC).

√*Evolvulus sericeus* Sw.—Silky evolvulus—Uncommon perennial herb/forb, less shaded, less rocky soils with moderate to no sloping; JPW, up to 6800 ft; *JJK 157*, *152* (SRSC). Observed on Limpia Spring Trail and along creek beds between Jones and Fortyeight Tank.

Ipomoea costellata Torr.—Crestrib morning-glory—Rare herbaceous vine, annual, shaded, less rocky soils; POW, 6200 ft; *LCH s.n*. (TEX-LL), *JJK 235* (SRSC). One individual found ca. 3.8 miles south on Madera Canyon Road.

Ipomoea cristulata Hallier f.—Scarlet morning-glory—Occasional herbaceous vine, annual, shaded to less shaded soils with little to no sloping; JPW, POW, up to 7200 ft; *WRC 19086* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *AMP & SAP 4891*, *5277*, *SCB & DM 510* (SRSC).

√*Ipomoea hederacea* Jacq.—Ivyleaf morning-glory—Occasional herbaceous vine, annual, shaded, fine soils with slight to no sloping; POW, JPW, 7200 ft; *JJK s.n.*, photographic records.

Ipomoea dumetorum Wild. ex Roem. & Schult.—Railwaycreeper—Herbaceous vine, annual, "infrequent in igneous soil in upper Madera Canyon of Mount Livermore, elev. 7500 ft"; *LCH s.n.* (TEX-LL & SRSC); *AMP, SAP & JMP 5266*, *5267*, *5273*, *BHW 23011*, *23068*, *LCH & BHW 7452* (SRSC).

Ipomoea lindheimeri A. Gray—Lindheimer morning-glory—Occasional herbaceous vine, annual, shaded to less shaded, rocky soils with moderate to slight sloping; JPW, POW, up to 7500 ft; *PRM 4054*, *SCB & DM 470*, *AMP & SAP 3930*, *AMP, SAP & JMP 5283*, *JJK 224* (SRSC).

Crassulaceae

Echeveria strictiflora A. Gray—Longpetal echeveria—Rare to uncommon perennial semi-succulent, crevices in rocks and rock faces; JPW, POW, MCH, 6400–7400 ft; *MSY s.n.* (TEX-LL); *KL, SAR, BJW, JCZ, LH2, JPK & PRM 233* (SRSC).

Sedum cockerellii Britton—Cockerell stonecrop—Uncommon perennial semi-succulent (G4S1), crevices of rock faces in shaded areas, mostly near some water source; MCH, POW, up to 8200 ft; *MCJ & CD 12399*, *DSC 33749*, *BHW 7507*, *BHW 7420*, *LHC s.n.*, *923* (TEX-LL & SRSC); *BHW 23209*, *PRM 5020*, *LCH & BHW 7475*, *AMP & SAP 3909*, *AMP, SAP, JW & BC 3215*, *JJK 62*, *283*, *394* (SRSC).

Sedum wrightii A. Gray—Wright stonecrop—Perennial semi-succulent, "Northeast slopes near Madera Canyon and near the peak of Mount Livermore"; *MSY s.n.* (TEX-LL); *ML 297*, *AMP, SAP & JMM 3513*, *AMP & SAP 4914* (SRSC).

Cucurbitaceae

Cyclanthera dissecta (Torr. & A. Gray) Arn.—Cutleaf cyclanthera—Occasional herbaceous vine, annual, less shaded, rocky soils with moderate to steep slopes; MCH, up to 8200 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 487*, *JJK 34*, *380* (SRSC).

Sicyos laciniatus L.—Oneseed bur-cucumber—Occasional herbaceous vine, annual, shaded to less shaded, rocky soils; MCH, POW, up to 8200 ft; *AMP & SAP 3924* (TEX-LL & SRSC); *ML* 313 (SRSC).

Sicyos microphyllus Kunth—Small-leaf bur-cucumber—Occasional to common herbaceous vine, annual, shaded to less shaded, rocky soils with variable sloping; MCH, POW, up to 8200 ft; *DSC 33742*, *MCJ s.n.* (TEX-LL); *LCH & BHW 7456*, *LCH s.n.* (TEX-LL & SRSC); *PRM, JCZ & JW2 3292*, *BHW 23105*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 278*, *JJK 63* (SRSC).

Ericaceae

Arbutus xalapensis Kunth—Texas madrone—Occasional tree, less shaded to shaded, less rocky soils with moderate to slight sloping; POW, JPW, up to 7500 ft; *DA 282* (TEX-LL), *LCH 2652*, *3654*, *SCB & DM 520*, *CN s.n.*, *CLK 18*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 258* (SRSC).

Euphorbiaceae

Acalypha neomexicana Müll. Arg.—New Mexico copperleaf—Occasional to common annual herb/forb, "on rocky rhyolite slope supporting a *Pinus cembroides-Juniperus deppeana-Quercus emoryi-Q. grisea* woodland, elev. 6000–6020 ft"; JPW; *WRC 28418* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC).

Acalypha phleoides Cav.—Lindheimer copperleaf—[*Acalypha lindheimeri* Müll. Arg.] Annual herb/forb, "Common, in rhyolite gravel and silt in dry creekbed partially shaded by *Pinus cembroides*, elev. 5090 ft"; *WRC 28453*, *LCH s.n.* (TEX-LL).

◊*Croton lindheimerianus* Scheele—Lindheimer croton—Uncommon annual herb/forb, less shaded, rocky to gravelly soils with slight sloping; JPW, 6200 ft; *JJK 298* (SRSC).

Ditaxis humilis (Engelm. & A. Gray) Pax—Low wildmercury—[*Aphora humilis* Engelm. & A. Gray; *Argythamnia humilis* (Engelm. & A. Gray) Müll. Arg.] Perennial herb/forb, "Rare, in grassland with scattered *Juniperus deppeana,* gentle colluvial slope derived from rhyolite, elev. 6000–6060 ft"; *WRC 28462* (TEX-LL).

◊*Ditaxis neomexicana* (Müll. Arg.) A. Heller—New Mexico wildmercury—[*Argythamnia neomexicana* Müll. Arg.] Uncommon annual or perennial herb/forb, less shaded, rocky soils with moderate sloping; JPW, GGR, 6200 ft; *JJK 343* (SRSC). One individual found on south facing hillside directly north of the MCC.

√*Euphorbia albomarginata* Torr. & A. Gray—Rattlesnake weed—[*Chamaesyce albomarginata* (Torr. & A. Gray) Small] Occasional perennial herb/forb, less shaded, rocky to gravelly soils along dry creek beds; JPW, SAS, 6100 ft; *JJK 159* (SRSC).

Euphorbia bifurcata Engelm.—Forked spruge—Common annual herb/forb, shaded, rocky to gravelly soils near intermittent and perennial streams; POW, up to 7500 ft; *WRC 19085* (TEX-LL), *AMP & SAP 4887*, *LCH & BHW 7411*, *LCH s.n.* (TEX-LL & SRSC); *PRM 5023*, *SCB & DM 478*, *BCT 291*, *BHW 23071*, *JJK 69* (SRSC).

Euphorbia bilobata Engelm.—Blackseed spurge—Occasional to common annual herb/forb, "On northeast flank of Mount Livermore, along bladed road between Bridge Gap and foot of Baldy Peak, frequent in rubble of igneous rock, elev. 8000–8100 ft"; *WRC, JMP & LH2 16828*, *WRC 26305* (TEX-LL).

Euphorbia brachycera Engelm.—Spurge—Occasional perennial herb/forb, shaded, gravelly or silty soils near intermittent and perennial streams, but often found on steep rocky slopes in higher elevations; POW up to 7100 ft; *WRC 19076*, *28424*, *LCH s.n.* (TEX-LL); *LCH 4754*, *AFJ 56*, *JJK 130*, *336* (SRSC).

◊*Euphorbia cyathophora* Murray—Narrowleaf poinsettia—[*Poinsettia cyathophora* (Murray) Bartl.] Rare to uncommon annual or perennial herb/forb, shaded, gravelly soils near intermittent and perennial streams; POW, 6400 ft; *JJK 13* (SRSC). One population found on Pine Canyon Trail along a mostly dry Madera Creek tributary.

Euphorbia dentata Michx.—Toothed spurge—[*Poinsettia dentata* (Michx.) Klotzch & Garke] Annual herb/forb, "Mount Livermore, west ridge, Goat Canyon"; *LCH s.n.*, *s.n.* (SRSC).

Euphorbia eriantha Benth.—Beetle spurge—Annual herb/forb, "Occasional, in herbaceous vegetation in sand and gravel among boulders of rhyolite in bed of wet-weather stream drain-

ing wooded mountain slopes, elev. 6000–6020 ft"; *WRC 28413* (TEX-LL). No Jeff Davis County collections at SRSC.

Euphorbia indivisa (Engelm.) Tidestr.—Pine spurge—[*Chamaesyce indivisa* (Engelm.) Boiss.] Occasional to common annual herb/forb, less shaded, less rocky soils with slight sloping; JPW, GGR, 6000 ft; *WRC 28416* (TEX-LL); *JJK 290* (SRSC).

Euphorbia maculata L.—Spotted matspurge—[*Chamaesyce maculata* (L.) Small] Annual herb/forb, "Occasional in grassland component of open woodland on gravelly soil on nearly level topography in bottom of broad canyon, elev. ca. 5900; JPW; *WRC, TW & BF 26281* (TEX-LL). No Jeff Davis County collections at SRSC.

Euphorbia nutans Lag.—Nodding spurge—[*Chamaesyce nutans* (Lag.) Small] Occasional annual or perennial herb/forb, "common, in igneous gravel and silt mostly unshaded bed of intermittent stream draing forested rhyolite slopes, elev. 6080–6100 ft"; POW, SAS; *WRC 28439* (TEX-LL); *BHW 13500* (TEX-LL & SRSC).

Euphorbia serpillifolia Pers.—Thymeleaf spurge—[*Chamaesyce serpillifolia* (Pers.) Small] Common annual or perennial herb/forb, less shaded to shaded, less rocky to gravelly soils often near intermittent and perennial streams; POW, SAS, up to 6500 ft; *WRC, JMP & AT 29204*, *WRC 28401*, *28417-B* (TEX-LL); *LCH s.n.*, *LCH & BHW 7380* (TEX-LL & SRSC); *JJK 70*, *160* (SRSC).

§*Phyllanthus polygonoides* Nutt. ex Spreng.—Knotweed leaf-flower—Uncommon perennial herb/forb, less shaded, rocky soils with moderate sloping; JPW, GGR, 6300 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 356* (SRSC). One individual found on south facing hillside directly north of the MCC.

Tragia amblyodonta (Müll. Arg.) Pax & K. Hoffm.—Noseburn—Occasional perennial herb/forb, generally less shaded, rocky soils with steep to moderate sloping; JPW, POW, up to 7500 ft; *WRC 28428* (TEX-LL); *LCH & BHW 7434*, *JJK 146* (SRSC).

Fabaceae

√*Acacia angustissima* (Mill.) Kuntze var. *chisosiana* Isely—Fern acacia—Uncommon perennial herb/forb, less shaded, rocky soils with moderate sloping; JPW, 6600 ft; *JJK 368* (SRSC). One population found on east face of McDaniel Mountain.

Acacia angustissima (Mill.) Kuntze var. *hirta* (Nutt.) B.L. Rob.—Fern acacia—Perennial herb/forb, "uncommon, steep slope, rocky soil, elev. 2155 m (7070 ft)"; *SCB & DM 498* (SRSC). "Wolf Den Canyon".

Astragalus giganteus S. Watson—Giant loco—Uncommon (G4S1) perennial herb/forb, less shaded, rocky soils beneath bluffs at high elevations on Mount Livermore; MCH, POW, generally well above 6000 ft; *LCH s.n.* (TEX-LL); *LCH & BHW 7396* (TEX-LL & SRSC); *LCH 4131*, *BHW 23332*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 281, *JJK 22* (SRSC). In Texas, known from only the Davis and Chinati Mountains based on voucher specimens from TEX-LL and SRSC.

Astragalus humistratus A. Gray—Loco—Rare perennial herb/forb, mostly shaded, less rocky soils with slight to no sloping; POW, 6600–7800 ft; *LCH 621* (NYBG); *LCH 1206* (TEX-LL); *LCH & BHW 7393* (TEX-LL & SRSC); *BHW 23330*, *PRM 3396*, *LCH 4756*, *JJK 137*, *340* (TEX-LL & SRSC). In Texas, only known from Brewster and Jeff Davis Counties (Turner et al. 2003).

Astragalus mollissimus Torr. var. *earlei* (Greene ex Rydb.) Tidestr.—Earle loco—Uncommon perennial herb/forb, unshaded, less rocky soils with slight to no sloping; JPW, GGR, up to 6200 ft; *WRC 28440*, *BHW T3* (TEX-LL); *LCH 532* (TEX-LL & SRSC); *LCH s.n.*, *PRM 3391*, *JJK 92* (SRSC). Frequent locally at Fortyeight Tank.

Calliandra humilis Benth.—Dwarf calliandra—Rare perennial herb/forb, less shaded, sandy to gravelly soils with no sloping; JPW, GGR, up to 6500 ft; *LCH 396* (NYBG); *WRC, LH & JMP 16826*, *WRC, TW & BF 26272*, *LCH s.n.* (TEX-LL); *LCH & BHW 7485* (TEX-LL & SRSC); *LCH 4757*, *BHW 28445*, *JJK 31* (SRSC). One population found on Right Hand Loop Road at 6100 ft.

Clitoria mariana L.—Atlantic pigeonwings—Herbaceous vine, perennial, "Madera Canyon, infrequent in understory"; JPW, POW; *AMB & AR 1*, *s.n.* (SRSC). First record in western Texas, growing in sandy, loamy soil, elev. 1900 m (6230 ft), 14 Aug 2003 (Oswald et al. 2004).

Cologania angustifolia Kunth—Longleaf cologania—Occasional to common herbaceous vine, perennial, less shaded to shaded, less rocky soils with slight to no sloping; JPW, POW, up to 7100 ft; *WRC 28444* (TEX-LL); *PG 270a*, *SCB & DM 459*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 228*, *BHW 13504*, *AMP, SAP & JMM 3502*, *AMP & SAP4932* (SRSC).

Dalea frutescens A. Gray—Black dalea—Uncommon sub-shrub, less shaded, rocky soils with moderate sloping; JPW, up to 6600 ft; *MCJ & CD 12404* (TEX-LL*) JJK 301*, *252* (SRSC).

Dalea polygonoides A. Gray—Sixweeks dalea—Uncommon to occasional annual herb/forb, shaded, sandy to gravelly soils near intermittent and perennial streams; POW, SAS, up to 7500 ft; *DSC 33767* (TEX-LL); *LCH 65*, *BHW 7387* (TEX-LL & SRSC); *AMP, SAP & JMM 3515*, *AMP & SAP 3936*, *BHW 23220*, *PRM 4019*, *ML 319*, *JJK 391* (SRSC). In Texas, confined to the higher Davis and Chisos Mountains, based on voucher specimens.

Desmanthus cooleyi (Eaton) Branner & Coville—Cooley bundle-flower—Rare sub-shrub, mostly shaded, less rocky soils with moderate sloping; POW, JPW, 7400 ft; *LCH s.n.* (TEX-LL); *JJK 154* (SRSC). One individual observed at the beginning of Limpia Chute Trail.

Desmodium grahamii A. Gray—Graham tickseed—Occasional to common perennial herb/forb, mostly shaded, rocky to less rocky soils with variable sloping; POW, JPW, up to 7500 ft; *WRC 16845*, *28454*, *SCB & DM 469* (TEX-LL); *LCH s.n.*, *AMP, SAP, JW & BC 3209* (TEX-LL & SRSC); *SCB & DM 544*, *PG 271*, *BHW 7508*, *JJK 71*, *12*, *42*, *46* (SRSC).

Desmodium neomexicanum A. Gray—New Mexico tickseed—Occasional to common annual herb/forb, mostly shaded, rocky to less rocky soils with variable sloping; POW, JPW, up to 7400 ft; *BHW 13513*, *JJK 35*, *72* (SRSC).

Lathyrus graminifolius (S. Watson) T.G. White—Grassleaf peavine—Uncommon perennial herb/forb, mostly shaded, deep, less rocky soils with moderate to steep sloping; POW, up to 8000 ft; *DSC 33731*, *LCH s.n.* (TEX-LL); *LCH 352*, *4753*, *PRM 3537*, *5024*, *SCB & DM 570*, *BHW 23314*, *AMP & SAP 4934*, *4924*, *JJK 10, 48*, *68* (SRSC).

Lotus plebeius (Brandegee) Barneby—Pine deervetch—[*Lotus oroboides* (Kunth) Ottley var. plebius (Brandegee) Ottley] Occasional to common perennial herb/forb, less shaded to shaded, rocky soils with moderate to slight sloping; POW, JPW, up to 7300 ft; *LCH s.n.*, *WRC 28446* (TEX-LL); *SCB & DM 542*, *LCH & BHW 7379*, *JJK 30*, *286*, *295* (SRSC).

Macroptilium gibbosifolium (Ortega) A. Delgado—Variableleaf bushbean—Perennial herb/forb, "Growing on both sides of the road before the cabin"; *PG 270* (SRSC).

Mimosa aculeaticarpa Ortega var. *biuncifera* (Benth.) Barneby—Catclaw mimosa—Occasional to common shrub, less shaded, rocky soils with moderate to no sloping; JPW, GGR, up to 6400 ft; *LCH 499* (NYBG); *LCH s.n.*, (TEX-LL & SRSC); *CLK 3*, *4* (SRSC).

§*Mimosa dysocarpa* Benth.—Velvetpod mimosa—Rare shrub, less shaded, rocky to gravelly soils with moderate sloping; JPW, 6800 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 151* (SRSC). One individual found on Limpia Spring Trail.

§*Phaseolus maculatus* Scheele—Metcalfe bean—Uncommon herbaceous vine, perennial, less shaded, rocky to gravelly soils

with moderate sloping; JPW, 6800 ft; *LCH s.n.* (TEX-LL); *JJK 320* (SRSC). One individual found on Limpia Spring Trail.

√*Prosopis glandulosa* Torr.—Western honey mesquite—Uncommon shrub, unshaded, less rocky soils with no sloping; JPW, 6300 ft; *JJK s.n.*, photographic record. Observed along Right Hand Canyon Road.

§*Rhynchosia senna* Gilles ex Hook. var. *texana* (Torr. & A. Gray) M.C. Johnst.—Texas snoutbean—Uncommon to occasional perennial herb/forb, mostly shaded, less rocky soils of dry beds near intermittent creeks; POW, JPW, up to 6300 ft; *LCH s.n.* (TEX-LL & SRSC), *JJK 121* (SRSC).

◊*Vicia ludoviciana* Nutt. ex Torr. & A. Gray—Louisiana vetch—Uncommon herbaceous vine, annual, shaded, deep, less rocky soils with slight to moderate sloping; POW, 6200 ft; *JJK 131* (SRSC). Found in Madera Canyon just north of the pipe gates.

Fagaceae

Quercus depressipes Trel.—Mexican dwarf oak—Rare (G3S1) shrub, unshaded, rocky soils at the base of Baldy Peak summit; MCH, 8000 ft; *CHM 8346*, *CD 75123A8*, *75123A1* (TEX-LL); *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 275, *LH2 s.n.* (SRSC). In Texas and the United States, confined to Mount Livermore (Poole et al. 2007).

Quercus emoryi Torr.—Emory oak—Occasional to common tree, less shaded, less rocky to rocky soils with slight to no sloping; JPW, up to 6300 ft; *LCH s.n.* (TEX-LL & SRSC); *CLK 5* (SRSC).

Quercus gambelii Nutt.—Gambel oak—Occasional to common tree, shaded to unshaded, rocky soils with moderate to steep sloping, MCH, POW, generally above 7800 ft; *MSY s.n.*, *CHM 8343*, *8351* (TEX-LL); *CHM 8344*, *8347*, *8348*; *AMP, SAP, JW & BC 3208*, *AMP & SAP 3919*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 270*, *EJP 32031*, *LCH s.n.*, *1160*, *989*, *BHW s.n.* (TEX-LL & SRSC); *BHW 23012*, *23327*, *PRM 3394*, *LCH & BHW 7429*, *7437*, *JJK 103* (SRSC).

Quercus gambellii × *grisea*—Uncommon tree, "Mount Livermore, high ridge south of the peak"; *AMP & SAP 3910*, *EJP 32025*, *LCH s.n.* (TEX-LL).

Quercus gravesii Sudw.—Chisos red oak—Occasional tree, less shaded, rocky soils generally near intermittent and perennial streams; JPW, up to 6300 ft; *EJP 30962*, *LCH s.n.*, *1030*, *148* (TEX-LL); *LCH 1029*, *SCB & DM 503*, *543*, *CLK 8*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 287*, *JJK 91* (SRSC).

Quercus grisea Liebm.—Gray oak—Abundant tree, ubiquitous; *RDW 5171* (TEX-LL); *AMP & SAP 3905*, *3915*, *3918*, *4901*, *4927*, *CHM 8349* (TEX-LL & SRSC); *LCH s.n.*, *AMP & SAP 3931*, *4902*, *4904*, *JPK 2512*, *ML 310*, *PRM 3232*, *CLK 9*, *SCB & DM 515*, *468*, *JJK 415* (SRSC).

Quercus hypoleucoides A. Camus—Whiteleaf oak—Occasional to common tree, mostly shaded, less rocky soils with moderate to steep sloping; POW, 6200–7800 ft; *WRC 28421*, *DSC 13549*, *MCJ & CD 12401* (TEX-LL); *BHW 21718*, *6501*, *LCH s.n.*, *CHM 8354*, *8342* (TEX-LL & SRSC); *CLK 16*, *PRM 3390*, *SCB & DM 479*, *549*, *OES s.n.* (SRSC).

Quercus muehlenbergii Engelm.—Chinkapin oak— Rare tree, "Tobe Canyon, below Tobe Spring"; *JPK 2513* (SRSC).

Quercus rugosa Née—Netleaf oak—Rare tree, "Mount Livermore, in tributary of Limpia Canyon, shaded area in wash"; *ST s.n.* (TEX-LL); *LCH 3* (TEX-LL & SRSC); *JLB, SCC, MPG, TOH, EFM, JPK & JCZ 27* (SRSC).

Gentianaceae

Gentiana affinis Griseb.—Bigelow gentian—[*Gentiana bigelovii* A. Gray] Rare to uncommon perennial herb/forb, mostly shaded, rocky soils with slight sloping; JPW, 7200–8000 ft; *LCH 1065* (TEX-LL & SRSC); *ML 314*, *JJK 250* (SRSC).

Geraniaceae

Geranium caespitosum James—Tufted geranium—[*Geranium atropurpureum* A. Heller] Occasional to common perennial herb/forb, shaded, less rocky soils with moderate sloping; POW, JPW, up to 7500 ft; *DSC 33746*, *MSY s.n.* (TEX-LL); *AMP & SAP 3911*, *4896*, *LCH s.n.*, (TEX-LL & SRSC); *LCH 3285*, *SCB & DM 566*, *AFJ 57*, *ML 315*, *PRM, JCZ & JW2 3281*, *AMP, SAP, JW & BC 3213*, *LCH & BHW 7395*, *BHW 23313*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 247, *JJK 66* (SRSC).

§*Geranium seemannii* Peyr.—Seemann geranium—Rare perennial herb/forb, shaded, less rocky soils with moderate sloping; POW, 7200–8000 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 268*, *409* (SRSC). First collections in the U.S. since 1936. One population in Short Pine Canyon near intermittent stream; one population near Tobe Spring.

Grossulariaceae

Ribes leptanthum A. Gray—Trumpet gooseberry—Rare shrub, less shaded, rocky soils with steep sloping; MCH, POW, 7800 ft; *LCH 296* (TEX-LL & SRSC); *BHW 23103*, *23083*, *PRM 3542*, *AMP, SAP & JMP 5292*, *JJK 174* (SRSC).

Hydrangeaceae

Fendlera rupicola Engelm. & A. Gray var. *rupicola*—Cliff fendlerbush—Uncommon to occasional shrub, less shaded, rocky soils with moderate sloping; MCH, POW, all elevations; *WRC 19077* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *CLK 13*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 243*, *BHW 7491*, *ML 288*, *AMP, SAP, JW & BC 3198* (SRSC).

Philadelphus microphyllus A Gray. var. *crinitus* (C.L. Hitchc.) B.L. Turner—Bearded mockorange—Occasional shrub, less shaded, rocky soils and among boulders, sloping steep to moderate; MCH, POW, up to 8200 ft; *EJP 34347* (NYBG); *LCH s.n.* (TEX-LL & SRSC); *JJK 165* (SRSC).

Philadelphus microphyllus A. Gray var. *microphyllus*—Littleleaf mockorange—Occasional shrub, "fregquent among igneous boulders in bed of drainage in header of wooded mesic high–elevation canyon, elev. ca. 7100 ft; POW, MCH; *WRC 19068* (TEX-LL); *AMP & SAP 3913*, *4909*, *LCH s.n.*, *RM2 7492* (TEX-LL & SRSC).

Philadelphus serpyllifolius A. Gray—Thymeleaf mockorange—Occasional shrub, shaded, rocky, soils on northern slopes of Mount Livermore; MCH, POW, 7600–8100 ft; *WRC, JPK, TW & BF 26304* (TEX-LL); *JJK 64* (SRSC).

Hydrophyllaceae

Phacelia rupestris Greene—White curls—Occasional perennial herb/forb, mostly shaded, rocky soils with moderate sloping; MCH, POW, all elevations; *DSC 13541* (TEX-LL); *AMP & SAP 3922*, *LCH s.n.* (TEX-LL & SRSC); *JPK & KB s.n.*, *ML 292*, *LCH & BHW 7496*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 268*, *JJK 53* (SRSC).

Juglandaceae

Juglans major (Torr.) A. Heller—Arizona walnut—Uncommon to occasional tree, rocky/sandy/gravelly soils in and near intermittent and perennial streams; SAS, POW, JPW; up to 6600 ft; *EJP 32055* (TEX-LL); *KL, SAR, BJW, JCZ, LH2, JPK & PRM 285*, *CLK 12* (SRSC).

Krameriaceae

Krameria erecta Willd. ex Schult.—Range ratany—Uncommon subshrub, "Mount Livermore"; *LCH s.n.* (TEX-LL).

Lamiaceae

Agastache micrantha (A. Gray) Wooton & Standl.—White gianthyssop—Uncommon to occasional sub-shrub, shaded, mostly gravelly to rocky soils near intermittent and perennial streams, often found in deep soils on steep northern slopes as well; POW, SAS, JPW, up to 7900 ft; *LCH s.n.* (TEX-LL & SRSC); *ML 334*, *AMP & SAP 3942*, *AMP, SAP & JMM 3501*, *BHW 7621*, *JJK 269* (SRSC). In Texas, confined to Trans-Pecos (Turner et al. 2003).

Agastache pallidiflora (A. Heller) Rydb.—Purple hyssop—Uncommon perennial herb/forb, less shaded, rocky soils with

moderate sloping; JPW, POW, MCH, mostly above 5800 feet; *WRC, JPK, TW & BF 26309*, *DSC 33735*, *MSY s.n.* (TEX-LL); *LCH & BHW 7447*, *23024*, *LCH s.n.*, *BHW 23075*, *DK 1445*, *PRM, JCZ & JW2 3286*, *AMP & SAP 4918*, *ML 290*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 276*, *JJK 54* (SRSC). Most collections from above 7500 ft. In Texas, confined to Trans-Pecos (Turner et al. 2003).

Hedeoma plicata Torr.—Dwarf hedeoma—Uncommon to occasional perennial herb/forb, mostly shaded, rocky to gravelly soils with moderate to slight sloping; JPW, POW, up to 7800 ft; *LCH s.n.*, *AMP & DF 1498* (TEX-LL & SRSC); *PRM 5021*, *SCB & DM 551*, *BHW 13510*, *JJK 124* (SRSC). In Texas, confined to Trans-Pecos (Turner et al. 2003).

Monarda citriodora Cerv. ex Lag.—Lemon beebalm—Annual or perennial herb/forb, "infrequent annual at lower spring, Madera Canyon on Mount Livermore, elev. 7000 ft"; *LCH s.n.*, *LCH & BHW 7412* (TEX-LL & SRSC); *LCH 3286* (SRSC).

Monarda fistulosa L. var. *menthifolia* (Graham) Fernald—Beebalm—Uncommon perennial herb/forb, shaded, rocky soils with moderate sloping; POW, up to 8000 ft; *WRC 19069* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC) *AMP & SAP 4911*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 265*, *JJK 410* (SRSC).

Monarda pectinata Nutt.—Plains beebalm—Uncommon perennial herb/forb, unshaded to less shaded, shallow, rocky soils with moderate sloping; MCH, POW, up to 8100 ft; *JLN 04-09-16-01*, *WRC 28419* (TEX-LL); *JJK 208* (SRSC).

Salvia arizonica A. Gray—Arizona sage—Occasional to common (G4S2) perennial herb/forb, shaded to less shaded, less rocky to deep, fine soils with moderate sloping; POW, mostly above 6300 ft; *LCH 44-2*, *DSC 33740*, *MSY s.n.*, *WRC, TW & BF 26268* (TEX-LL); *AMP & SAP 4910*, *LCH & BHW 7414*, *7430* (TEX-LL & SRSC); *LCH & BHW 7457*, *BHW 23076*, *LCH s.n.*, *4145*, *PRM 4038*, *PRM, JCZ & JW2 3284*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 248*, *AMP, SAP, JW & BC 3210*, *JJK 56*, *73*, *322* (SRSC).

Scutellaria potosina Brandegee var. *davisiana* B.L. Turner—Mexican skullcap—Perennial herb/forb, "Thick on the high slope of Pine Peak at the head of Elbow Canyon"; *LCH 4599* (SRSC).

Lemnaceae

Lemna valdiviana Phil.—Valdivia duckweed—Uncommon perennial herb/forb, aquatic, standing water in intermittent and perennial streams; POW, JPW, up to 6200 ft; *JJK s.n.*, photographic records. One population found in Limpia Spring. Several other collections documented from lower Limpia Canyon.

Linaceae

◊*Linum australe* A. Heller—Flax—Uncommon annual herb/forb, less shaded, rocky soils with moderate sloping; JPW, MCH, 6900 ft–8000 ft; *JJK 132*, *388* (SRSC). Confined to, but uncommon, in the Trans-Pecos (Turner et al. 2003). No specimens at TEX-LL. Two collections from Guadalupe Mountains, Culberson County, *BHW 21676*, *10977*, at SRSC.

Linum lewisii Pursh—Lewis flax—Occasional perennial herb/forb, less shaded, rocky/gravelly soils with moderate sloping, MCH, JPW, generally above 7400 ft; *LCH s.n.* (TEX-LL & SRSC); *AMP & SAP 4898* (SRSC).

Linum rupestre (A. Gray) Englem. ex A. Gray—Rock flax—Uncommon perennial herb/forb, less shaded, rocky/gravelly soils with slight to no sloping; JPW, POW, up to 7400 ft; *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 259, *JJK 242* (SRSC).

Loasaceae

Mentzelia lindheimeri Urb. & Gilg—Lindheimer stickleaf—Uncommon perennial herb/forb, less shaded, rocky/sandy soils near intermittent or perennial streams, often found on unshaded, dry rock outcrops as well; SAS, JPW, MCH, up to 7000 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 477*, *JJK 237* (SRSC).

√*Mentzelia multiflora* (Nutt.) A. Gray—Desert mentzelia—Uncommon perennial herb/forb, unshaded, gravelly soils in disturbed areas; JPW, GGR, 5800 ft; *JJK s.n.*, photographic record. Directly next to entrance gate.

Malvaceae

Anoda cristata (L.) Schltdl.—Crested anoda—Uncommon to occasional annual herb/forb, variable habitats, less shaded to shaded, rocky to gravelly soils with slight to moderate sloping; JPW, POW, up to 7200 ft; *LCH 10* (TEX-LL); *LCH s.n., AMP & SAP 4912*, *JJK 36*, *161*, *277* (SRSC). Occasionally found near intermittent or perennial streams, where a signicant increase in size is exhibited.

Sida neomexicana A. Gray—New Mexico sida—Occasional to common perennial herb/forb, less shaded, gravelly soils with moderate to no sloping; JPW, up to 7400 ft; *WRC 28411*, *JLN 04-09-16-06* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 504*, *JJK 39*, *227* (SRSC).

Sphaeralcea incana Torr. ex A. Gray—Soft globemallow—Uncommon perennial herb/forb, less shaded, gravelly soils in disturbed areas; JPW, 5800 ft; *LCH s.n.* (TEX-LL); *JJK s.n.*, photographic record. Observed just near the entrance gate.

Martyniaceae

√*Proboscidea parviflora* (Wooton) Wooton & Standl.—Sweet devil's-claw—Uncommon annual herb/forb, less shaded, gravelly/sandy soils near intermittent streams; JPW, GGR, 6000 ft; *JJK 28* (SRSC).

Montiaceae

Phemeranthus brevicaulis (S. Watson) Kiger—Flameflower—[*Talinum brevicaule* S. Watson] Rare perennial semi-succulent, unshaded, rocky soils with moderate sloping; MCH, up to 8200 ft; *MSY s.n.* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *JJK 265* (SRSC).

Phemeranthus parviflorus (Nutt.) Kiger—Prairie flameflower—[*Talinum parviflorum* Nutt.] Rare perennial semi-succulent, less shaded, rocky/sandy/gravelly soils near intermittent or perennial streams, but also found on steep slopes at higher elevations; JPW, SAS, POW, up to 8200 ft; *LCH s.n.*, *BHW 7505*, *23050*, *2k526*, *PRM, JCZ & JW2 3277*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 238*, *JJK 229* (SRSC).

Nyctaginaceae

Mirabilis linearis (Pursh) Heimerl—Linearleaf four-o'clock—Occasional perennial herb/forb, shaded, less rocky to gravelly, deep soils with moderate to no sloping; POW, up to 7900 ft; *DSC 33762*, *MCJ 12445* (TEX-LL); *LCH s.n.*, *LCH & BHW 7464*, *AMP & SAP 3914* (TEX-LL & SRSC); *LCH 392*, *AMP & SAP4899*, *BHW 22465*, *23092*, *SCB & DM 505*, *LCH & BHW 7478*, *JJK 14*, *57* (SRSC).

Mirabilis longiflora L.—Sweet four-o'clock—Uncommon perennial herb/forb, less shaded, rocky outcrops on steep slopes; MCH, POW, up to 8000 ft; *LCH s.n.*, *MSY s.n.* (TEX-LL); *SCB & DM 486* (TEX-LL & SRSC); *JPK & KB s.n.*, *JJK 79* (SRSC). In Texas, confined to Trans-Pecos (Turner et al. 2003).

Oleaceae

Forestiera neomexicana A. Gray—Desert olive—Uncommon shrub, "Near Mount Livermore, rocky banks of canyon, elev. 2200 m (7220 ft)"; *EJP 32056* (TEX-LL); *LCH s.n.*, *s.n.* (TEX-LL & SRSC).

Fraxinus velutina Torr.—Arizona ash—Rare tree, shaded, moist soils near intermittent or perennial streams; POW, JPW, 6200 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 389* (SRSC). Two individuals observed at Limpia Spring.

Onagraceae

Epilobium ciliatum Raf.—Trans-Pecos willow-herb—Rare to uncommon perennial herb/forb, less shaded, moist soils near springs and perennial streams; JPW, POW, up to 7500 ft; *MSY*

s.n. (TEX-LL); *LCH & BHW 7468*, *LCH s.n.* (TEX-LL & SRSC), *JJK 377* (SRSC). Large population found at dam on east facing drainage of Whitetail Mountain. In Texas, confined to the Trans-Pecos (Turner et al. 2003).

√*Oenothera brachycarpa* A. Gray—Shortpod evening-primrose—Uncommon perennial herb/forb, less shaded, gravelly soils with no significant sloping; JPW, 6600 ft; *JJK 21* (SRSC). One individual found on Cherry Canyon Road.

Oenothera elata Kunth subsp. *hookeri* (Torr. & A. Gray) W. Dietr. & W.L. Wagner—Hooker evening-primrose—Perennial herb/forb, "Pocket of Mount Livermore"; *LCH s.n.* (TEX-LL).

Oenothera kunthiana (Spach) Munz—Kunth sundrops—Annual or perennial herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL).

Oenothera rosea L'Hér. ex Aiton—Pink eveing-primrose—Perennial herb/forb, "Pine Canyon, Mount Livermore"; *LCH s.n.* (TEX-LL).

Oenothera texensis P.H. Raven & D.R. Parn.—Texas evening-primrose—Rare (G4S1) perennial herb/forb, shaded, moist soils near springs or perennial streams; POW, up to 7900 ft; *MSY s.n.* (TEX-LL); *ST s.n.*, *BHW 7608*, *JJK 148* (SRSC). One population found at Limpia Spring, one population found in Short Pine Canyon just south of Baldy Peak summit. In Texas, confined to Jeff Davis County (Turner et al. 2003).

Orobanchaceae

Castilleja integra A. Gray—Indian paintbrush—Uncommon to occasional perennial herb/forb, less shaded to mostly shaded, less rocky soils with moderate to no sloping; JPW, POW, up to 7200 ft; *JMP 2601* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH & BHW 7416*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 245*, *JJK 1*, *43*, *197* (SRSC).

Castilleja mexicana (Hemsl.) A. Gray—Yellow paintbrush—Uncommon annual or perennial herb/forb, "occasional, in grassland with scattered *Juniperus deppeana*, on gentle slope underlain by rhyolite, elev. 5900–5930 ft"; *WRC 28449* (TEX-LL); *PG 274*, *275* (SRSC).

Castilleja wootonii Standl.—Fringed paintbrush— Perennial herb/forb, "Infrequent at upper spring in Madera Canyon, igneous soil, elev. 7500 ft"; *LCH 985* (TEX-LL); *RDW 5155, LCH & BHW 7460* (TEX-LL & SRSC); *ML 188*, *288*, *296* (SRSC). In Texas, confined to Jeff Davis County (Turner et al. 2003).

Conopholis alpina Liebm.—Mexican squawroot—Uncommon perennial herb/forb, "Rare on Mount Livermore growing under *Quercus grisea*"; *LCH s.n.*, *BHW s.n.*, *21552* (TEX-LL); *OES T744* (SRSC).

Orobanche uniflora L.—Oneflowered broomrape—Rare annual herb/forb, "Rocky open ground near top of Mount Livermore, elev. 2200 m (7220 ft)"; *EJP 30875* (TEX-LL). No successive collection since 1926. No specimens at SRSC.

Seymeria scabra A. Gray—Limpia seymeria—Perennial herb/forb, "Infrequent, near Mount Livermore Peak, high ridges southeast of the peak"; *MSY s.n.* (TEX-LL); *LCH 1166*, *AMP, SAP, JW & BC 3206* (TEX-LL & SRSC).

Oxalidaceae

Oxalis alpina (Rose) Rose ex R. Knuth—Alpine wood-sorrel—[*Oxalis metcalfei* (Small) R. Kunth] Perennial herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL & SRSC).

Oxalis dillenii Jacq.—Common sourclover—Perennial herb/forb, "Mount Livermore, Upper Limpia"; LCH s.n. (TEX-LL).

Oxalis latifolia Kunth—Largeleaf wood-sorrel—Occasional perennial herb/forb, less shaded to shaded, rocky/gravelly soils with moderate sloping; POW, JPW, up to 7900 ft; *SCB & DM 547*, *AMP & SAP 4895*, *LCH & BHW 7465*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 227*, *JJK 18*, *60* (SRSC). Previously identified as *O. drummondii* and later annotated *O. latifolia* by A.M. Powell.

Papaveraceae

Corydalis aurea Willd.—Scrambled eggs—Annual or perennial herb/forb, "North slope of Mount Livermore, usually in moist, shaded spots, elev. ca. 8000 ft"; *LCH s.n.*, *217* (TEX-LL).

★-TX *Corydalis curvisiliqua* (A. Gray) Engelm. ex A. Gray var. *curvisiliqua*—Curvepod fumewort—Uncommon to occasional annual or perennial herb/forb, shaded, rocky soils with moderate sloping, POW, MCH, up to 7800 ft; *JJK 102* (SRSC).

Phrymaceae

Erythranthe inamoena (Greene) G.L. Nesom—Yellow monkeyflower—[*Mimulus inamoenus* Greene] Uncommon annual herb/forb, shaded, moist soils in or near springs or perennial streams; POW, up to 7700 ft; *LCH s.n.* (TEX-LL & SRSC); *KL, SAR, BJW, JCZ, LH2, JPK & PRM* 230, *BHW 7606*, *JJK 221*, 149, 203, (SRSC).

Plantaginaceae

Maurandya antirrhiniflora Humb. & Bonpl. ex Willd.—Snapdragon vine—Rare to uncommon herbaceous vine, perennial, less shaded rocky soils with moderate sloping; JPW, MCH, 6300 ft; *LCH s.n.* (TEX-LL); *JJK 346* (SRSC). One population found on south face of hillside directly north of the MCC.

Mecardonia procumbens (Mill.) Small—Baby jump-up—Rare annual or perennial herb/forb, less shaded, sandy/gravelly soils in or near intermittent or perennial streams or springs; POW, JPW, up to 6300 ft; *WRC 19094* (TEX-LL); *AMP 4936*, *JJK 126* (SRSC).

Penstemon barbatus (Cav.) Roth subsp. *torreyi* (Benth.) D.D. Keck—Beardlip penstemon—Occasional to common perennial herb/forb, mostly shaded, less rocky soils with moderate to slight sloping; POW, JPW, up to 8100 ft; *DSC 33729* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *AFJ 64*, *LCH & BHW 7392*, *JJK 40*, *90* (SRSC).

Penstemon cardinalis Wooton & Standl. subsp. ***regalis*** (A. Nelson) G.T. Nisbet & R.C. Jacks.—Royal red penstemon—Rare (G3T2T3S2) perennial herb/forb, "Mount Livermore, west ridge"; *LCH s.n.* (SRSC). In Texas, confined to the Trans-Pecos (Turner et al. 2003).

Penstemon fendleri Torr. & A. Gray—Fendler penstemon—Perennial herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL & SRSC).

Veronica peregrina L.—Wandering veronica—Annual herb/forb, "Mount Livermore"; *LCH s.n.* (SRSC).

Polemoniaceae

Ipomopsis aggregata (Pursh) V.E. Grant—Standing cypress—Occasional to common perennial herb/forb, mostly shaded, less rocky, deep soils with moderate sloping; POW, JPW up to 8000 ft; *LCH 44-4*, *AMP & DF 1496* (TEX-LL); *KL, SAR, BJW, JCZ, LH2, JPK & PRM 266*, *LCH & BHW 7399*, *JJK 33* (SRSC).

Phlox nana Nutt.—Santa Fe phlox—[*Phlox mesoleuca* Greene] Occasional perennial herb/forb, less shaded, rocky soils with slight to no sloping; JPW, GGR, up to 6400 ft; *WRC 28447* (TEX-LL); *JJK 11*, *212* (SRSC).

Polemonium pauciflorum S. Watson subsp. ***hinckleyi*** (Standl.) Wherry—Hinckley Jacob's ladder—Rare (G3G5T2S1) to uncommon perennial herb/forb, shaded, rocky soils with moderate sloping; POW, 6500–8000 ft; *LCH & BHW 7450*, *JPK & KB s.n.*, *BHW 23029*, *LCH s.n.*, *283* (TEX-LL & SRSC); *BHW 23069*, *LCH 3490*, *JJK 193* (SRSC). Locally frequent in upper Tobe Canyon. In Texas, only known from Mount Livermore, based on voucher specimens from TEX-LL and SRSC.

Polygalaceae

Polygala barbeyana Chodat—Narrowleaf milkwort—Rare annual or perennial herb/forb, less shaded, rocky soils with moderate sloping; JPW, up to 6400 ft; *WRC, TW & BF 26261*, *WRC 28461* (TEX-LL); *JJK 155* (SRSC).

◊*Polygala hemipterocarpa* A. Gray—Winged milkwort—Rare perennial herb/forb, less shaded, less rocky soils with slight to no sloping; JPW, 6100 ft; *JJK 51* (SRSC). One population found off of Fortyeight Tank Loop. In Texas, confined to the Davis Mountains, based on vouchers specimens at TEX-LL and SRSC.

Polygala scoparioides Chodat—Broom milkwort—Uncommon to occasional perennial herb/forb, less shaded, less rocky soils with slight to no sloping; JPW, up to 7200 ft; *MCJ & CD 12396*, *WRC, TW & BF 26277* (TEX-LL); *JJK 310* (SRSC).

Polygonaceae

Eriogonum jamesii Benth var. *jamesii*—James wildbuckwheat—Occasional perennial herb/forb, less shaded, rocky soils or crevices in rock faces; MCH, POW, up to 8000 ft; *MSY s.n.*, *WRC 28467*, *DSC 33739*, *13530* (TEX-LL); *RM2 7485*, *LCH s.n.* (TEX-LL & SRSC); *AMP, SAP, JW & BC 3189*, *AMP, SAP & JMP 5272*, *AFJ 60*, *AMP & SAP 3926*, *BHW 7489, JJK 171*, *190, 359* (SRSC).

Eriogonum tenellum Torr.—Rosette wildbuckwheat—Rare perennial herb/forb, unshaded, rock outcrops; MCH, 7300 ft; *LCH s.n.* (TEX-LL); *JJK 374* (SRSC). One individual found atop Whitetail Mountain.

Eriogonum wrightii Torr. ex Benth.—Wright wildbuckwheat—Occasional perennial herb/forb, less shaded to unshaded, rock outcrops; MCH, JPW, POW, up to 8200 ft; *LCH s.n.* (TEX-LL & SRSC); *ML 295*, *OES T216*, *JJK 38*, *279*, *350*, *376* (SRSC).

Persicaria pensylvanica (L.) M. Gómez—Pennsylvania smartweed—Uncommon to locally occasional annual herb/forb, shaded or unshaded, moist soils near springs, tanks, and perennial streams; SAS, JPW, POW, GGR, up to 6100 ft; *JJK 225* (SRSC).

√≠*Rumex crispus* L.—Curly dock—Rare perennial herb/forb, moist, gravelly soils in perennial streams; POW, 6200 ft; *JJK s.n.*, photographic record. One individual observed in Madera Creek.

Portulacaceae

Portulaca oleracea L.—Common purslane—Rare annual semi-succulent, less shaded, gravelly soils with slight sloping; JPW, 6800 ft; *SCB & DM 506*, *LCH s.n.*, *JJK 150* (SRSC). One individual found on Limpia Spring Trail.

§*Portulaca pilosa* L.—Chisme—Rare annual or perennial semi-succulent, unshaded, rocky soils with moderate sloping; JPW, 6400 ft; *LCH s.n.*, *JJK 412* (SRSC). One population located at the north origin of Pine Canyon Trail.

Primulaceae

Androsace septentrionalis L.—Pygmyflower rock jasmine—Occasional annual or perennial herb/forb, "Occasional but local among shaded outcrops of igneous rock, elev. 8000–8100 ft"; *EJP 30868*, *WRC, JPK, TW & BF 26290* (TEX-LL); *LCH & BHW 7436*, *BHW 22890*, *LCH 592* (TEX-LL & SRSC); *PRM 3285*, *BHW 21521*, *23052* (SRSC).

Ranunculaceae

Aquilegia longissima A. Gray ex S. Watson—Longspur columbine—Uncommon (G3S2) to locally occasional perennial herb/forb, shaded, moist, rocky soils near spring and intermittent or perennial streams; POW, 6000–8000 ft; *DSC 13529*, *MSY s.n.* (TEX-LL); *BHW 23084*, *LCH s.n.* (TEX-LL & SRSC); *BHW 7510, 23329*, *PRM, JCZ & JW2 3288*, *PRM 2036*, *AFJ 58*, *KB s.n.*, *JJK 140* (SRSC).

Clematis pitcheri Torr. & A. Gray var. *dictyota* (Greene) W.M. Dennis—Purple leatherflower—Rare herbaceous vine, perennial, less shaded, rocky/sandy soils near dry creek washout; SAS, JPW, 6100 ft; *WRC, TW & BF 26270* (TEX-LL); *JJK 158* (SRSC).

Thalictrum fendleri Engelm. ex A. Gray—Fendler meadow-rue—Occasional perennial herb/forb, shaded, less rocky soils with steep to moderate sloping; POW, up to 8000 ft; *WRC 19082* (TEX-LL); *LCH s.n.*, *LCH & BHW 7427* (TEX-LL & SRSC); *PRM 4040*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 280*, *JJK 81* (SRSC).

Rhamnaceae

Adolphia infesta (Kunth) Meisn.—Texas adolphia—Uncommon to locally occasional shrub, unshaded, rocky soils with moderate sloping; MCH, JPW, up to 8200 ft; *LCH s.n.* (TEX-LL & SRSC); *CLK 17*, *JJK 304* (SRSC). Large population on the south base of Baldy Peak.

Ceanothus fendleri A. Gray—Fendler ceanothus—Rare shrub, "Uncommon, upper canyons and slopes, vicinity of Tobe's Gap, north of Mount Livermore, elev. ca. 7200 ft"; *DA 284* (TEX-LL); *AMP, SAP & JMP 5258*, *PRM 3393* (SRSC).

Frangula betulifolia (Greene) Grubov—Indian cherry—[*Rhamnus betulifolia* Greene] Uncommon to occasional shrub, shaded, less rocky to rocky soils with moderate sloping; POW, up to 7700 ft; *DSC 13531*, *MSY s.n.*, *LCH s.n.* (TEX-LL); *AMP, SAP, JW & BC 3197* (TEX-LL & SRSC); *KL, SAR, BJW, JCZ, LH2, JPK & PRM 256*, *BHW 13502*, *OES T764*, *AMP, SAP & JMP 5269*, *ML 294*, *JJK 109* (SRSC).

Rhamnus serrata Schult.—Smith buckthorn—Rare shrub, unshaded rock out crops on high ridges; MCH, up to 8200 ft; *LCH s.n.* (TEX-LL); *AMP 3188*, *AMP & SAP 3908* (TEX-LL & SRSC); *JJK 267* (SRSC). One plant found on outcrop on the south base of Baldy Peak.

Ziziphus obtusifolia (Hook. ex Torr. & A. Gray) A. Gray—Lotebush—Rare shrub, less shaded to unshaded, rocky soils with variable sloping; JPW, POW, up to 6400 ft; *LCH 529* (TEX-LL & SRSC). Observed once in Madera Canyon, moving far up slope from the creek.

Rosaceae

Cercocarpus breviflorus A. Gray—Hairy mountain mahogany—[*Cercocarpus montanus* Raf. var. *paucidentatus* (S. Watson) F.L. Martin] Occasional to common shrub, unshaded to shaded, rocky to less rocky soils with variable sloping; MCH, POW, mostly above 6500 ft; *MSY s.n.*, *RM2 7486* (TEX-LL); *LCH s.n.* (SRSC & TEX-LL); *SCB & DM 456*, *JJK 107*, *266* (SRSC).

Fallugia paradoxa (D. Don) Endl. Ex Torr.—Apache-plume—Uncommon to occasional shrub, unshaded, less rocky, gravelly to sandy soils with slight to no sloping; JPW, SAS, GGR, mostly below 6300 ft; *AMP, SAP, JW & BC 3187*, *LCH s.n.* (TEX-LL & SRSC); *CLK 22*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 289*, *JJK 144* (SRSC).

Holodiscus discolor (Pursh) Maxim.—Rush rock-spires—Occasional to common shrub, less shaded to unshaded rock outcrops and boulders; MCH, POW, mostly above 7400 ft; *MCJ & CD 12408*, *DSC 33756*, *RM2 7482*, *7491*, *MSY s.n.* (TEX-LL), *LCH s.n.*, *AMP, SAP, JW & BC 3189* (TEX-LL & SRSC); *LCH 121*, *PRM 3541*, *JLB, SCC, MPG, TOH, EFM, JPK & JCZ 26*, *AMP, SAP & JMP 5286, BHW 23326*, *LCH & BHW 7467*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 267*, *JJK 9*, *65* (SRSC).

Prunus serotina Ehrh. var. *virens* (Wooton & Standl.) McVaugh—Southwestern chokecherry—Occasional tree, shaded, mostly rocky soils with moderate sloping; POW, MCH, up to 7900 ft; *AMP & SAP 3917*, *LCH s.n.* (TEX-LL & SRSC); *AMP, SAP, JW & BC 3201*, *CLK 23*, *ML 311* (SRSC).

Rosa woodsii Lindl.—Woods rose—Rare shrub, shaded, less rocky, gravelly soils near intermittent and perennial streams and springs; POW, 7000 ft; LCH 90 (TEX-LL); *KB s.n.*, *s.n.*, *ML 303*, *JJK 210* (SRSC). Two populations known from Bridge Spring and Tobe Spring.

Rubiaceae

Bouvardia ternifolia (Cav.) Schltdl.—Scarlet bouvardia—Uncommon to locally occasional shrub, less shaded to unshaded, rocky/gravelly soils with slight to no sloping; MCH, JPW, all elevations; *LCH s.n.* (TEX-LL & SRSC), *SCB & DM 524*, *489*, *AMP, SAP & JMP 5271*, *JJK 6* (SRSC).

Galium mexicanum Kunth var. *asperulum* (A. Gray) Dempster—Mexican bedstraw—Perennial herb/forb, "In relatively mesic mesic shaded area at base od large rhyolite boulder, elev. ca. 8100 ft"; *WRC, JMP & ATK 29202* (TEX-LL).

Galium mexicanum Kunth var. *flexicum* (Dempster) B.L. Turner—Mexican bedstraw—Uncommon to occasional perennial herb/forb, shaded, less rocky soils with moderate sloping; POW, mostly above 7000 ft; *DSC 13543*, *33755*, *LCH s.n.* (TEX-LL); *SCB & DM 554*, *AMP, SAP & JMM 3507*, *AMP, SAP & JMP 5268*, *BHW 23087*, *23098*, *LCH & BHW 7406*, *JJK 5*, *138* (SRSC).

Galium microphyllum A. Gray—Bracted bedstraw—Occasional perennial herb/forb, less shaded, rocky/gravelly soils with variable sloping; JPW, POW, up to 7100 ft; *WRC 19084*, *LCH s.n.* (TEX-LL); *SCB & DM 555*, *JJK 147* (SRSC).

Galium wrightii A. Gray—Wright bedstraw—Rare (G3G4S2) perennial herb/forb, shaded crevices in rock faces in canyons; MCH, POW, up to 7900 ft; *DSC 33734*, *WRC, JMP & ATK 29203* (TEX-LL); *AMP & SAP 4917* (TEX-LL & SRSC); *LCH s.n., PRM 5022*, *JPK & KB s.n.*, *LCH & BHW 7455*, *AMP, SAP & JMM 3508*, *BHW 23097*, *JJK 276*, *175* (SRSC). Locally frequent in upper Tobe Canyon.

Hedyotis nigricans (Lam.) Fosberg var. *nigricans*—Prairie bluets—Uncommon to occasional perennial herb/forb, variable habitats, shaded or unshaded, rocky to fine soils with variable sloping; POW, JPW, MCH, at all elevations; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 537*, *JJK 129*, *135*, *324* (SRSC).

Hedyotis wrightii (A. Gray) Fosberg—Wright bluets—Perennial herb/forb, LCH s.n., "Occasional in grassland scattered with *Juniperus deppeana*, on gentle slope underlain by rhyolite, elev. 5900–5930 ft"; *WRC, TW & BF 26280*, *WRC 28451* (TEX-LL).

Rutaceae

Ptelea trifoliata L. var. *angustifolia* (Benth.) M.E. Jones—Skunkbush—Uncommon to occasional shrub, shaded, less rocky, deep soils with moderate sloping; POW, up to 8000 ft; *RM2 7483* (TEX-LL); *LCH & BHW 7446* (TEX-LL & SRSC); *CLK 11*, *JJK 3*, *141* (SRSC).

Salicaceae

Populus fremontii S. Watson—Arizona cottonwood—Rare tree, shaded, rocky soils in or near intermittent or perennial streams or springs; POW, up to 7300 ft; *JPK & KB s.n.* (TEX-LL).

Populus tremuloides Michx.—Quaking aspen—Uncommon tree, less shaded, rocky talus slopes or escarpments or deep soils on northern facing slopes of Mount Livermore; POW, MCH, 7200–7800 ft; *DSC 13547*, *EJP 30859*, *32030*, *CHM 8352* (TEX-LL); *AMP & SAP 4921* (TEX-LL & SRSC); *LCH s.n.*, *MSY s.n.*, *PRM & JCZ 3533*, *JPK & KB s.n.*, *AMP, SAP & JMP 5293*, *AFJ s.n.*, *OES s.n.*, *BHW 7500*, *ML 332*, *333*, *JLB, SCC, MPG, TOH, EFM, JPK & JCZ* 24, *JJK 96*, *108* (SRSC).

Salix lasiolepis Benth.—Arroyo willow—Rare to uncommon shrub, shaded, less rocky, gravelly soils near intermittent and perennial streams and springs; POW, up to 7500 ft; *EJP 30799* (TEX-LL); *LCH 1095* (TEX-LL & SRSC); *JJK 93*, *95* (SRSC).

Saxifragaceae

Heuchera rubescens Torr.—Red alumroot—Uncommon perennial herb/forb, shaded rock crevices near natural watersheds or springs; POW, 7400–8000 ft; DSC 13515, LCH s.n., MSY s.n. (TEX-LL); LCH 117, 4151, BHW 7497, 23074, OES s.n., AMP & SAP 4916, AFJ 54, JJK 139 (SRSC).

Solanaceae

√*Datura quercifolia* Kunth—Oakleaf jimsonweed—Uncommon annual herb/forb, mostly shaded, less rocky soils with slight to no sloping; POW, up to 6700 ft; *JJK 58* (SRSC).

§*Margaranthus solanaceus* Schltdl.—Netted globeberry—Rare herbaceous vine, annual, less shaded, gravelly soils with slight to moderate sloping; JPW, 6800 ft; *LCH s.n.* (TEX-LL); *JJK 321* (SRSC). One population found on Limpia Spring Trail.

§*Nicotiana obtusifolia* M. Martens & Galeotti—Desert tobacco—Uncommon annual or perennial herb/forb, less shaded, more rocky soils; JPW, 6400 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 423* (SRSC).

Physalis hederifolia A. Gray—Heartleaf groundcherry—Occasional to common perennial herb/forb, mostly shaded, less rocky, gravelly soils with moderate to no sloping; JPW, POW, up to 7200 ft; *LCH s.n.* (TEX-LL & SRSC); *AMP, SAP & JMP 5259*, *JJK 37*, *119*, *270*, *275* (SRSC).

Solanum elaeagnifolium Cav.—Silverleaf nightshade—Uncommon perennial herb/forb, unshaded, gravelly soils near disturbed areas, JPW, GGR, 5800 ft; *LCH 256* (TEX-LL). Observed near the MCC and the entrance gate.

Solanum davisense Whalen—Davis Mountains nightshade—Rare (G3S2) annual herb/forb, less shaded, gravelly to sandy soils with slight to no sloping; JPW, GGR, up to 6500 ft; *LCH s.n.* (TEX-LL & SRSC); *KL, SAR, BJW, JCZ, LH2, JPK & PRM 290*, *JJK 50* (SRSC). One individual located on Basecamp Road; one individual located in Cherry Canyon. Also found in Presidio and Brewster Counties in Texas.

Solanum douglasii Dunal—Douglas nightshade—Occasional perennial herb/forb, mostly shaded, less rocky to deep soils with moderate to slight sloping; JPW, POW, up to 7500 ft; *LCH 991* (TEX-LL); *BHW 7498*, *AMP, SAP, JW & BC 3196*, *LCH 51* (TEX-LL & SRSC); *SCB & DM 568*, *AMP & SAP 3927*, *3194*, *ML 316*, *JJK 133* (SRSC).

Solanum stoloniferum Schltdl. & Bouché—Wild potato—[*Solanum leptosepalum* Correll; *S. fendleri* A. Gray] Uncommon to occasional perennial herb/forb, less shaded, less rocky, deep soils with moderate sloping; POW, JPW, mostly between 6500–8000 ft; *LCH 293* (NYBG); *DSC 33763* (TEX-LL); *BHW 23090*, *LCH & BHW 7451*, *MSY s.n.*, *LCH s.n.* (TEX-LL & SRSC); *BHW 23021*, *23310*, *PRM 3290*, *PRM & ME 4041*, *AMP & SAP 3928*, *4888*, *AMP, SAP & JMP 5287*, *5276*, *ML 289*, *JPK & KB s.n.*, *JPK 2002-08091-2*, *LCH & BHW 4138*, *AMP, SAP, JW & BC 3195*, *JJK 45*, *387* (SRSC).

Talinaceae

§*Talinum aurantiacum* Engelm.—Yellow flameflower—Rare perennial semi-succulent, unshaded, rocky soils with moderate sloping; JPW, 6400 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 123* (SRSC). One individual found at northern origin of Pine Canyon Trail.

Ulmaceae

Celtis reticulata Torr.—Netleaf hackberry—Uncommon tree, shaded, shaded rocky soils; JPW, GGR, 6400 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 424* (SRSC). Observed once on hillside directly north of MCC.

Urticaceae

Parietaria pensylvanica Muhl. ex Willd.—Rock pellitory—Uncommon annual herb/forb, "Mount Livermore"; *LCH s.n.* (TEX-LL & SRSC).

Urtica gracilenta Greene—Stinging nettle—Uncommon to occasional annual herb/forb, mostly shaded, rocky soils with moderate to steep sloping; MCH, POW, 6700–8000 ft; *WRC 26306*, *DSC 13542*, *33751* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *LCH & BHW 7423*, *JJK 375* (SRSC).

Verbenaceae

§*Aloysia grattisima* (Gillies & Hook.) Tronc.—Whitebrush—Uncommon shrub, unshaded, mostly rocky soils with moderate sloping; GGR, JPW, 6300 ft; *LCH s.n.* (TEX-LL & SRSC); *JJK 355* (SRSC). One population observed on south face of hillside directly north of the McIvor Conservation Center.

§*Aloysia wrightii* A. Heller—Wright beebrush—Uncommon shrub, unshaded, mostly rocky soils with moderate sloping; GGR, JPW, 6300 ft; *LCH s.n.* (TEX-LL); *JJK 351* (SRSC). One population observed on south face of hillside directly north of the MCC.

Glandularia pubera (Greene) G.L Nesom—Davis Mountains mock vervain—[*Verbena pubera* Greene; *V. ciliata* Benth. var. *pubera* (Greene) L.M. Perry] Occasional annual or perennial herb/forb,

less shaded, gravelly soils with slight to no sloping; JPW, up to 6900 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 497*, *JJK 20* (SRSC).

Verbena bracteata Lag. & Rodr.—Bracted vervain—Occasional annual or perennial herb/forb, unshaded, deep soils near dry creek beds and tanks; JPW, GGR, 6000–6100 ft; *WRC 28470* (TEX-LL); *JJK 125* (SRSC). Common around Fortyeight Tank.

Verbena livermorensis B.L. Turner & G.L. Nesom—Livermore vervain—Occasional annual or perennial herb/forb, mostly shaded, rocky to less rocky soils with moderate sloping; JPW, POW, up to 8000 ft; *LCH s.n.* (TEX-LL); *AFJ 51*, *JJK 115*, *296*, *373* (SRSC).

Viscaceae

Arceuthobium divaricatum Engelm.—Forking dwarf mistletoe—Sub-shrub, "infrequent parasite growing on *Pinus cembroides*, elev. 6000 ft"; *LCH s.n.*, *BHW 22891* (TEX-LL & SRSC); *BHW 23308* (SRSC).

Arceuthobium vaginatum (Humb. & Bonpl. ex Willd.) J. Presl.—Pine dwarf mistletoe—Sub-shrub, "on *Pinus ponderosa* in Madera Canyon on the north slope of Mount Livermore, elev. ca. 6500 ft"; *LCH 395* (TEX-LL & SRSC); *LCH 2650*, *BHW s.n.* (SRSC).

Phoradendron juniperinum A. Gray—Juniper mistletoe—Sub-shrub, "In pinyon-oak-juniper woodland on relatively level topography in valley between rhyolite slopes, parasitic on *Juniperus deppeana*, elev. 6720–6760 ft"; *WRC, JMP & ATK 29196* (TEX-LL); *LCH s.n.* (TEX-LL & SRSC); *CN s.n.* (SRSC).

Phoradendron villosum (Nutt.) Nutt. ex Engelm. ssp. *coryae* (Trel) Wiens—Oak mistletoe—Sub-shrub, "In open pinyon-oak-juniper woodland on relatively level topography in valley between steep rhyolite slopes, parasitic on *Quercus grisea*, elev. 6720–6760 ft"; *LCH s.n.*, *WRC, JMP & ATK 29197* (TEX-LL).

Vitaceae

Parthenocissus vitacea (Knerr) Hitchc.—Thicket creeper—Uncommon woody vine, mostly shaded, rocky soils and slopes of mesic canyons; POW, up to 7700 ft; *LCH s.n.* (TEX-LL & SRSC); *SCB & DM 556*, *LCH & BHW 4149*, *PRM 3535*, *AMP, SAP & JMP 5291*, *JJK 110* (SRSC).

Vitis arizonica Engelm.—Canyon grape—Occasional woody vine, mostly shaded, rocky soils near intermittent and perennial streams, but also found on rocky talus slopes of canyon walls; POW, up to 8000 ft; *LCH s.n.*, *MSY s.n.*, *EJP 30780* (TEX-LL); *SCB & DM 535*, *OES T748*, *KL, SAR, BJW, JCZ, LH2, JPK & PRM 286*, *LCH & BHW 7391* (SRSC).

Zygophyllaceae

Kallstroemia parviflora Norton—Warty caltrop—Uncommon annual herb/forb, unshaded, rocky/gravelly soils with moderate sloping; JPW, 7000 ft; *LCH 44-1* (TEX-LL); *JJK 240* (SRSC).

APPENDIX A: Transect species lists

The following lists present the compilation of species observed and/or collected from each transect site. Species are seen overlapping in all six transects, but each transect's overall composition is unique, representing variations in the habitat of their locations. Observations and collections were made twice in two years at transects 2, 4, and 6 and once for transects 1, 3, and 5. Common taxa throughout the DMP were not collected at each transect site. Total taxa per transect is noted at the beginning of each list.

TRANSECT 1 SPECIES LIST: Total species–genera–families: 59–51–21

LYCOPODIOPHYTA

Selaginellaceae

Selaginella peruviana (Milde) Hieron.

PTERIDOPHYTA

Pteridaceae

Cheilanthes bonariensis (Willd.) Proctor
Cheilanthes fendleri Hook.
Cheilanthes tomentosa Link
Pellaea wrightiana Hook.

CONIFEROPHYTA

Cupressaceae

Juniperus deppeana Steud.

Pinaceae

Pinus cembroides Zucc.

ANTHOPHYTA–Monocotyledones

Commelinaceae

Commelina dianthifolia Delile

Cyperaceae

Eleocharis palustris (L.) Roemer & Schultes

Poaceae

Bothriochloa barbinodis (Lag.) Herter var. barbinodis
Bouteloua curtipendula (Michx.) Torr. var. caespitosa Gould & Kapadia
Bouteloua gracilis (Kunth) Lag. ex Steud.
Echinochloa crus-galli (L.) P.Beauv.
Eragrostis intermedia Hitchc.
Leptochloa dubia (Kunth) Nees
Muhlenbergia alopecuroides (Griseb.) P.M. Peterson & Columbus
Muhlenbergia emersleyi Vasey
Muhlenbergia rigens (Benth.) Hitchc.
Muhlenbergia tricholepis (Torr.) Columbus
Piptochaetium pringlei (Beal) Parodi
Schizachyrium scoparium (Michx.) Nash var. scoparium

Ponteridaceae

Heteranthera limosa (Sw.) Willd.

ANTHOPHYTA–Eudicotyledones

Asteraceae

Amauriopsis dissecta (A. Gray) Rydb.
Artemisia ludoviciana Nutt.
Bidens bigelovii A. Gray
Brickellia lemmonii A. Gray var. conduplicata (B.L. Rob.) B.L. Turner
Carminatia tenuiflora DC.
Cosmos parviflorus (Jacq.) Pers
Dyssodia papposa (Vent.) Hitchc.
Heterosperma pinnatum Cav.
Hieracium carneum Greene
Pseudognaphalium viscosum (Kunth) Anderb.
Psilactis tenuis S. Watson
Schkuhria pinnata (Lam.) Kuntze ex Thell. var. wislizenii (A. Gray) B.L. Turner
Tagetes micrantha Cav.
Tetraneuris linearifolia (Hook.) Greene var. linearifolia

Brassicaceae

Hesperidanthus linearifolius (A. Gray) Rydb.
Pennellia longifolia (Benth.) Rollins

Cactaceae

Echinocereus dasyacanthus Engelm.
Mammillaria meiacantha Engelm.
Opuntia engelmannii Salm-dyck ex Engelm. var. engelmannii

Convolvulaceae

Dichondra brachypoda Wooton & Standl.

Evolvulus sericeus Sw.
Ipomoea cristulata Hallier f.
Ipomoea lindheimeri A. Gray
Euphorbiaceae
Acalypha phleoides Cav.
Tragia amblyodonta (Müll. Arg.) Pax & K. Hoffm.
Fabaceae
Cologania angustifolia Kunth
Desmodium neomexicanum A. Gray
Mimosa aculeaticarpa Ortega var. biuncifera (Benth.) Barneby
Fagaceae
Quercus emoryi Torr.
Quercus grisea Liebm.
Malvaceae
Anoda cristata (L.) Schltdl.
Sida neomexicana A. Gray
Polemoniaceae
Phlox nana Nutt.
Polygonaceae
Persicaria pensylvanica (L.) M. Gómez
Rubiaceae
Hedyotis nigricans (Lam.) Fosberg var. nigricans
Solanaceae
Solanum davisense Whalen
Verbenaceae
Glandularia pubera (Greene) G.L Nesom

TRANSECT 2 SPECIES LIST: Total species–genera–families: 97–73–31

LYCOPODIOPHYTA
Selaginellaceae
Selaginella mutica Eaton ex Underwood var. limitanea Weatherby
Selaginella peruviana (Milde) Hieron.

PTERIDOPHYTA
Dryopteridaceae
Cystopteris reevesiana Lellinger
Pteridaceae
Cheilanthes eatonii Baker
Cheilanthes fendleri Hook.

CONIFEROPHYTA
Cupressaceae
Juniperus deppeana Steud.
Pinaceae
Pinus ponderosa P. Lawson & C. Lawson

ANTHOPHYTA–Monocotyledones
Commelinaceae
Commelina dianthifolia Delile
Cyperaceae
Cyperus esculentus L.
Cyperus squarrosus L.
Juncaceae
Juncus interior Wiegand
Juncus torreyi Coville
Poaceae
Agrostis hyemalis (Walter) Britton, Sterns, & Poggenb.
Aristida schiedeana Trin. & Rupr.
Bouteloua curtipendula (Michx.) Torr. var. caespitosa Gould & Kapadia
Bouteloua gracilis (Kunth) Lag. ex Steud.
Bromus ciliatus L.
Echinochloa crus-galli (L.) P. Beauv.
Eragrostis intermedia Hitchc.
Eragrostis pectinacea (Michx.) Nees
Muhlenbergia alopecuroides (Griseb.) P.M. Peterson & Columbus
Muhlenbergia emersleyi Vasey
Muhlenbergia fragilis Swallen
Muhlenbergia glauca (Nees) B.D. Jacks.
Muhlenbergia polycaulis Scribn.
Muhlenbergia rigens (Benth.) Hitchc.
Muhlenbergia tricholepis (Torr.) Columbus
Panicum bulbosum Kunth
Piptochaetium pringlei (Beal) Parodi
Setaria grisebachii E. Fourn.
Setaria scheelei (Steud.) Hitchc.
Schizachyrium scoparium (Michx.) Nash var. scoparium

ANTHOPHYTA - Eudicotyledones
Asclepiadaceae
Asclepias texana A. Heller
Asteraceae
Amauriopsis dissecta (A. Gray) Rydb.
Artemisia ludoviciana Nutt.
Baccharis salicifolia (Ruiz & Pav.) Pers.
Bahia bigelovii A. Gray
Bidens bigelovii A. Gray
Brickellia californica (Torr. & A. Gray) A. Gray
Brickellia eupatorioides L. Shinners var. chlorolepis (Wooton & Standl.) B.L. Turner
Brickellia grandiflora (Hook.) Nutt.
Carminatia tenuiflora D.C.
Cosmos parviflorus (Jacq.) Pers
Heliomeris longifolia (B.L. Rob. & Greenm.) Cockerell
Heterosperma pinnatum Cav.
Hieracium carneum Greene
Laennecia sophiifolia (Kunth) G.L. Nesom
Packera millelobata (Rydb.) W.A. Weber & Á. Löve
Pseudognaphalium stramineum (Kunth) Anderb.
Pseudognaphalium viscosum (Kunth) Anderb.
Psilactis tenuis S. Watson
Solidago velutina DC.
Solidago wrightii A. Gray
Symphyotrichum expansum (Poepp. ex Spreng) G.L. Nesom
Tagetes micrantha Cav.
Tetraneuris linearifolia (Hook.) Greene var. linearifolia
Verbesina oreophila Wooton & Standl.
Brassicaceae
Erysimum capitatum (Douglas ex Hook.) Greene
Hesperidanthus linearifolius (A. Gray) Rydb.
Pennellia micrantha (A. Gray) Nieuwl.
Cactaceae
Echinocereus dasyacanthus Engelm.
Convolvulaceae
Dichondra brachypoda Wooton & Standl.
Ipomoea cristulata Hallier f.
Ipomoea lindheimeri A. Gray
Ericaceae
Arbutus xalapensis Kunth
Euphorbiaceae
Acalypha phleoides Cav.
Euphorbia bifurcata Engelm.
Euphorbia nutans Lag.
Tragia amblyodonta (Müll. Arg.) Pax & K. Hoffm.
Fabaceae
Cologania angustifolia Kunth
Dalea polygonoides A. Gray

Desmodium grahamii A. Gray
Desmodium neomexicanum A. Gray
Lotus plebeius (Brandegee) Barneby
Mimosa aculeaticarpa Ortega var. biuncifera (Benth.) Barneby
Fagaceae
Quercus emoryi Torr.
Quercus gravesii Sudw.
Quercus grisea Liebm.
Quercus hypoleucoides A. Camus
Geraniaceae
Geranium caespitosum James
Hydrangaceae
Fendlera rupicola Engelm. & A. Gray var. rupicola JUGLANACEAE
Juglans major (Torr.) A. Heller
Lamiaceae
Agastache micrantha (A. Gray) Wooton & Standl.
Hedeoma plicata Torr.
Monarda fistulosa L. var. menthifolia (Graham) Fernald
Malvaceae
Anoda cristata (L.) Schltdl.
Sida neomexicana A. Gray
Plantaginaceae
Mecardonia procumbens (Mill.) Small
Penstemon barbatus (Cav.) Roth subsp. torreyi (Benth.) D.D. Keck
Polygonaceae
Persicaria pensylvanica (L.) M. Gómez
Rhamnaceae
Ziziphus obtusifolia (Hook. ex Torr. & A. Gray) A. Gray
Rubiaceae
Galium mexicanum Kunth var. asperulum A.Gray
Hedyotis nigricans (Lam.) Fosberg var. nigricans
Salicaceae
Salix lasiolepis Benth.
Solanaceae
Physalis hederifolia A. Gray
Solanum douglasii Dunal
Vitaceae
Vitis arizonica Engelm.

TRANSECT 3 SPECIES LIST: Total species–genera–families: 64–58–26

PTERIDOPHYTA

Marsileaceae
Marsilea vestita Hook. & Grev.

CONIFEROPHYTA

Cupressaceae
Juniperus deppeana Steud.
Pinaceae
Pinus ponderosa P. Lawson & C. Lawson

ANTHOPHYTA–Monocotyledones

Commelinaceae
Commelina dianthifolia Delile
Cyperaceae
Eleocharis palustris (L.) Roemer & Schultes
Poaceae
Aristida ternipes Cav. var. ternipes
Bothriochloa barbinodis (Lag.) Herter var. barbinodis
Bouteloua gracilis (Kunth) Lag. Es Steud.
Bromus carinatus Hook. & Arn. var. carinatus
Echinochloa crus-galli (L.) P. Beauv.
Elymus elymoides (Raf.) Swezey
Eragrostis intermedia Hitchc.
Muhlenbergia alopecuroides (Griseb.) P.M. Peterson & Columbus
Muhlenbergia emersleyi Vasey
Muhlenbergia tricholepis (Torr.) Columbus
Pascopyrum smithii (Rydb.) Barkworth & D.R. Dewey
Piptochaetium pringlei (Beal) Parodi
Schizachyrium scoparium (Michx.) Nash var. scoparium
Ponteridaceae
Heteranthera limosa (Sw.) Willd.

ANTHOPHYTA–Eudicotyledones

Amaranthaceae
Amaranthus palmeri S. Watson

Asclepidiaceae
Asclepias subverticillata (A. Gray) Vail
Asteraceae
Ageratina herbacea (A. Gray) R.M. King & H. Rob.
Artemisia ludoviciana Nutt.
Bidens bigelovii A. Gray
Coreopsis tinctoria Nutt.
Cosmos parviflorus (Jacq.) Pers
Dyssodia papposa (Vent.) Hitchc.
Heliomeris longifolia (B.L. Rob. & Greenm.) Cockerell
Heterosperma pinnatum Cav.
Hieracium carneum Greene
Laennecia coulteri (A. Gray) G.L. Nesom
Laennecia sophiifolia (Kunth) G.L. Nesom
Packera millelobata (Rydb.) W.A. Weber & Á. Löve
Pseudognaphalium stramineum (Kunth) Anderb.
Psilactis tenuis S. Watson
Schkuhria pinnata (Lam.) Kuntze ex Thell. var. wislizenii (A. Gray) B.L. Turner
Solidago velutina DC.
Tetraneuris linearifolia (Hook.) Greene var. linearifolia
Verbesina oreophila Wooton & Standl.
Xanthium spinosum L.
Brassicaceae
Pennellia micrantha (A.Gray) Nieuwl.
Cactaceae
Echinocereus triglochidiatus Engelm.
Campanulaceae
Campanula rotundifolia All. ex Steud
Caprifoliaceae
Symphoricarpos palmeri G.N. Jones
Chenopodiaceae
Chenodpodium fremontii S. Watson
Dysphania graveolens (Willd.) Mosyakin & Clemants
Salsola tragus L.
Ericaceae
Arbutus xalapensis Kunth
Euphorbiaceae
Acalypha phleoides Cav.
Euphorbia serpillifolia Pers.
Fabaceae
Desmodium grahamii A. Gray
Desmodium neomexicanum A. Gray
Fagaceae
Quercus gambelii Nutt.
Quercus grisea Liebm.
Quercus hypoleucoides A. Camus
Geraniaceae
Geranium caespitosum James

Lamiaceae
Agastache micrantha (A. Gray) Wooton & Standl.
Monarda fistulosa L. var. menthifolia (Graham) Fernald
Plantaginaceae
Penstemon barbatus (Cav.) Roth subsp. torreyi (Benth.) D.D. Keck
Rhamnaceae
Frangula betulifolia (Greene) Grubov
Rubiaceae
Galium microphyllum A. Gray
Solanaceae
Physalis hederifolia A. Gray
Solanum douglasii Dunal
Verbenaceae
Glandularia pubera (Greene) G.L Nesom

TRANSECT 4 SPECIES LIST: Total species–genera–families: 61–54–23

PTERIDOPHYTA
Pteridaceae
Cheilanthes fendleri Hook.

CONIFEROPHYTA
Cupressaceae
Juniperus deppeana Steud.
Pinaceae
Pinus cembroides Zucc.
Pinus ponderosa P. Lawson & C. Lawson

ANTHOPHYTA–Monocotyledones
Commelinaceae
Commelina dianthifolia Delile
Cyperaceae
Cyperus esculentus L.
Poaceae
Aristida schiedeana Trin. & Rupr.
Bouteloua curtipendula (Michx.) Torr. var. caespitosa Gould & Kapadia
Bouteloua gracilis (Kunth) Lag. ex Steud.
Eragrostis intermedia Hitchc.
Eragrostis mexicana (Hornem.) Link
Muhlenbergia alopecuroides (Griseb.) P.M. Peterson & Columbus
Muhlenbergia emersleyi Vasey
Muhlenbergia polycaulis Scribn.
Piptochaetium pringlei (Beal) Parodi
Schizachyrium scoparium (Michx.) Nash var. scoparium
Setaria grisebachii E. Fourn.

ANTHOPHYTA–Eudicotyledones
Amaranthaceae
Amaranthus palmeri S. Watson
Asteraceae
Amauriopsis dissecta (A. Gray) Rydb.
Artemisia ludoviciana Nutt.
Bahia bigelovii A. Gray
Bidens bigelovii A. Gray
Brickellia grandiflora (Hook.) Nutt.
Brickellia lemmonii A. Gray var. conduplicata (B.L. Rob.) B.L. Turner
Carminatia tenuiflora DC.
Carphochaete bigelovii A. Gray
Dyssodia papposa (Vent.) Hitchc.
Heliomeris longifolia (B.L. Rob. & Greenm.) Cockerell
Heterosperma pinnatum Cav.
Packera millelobata (Rydb.) W.A. Weber & Á. Löve
Pseudognaphalium stramineum (Kunth) Anderb.
Psilactis tenuis S. Watson
Solidago wrightii A. Gray
Verbesina oreophila Wooton & Standl.
Cactaceae
Echinocereus dasyacanthus Engelm.
Opuntia polyacantha Haw. var. polyacantha
Chenopodiaceae
Dysphania graveolens (Willd.) Mosyakin & Clemants
Convolvulaceae
Dichondra brachypoda Wooton & Standl.
Cucurbitaceae
Cyclanthera dissecta (Torr. & A. Gray) Arn.
Sicyos laciniatus L.
Ericaceae
Arbutus xalapensis Kunth
Euphorbiaceae
Acalypha phleoides Cav.
Euphorbia indivisa (Engelm.) Tidestr.
Tragia amblyodonta (Müll. Arg.) Pax & K. Hoffm.
Fabaceae
Astragalus giganteus S. Watson
Cologania angustifolia Kunth
Desmodium grahamii A. Gray
Lathyrus graminifolius (S. Watson) T.G. White
Lotus plebeius (Brandegee) Barneby
Rhynchosia senna Gilles ex Hook. var. texana (Torr. & A. Gray) M.C. Johnst.
Fagaceae
Quercus grisea Liebm.
Quercus hypoleucoides A. Camus
Hydrangeaceae
Fendlera rupicola Engelm. & A. Gray var. rupicola
Lamiaceae
Agastache micrantha (A. Gray) Wooton & Standl.
Hedeoma plicata Torr.
Linaceae
Linum rupestre (A. Gray) Englem. ex A. Gray
Polemoniaceae
Ipomopsis aggregata (Pursh) V.E. Grant
Rosaceae
Cercocarpus breviflorus A. Gray.
Solanaceae
Datura quercifolia Kunth
Solanum douglasii Dunal
Verbenaceae
Glandularia pubera (Greene) G.L Nesom

TRANSECT 5 SPECIES LIST: Total species–genera–families: 91–74–44

LYCOPODIOPHYTA
Selaginellaceae
Selaginella mutica Eaton ex Underwood var. limitanea Weatherby

PTERIDOPHYTA
Dryopteridaceae
Cystopteris reevesiana Lellinger
Dryopteris filix-mas (L.) Schott
Woodsia neomexicana Windham
Pteridaceae
Cheilanthes bonariensis (Willd.) Proctor
Cheilanthes eatonii Baker
Cheilanthes tomentosa Link

CONIFEROPHYTA

Cupressaceae
Juniperus deppeana Steud.
Pinaceae
Pinus cembroides Zucc.
Pinus ponderosa P. Lawson & C. Lawson
Pinus strobiformis Engelm.

ANTHOPHYTA–Monocotyledones

Commelinaceae
Commelina dianthifolia Delile
Commelina erecta L.
Juncaceae
Juncus interior Wiegand
Poaceae
Aristida schiedeana Trin. & Rupr.
Aristida ternipes Cav. var. ternipes
Bouteloua curtipendula (Michx.) Torr. var. caespitosa Gould & Kapadia
Bromus carinatus Hook. & Arn. var. carinatus
Bromus lanatipes (Shear) Rydb.
Leptochloa dubia (Kunth) Nees
Muhlenbergia fragilis Swallen
Muhlenbergia glauca (Nees) B.D. Jacks.
Muhlenbergia polycaulis Scribn.
Muhlenbergia spiciformis Trin.
Panicum bulbosum Kunth
Piptochaetium pringlei (Beal) Parodi
Setaria grisebachii E. Fourn.

ANTHOPHYTA–Eudicotyledones

Amaranthaceae
Amaranthus palmeri S. Watson
Apiaceae
Osmorhiza bipatriata Constance & Shan
Aslclepidiaceae
Asclepias texana A. Heller
Matelea producta (Torr.) Woodson
Asteraceae
Ageratina herbacea (A. Gray) R.M. King & H. Rob.
Artemisia ludoviciana Nutt.
Bahia bigelovii A. Gray
Bidens bigelovii A. Gray
Brickellia laciniata A. Gray
Brickellia lemmonii A. Gray var. conduplicata (B.L. Rob.) B.L. Turner
Cosmos parviflorus (Jacq.) Pers
Galinsoga parviflora Cav.
Heliomeris longifolia (B.L. Rob. & Greenm.) Cockerell
Laennecia coulteri (A. Gray) G.L. Nesom
Laennecia sophiifolia (Kunth) G.L. Nesom
Packera millelobata (Rydb.) W.A. Weber & Á. Löve
Pericome caudata A. Gray
Pseudognaphalium stramineum (Kunth) Anderb.
Solidago velutina DC.
Solidago wrightii A. Gray
Verbesina oreophila Wooton & Standl.
Brassicaceae
Erysimum capitatum (Douglas ex Hook.) Greene
Cactaceae
Echinocereus triglochidiatus Engelm.
Campanulaceae
Campanula rotundifolia All. ex Steud
Caprifoliaceae
Symphoricarpos palmeri G.N. Jones
Caryophyllaceae
Stellaria cuspidata Willd. ex D.F.K Schltdl.
Chenopodiaceae
Chenopodium neomexicanum Standl.
Dysphania graveolens (Willd.) Mosyakin & Clemants
Convolvulaceae
Dichondra brachypoda Wooton & Standl.
Crassulaceae
Sedum cockerellii Britton
Cucurbitaceae
Cyclanthera dissecta (Torr. & A. Gray) Arn.
Sicyos laciniatus L.
Sicyos microphyllus Kunth
Euphorbiaceae
Acalypha phleoides Cav.
Euphorbia bifurcata Engelm.
Fabaceae
Astragalus giganteus S. Watson
Fagaceae
Quercus gambelii Nutt.
Quercus hypoleucoides A. Camus
Fumariaceae
Corydalis curvisiliqua (A. Gray) Engelm. ex A. Gray
Geraniaceae
Geranium caespitosum James
Hydrophyllaceae
Phacelia rupestris Greene
Lamiaceae
Agastache micrantha (A. Gray) Wooton & Standl.
Monarda fistulosa L. var. menthifolia (Graham) Fernald
Salvia arizonica A. Gray
Nyctaginaceae
Mirabilis linearis (Pursh) Heimerl
Oxalidaceae
Oxalis latifolia Kunth
Phrymaceae
Erythranthe inamoena (Greene) G.L. Nesom
Polemoniaceae
Polemonium pauciflorum S. Watson subsp. hinckleyi (Standl.) Wherry
Polygonaceae
Eriogonum jamesii Benth. var. jamesii
Ranunculaceae
Aquilegia longissima A. Gray ex S. Watson
Thalictrum fendleri Engelm. ex A. Gray
Rhamnaceae
Frangula betulifolia (Greene) Grubov
Rosaceae
Cercocarpus breviflorus A. Gray
Prunus serotina Ehrh. var. virens (Wooton & Standl.) McVaugh
Rubiaceae
Bouvardia ternifolia (Cav.) Schltdl.
Galium microphyllum A. Gray
Galium wrightii A. Gray
Rutaceae
Ptelea trifoliata L. var. angustifolia (Benth.) M.E. Jones
Salicaceae
Salix lasiolepis Benth.
Saxifragaceae
Heuchera rubescens Torr.
Solanaceae
Solanum douglasii Dunal
Solanum stoloniferum Schltdl. & Bouché

Urticaceae
Urtica gracilenta Greene
Verbenaceae
Verbena livermorensis B.L. Turner & G.L. Nesom
Vitaceae
Vitis arizonica Engelm.

TRANSECT 6 SPECIES LIST: Total species–genera–families: 81–69–37

LYCOPODIOPHYTA
Selaginellaceae
Selaginella mutica Eaton ex Underwood var. limitanea Weatherby
Selaginella peruviana (Milde) Hieron.

PTERIDOPHYTA
Dryopteridaceae
Cystopteris reevesiana Lellinger
Pteridaceae
Cheilanthes eatonii Baker
Pellaea cordifolia (Sessé & Moc.) A.R. Sm.

CONIFEROPHYTA
Cupressaceae
Juniperus deppeana Steud.
Pinaceae
Pinus ponderosa P. Lawson & C. Lawson
Pinus strobiformis Engelm.

ANTHOPHYTA–Monocotyledones
Commelinaceae
Commelina dianthifolia Delile
Liliaceae
Allium cernuum Roth
Poaceae
Aristida schiedeana Trin. & Rupr.
Aristida ternipes Cav. var. ternipes
Bouteloua curtipendula (Michx.) Torr. var. caespitosa Gould & Kapadia
Bromus ciliatus L.
Bromus lanatipes (Shear) Rydb.
Muhlenbergia glauca (Nees) B.D. Jacks.
Muhlenbergia polycaulis Scribn.
Panicum bulbosum Kunth
Piptochaetium pringlei (Beal) Parodi
Setaria grisebachii E. Fourn.

ANTHOPHYTA–Eudicotyledones
Amaranthaceae
Amaranthus palmeri S. Watson
Apiaceae
Pseudocymopterus montanus (A. Gray) J.M. Coult. & Rose
Asteraceae
Achillea millefolium L.
Ageratina herbacea (A. Gray) R.M. King & H. Rob.
Ageratina rothrockii (A. Gray) R.M. King & H. Rob
Artemisia ludoviciana Nutt.
Bidens bigelovii A. Gray
Brickellia grandiflora (Hook.) Nutt.
Brickellia lemmonii A. Gray var. conduplicata (B.L. Rob.) B.L. Turner
Carminatia tenuiflora DC.
Conyza canadensis (L.) Cronquist
Cosmos parviflorus (Jacq.) Pers
Galinsoga parviflora Cav.
Heliomeris longifolia (B.L. Rob. & Greenm.) Cockerell
Hieracium carneum Greene
Laennecia coulteri (A. Gray) G.L. Nesom
Laennecia schiedeana (Less.) G.L. Nesom
Laennecia sophiifolia (Kunth) G.L. Nesom
Packera millelobata (Rydb.) W.A. Weber & Á. Löve
Pericome caudata A. Gray
Pseudognaphalium stramineum (Kunth) Anderb.
Pseudognaphalium viscosum (Kunth) Anderb.
Solidago velutina DC.
Solidago wrightii A. Gray
Verbesina oreophila Wooton & Standl.
Boraginaceae
Lithospermum multiflorum Torr. ex A. Gray
Brassicaceae
Descurainia incisa (Engelm. ex A. Gray) Britton
Erysimum capitatum (Douglas ex Hook.) Greene
Hesperidanthus linearifolius (A. Gray) Rydb.
Cactaceae
Echinocereus viridiflorus Engelm. var. weedinii A.D. Zimmerman
Campanulaceae
Campanula rotundifolia All. ex Steud
Caryophyllaceae
Arenaria ludens Shinners
Silene laciniata Cav. var. greggii (A. Gray) S. Watson
Stellaria cuspidata Willd. Ex D.F.K Schltdl.
Chenopodiaceae
Dysphania graveolens (Willd.) Mosyakin & Clemants
Convolvulaceae
Dichondra brachypoda Wooton & Standl.
Ericaceae
Arbutus xalapensis Kunth
Euphorbiaceae
Euphorbia bifurcata Engelm.
Tragia amblyodonta (Müll. Arg.) Pax & K. Hoffm.
Fabaceae
Lathyrus graminifolius (S. Watson) T.G. White
Fagaceae
Quercus gambelii Nutt.
Quercus hypoleucoides A. Camus
Fumariaceae
Corydalis curvisiliqua (A. Gray) Engelm. ex A. Gray
Geraniaceae
Geranium caespitosum James
Hydrophyllaceae
Phacelia rupestris Greene
Lamiaceae
Agastache micrantha (A. Gray) Wooton & Standl.
Monarda fistulosa L. var. menthifolia (Graham) Fernald
Salvia arizonica A. Gray
Nyctaginaceae
Mirabilis linearis (Pursh) Heimerl
Oxalidaceae
Oxalis latifolia Kunth
Plantaginaceae
Penstemon barbatus (Cav.) Roth subsp. torreyi (Benth.) D.D. Keck
Polemoniaceae
Ipomopsis aggregata (Pursh) V.E. Grant
Ranunculaceae
Thalictrum fendleri Engelm. ex A. Gray
Rhamnaceae
Frangula betulifolia (Greene) Grubov
Rosaceae
Cercocarpus breviflorus A. Gray

Rubiaceae
Galium mexicanum Kunth
Rutaceae
Ptelea trifoliata L. var. angustifolia (Benth.) M.E. Jones
Solanaceae
Physalis hederifolia A. Gray
Solanum douglasii Dunal
Solanum stoloniferum Schltdl. & Bouché
Vitaceae
Vitis arizonica Engelm.

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