CHRISTMAS MOUNTAINS RESEARCH SYMPOSIUM

2014

Terlingua Ranch Headquarters
Brewster County, Texas
May 19th–21st, 2014

THE TEXAS STATE UNIVERSITY SYSTEM™

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CHRISTMAS MOUNTAINS RESEARCH SYMPOSIUM

Terlingua Ranch Headquarters
Brewster County, Texas
May 19th–21st, 2014

Monday, May 19th

6:00 pm Informal social for meeting participants by the swimming pool

7:00 pm Dinner available (on your own) at the Bad Rabbit Café

Tuesday, May 20th

9:00 am Field trip to Christmas Mountains overlook (meet in the parking lot next to the swimming pool)

9:00 am Field trip to fluorspar mines (meet on the patio outside the café)

1:30 pm Paper session (in the bunkhouse beneath the Bad Rabbit Café)

8:00 pm Christmas Mountains Advisory Committee meeting (bunkhouse)

Wednesday, May 21st

8:00 am Hike to Christmas Mountains overlook (meet in the parking lot next to the swimming pool)

8:30 am Field trip to Paisano Peak overlook (meet on the patio outside the café)

1:30 pm Paper session (in the bunkhouse beneath the Bad Rabbit Café)

7:00 pm Dinner for meeting registrants at the Bad Rabbit Café (regular dinner menu will be available for others at the café)

FIELD TRIPS

Christmas Mountains Overlook
Trip leader: Michael Huston
Tuesday morning at 9:00 – meet in the parking lot next to the swimming pool

Participants will carpool up the Old Mine Road to a scenic overlook at the road's end. We will make several stops along the way to examine the geology and vegetation of the area and to take in views of the Rosillos Mountains and desert flats to the east and the Chisos Mountains to the southeast. The overlook, at an elevation of approximately 1640 m (5370 ft), provides stunning views of the region to the south and west, and participants will have the option of making the short but rugged hike to the summit at 1746 m (5728 ft).

Please note that the Old Mine Road requires high-clearance vehicles and, consequently, the number of participants on this trip will, of necessity, be limited by the number of vehicles we have at our disposal.

Fluorspar Mine Area
Trip leader: David Lemke
Tuesday morning at 9:00 – meet on the patio outside the Bad Rabbit Cafe

We will carpool to an area near the base of Paisano Peak and hike a short distance (approx. 1 km or 0.6 mi) to the site of the Paisano Fluorspar Mine, which operated in the Christmas Mountains from 1971 until 1982. Fluorspar, an aggregate of rock and mineral matter containing varying amounts of fluorite (CaF_2), is an important industrial mineral commodity for which there are no known substitutes in its major commercial uses. Participants will have the opportunity to explore the old mining camp, the mines (no spelunking—the shafts are sealed), and the piles of debris discarded by the miners. We will also have time to examine the desert plant communities characteristic of the area. This is a relatively easy hike, but since we are in the desert, plan to carry at least a liter of water with you.

Christmas Mountains Hike
Trip leader: David Lemke
Wednesday morning at 7:30 – meet in the parking lot next to the swimming pool

Participants will carpool to the parking area at the base of the Old Mine Road and hike to the scenic overlook at road's end. Along the way we will be able to examine the geology and vegetation of the area and to take in views of the Rosillos Mountains and desert flats to the east and the Chisos Mountains to the southeast. The overlook, at an elevation of approximately 1640 m (5370 ft), provides stunning views of the region to the south and west, and participants will have the option of making the short but rugged hike to the summit at 1746 m (5728 ft). The round-trip hike is approximately 11 km (7 mi) long and occasionally steep, and participants should be in good physical condition. Each hiker should wear sturdy hiking shoes and carry a minimum of 2 liters of water.

FIELD TRIPS (cont'd)

Paisano Peak Overlook Hike
Trip leader: Michael Huston
Wednesday morning at 8:30 – meet on the patio outside the Bad Rabbit Cafe

We will carpool to an area along the northern boundary of the Christmas Mountains property and hike a moderate distance (approx. 3 km or 1.8 mi each way) to a scenic overlook located in a saddle on the south side of Paisano Peak that presents a broad vista to the west and southwest. The top of a nearby hillside offers a panoramic view of the Christmas Mountains caldera complex and, if we have any geologists with us, they can hopefully explain to us what we are looking at. We will also have time to examine the desert plant communities characteristic of the area. This is a moderately easy hike, but since we are in the desert, plan to carry at least two liters of water with you.

CHRISTMAS MOUNTAINS RESEARCH SYMPOSIUM

Tuesday, May 20

1:30 Welcome and Introductions

1:45 An introduction to the Christmas Mountains
David E. Lemke, Texas State University

2:00 The Conservation Fund and the Christmas Mountains
Reggie Hall and Andy Jones, The Conservation Fund

2:15 Emplacement of the Christmas Mountains dome
Lauren Royter, Sul Ross State University

2:30 Break

2:45 Igneous mineralogy of the Christmas Mountains
Kevin M. Urbanczyk, Blake Huston and Sofia Caylor, Sul Ross State University

3:00 Field mapping and petrology of dikes in the Lost Mine Trail area, Big Bend National Park, Texas
Seth C. Sonnier and Kevin M. Urbanczyk, Sul Ross State University

3:15 CoCoRaHS For the Christmas Mountains
Jim DeBerry, National Weather Service

3:30 Using soil chloride concentrations as a proxy for rainfall recharge in the Rio Grande basin
Alyson K. McDonald and Girisha Gangegunte, Texas AgriLife Extension Service and Texas AgriLife Research and Extension Center

4:00 Break

4:00 The ants of Texas: An introduction to a collaborative myrmecological endeavor
Danny L. McDonald, Ross B. Messer and Jerry L. Cook, Sam Houston State University

4:15 Increasing consumption and the absence of production: Scylla and Charybdis in the conservation of *Lophophora williamsii* (peyote)
Martin Terry, Sul Ross State University

4:30 A review of mammalian ectoparasites from the Northern Chihuahuan Desert
Chris M. Ritzi, Sul Ross State University

4:45 Survey of the Mexican beaver in Big Bend National Park
Joey Reich and Thomas R. Simpson, Texas State University

Wednesday, May 21

1:30 Gaining insights into Middle Archaic lifeways of the Texas Big Bend, 2500—1000 B.C.
Andrea J. Ohl, Sul Ross State University

1:45 Taxonomic utility of rattle acoustic variables as behavioral characters in U.S. populations of *Crotalus lepidus*
Bret Welch and Martin Terry, Sul Ross State University

2:00 Plant communities associated with limestone bedrock in southern Brewster County, Texas
Michael R. Margo and Lynn E. Loomis, USDA-NRCS

2:15 Establishing a population of the threatened Chisos Mountain hedgehog cactus
Haley J. Hale and Bonnie Amos, Angelo State University

2:30 Break

2:45 An annotated flora and floristic analysis of The Nature Conservancy Davis Mountains Preserve, Jeff Davis County, Texas
Jeffrey James Keeling, Sul Ross State University

3:00 The fossil woods of Terlingua Ranch, Brewster County, Texas
David E. Lemke, Texas State University

3:15 A re-examination of the fossil land snails (Gastropoda: Pulmonata) from the Devil's Graveyard Formation of west Texas using CT scanning
Mary Jones, Ned E. Strenth and Alfonso Correa-Sandoval, Angelo State University and Instituto Technologico de Cd. Victoria

3:30 New records of the Chinati sheepmoth *Hemileuca chinatiensis* (Lepidoptera: Saturniidae) from central Texas
Ned E. Strenth, Andrew G. Garcia and Mary Jones, Angelo State University and San Angelo Nature Center

3:45 Break

4:00 Relative species abundance and diversity of amphibian and reptile communities among three habitat scales at the Devils River State Natural Area – Big Satan Unit
Austin B. Osmanski and Michael T. Dixon, Angelo State University

4:15 Use of moth size distributions to evaluate productivity differences between ecosystems
Virginia Brown and Michael Huston, Texas State University

ABSTRACTS

An introduction to the Christmas Mountains

David E. Lemke, Department of Biology, Texas State University, San Marcos, TX

This presentation will provide a brief overview of the geology, ecology, and history of the Christmas Mountains property from its inclusion as part of the massive G4 Ranch in the nineteenth century to its recent transfer to the Texas State University System. Geologically, the approximately 4000 hectare property is characterized largely by marine sedimentary rocks of Cretaceous age that have been intruded by much younger (44–40 million year old) igneous rocks forming a complex caldera system. At present, the area supports a well-developed desert grassland ecosystem comprising several distinct plant commuity types and may represent one of the best-preserved examples of Chihuahuan Desert grassland in the State. The potential for use of the property as an educational tool will be discussed.

The Conservation Fund and the Christmas Mountains

Reggie Hall and Andy Jones, The Conservation Fund, Arlington, VA and The Conservation Fund, Austin, TX

For nearly 30 years, The Conservation Fund has been saving special places across America. The organization has protected more than seven million acres of land and water in all 50 states, from the park down the street to historic battlefields, wild areas and favorite destinations of all kinds. Working with community, government and business partners, we strive to balance economic and environmental goals. This presentation will address the role of The Conservation Fund in the acquisition of the Christmas Mountains property, its transfer to the State of Texas, and the role of the organization in monitoring and enforcing the conservation easement.

Emplacement of the Christmas Mountains dome

Lauren Royter, Department of Biology, Geology and Physical Sciences, Sul Ross State University, Alpine, TX

The Christmas Mountains dome is a laccolithic intrusion and caldera complex that was emplaced between 44 and 40 million years ago within the pre-main phase of the Trans-Pecos Magmatic Province, Texas. Field observations, sample collection, and three-dimensional modeling were used to define the mechanism of emplacement. Field observations and data were compiled and used to create two, three-dimensional models. The first shows the geologic history of emplacement, and the second shows the shape of the underlying magma chamber. The volume, in cubic kilometers, of the magma chamber was estimated in ArcScene using contacts and stratigraphic correlation between surrounding Cretaceous sedimentary units. Based on classification and analysis of tuffs from the four calderas, it was determined that the Christmas Mountains dome was emplaced in two to three pulses. Pre-existing structure as well as post emplacement structure combined to influence the orientation and elongation of the dome. Radial faults formed contemporaneously with doming and were reactivated during Basin and Range faulting that occurred several million years after the emplacement of the dome.

Igneous Mineralogy of the Christmas Mountains

Kevin Urbanczyk, Blake Huston, and Sofia Caylor, Department of Biology, Geology and Physical Sciences, Sul Ross State University, Alpine, TX

The Christmas Mountains offer a unique opportunity to study the mineralogy of the igneous rocks of the area. The Christmas Mountains are part of the Trans-Pecos Magmatic Province which erupted during the Tertiary period, with the majority of volcanic activity occurring 40–44 mya. A suite of geochemically diverse rock samples were collected and studied through the use of a Scanning Electron Microscope (SEM). The use of the SEM allows us to explore thin sections at view extents of less than 10µm, a scale at which standard petrographic microscopic observation is impossible. Energy Dispersive Spectroscopy (EDS) analysis allows for the determination of the chemical composition at these scales and allows for the identification of the mineralogy of fine grained samples. Silicic magmatism dominated the Christmas Mountains region with common lithologies including rhyolites, quartz trachytes, and trachyandesites. These rocks are composed of common minerals including plagioclase, alkali feldspar, augite, amphibole, and Fe-Ti oxides. The Luna Vista sill is located in the Christmas Mountains vicinity. It is a peralkaline quartz trachyte based upon whole rock analysis. A peralkaline rock is one that has an excess of Na and K than needed for feldspar, and as a result, peralkaline rocks will commonly contain aegirine-augite or other sodic and/or potassic minerals. We have been able to identify large elongate crystals (~2 cm in length) of aegirine-augite with inclusions of apatite that have the rare earth elements Ce (up to 5 wt. % CeO_2) and La (up to 2.5 wt % La_2O_3). The groundmass includes a labyrinthine framework of intimately intergrown alkali feldspar and albite and a fibrous-appearing mineral in the ~5 µm void spaces in this labyrinthine framework that appears to be arfvedsonite, yet is rich in K relative to Na.

Field Mapping and Petrology of Dikes in the Lost Mine Trail Area, Big Bend National Park, Texas

Seth C. Sonnier, Kevin M. Urbanczyk, Department of Biology, Geology and Physical Sciences, Sul Ross State University, Alpine, TX

The Lost Mine Trail area of the Chisos Mountains lies just outside the north-eastern margin of the Pine Canyon Caldera. The sequence of volcanic events that produced the South Rim formation in the high Chisos Mountains is thought to have involved two separate and distinct magmas, one producing the lava and tuffs of the Pine Canyon rhyolite and Boot Rock members, and the other producing the lava and tuffs of the Emory Peak rhyolite. A series of intrusive igneous rocks including a large plutonic intrusion or possible lava dome, and a large swarm of dikes that strike west-southwest from the north-eastern margin toward extra-caldera vents at Casa Grande, Toll Mountain, and Emory Peak, are also included into the South Rim Formation. Detailed field mapping at a 1:10,000 scale of the Lost Mine Trail area has recorded a more accurate spatial distribution of these dikes, as well as providing some new information on the structure and general geology of the area. Geochemical analysis has provided evidence for a co-magmatic relationship for the dikes on top of the Lost Mine Trail, and the Casa Grande Lava Dome through mass balance and trace-element modeling, ED-XRF feldspar analysis, and petrography. Pearce Element Ratios indicate that these dikes and the Casa Grande Lava Dome are possibly petrogenetically related to the source magma for the Pine Canyon rhyolite and Boot Rock members, and not the separate magma of the Emory Peak rhyolite.

CoCoRaHS For the Christmas Mountains

Jim DeBerry, National Weather Service, Midland, TX

West Texas is one of the most sparsely populated areas of the state. As result, meteorological observations here are similarly sparse. Even automated observing platforms are not as abundant out here as in more populated areas of the state, for funding for such systems logically tends to be concentrated where benefits will be maximized, i.e., population centers. As a result, west Texas rainfall climatology is poor. In 1998, the CoCoRaHS (Community Collaborative Rain, Hail and Snow) network was established. CoCoRaHS is a unique, non-profit, community-based network of volunteers of all ages and backgrounds working together to measure and map precipitation (rain, hail and snow). With a simple rain gauge and an internet connection, landowners can establish a climatology of rainfall on their land. The denser the observing network, the better, especially in mountainous terrain such as the Christmas Mountains, for rainfall can vary considerably in areas of dissimilar topography. CoCoRaHS is the cheapest, easiest-to-use network devised so far for measuring precipitation.

Using soil chloride concentrations as a proxy for rainfall recharge in the Rio Grande Basin

Alyson K. McDonald and Girisha Gangegunte, Texas AgriLife Extension Service, Fort Stockton, TX and Texas AgriLife Research and Extension Center, El Paso, TX

Previous studies of rangelands in New Mexico dominated by *Larrea tridentata* (creosotebush) indicate this plant may have a profound effect on rainfall interception and runoff resulting in up to 30 percent reduction of rainfall infiltration into the soil. Rainfall infiltration is desirable not only for plant sustenance and growth, but also for groundwater recharge. Groundwater recharge, or deep drainage, can be difficult and expensive to measure. Therefore, recharge is often estimated rather than empirical. The chloride mass balance approach has been used to assess rainfall infiltration and deep percolation in desert shrub communities, on fallow cropland, and in pastures cleared of mesquite in south Texas. Atmospheric chloride is a stable isotope that enters the soil with rainfall. Thus, soil chloride content is a proxy for wetting front penetration and is an historic record of rainfall infiltration. We tested the hypothesis that rainfall infiltration would be enhanced by conversion from shrubland to grassland by measuring woody plant cover and density, and herbaceous cover and productivity in areas treated with herbicide in 1982, and within untreated areas in Pecos, Brewster, and Culberson counties. We also sampled soils to determine texture, porosity, and chloride concentration. Results indicate that rainfall recharge in the Trans-Pecos region may be grossly overestimated, which may lead to difficulties in future management of groundwater resources. Not only are the recharge estimates substantially less than 2 percent of annual rainfall, the depth of chloride accumulation suggests rainfall rarely percolates more than a few meters and the water table in many areas is ≥ 100 meters deep. Aquifer recharge in these areas may be zero.

The Ants of Texas: An Introduction to a Collaborative Myrmecological Endeavor

Danny L. McDonald, Ross B. Messer and Jerry L. Cook. Texas Research Institute for Environmental Studies and Department of Biological Sciences, Sam Houston State University, Huntsville, TX

There are 291 known ant species in Texas. We visually summarized the distribution of known myrmecofauna across Texas to identify counties and ecoregions that are under-surveyed. The mean number of documented

species per county was 16.7 ± 15.9. Counties in the Trans-Pecos ecoregion had the highest known myrmecofaunal diversity. The majority of counties in the Piney Woods and Oak Woods and Prairies ecoregions are likely under-surveyed and are recommended for highest sampling priority. This study serves as a guide for future myrmecofaunal surveying efforts and introduces a collaborative project known as the Ants of Texas (AoT).

Increasing consumption and the absence of production: Scylla and Charybdis in the conservation of *Lophophora williamsii* (peyote)

Martin Terry, Department of Biology, Geology and Physical Sciences, Sul Ross State University, Alpine, TX

Lophophora williamsii (peyote), a cactus of the Chihuahuan Desert and Tamaulipan thornscrub, is utilized for medicinal and ceremonial purposes in indigenous cultures of Mexico and the United States. The plant is currently considered "vulnerable" in terms of its conservation status, due in large part to the overharvesting of wild populations for the last several decades, plus the fact that wild populations constitute the only source of peyote for all the uses by all groups of consumers. Peyote, being a binational cactus, is subject to the different laws and regulations of the two countries. Up until now, the focus of those legal instruments has been the consumption of peyote—either to prohibit it or to create exceptions to the prohibition in order not to interfere with the traditional customs of the indigenous cultures that use peyote. But there has been practically no governmental concern about the absence of production of peyote to sustain the authorized consumption. Here I touch on some of the techniques now available for the production of peyote. Also presented is the logic of taking official action—in both the U.S. and Mexico— to promulgate the appropriate regulations to permit the application of such horticultural techniques to the production of peyote. The objective is that enough peyote would eventually be produced through regulated cultivation to satisfy the demands of legal consumption. That would concomitantly make possible the recovery of the decimated wild populations of peyote, as well as the restoration of extinct populations.

A Review of Mammalian Ectoparasites from the Northern Chihuahuan Desert

Chris M. Ritzi, Department of Biology, Geology and Physical Science, Sul Ross State University, Alpine, TX

Ectoparasites tend to be an underappreciated facet of mammalian natural history. This is in light of their possible involvement with changes in roosting and nesting behavior, daily activity patterns, and the growth and development of mammals. In order to better appreciate the diversity of ectoparasitic organisms present in the Chihuahuan Desert region, a compilation of known ectoparasite-host relationships has been gathered for the diverse mammalian species known to occur within the northern extent of the desert's boundaries. Ectoparasites reported include fleas (Siphonaptera), lice (Mallophaga and Anoplura), true bugs (Hemiptera), flies (Nycteribiidae and Streblidae), ticks (Argasidae and Ixodidae), and other mites (Acari). Common methods for the collection and recovery of ectoparasitic insects and acari from mammals will be presented. The variety of parasitic forms found will be discussed, combined with aspects of natural history, such as methods of feeding, host attachment, and known disease vectoring. In addition, a few areas of future study will be suggested, including the need to collect, identify, describe, and begin the ecological study on several largely overlooked groups of ectoparasites.

Survey of the Mexican beaver in Big Bend National Park

Joey Reich and Thomas R. Simpson, Department of Biology, Texas State University, San Marcos, TX

The Rio Grande River forms the 176 km boundary of Big Bend National Park with Mexico and is home to the southwestern subspecies of North American beaver, *Castor canadensis mexicanus*. The last survey on the Mexican beaver in Big Bend National Park was conducted in 1976 by J. Connor and B. Feeley. Our objectives are to document centers of beaver activity and estimate the population of beaver within the park. We surveyed the Rio Grande River from the mouth of Terlingua Creek to the mouth of Boquillas Canyon by float trips using kayaks, canoes, and river rafts. On the float trips, we recorded water depth, type of vegetation, and sign of active beaver colonies (presence of beaver tracks, scat, and cuttings). To date, we have extensively surveyed approximately 88 km of the river, from Terlingua Creek to Black Dike and from Talley to Boquillas Canyon. From data gathered on float trips, we have created an ArcGIS map showing bathymetry of the river, vegetation profiles, and active beaver sign. Over 95 active beaver dens have been located, indicating a healthy population of beaver in the park. Motion sensitive cameras were set a total of 60 camera trap-nights at the mouth of Santa Elena Canyon, Daniel's Ranch, and in the vicinity of Rio Grande Village. Mean number of beaver recorded per camera set was 3.5. We recorded vegetative species cut or removed from the river bank by beaver and presumably used for food. These include willow (*Salix* spp.), baccharis (*Baccharis* sp.), sunflower (*Helianthus* sp.), and *spikerushes* (Eleocharis spp.) Information generated from this project will be used by the National Park Service in implementing management practices to restore the river and riparian area to a more natural state. Practices include the removal of exotic plant and animal species as well as planting and managing for native plant species such as cottonwoods and willows.

Gaining Insights into Middle Archaic Lifeways of the Texas Big Bend, 2500—1000 B.C.

Andrea J. Ohl, Center for Big Bend Studies, Sul Ross State University, Alpine, Texas

The Chihuahuan Desert as we know it today first became well established in the southern Big Bend region about 4,000 years ago. This paper examines the archaeological evidence regarding the lifeways of indigenous people who lived here from 4500 to 3000 years ago. It looks closely at three recently excavated sites in the Big Bend area that date to that time period, and also draws on information from over 500 sites of that age in the eastern Trans-Pecos of Texas.

Taxonomic utility of rattle acoustic variables as behavioral characters in U.S. populations of *Crotalus lepidus*

Bret Welch and Martin Terry, Department of Biology, Geology and Physical Sciences, Sul Ross State University, Alpine, TX

The rattle sounds of 100 *Crotalus lepidus* individuals, comprised of 26 *Crotalus lepidus lepidus* and 74 *Crotalus lepidus klauberi* from U.S. populations, were recorded under controlled laboratory conditions and analyzed. The following acoustic variables were analyzed: rattle speed, center frequency, peak frequency, average power, and RMS power. For each variable analyzed, the mean value for the *C. l. lepidus* group was compared with the mean value for the *C. l. klauberi* group with a t-test, which was run at a 95% confidence level to determine whether the two means were statistically distinguishable. For all five rattle sound variables tested for the two subspecies, the P values of the t-tests were significant, indicating differences between the two

subspecies in these various quantitative acoustic aspects of their rattle behavior—comparable to the rattle behavioral differences observed in the field and in captivity. Another t-test analyzing the rattle speeds of small individuals versus large individuals of *C. l. klauberi* yielded a nonsignificant value indicating that body size was not a significant factor affecting the rattle speed in that subspecies. That result was confirmed by regression and correlation tests. The other four acoustic variables tested (center frequency, peak frequency, average power, and RMS power) did show significant correlations with body size in *C. l. klauberi*. These aspects of rattle behavior, based on readily quantifiable acoustic variables, merit consideration for more extensive use as characters in *Crotalus lepidus* systematics.

Plant communities associated with limestone bedrock in southern Brewster County, Texas

Michael R. Margo and Lynn E. Loomis, USDA-NRCS, Marfa Soil Survey Office, Marfa, TX

Limestone bedrock occupies 2.4 million hectares (about 25%) of Trans-Pecos Texas. In this region, vegetation physiognomy on limestone ranges from shrubland along the Rio Grande to forestland in the Guadalupe Mountains. An ecological site is a conceptual landscape division defined by recurring soil, landform, geological, and climate characteristics. A site produces distinctive kinds, amounts, and proportions of vegetation and responds similarly to management actions and natural disturbances. Ecological sites are the fundamental units for inventorying and managing rangelands. Currently three limestone ecological sites are recognized in southern Brewster County, each characterized by a suite of unique plant communities. Their distribution is controlled by elevation and climate. The Mixed Prairie site occurs at elevations generally above 1400 m and annual water deficit less than 500 mm. The Hot Desert Shrub site is situated below 1050 m elevation has an annual water deficit greater than 700 mm. The Desert Grassland site is at intermediate elevations. This presentation will focus on vegetation on the Hot Desert Shrub site of southern Brewster County but will compare and contrast with the ecological sites at higher elevations. More than 150 sample stands were selected along significant ecological gradients. Species composition was documented by assigning a cover class (modified Domin-Krajina) to each species within a 20x20 m plot. Values of annual water deficit were extracted for each georeferenced stand from a GIS grid. Vegetation data were subjected to classification and ordination analysis (PC-ORD Twinspan and Decorana). Ordination axis scores of stands and species, and annual water deficit were subjected to correlation analysis to determine if ordination axes represent environmental gradients. Data analysis has initially revealed chino grama/lechuguilla-candelilla plant communities in the Hot Desert Shrub site. Redberry juniper-wavyleaf oak/curlyleaf muhly woodlands characterize the Mixed Prairie site. Black grama is a common vegetation component in the Desert Grassland site; this species is virtually absent from Hot Desert Shrub communities. Knowledge of plant communities across environmental gradients will be used to develop ecological site descriptions and to refine the delineation of ecological sites.

Establishing a population of the threatened Chisos Mountain hedgehog cactus

Haley J. Hale, Dr. Bonnie Amos, Department of Biology, Angelo State University, San Angelo, TX

The Chisos Mountain hedgehog cactus (*Echinocereus chisoensis*, Cactaceae) (ECCH) is a rare cactus restricted to Big Bend National Park. In 1989 the U.S. Fish and Wildlife Service listed this taxon as threatened because of its limited numbers and very narrow range. In 2004, botanists from Angelo State University, Big Bend National Park, and the Phoenix Desert Botanical Garden collaborated on a project intended to increase plant numbers by establishing a new population within the historical range of the cactus. To do so, 200 2-meter square semi-

permanent quadrats were established in Big Bend National Park. Twenty quadrats served as control plots, and no seedlings were planted or seeds dispersed within them. A total of 560 seedlings that had been grown from seed by the Desert Botanical Garden were planted in the experimental quadrats. In addition, 12,600 ECCH seeds were systematically distributed in each quadrat. Quadrats were surveyed for surviving plants and seed-generated seedlings in 2005, but due to loss of funding for the project, quadrants were not surveyed again until our investigation in 2013. Our survey showed that possibly a few of the seedlings survived (N=4) and a couple (N=2) of the seeds resulted in an established plant. Three other living ECCH were found within the quadrants, but did not match with plants from the 2005 assessment. Re-establishment of rare plant species via artificial propagation is notoriously difficult. Based on our poor results, we must, at least, carefully assess our methodology (i.e., time plantings during seasons or years with predicted higher rainfalls or plant older seedlings). We must also, before attempting another try, consider whether or not the success rate justifies the necessary expense of removing seeds from existing, struggling populations.

An annotated flora and floristic analysis of The Nature Conservancy Davis Mountains Preserve, Jeff Davis County, Texas

Jeffrey J. Keeling, Department of Biology, Geology and Physical Sciences, Sul Ross State University, Alpine, TX

The Nature Conservancy Davis Mountains Preserve (DMP) is located 40 km north of Fort Davis, Texas in the northeastern region of the Chihuahuan Desert. The Davis Mountains are the largest single range in the Trans-Pecos Texas volcanic field, spanning from 1524 – 2555 m in elevation, and were part of a continental volcanic arc active in Texas between 48 and 31 Ma. The cool-temperate region receives an annual precipitation between 28 and 57 cm with the majority occurring during the late summer monsoonal months between June through September. This “sky island” ecosystem caters to the requirements that are needed to accommodate a wide range of vegetation patterns, endemism, and unique biodiversity. Distinct vegetative zones include the Draw (desert grassland), exhibiting species found in grama, tobosa, and sacaton grassland associations, and dominating the lower elevations in Jeff Davis County. The montane savannah sites, between 1747 and 2469 m, exhibit characteristics of the montane woodland associations such as the juniper-pinyon, oak, and pine woodlands. Dominant species of these forests include *Juniperus deppeana*, *Quercus grisea*, *Q. gravesii*, *Q. hypoleucoides*, *Pinus cembroides*, *P. ponderosa*, and *P. strobiformis*. The current study began in May of 2011 and aimed to catalogue the entire vascular flora of the 13,000 hectares 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 approximately 2,153 voucher specimens, representing 471 species, 285 genera, and 84 families. The best represented families are the Asteraceae (87 species; 18.5 % of the total flora), Poaceae (77 species; 16.3% of the total flora), and Fabaceae (20 species; 4.2% of the total flora).

Fossil woods of Terlingua Ranch, Brewster County, Texas

David E. Lemke, Department of Biology, Texas State University, San Marcos, TX

Late Cretaceous and early Tertiary strata (Aguja, Javelina and Black Peaks formations) exposed across Terlingua Ranch in southern Brewster County, Texas, contain an abundance of fossilized wood specimens. Material ranges from large logs 1.6 m in diameter and 15 m in length to much smaller logs and float. Preliminary examination of thin sections prepared from this material indicates the presence of several conifer

and angiosperm taxa. A comparison between the fossil wood flora of Terlingua Ranch and that previously documented for Big Bend National Park, as well as implications for the paleoecology of the area, will be discussed.

A re-examination of the fossil land snails (Gastropoda: Pulmonata) from the Devil's Graveyard Formation of west Texas using CT scanning

Mary Jones, Ned E. Strenth and Alfonso Correa-Sandoval, Department of Biology, Angelo State University, San Angelo, TX and Instituto Technológico de Cd. Victoria, Tamaulipas, México

Previous examination of specimens of the fossil land snail *Lysinoe breedlovei* from the Colmena tuff (Eocene) in Presidio County of west Texas revealed considerable morphological variation within the type series. In an effort to quantify a more comprehensive assessment of this variation, the current study examined a series of fossils from the Devil's Graveyard formation (DGF). These localities are not only relatively close geographically (approximately 105 km) but the formations also share a similar geological age and have correlating vertebrate fauna. Material from the DGF was referred to *Lysinoe breedlovei* in the original description of the species. Recent field collections from the DGF have yielded additional specimens. These new specimens were examined using standard external measurements as well as CT scanning. Multivariate analysis showed significant variation between the two groups. Results of this study do not support the referral status of the DGF material to the fossil species *Lysinoe breedlovei* and further question the degree of variation within the type series.

New records of the Chinati sheepmoth *Hemileuca chinatiensis* (Lepidoptera: Saturniidae) from central Texas

Ned E. Strenth, Andrew G. Garcia and Mary Jones, Department of Biology, Angelo State University, and San Angelo Nature Center, San Angelo, TX

The Chinati sheepmoth (*Hemileuca chinatiensis*) was originally described from Shafter, Texas, in 1943 and is currently reported only from Presidio, Brewster, Culberson, Hudspeth, Pecos and Terrell counties of the Big Bend region of west Texas, as well as Eddy and Chaves counties of southeastern New Mexico. During November of 2013, adult specimens conforming to this species were collected from locations in both Glasscock and Tom Green counties of west central Texas. The habitats of these recent collections differ significantly from the more typical Chihuahuan Desert habitats of west Texas and southeastern New Mexico. Like the west Texas populations, both of these two new locations are also shared with a second species of saturniid moth (*Agapema anona*). While the larval stages of both moth species are reported to share several common host plants, it should be noted that egg rings, feeding larvae, and pupae of both species have to date been found only on a single species of host plant, *Condalia ericoides*. Observations in Glasscock County during the spring of 2014 revealed that by mid-March, the larval stages of both *H. chinatiensis* and *A. anona* were feeding and undergoing pupation. By mid-April, there was a marked decrease in the numbers of larval stages which by then had denuded most of the *Condalia* leaves. Field studies near Shafter are currently being conducted in an effort to compare the life cycle of *H. chinatiensis* from desert populations with that from non-desert locations in central Texas.

Relative species abundance and diversity of amphibian and reptile communities between three habitat scales at the Devils River State Natural Area – Big Satan Unit

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Effective management of herpetofauna depends on the fundamental understanding of habitat use. Our goal is to generate a thesis reporting the quantitative estimates of the relative species abundance and diversity of amphibian and reptile communities between two different habitat resolutions: vegetation type and microhabitat. The broad areas associated with abundant vegetation types will be compared against microhabitat structure to determine the most accurate predictor in the variation of abundance and diversity in herpetofauna. We have utilized a previous vegetation survey performed on the Devils River State Natural Area – Big Satan Unit (DRSNA-BSU) by the Texas Parks and Wildlife Department (TPWD) to identify six major vegetation types constituting 97 percent of the total 7300 hectare area. The property lies on the eastern edge of the Chihuahuan Desert and shares vegetative communities with the Southern Texas Plains and the Edwards Plateau ecoregions. Angelo State University and TPWD have a contracted agreement to conduct a herpetological survey of the DRSNA-BSU and these data will serve as a beneficial addendum to the survey.

Use of moth size distributions to evaluate productivity differences between ecosystems

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The energy that plants produce through photosynthesis is positively correlated with the amount of plant and animal biomass in ecosystems. Growth of herbivores is affected by the quality and quantity of the plant material they consume. Lepidopteran larvae (caterpillars) are herbivores, with only a few exceptions. Due to this relationship we hypothesize that there should be a positive correlation between plant productivity and the number and biomass of Lepidoptera in a given area. We collected moths in Chihuahuan Desert and in an Edwards Plateau grassland ecosystem, which differ in annual precipitation by a factor of five. Within each ecosystem two sites of differing plant composition were sampled to investigate this relationship. The Chihuahuan Desert sampling sites, located near the Christmas Mountains, are a hillside and a valley. The grassland sampling sites, located at Freeman Ranch near San Marcos, Texas, are an open grassland and a wooded thicket. Using a UV light trap, adult Lepidoptera and other flying nocturnal insects at both sites have been sampled monthly for an hour and a half between the full moon and the new moon lunar phases. All individual moths are sorted to morphospecies, then dried and weighed to allow analysis by size classes. Use of size classes for analysis is intended to standardize variability due to different species composition among sites. Preliminary results indicate that both the total weight of all insects and the average size of individual insects is greater in the desert ecosystems than in the grasslands, contrary to expectations based on rainfall. Unusual weather patterns in both areas may have affected the results. More research and sampling is needed to determine if moths can be an indicator of the overall primary production in these Texas regions.

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www.terlinguaranch.com

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- **Check-out** time is 11:00 am. If you wish to extend your stay, please notify the Front Desk prior to check - out.
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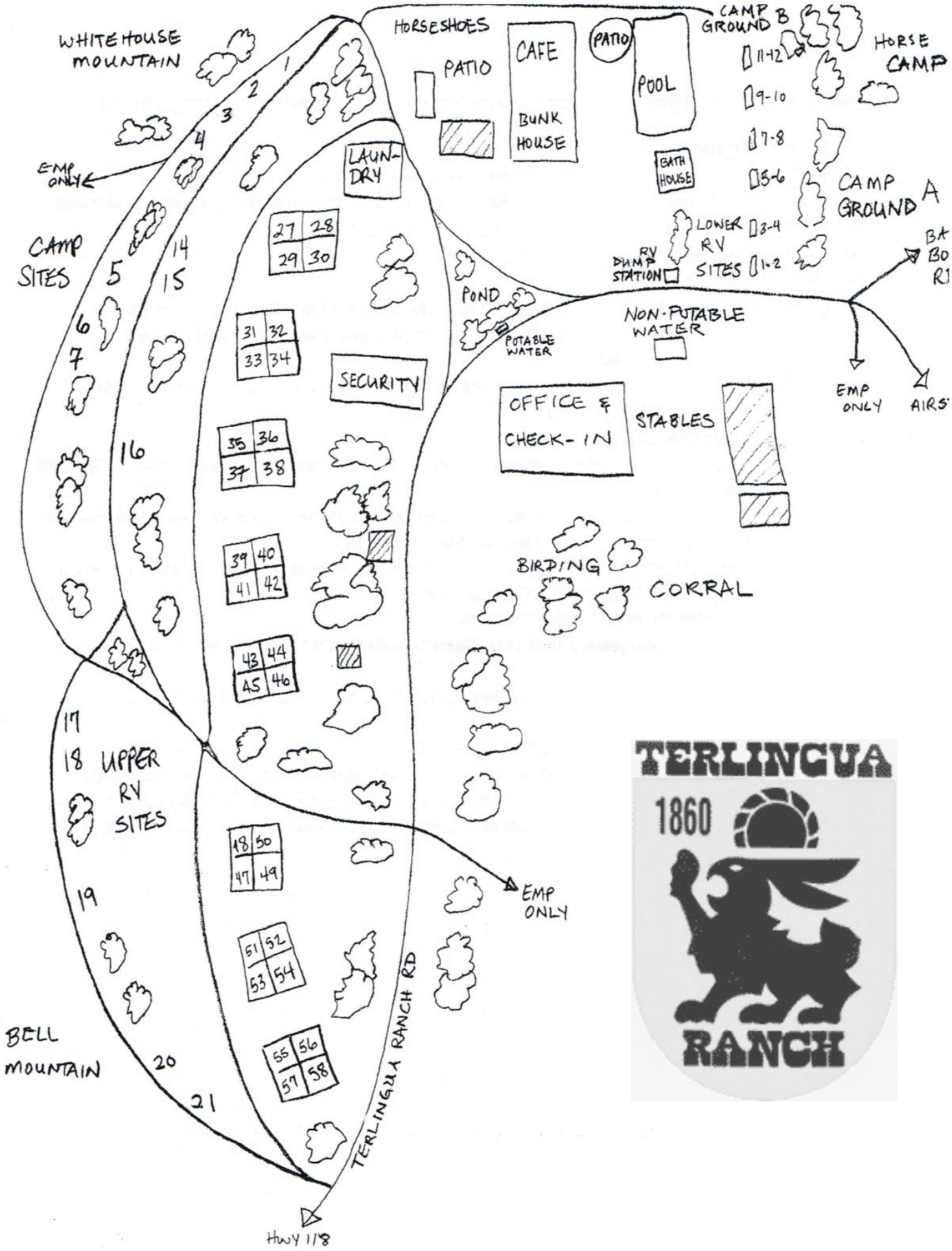
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