2019 Arizona Botany Meeting
Meeting Schedule – Oral Presentations

8:00 AM **Check in at Geharld L. Hoopes, Jr. Activities Center, Eastern Arizona College, Thatcher**
Continental Breakfast

8:45 AM **Welcome, Introductions, Overview of Events**
Ries Lindley and Doug Ripley, Arizona Native Plant Society

9:00 AM ***Rapid Ecosystem Change in the Finger Rock Canyon Drainage, Santa Catalina Mountains, Arizona***

C. David Bertelsen
School of Natural Resources and the Environment,
University of Arizona, Tucson, AZ. (bertelsen@email.arizona.edu)

I will briefly describe (1) the methods and scope of my long-term study of the Finger Rock Canyon drainage, (2) look at climate during the study period, and (3) list many of the ecological changes occurring in the watershed since the onset of the current drought. High mortality in a number of dominant species, dramatic decreases in abundance of many native species, and rapid increase and spread of non-native invasive species, particularly grasses, have been occurring. Significant changes in vegetative assemblages are seen at all elevations and suggest the system may have already passed the "tipping point." Rather than simple shifts of communities to higher elevations, novel assemblages seem highly likely to develop. If the current drought is driven by global climate change, which is highly likely, the ongoing processes are probably irreversible and will have cascading effects throughout the ecosystem.

9:45 AM ***Stone Grids and the Archaeology of Agave Cultivation in the Safford Valley***

Suzanne Fish
Curator Emerita, Arizona State Museum
Professor Emerita, School of Anthropology, University of Arizona

Paul Fish
Curator Emeritus, Arizona State Museum
Professor Emeritus, School of Anthropology, University of Arizona

Stone alignments forming grids and terraces in the Safford Valley create huge checkerboards on the ground and are strikingly visible from the air. These agricultural features made of cobbles and boulders were long known to archaeologists, naturalists, and local residents, but not well understood.

Geographer William Doolittle and archaeologist James Neely organized a multi-disciplinary project in 1998 to better establish their role in regional agriculture and archaeology. Our role was to examine evidence for crops associated with the grids and terraces in light of our recent research and insights documenting Hohokam practices of agave cultivation and this crop's economic importance among neighboring Hohokam agriculturalists to the west. We summarize main findings of the overall Safford study, highlighting archaeological evidence linking the grids to agave production and modern vegetational responses to the persisting effectiveness of the stone features for growth enhancement.

10:15 AM **Break – Coffee, Tea, and Water**

10:45 AM ***Decline of Arizona Cypress in the Dragoon Mountains, Cochise County, Arizona: Heat and Size Matter***

James Verrier
University of Arizona, Associate, School of Plant Sciences

Tree mortality events are strongly influenced by climate change and pose dire consequences to global ecosystem services, carbon cycling, wildfire intensity, and forest composition and function. Combinations of drought and rising temperatures are driving global tree die-off and extreme heat events hasten fatalities, which are exacerbated by subsequent bark beetle attacks. Arizona cypress (*Hesperocyparis arizonica*) is a climate relic and was more widely distributed in Arizona sky islands 11,000 or more years ago during the cooler and wetter late Wisconsin Period. After observing significant levels of mortality and decline in several cypress populations in southeastern Arizona, I conducted a near-enumerated inventory of H. arizonica along five miles of canyons in the Cochise Stronghold of the Dragoon Mountains (Cochise County). Detailed metrics of size and health were collected for 1,283 trees to determine a trajectory of recent past and current stand dynamics for this population. Size-class demographics, ecological observations, mortality and decline of the trees will be discussed. Arizona cypress is a valuable indicator of climate-influenced ecosystem degradation.

11:15 PM ***Plants and Animals in the Yoeme World: Ethnobiology of the Yaquis of Sonora and Arizona***

Richard Stephen Felger*
Herbarium, University of Arizona, Tucson, AZ
(rfelger@email.arizona.edu)
and Felipe Silvestre Molina, with photos by Peter Blystone

We present highlights from our recently completed book on plants and animals

in the Yoeme world. We document more than 400 plant species and 575 species of animal life. Yoeme is the people's own name for themselves and Yoem Bwiara is their sacred homeland in Sonora, centered along the lower Río Yaqui. Our research focuses on plants and animals of the Yoem Bwiara and includes key species in the Yoeme realm in southern Arizona. Yoem Lutu'uria, Yoeme Truth, is the core creed that respects all life, animals, plants, and sea life, as well as water, sea, rocks, clouds, rain, and wind. It is the Aniam, all the connected spiritual worlds including Huya Ania, the wilderness world, also known as the plant world. Yoem Lutu'uria underlies the spirit of our work. Let's explore some plants and animals of Huya Ania, exemplified via recent photos by Peter Blystone.

11:45 AM ***The Desert Edge – The Flora of the Guaymas–Yaqui Region of Sonora, Mexico***

Susan D. Carnahan
Richard Stephen Felger
José Jesús Sánchez-Escalante

Only six hours south of Tucson, the Sonoran Desert starts transitioning to thornscrub and tropical deciduous forest – or it ends at the sea. This is the desert edge, a dynamic coastal region featuring native fig trees, palms, and mangroves, five species of columnar cacti, four mountain ranges, and tropical riparian canyons and 836 documented vascular plant species. Come enjoy a photo show of our recently completed flora of the Guaymas–Yaqui region.

12:15 PM **Buffet Luncheon**

1:15 PM ***Hohokam Lost Crop Found: A New Agave* (Agavaceae) *Species Only Known from Large-scale pre-Columbian Agricultural Fields in Southern Arizona***

Wendy C. Hodgson, and Andrew M. Salywon*
Desert Botanical Garden, 1201 N Galvin Parkway, Phoenix, Arizona
(whodgson@dbg.org; asalywon@dbg.org)

and

William H. Doelle
Archaeology Southwest, 300 N Ash Alley, Tucson, Arizona

For over thirty years archaeologists have provided evidence that southern Arizona pre-Columbian Native Americans, the Hohokam, extensively cultivated agave. However, no archeologists reported finding living agaves growing in the rock-piled or gridded Hohokam fields, therefore researchers could only speculate about the species cultivated. Our work expands upon a

recent publication noting several agaves growing in prehistoric dry-farmed fields on terraces overlooking the San Pedro River. These agaves have affinities to *A. phillipsiana* W. C. Hodgs. and *A. palmeri* Engelm. based on flower color but differ by their gray-green leaves with thick bases and conspicuous bud imprinting. They are extremely rare, reproduce asexually via rhizomatous offsets with no apparent fruit set, have relatively uniform intra-and inter-population morphology, grow only with archaeological features and are unknown from natural settings: all characteristics expected in a domesticated crop. Here we describe *Agave sanpedroensis*, provide a key to distinguish it from other agaves in south-central Arizona and propose that it is a clonal, relictual crop grown from ca. A.D. 800–1450 by the Hohokam, and thus represents a 'lost crop' as sought by archaeologists. The extensive size and wide distribution of Hohokam agave fields that transformed the landscape and are still visible today indicates the crop's importance in the Hohokam economy. The question of where and when this agave originated has implications for North American domestication centers. Our discovery emphasizes the importance of collaborative research between archaeologists and botanists whose distinctive data can provide a richer understanding of how the Hohokam developed and then sustained one of the American Southwest's largest prehistoric populations.

1:45 PM ***The Occurrence of Crested Coral Root Orchids (Hexalectris species) in Arizona***

Janet Fox
Biological and Botanical Consultant
2275 W. Golden Hills Rd., Tucson AZ 85745
(janfoxx@gmail.com)

Hexalectris is a genus of myco-heterotrophic terrestrial orchids in North America. There are nine accepted species of *Hexalectris* orchids (Kennedy and Watson 2010), which occur from the northeastern to southwestern US and south into Mexico and Guatemala, eight of which are known to occur in the U.S. In Arizona there are four known species: *H. arizonica, H. warnockii, H. colemanii, H. parviflora.*

I present here a synthesis of research regarding the occurrence of Crested Coral Root orchids in Arizona, discuss the instrumental role the late Ronald A. Coleman played in the taxonomy of the species, and discuss the natural history of the genus.

Finally, I outline gaps in the research for *Hexalectris* in Arizona.

2:15 PM ***Botanical Explorations in the Sierra Chivato, Sonora***

Thomas R. Van Devender and Ana L. Reina-Guerrero
(yecora4@comcast.net)
GreaterGood.org, 6262 N. Swan Ave., Suite 165, Tucson, AZ 85718
Stephen F. Hale
EcoPlan Assoc. Inc. 3610 N. Prince Village Pl, Suite 140, Tucson, AZ 85719
John L. Anderson
PO Box 20911, Wickenburg, AZ 85358
Chris Roll
University of Arizona Herbarium, P. O. Box 210036, Tucson, AZ 85721

The Sierra Chivato is a small Sky Island mountain range located in Sonora, Mexico east of the Santa Cruz River, about 20 km south of the Arizona border, and 47 km southeast of Nogales. The elevation ranges from 1282 m near San Lázaro to 2190 meters on the highest peak. The vegetation is grassland below with oak-juniper woodland on mountain slopes.

Plants were inventoried on Madrean Discovery Expedition Sierra Chivato on April 24-28, 2019. A total of 158 species in 60 families typical of desert grassland and oak woodland were seen. Plants were also inventoried in cottonwood-willow riparian forest along a perennial stretch of the Río Santa Cruz northeast of San Lázaro. The endangered Huachuca water umbel (Lilaeopsis schaffneriana subsp. recurva) was seen in two areas.

2:45 PM

Afternoon Break – Coffee, Tea, and Water

3:15 PM ***Fire and Reseeding Effects on Arizona Upland Plant Community Composition***

Kara Barron
Gila Watershed Partnership,
1615 W Discovery Park Blvd, Safford, AZ 85546
(kara@gwpaz.org)

Baseline community composition data provides a snapshot in time that allows changes in composition to be monitored more effectively and can inform best practices. This study examines Arizona Upland plant community composition through the lens of fire and restoration effects.

Two questions underlie the study: 1) What species are present at each study site? 2) How did fire and reseeding affect the cover and diversity of the plant communities? To address these questions, I compared burned, reseeded, and unburned treatments in plots within Cave Creek Regional Park. I also compared burned and adjacent unburned treatments at three sites within McDowell

Sonoran Preserve.

Eleven of twenty-eight species used in the post-fire seed mix persist twelve years post-fire. The reseeded treatment showed greater overall diversity than the burned and adjacent unburned treatments. Succulent cover was significantly reduced by fire while subshrub cover was significantly greater in the reseeded treatment. Sixteen species showed significant difference in distribution of cover between treatments.

McDowell Sonoran Preserve sites revealed overall diversity and cover was similar between treatments but succulent and annual cover was significantly reduced by fire, while subshrub cover was significantly greater in the burn treatment. Seventeen species showed significant difference in distribution of cover between treatments.

Fire appears to impact plant community composition across Arizona Upland sites. Diverse seed mixes for post-fire reseeding, based on individual species' fire responses, may be a useful tool to promote post-fire plant community recovery.

3:45 PM **Lyn Loveless**

4:15 PM ***Successful Salvage of Cactus and Other Desert Plants***

Jessie Byrd
Native Plant Nursery Manager, Pima County Natural Resources, Parks and Recreation
5845 N. Camino de la Tierra, Tucson, AZ
(Jessie.byrd@pima.gov)

Part of Pima County's award-winning Sonoran Desert Conservation Plan from 1999 included the creation of a Native Plant Nursery to help balance habitat loss due to urban development. Today, the Native Plant Nursery is a 2-acre facility maintaining over 20,000 native plants representing 230 Sonoran Desert species, all destined for restoration projects and other public spaces. Nursery inventory also includes mature plants salvaged from areas being developed, which helps to preserve local genetics and habitat resources while keeping plants out of the landfill. Many of the plant species are easy to salvage and re-establish, some are much more challenging! Learn how the Native Plant Nursery is leading the effort to protect native species in the urban fabric of Tucson, Arizona, putting the desert back where it belongs.

4:45 PM ***The Imminent Explosion of Stinknet*** **(Onchosiphon pilluliferum)** ***in Central and Southern Arizona***

John Scheuring
Chair, Conservation Committee, Arizona Native Plant Society
(jfscheuring@hotmail.com)

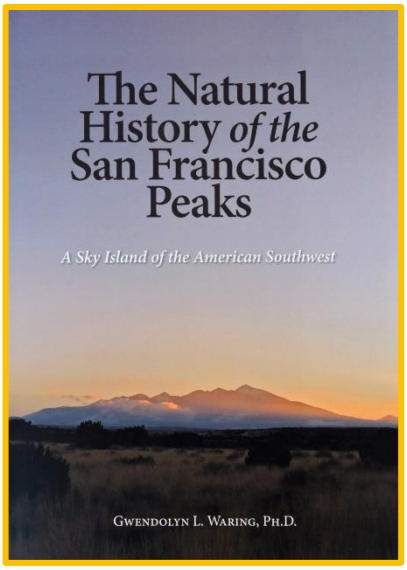
Stinknet (*Onchosiphon pilluliferum*) is a winter annual composite native to South Africa. Stinknet first appeared in California and Arizona herbarium records in the early 1990s. In Arizona the earliest records were in Maricopa and Pinal Counties. In California earliest records were in Los Angeles, San Diego and Riverside Counties. Beginning around 2003 an infestation appeared at the Arizona Game and Fish Ben Avery Shooting Facility in Maricopa County and was allowed to slowly build up between 2003 to 2019. Secondary infestations also escaped notice and slowly built up populations around the Phoenix metro area and in the Tonto National Forest. The unusually wet winters of 2016-17 and 2018-19 caused the development of major and large Stinknet infestations throughout the Phoenix metro area, Tonto NF, and along I-10 south the Casa Grande and west to Buckeye. But by 2019 Stinknet still had not been listed by Arizona or California as a noxious weed. With higher frequencies of extreme and unusual weather events, there is urgency for early detection and control of noxious weeds.

5:15 PM **Summary and Reception (Beverages and Snacks) in Lobby adjacent to Conference Room – All Welcome**

6:00 PM **Buffet Dinner (With Ticket)**

7:00 PM **Evening Presentation: The Natural History of the San Francisco Peaks. A Sky Island in the American Southwest**

Gwendolyn L. Waring, Ph.D.



Poster Sessions

A proposed Sonoran Desert Native Seed Library

Danielle Carlock

Scottsdale Community College, 9000 East Chaparral Road, Scottsdale, AZ 85256 (d.carlock@scottsdalecc.edu)

Because of habitat loss, our backyards are increasingly important wildlife habitat (Audubon, 2016; Derby et al, 2019; Tallamy, 2009; Rainer & West, 2015; Lewis et al, 2019). It is also well established that natives benefit wildlife more than non-natives (Burghardt et al. 2010; Burghardt et al. 2009; Narango et al. 2018). Therefore, what we grow in our yards matter.

While seed libraries exist in Maricopa County, none focus on native plants. The proposed seed library will offer Sonoran Desert natives freely to the public, and will focus on natives that are not widely available in order to increase their use in landscapes. When selecting species for inclusion, consideration will also be paid to their wildlife value (especially to pollinators), to their ease of growth, and to their heat and drought tolerance (in consideration of climate change). Seed will be ethically collected following the SOS protocol (BLM, 2018).

The seed library's impact will be extended through mobile components such as sharing seeds with other seed libraries in the Valley, distributing seeds at farmer's markets, and hosting seed swaps. Additionally, educational materials and workshops will be offered on the value of native plants, how to grow them, and how to establish gardens for wildlife.

The purpose of the presenting this poster is to improve the project by obtaining feedback from experts in Arizona native plants and by building partnerships with other organizations working in native plant conservation.

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Anatomy of a Soapberry Forest from the Lower San Pedro, Arizona

Daniel McNair and Chuck Powell
WestLand Resources, Inc., AZ
(danielmcnair@gmail.com

Cleste Andersen
The Nature Conservancy, Tucson, AZ

Dawn Rocha, Shanelle Sakeva, Anthony Villarreal, and Trent Tu'tsi
Tonto National Forest Tribal Monitoring Program, AZ

We are in the process of collecting natural and cultural history data on *Sapindus saponaria* (Sapindaceae), a widely distributed deciduous tree-shrub in the New World tropics and subtropics. Of particular interest in our study is a relatively large and concentrated population of over 5,000 soapberry stems, putatively clonal, and forming a monotypic canopy within a mature mesquite bosque forest in the lower San Pedro River valley, Arizona. The property is currently owned by Resolution Copper and being managed by The Nature Conservancy. Funding for this research was provided by Resolution Copper.

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Digital Tools for Obtaining Knowledge of Plants in the American Southwest

Dawn Rocha and LeRoy Shingoitewa
Tonto National Forest Tribal Monitoring Program, AZ

Avi Buckles and Daniel McNair
WestLand Resources, Inc., AZ

We present observations from a series of workshops organized by the Tonto National Forest Tribal Monitoring Program and WestLand Resources. The workshops focused especially on using digital tools for obtaining knowledge of plants in Arizona and surrounding regions, such as the Southwestern Environmental Information Network (SEINet) and the Native American Ethnobotany Database (BRIT). We also discuss limitations and ethical considerations when utilizing these kinds of digital resources, especially in the context of traditional ecological knowledge.

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Velvetleaf mallows of the Apache Highlands Ecoregion

Daniel McNair
WestLand Resources, Inc., AZ
(danielmcnair@gmail.com)

The mallow family (Malvaceae) contains numerous plant species of cultural and economic importance around the world such as cacao, cotton, durian, hibiscus, jute, marshmallow, and okra. The Apache Highlands Ecoregion – spanning Arizona, New Mexico, Chihuahua, and Sonora – contains an incredible diversity of native mallow species (Fryxell and Hill 2015; McNair et al 2018). This poster focuses especially on the genus *Abutilon* and other similar genera.

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Organic Velvet Mesquite – Successful Treatment of Mesquite Psyllid

Tracey Till and Rachel Soltis
Pima County Native Plant Nursery
5845 N. Camino de la Tierra, Tucson, AZ 85741
(Tracey.Till.pima.gov)

The two-acre Pima County Native Plant Nursery is an essential part of the county's award-winning Sonoran Desert Conservation Plan. We maintain over 20,000 native plants representing 230 Sonoran Desert species, all destined for restoration projects and other public spaces. The nursery is committed to growing plants organically in order to maintain a nursery that acts as a functional part of our ecosystem.

The velvet mesquite, *Prosopis velutina*, plays an important role in the ecology of the Sonoran Desert. We are currently growing over 1,500 velvet mesquite trees. In recent years, populations of mesquite psyllid, *Heteropsylla texana*, have severely damaged our velvet mesquite seedling to the point of causing defoliation and preventing their growth. In 2019, we determined a successful organic treatment for this insect pest. We found that the product Organic JMS Stylet Oil prevented the psyllid from reaching damaging levels. Horticultural oil is successfully used to manage other psyllids in organic agricultural systems, such as vineyards.

We carefully applied Organic JMS Stylet Oil at 3 tbsps. per gallon of water to the branches and leaf tips using a three gallon hand pump sprayer. We applied it weekly and biweekly depending on observed population levels. The results of the treatment were dramatically different from using no treatment in previous years. Our result was less leaf curling, no defoliation, and more vigorous growth.

We hope by sharing an outline of the treatment we used, and the positive results we achieved, that other tree growers will be empowered to grow velvet mesquite trees in a way that protects their health and the health of the ecosystem.

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Flora of the Santa Catalina Mountains, Pima and Pinal Counties, Southeastern Arizona

James T. Verrier
University of Arizona Herbarium
School of Plant Sciences, Tucson, AZ
(jverrier@email.arizona.edu)

The Santa Catalina Mountains are located in Pima and Pinal Counties, southeastern Arizona. The study area is approximately 259,000 acres or 405 mi2, spanning an elevational gradient of 6457 ft. Highly diverse plant communities range from Sonoran Desert to subalpine forest, located on the northwestern edge of the Madrean-influenced sky island complex of southeastern Arizona and northern Sonora. A total of 380 days of fieldwork were conducted between 2007–2017, including the remote east side of the mountains. The vascular flora includes 1360 taxa in 127 families, 628 genera, 1307 species, and 287 infraspecific taxa, and is currently the largest of any range in southern Arizona. The largest plant families are Asteraceae, Poaceae, and Fabaceae, with 213, 187, and 107 taxa respectively. Euphorbia, Muhlenbergia, and Dalea are the largest genera with 24, 22, and 16 species. A total of 375 taxa are found on limestone or dolomitic substrates. Non-native plants are represented by 167 taxa, 12.3% of the flora. Non-vascular plants include 169 taxa from 36 families, based on over 1150 collections from 18 national herbaria. The floristic diversity of this sky island represents nearly a third of the entire state flora while occupying less than half a percent of the state. Geographic location, elevational gradient, geological diversity, and a high percentage of species found at the edge of their ranges contribute to the rich diversity of this unique mountain range.

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Flora of the Santa Rita Mountains, Pima and Santa Cruz Counties, Southeastern Arizona

James T. Verrier, University of Arizona Herbarium, School of Plant Sciences,
(jverrier@email.arizona.edu)
Susan Davis Carnahan, University of Arizona Herbarium, School of Plant Sciences,
(scarnahan@email.arizona.edu)
Iris E. Rodden, University of Arizona, School of Natural Resources and the Environment,
irisr@email.arizona.edu

This project represents the first undertaking to create a botanical inventory of vascular plants of the Santa Rita Mountains. This biologically rich Madrean sky island spans Pima and Santa Cruz

counties; the defined study area is approximately 151,000 acres (61,107 hectares) along a 5856 ft. (1785 m) elevational gradient. Since August 2016, we have performed 101 days of fieldwork. We anticipate completion by the end of 2019. This listing is specimen-based and currently includes 1138 taxa in 110 families. While 35 historically collected species have been verified and 133 new taxa have been added to the flora, 81 historical records remain unverified and are excluded from this checklist. Non-native plants are represented by 91 taxa (8%). The Santa Rita Mountains are the 3rd most botanically diverse range in southern Arizona. Many taxa with Mexican affinities are found at or near their northern limit in this highly diverse sky island, along with other rare species such as orchids, jaguars, and ocelots. The flora of this unique range faces many threats including three proposed open-pit mines, heavy livestock grazing, long-term drought, and climate change.

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Vegetation Response to Watershed Restoration in Southeastern Arizona

Natalie R. Wilson and Laura M. Norman
US Geological Survey, Western Geographic Science Center
520 Park Avenue, Tucson, AZ 85719
(nrwilson@usgs.gov)

Vegetation communities are increasingly affected by interactions of precipitation and temperature changes, land use change, and local alterations of ecological processes. Restoration practitioners in many regions seek to mitigate these changes and conserve landscapes. In southeast Arizona, threats to the landscape include changes in precipitation patterns, increased wildfire interval and intensity, and increased use of ground and surface water resources by a growing human population. In this region, vegetation dynamics are primarily driven by water availability and in response a suite of restoration techniques have been developed to restore watershed function. These techniques affect the hydrology of the landscape, increasing water availability and decreasing damaging flows, but the effect of these techniques on vegetation dynamics have not been adequately documented. To evaluate the effect of restoration structures on vegetation, field data was collected for four growing seasons (August – September) from 2015 to 2018. We measured and documented overall vegetation response, changes in species composition and abundance, occurrence of wetland species, and native/non-native species dynamics. Preliminary results show higher frequencies of perennial vegetation at treatment sites after four years for all sites and site specific dynamics will be discussed.

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Field Trips

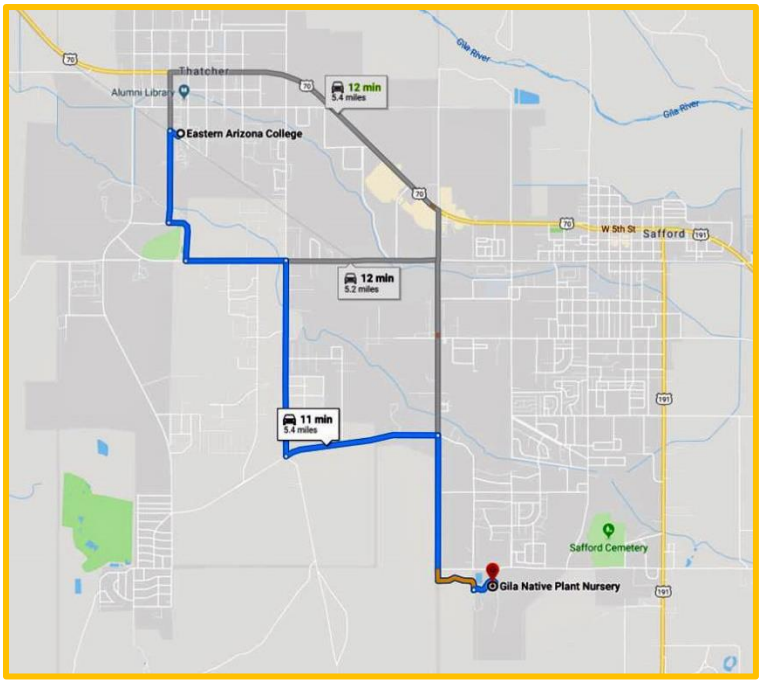
Sunday, August 31, 2019

(Field Trip Sign Up at Meeting Check In)

1. Safford Valley Grid Field Trip. Prehistoric farmers constructed cobble and boulder grids and terraces at a remarkable landscape scale that covers Pleistocene terraces of the Gila River north of Pima, Arizona. In a six km2 sample area within a much more extensive distribution, multi-disciplinary investigators recorded 203 acres (82.2 ha) of these well-preserved agricultural complexes for the cultivation of agave. We will visit these Safford Valley grids to examine enhanced moisture properties, persisting effects on native vegetation, and archaeological evidence for agave as the principal crop. On Sunday morning, we will meet at the Gherald L. Hoopes, Jr. Activities Center of Eastern Arizona College at 8:00 AM and arrange a carpool to travel approximately 7 miles. We will then park and walk on rocky surfaces over rolling to hilly topography. Sturdy shoes are recommended and please bring sufficient water for a 2.5 -hour round trip. **Trip Leaders:** Professor Suzanne Fish and Professor Paul Fish, School of Anthropology, University of Arizona.

2. The Gila Native Plant Nursery. The Gila Native Plant Nursery is located at Discovery Park, in Safford, which is an auxiliary campus of Eastern Arizona College. The nursery contains a 2,800 sq. ft. climate controlled greenhouse and over 3, 000 sq. ft. of shadehouse. We do production of plant material predominantly for our restoration projects, both contracted and our own properties along the Gila River. At last count we have around 17,000 plants in stock. We also have a retail side of things, selling native plant material to the general public and trying to promote pollinator gardens in the Gila Valley. Plant material would be available to anyone participating on a tour of the facility.

At Discovery Park we also manage the Pollinator Garden which is an on-going work in progress. We currently have a little over an acre in development but will eventually expand to include 3+ acres. The garden is divided into various water harvesting basins that contain Arizona native plants chosen to lure certain pollinators such as, Monarch butterflies, moths, bats, bees and hummingbirds. There are shade structures and benches for people to utilize when visiting the garden. A tour of this site can be a part of the nursery tour and is a short distance from the greenhouse. **Tour Leader:** Steve Plath. Individual tour participants meet at the nursery (1651 Discovery Park Blvd., Safford) at 8:00 AM. The nursery is located about 5.5 miles from the EAU Campus.



3. Introduction to the Pinaleño Mountains. This trip will begin at 8:00 AM at the Eastern Arizona College. Travel will be in either individual cars or car pools. We will proceed about 12 miles south of Safford to the Swift Trail Junction along Highway 191. From there we will climb into the mountains via the Swift Trail, an excellent paved highway. The highway rises from approximately 3.000 to 9,000 feet elevation. Along the way we will make numerous stops at botanically interesting areas and allow time for short hikes from the road. We will assess at the time how far we wish to proceed on the Swift Trail. The pavement eventually ends on this road but the unpaved road is in excellent shape. Individuals will be free to depart the tour whenever they wish. **Tour Leaders:** Doug Ripley, Jim Verrier, and Elliott Hendricks, Arizona Native Plant Society.