

CHRISTMAS MOUNTAINS RESEARCH SYMPOSIUM

2018



Terlingua Ranch Headquarters
Brewster County, Texas
May 21–23, 2018



Sponsored by the Texas State University System, the TSUS Foundation,
and the Texas State University Department of Biology

CHRISTMAS MOUNTAINS RESEARCH SYMPOSIUM

Terlingua Ranch Headquarters
Brewster County, Texas
May 21st–23rd, 2018

Monday, May 21st

- 5:00 pm Informal social for meeting participants on the patio by the café
- 6:00 pm Dinner for meeting registrants at the Bad Rabbit Café (buffet available for attendees who did not preregister, \$11)

Tuesday, May 22nd

- 8:30 am Field trip to Christmas Mountains overlook (meet in the parking lot outside the bunkhouse)
- 1:00 pm Paper session (in the bunkhouse beneath the Bad Rabbit Café)
- 4:30 pm Small mammal trapping field trip, part 1 (meet in the parking lot outside the bunkhouse)
- 6:00 pm Dinner for meeting registrants at the Bad Rabbit Café (buffet available for attendees who did not preregister, \$16)

Wednesday, May 23rd

- 8:30 am Field trip to Christmas Mountains overlook (meet in the parking lot outside the bunkhouse)
- 8:30 am Small mammal trapping field trip, part 2 (meet in the parking lot outside the bunkhouse)
- 8:30 am Geology stroll (meet on the patio outside the café)
- 1:00 pm Afternoon paper session (in the bunkhouse beneath the Bad Rabbit Café)
- 6:00 pm Dinner for meeting registrants at the Bad Rabbit Café (buffet available for attendees who did not preregister, \$16)

FIELD TRIPS

Christmas Mountains Overlook

Trip leader: Dave Lemke

Tuesday morning at 8:30 – meet in the parking lot outside the bunkhouse

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.

Small Mammal Trapping

Trip leaders: Scott Walter and Leah Cuddeback

Tuesday afternoon at 4:30/Wednesday morning at 8:30 – meet in the parking lot outside the bunkhouse

The Trans-Pecos is home to a variety of small mammals unique to its dry and rugged landscapes. On Tuesday afternoon we will set over 100 small Sherman traps and a handful of medium-sized Tomahawk traps in a few locations on the east side of the Christmas Mountains. On Wednesday morning we will check the traps and participants will have a chance to observe the captures up close, which could include the Merriam's kangaroo rat (*Dipodomys merriami*), Nelson's pocket mouse (*Chaetodipus nelsoni*), and the silky pocket mouse (*Perognathus flavus*). Setting and checking traps will only entail short walks, but occasionally up and down steep slopes. Plan to carry at least a liter of water with you.

Christmas Mountains Overlook

Trip leader: Dave Lemke

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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.

Geology Stroll

Trip leader: Jim Chude

Wednesday morning at 8:30 – meet on the patio outside the Bad Rabbit Café

Join Jim Chude for a short hike to the overlook east of the headquarters area where he will provide an introduction to some of the major sedimentary rock formations and igneous intrusions that characterize the geology of the Christmas Mountains area. The hike will involve a short, mostly uphill trek over a gravel road and dirt path, as well as the possibility of some scrambling over open, rocky areas. This is a moderately easy hike, although since we are in the desert, plan to carry at least a liter of water with you.

2018 CHRISTMAS MOUNTAINS RESEARCH SYMPOSIUM

Tuesday, May 22

- 1:00 Welcome and Introductions
- 1:15 An introduction to the Christmas Mountains – a site for education and research
David E. Lemke, Texas State University
- 1:30 Inventory and analysis of *Arbutus xalapensis* in Texas: geospatial and soil data
Miranda Gilbert, Sul Ross State University
- 1:45 Cactaceae in the vicinity of the Christmas Mountains, Brewster County, Texas
Jim Weedin, Sul Ross State University
- 2:00 Mescaline content in over-the-counter anti-rheumatics presumed to contain peyote (*Lophophora williamsii*)
Robert LeBlanc and Martin Terry, Sul Ross State University
- 2:15 Interactive effects of fire, drought, and soil fertility on herbaceous communities in a semi-arid savanna
Heather J. Hannusch, William E. Rogers, and Sascha Lodge, Texas A&M University, and Doug Tolleson and Heath Sterns, Texas A&M AgriLife Research Station–Sonora
- 2:30 Break**
- 3:00 A survey of insect pollinator diversity and other associates on saltcedar (*Tamarix*) and native plant species, using colored pan traps, along the Rio Grande in Presidio County, Texas
Alexandria M. Hassenflu and Christopher M. Ritzi, Sul Ross State University
- 3:15 Survey and natural history of bee fly parasitoids (Diptera: Bombyliidae) of native bees and wasps within Brewster and Jeff Davis counties, Texas
Lauren G. Garrett and Christopher M. Ritzi, Sul Ross State University
- 3:30 A historical and preliminary survey of the freshwater bivalves (Mollusca, Unionidae) of northern Coahuila, Mexico
Mary P. Jones, Howard College, Ned E. Strenth, Angelo State University, and Robert G. Howells, Biostudies
- 3:45 Gastropods on the edge of extinction: latest Middle Permian gastropods from Guadalupe Mountains National Park, Texas
Rebecca Percoco, Sul Ross State University
- 4:00 Combating light pollution in the Big Bend
Amber Harrison, Texas Parks and Wildlife Department

Wednesday, May 23

- 1:00 A brief overview of plant-based subsistence in the Big Bend of Texas
Tim Gibbs, Texas Parks and Wildlife Department
- 1:15 How does your garden grow: strengthening the food web of the desert borderlands
Jenny Schooler, Terlingua Community Garden
- 1:30 Water relations in the desert resurrection plant, *Selaginella lepidophylla*
Frank Horne, Texas State University
- 1:45 Influence of black-tailed prairie dogs on the abundance of small mammals in the Marathon Basin, Texas
Julie R. Schmidt, Cullom S. Simpson, Thomas S. Janke, and Whitney J. Gann, Sul Ross State University
- 2:00 Break**
- 2:15 Beetles, weevils, and scales, oh my! Monitoring of three biocontrols for saltcedar in Trans-Pecos Texas and southeast New Mexico
Christopher M. Ritzi and Alexandria M. Hassenflu, Sul Ross State University
- 2:30 A review of the current status of the Rio Grande Monkeyface (*Quadrula couchiana*; Bivalvia, Unionidae) from Texas, New Mexico, and northern Mexico
Ned E. Strenth, Angelo State University, Mary P. Jones, Howard College, and Robert G. Howells, Biostudies
- 2:45 Movement patterns of the red swamp crayfish (Crustacea: Decapoda) in the South Concho River of west-central Texas
Michael Lucero and Ned E. Strenth, Angelo State University
- 3:00 Geologic field and remote sensing studies of the Christmas Mountains complex
Joshua Krnavek, Texas A&M University–Kingsville
- 3:15 Break**
- 3:30 Assessing the structural history of the Christmas Mountains in relation to the greater Trans-Pecos region
Veronica Sanchez and Joshua Krnavek, Texas A&M University–Kingsville
- 3:45 Geomorphic change along a section of Alamito Creek
Kevin Urbanczyk and David Hallum, Sul Ross State University
- 4:00 Facies and depositional environments of the Lower Cretaceous Presidio Formation, Cibolo Creek Ranch, Presidio County, Texas
Mahmoud Mohamed and Elizabeth Measures, Sul Ross State University
- 4:15 A study of leucobands in the Wax Factory Laccolith, Big Bend Ranch State Park, Texas
Olivia Enriquez and Kevin Urbanczyk, Sul Ross State University

ABSTRACTS

Tuesday Afternoon

Introduction to the Christmas Mountains – a site for education and research

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 community types and may represent one of the best-preserved examples of Chihuahuan Desert grassland in the State. Over the past several years the property has been used as a field site by a number of college and university classes, as well as a research site for both students and faculty. Plans by the Texas State University System to enhance the utility of the site for education, outreach, and research will be presented and discussed.

Inventory and analysis of *Arbutus xalapensis* in Texas: geospatial and soil data

Miranda Gilbert, Department of Biology, Geology, and Physical Sciences, Sul Ross State University, Alpine, TX

Arbutus xalapensis (Texas Madrone) is an uncommon tree native to the Chihuahuan Desert region. Mixed reports and success rates of transportation, propagation, and conservation across Texas imply the need for a larger-scale qualitative and quantitative analysis of the factors that influence madrones. This project seeks to create a public access multi-data-set inventory to unify observations across Texas for later interpretation and practice. The starting objective for this project is documentation of geospatial and soil data relative to *Arbutus xalapensis*. Geospatial data may include elevation, hydrologic zones, atmospheric conditions, and location coordinates. Soil data may include mineralogy, provenance, and organics.

Cactaceae in the vicinity of the Christmas Mountains, Brewster County, Texas

Jim Weedin, A. Michael Powell Herbarium, Department of Biology, Geology, and Physical Sciences, Sul Ross State University, Alpine, TX

The Cactus Family represents one of the most distinctive plant families in the Chihuahuan Desert. Approximately 120 taxa of cacti are known to occur in the Trans-Pecos and, of those, 40+ taxa occur in the vicinity of the Christmas Mountains. The varied geology of the region should provide significant opportunity for ecological niche and biogeographic diversity. Polyploidy may be a significant factor in *Opuntia* and *Echinocereus*, with the occurrence of hybrid *Opuntia* a distinct possibility.

Mescaline content in over-the-counter anti-rheumatics presumed to contain peyote (*Lophophora williamsii*)

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

This study investigated samples of commercial over-the-counter products that were purported to contain peyote (*Lophophora williamsii*), a vulnerable over-harvested species of cactus. The purpose of this investigation was to indicate the presence or absence of *Lophophora williamsii* in the products. Samples were extracted with organic solvent and acid-base washed to remove impurities. The alkaloids were then separated through silica gel preparatory columns and analyzed with high pressure liquid chromatography (HPLC) and mass spectrometry (MS). This has indicated the presence or absence of the stable and abundant alkaloid mescaline (3, 4, 5-trimethoxyphenethylamine) in samples of ostensibly *Lophophora williamsii*-infused oils, gels, and ointments that were distributed as topical remedies. If detectable levels of mescaline were found in a given extract, then it was inferred that *Lophophora williamsii* was present in the corresponding topical product. Results from the HPLC and MS analyses will be presented and discussed, as well as the implications for conservation.

Interactive effects of fire, drought, and soil fertility on herbaceous communities in a semi-arid savanna

Heather J. Hannusch¹, William E. Rogers¹, Sascha Lodge¹, Doug Tolleson², and Heath Sterns², ¹Department of Ecosystem Science and Management, Texas A&M University, College Station, TX and ²Texas A&M AgriLife Research Station, Sonora, TX

Understanding the response of savanna vegetation to disturbance and altered resource conditions will gain importance under climate-change induced modifications to precipitation and nutrient cycling. This study will investigate 1) how an herbaceous community within a semi-arid savanna will respond to prescribed fire, drought, and soil fertility, and 2) how these factors will interact to mediate those responses. The study site is at the Texas A&M AgriLife Research Station on the border of the Trans-Pecos and Edwards Plateau regions (lat 31°N, long 100°W). Sixty-four 5x5 m grass-dominated plots have been established. Each of the plots has received a randomly assigned prescribed fire treatment (burned or control), precipitation treatment (rainfall exclusion or ambient), and nutrient treatment (N addition or control), in a 2 x 2 x 2 full factorial. The Drought-Net (www.drought-net.colostate.edu) protocol will be followed to monitor the differential responses in community composition, primary productivity, and soil properties over time. Comparisons between treatments will not only enable the identification of the independent effects of fire, drought, and soil fertility, but will also demonstrate how these factors may interact in a changing climate. We predict that spring fires will increase the relative dominance of native C4 grasses (dormant at time of burn). Simulated drought is also expected to increase the relative dominance of native C4 grasses (that are well-adapted to water limitation) but decrease overall biomass production. Finally, nitrogen addition is expected to decrease species richness but increase overall biomass production. These results will provide insights into how managers and ecologists can use the feedbacks between prescribed fire, drought, and soil fertility to achieve herbaceous management goals and protect semi-arid savanna systems from degradation.

A survey of insect pollinator diversity and other associates on saltcedar (*Tamarix*) and native plant species, using colored pan traps, along the Rio Grande, in Presidio County, Texas

Alexandria M. Hassenflu and Christopher M. Ritzi, Department of Biology, Geology, and Physical Sciences, Sul Ross State University, Alpine, TX

Tamarix was introduced to North America in the 1800s and has become an ecological dilemma due to its rapid spread. Many studies have looked at the negative effects of saltcedar from an ecological standpoint, but not specifically at its effects on pollinators. As part of this study, a combination of pan trapping and observational techniques, supplemented with sweep netting and hand capturing techniques, was used to assess the pollinators associated with saltcedar and native flora. A total of twelve trees, six saltcedar and six native, were monitored along the Rio Grande in Presidio County. Each tree had three differently colored pan traps placed at its base for 24 hours and was observed for pollinator activity for 15 minutes at the time of pan trap placement. Sampling began in April and was conducted biweekly at the beginning and end of the project and weekly during the summer months concluding in November 2016. Approximately 6,816 insects, belonging to seventeen orders, were collected, with Hymenoptera being the dominant group. All specimens were returned to the Jim V. Richerson Invertebrate Collection for sorting, pinning, and identification. Statistical analyses, including Shannon-Weiner indices, were run to determine the significance of pan trap color and host environment on insect collection.

Survey and natural history of bee fly parasitoids (Diptera: Bombyliidae) of native bees and wasps within Brewster and Jeff Davis counties, Texas

Lauren G. Garrett and Christopher M. Ritzi, Department of Biology, Geology, and Physical Sciences, Sul Ross State University, Alpine, TX

Bee flies of the family Bombyliidae are pollinators and parasitoids found to parasitize no fewer than six insect orders. Over half of bee fly genera known to inhabit Texas exploit bees and wasps. However, the specific life histories of many bombyliid genera and species found within far west Texas are heavily lacking or non-existent in description. Given the recent rise in concern for pollinators and native bee populations, expanding knowledge into bee fly life cycles and host usage may help illuminate some of the complex ecological interactions and fluctuations within these fragile insect communities. This study was conducted to determine the prevalence and diversity of bee flies exploiting hymenopterans within Brewster and Jeff Davis counties, using trap-nests and sand pits to attract local nesting bees and wasps. A novel pan trapping method was also employed to potentially increase bee fly capture within our three study areas: the Chihuahuan Desert Research Institute, Davis Mountains Preserve, and Terlingua Ranch. The results of a preliminary study using the same novel pan trapping methodology in 2017 at the Sul Ross State University Ranch and Vineyard, will also be discussed.

A historical and preliminary survey of the freshwater bivalves (Mollusca, Unionidae) of northern Coahuila, Mexico

Mary P. Jones¹, Ned E. Strenth² and Robert G. Howells³; ¹Howard College, San Angelo, TX; ²Department of Biology, Angelo State University, San Angelo, TX; and ³BioStudies, Kerrville, TX

Multiple factors, including excessive groundwater pumping, habitat alteration and destruction, are thought to have caused population declines of multiple freshwater bivalve species in Texas. Recently, there has been an increase in freshwater mussel research throughout Texas including in the Rio Grande and its tributaries. However, very little work has been done in the Rio Grande drainages of northern Coahuila, Mexico. A baseline for the historical status of freshwater mussel populations in northern Mexico has proved difficult to establish due to the lack of studies or collections from this region. There are very few records in the malacological collections of Mexico and the United States. The purpose of this study is to examine the historical records of freshwater bivalves of northern Coahuila and evaluate localities for future survey efforts. Recent visits to several localities on the Río San Rodrigo, Río San Diego, Río Sabinas, and Río Salado have shown potential habitat for extant mussel populations. Evidence of these populations includes a combination of both long-dead valves and what appear to be fresh-dead specimens at various locations. Shell material from the following species has been identified: Tampico Pearlymussel (*Cyrtonaias tampicoensis*), Salina Mucket (*Potamilus metnecktayi*), Texas Hornshell (*Popenaias popeii*), Yellow Sandshell (*Lampsilis teres*), Texas Lilliput (*Toxolasma texasiense*), Pondhorn (*Uniomerus* spp.), Paper Pondshell (*Utterbackia imbecillis*) and Rio Grande Monkeyface (*Quadrula couchiana*). Future survey efforts to further elucidate the status of freshwater mussel populations are planned. Material collected will be deposited in major museums in both Mexico and the United States.

Gastropods on the edge of extinction: latest Middle Permian gastropods from Guadalupe Mountains National Park, Texas

Rebecca Percoco, Department of Biology, Geology and Physical Sciences, Sul Ross State University, Alpine, TX

A large collection of micro-gastropods was recovered from the latest Middle Permian age Reef Trail Member of the Bell Canyon Formation in Guadalupe Mountains National Park, west Texas. The diverse, small (<5 mm), silicified gastropods preserve fine details such as ornamentation and protoconchs when examined under a scanning electron microscope. The challenges of imaging these delicate specimens will be demonstrated.

Combating light pollution in the Big Bend

Amber Harrison, Texas Parks and Wildlife Department, Big Bend Ranch State Park, TX

Big Bend Ranch State Park (BBRSP) was designated as an International Dark Sky Park by the International Dark-Sky Association (IDA) in October 2018. It is the fourth Texas state park to receive the honor, joining neighboring Big Bend National Park (BBNP), which received IDA accreditation in 2012. Together, these parks form one of the largest contiguous areas under dark-skies protection in the United States. This achievement is an important step forward in the conservation of some of the darkest night skies remaining in the lower 48 states. Along with neighboring BBNP, we have secured the protection of natural nighttime darkness over an area larger than the U.S. state of Rhode Island. This presentation will provide an introduction to the international dark sky movement and its significance to our community. Night sky data recently collected at BBRSP and Terlingua/Study Butte provides a baseline by which to monitor sky quality over time and space as we continue develop and grow in population size. This overview serves to inform the public about the dark sky initiative and is a call to action to combat light pollution in the Big Bend.

Wednesday Afternoon

A brief overview of plant-based subsistence in the Big Bend of Texas

Tim Gibbs, Texas Parks and Wildlife Department, Big Bend Ranch State Park, TX

Human populations have occupied the Big Bend region for at least 12,000 years, and the underlying secrets to this success have only been partially decoded. This talk will provide a brief overview of regional Native American subsistence patterns and discuss the evidence that supports our limited understanding of how these desert specialists thrived in this hostile environment.

How does your garden grow: strengthening the food web of the desert borderlands

Jenny Schooler, Terlingua Community Garden, Terlingua, TX

The people who reside in the sparsely populated communities in near proximity to the Rio Grande live in a desert: the Chihuahuan Desert that has existed over centuries and the food desert that has formed over the last few decades. The great challenges of food production in this region have been addressed by those people who came before us. Much of that knowledge is gone but some pieces remain, including century-old surviving cultivars. This presentation will address our unique environment and history as it relates to food production, provide insight into innovative technologies that previous inhabitants to the region used to produce food, highlight current research into existing cultivars, and address how much farther we have to go to secure our local food web.

Water relations in the desert resurrection plant, *Selaginella lepidophylla*

Frank Horne, Department of Biology, Texas State University, San Marcos, TX

Selaginella plants, often referred to by their common name as resurrection plants or spikemosses, represent an ancient taxon with an almost cosmopolitan distribution, the plants occurring in North and South America, Asia, China, Japan, South Africa and Australia. Our common native west Texas species, *S. lepidophylla*, inhabits desert and semi-desert regions such as the Big Bend area. Plants go in and out of dormancy based on water availability like other poikilohydric plants. When plants do not receive enough water, leaves roll into a tight brown ball and the plant becomes totally dormant. Once dormant plants encounter adequate moisture, leaves open up, turn green, and the plant starts to grow again. Because dry, brown, balled-up plants transform into a green leafy plant, *Selaginella lepidophylla* is commonly called the “resurrection plant.” Plants hydrate within a few hours. The leaves unfold at relative humidities greater than 90%. Expansion of the leaves depends on hygroscopic movements and turgor pressure and water content quickly equilibrates with the environment. Respiration begins quickly upon hydration, whereas photosynthesis is delayed for 5–6 hours. Retooling for photosynthesis is apparently more complicated than gearing up for respiration. Photosynthesis recovery is maximum at about 25°C, much slower at 15°C or 35°C. At 45°C the respiratory rate is greater than the photosynthetic rate – no carbon dioxide fixation occurs. The optimum photosynthetic temperature range is 20–32°C. Sucrose is the most important photosynthetic product, constituting 5% of dry weight of the plant. Starch is absent from the leaves. Photosynthesis and respiration virtually cease once drying leaves are tightly rolled inwards. On rehydration, the respiration rate rises quickly, providing energy to repair and retool

chloroplasts for photosynthesis. The photosynthetic rates following rehydration decline the longer the dehydration period.

Influence of black-tailed prairie dogs on the abundance of small mammals in the Marathon Basin, Texas

Julie R. Schmidt, Cullom S. Simpson, Thomas S. Janke, and Whitney J. Gann, Borderlands Research Institute, Sul Ross State University, Alpine, TX

Black-tailed prairie dogs (*Cynomys ludovicianus*) play a vital role in grassland ecosystems. They alter the landscape through soil aeration, seed dispersal, and grazing vegetation. In May 2017, Sherman live traps (n = 108) were used to trap small mammals in the Marathon Basin Grassland Preserve, located 16 km northeast of Marathon, Texas. The traps were divided evenly between the local prairie dog colony and the adjacent grasslands, with two transect lines of traps on the colony, and two off the colony. Each transect line included 26 traps set 12 m apart, forming a transect with a total length of 312 m. Traps were set each night (n = 4) with bird seed and checked the following morning. If a small mammal had been captured, the location and species were noted and the animal was photographed. During this study (432 total trap nights), 8 small mammals (four different species) were captured on the prairie dog colony, and 12 individuals (three different species) were captured off of the prairie dog colony.

Beetles, weevils, and scales, oh my! Monitoring of three biocontrols for saltcedar in Trans-Pecos Texas and southeast New Mexico

Christopher M. Ritzi and Alexandria M. Hassenflu, Department of Biology, Geology, and Physical Sciences, Sul Ross State University, Alpine, TX

Saltcedar (*Tamarix* spp.) is a deciduous shrub or small tree that was introduced into the United States from Eurasia in the early 1800s to stabilize riverbank erosion, serve as a windbreak, and as an ornamental. However, due to a high reproductive potential, saltcedar has become invasive on many river systems in the western United States. Some of the densest tamarisk infestations have occurred in the southern areas of the Rio Grande, and in an attempt to control this plant by biological means, a consortium consisting of the USDA, NRCS, and Sul Ross State University released several species of tamarisk leaf beetle (*Diorhabda* spp.) in southern Brewster and Presidio counties in Texas. The suitability of the species was evaluated, and data suggested that the Tunisian subtropical species (*D. sublineata*) was best suited to this region. Observations have also shown that the tamarisk leaf beetles are capable of establishing on a close relative non-target species, the athel tree (*T. aphylla*). Six sites along the Rio Grande, from Lajitas to Candelaria, Texas, have been routinely monitored to determine the long-term impact of leaf beetle defoliation on saltcedar and the non-target athel trees in the region. While defoliation by *D. sublineata* has been sporadic this past year, activity by other biocontrols, namely the splendid tamarisk weevil (*Coniatus splendidulus*) and the tamarisk scale (*Chionaspis* spp.), has been increasing. Efforts were made to broaden the search for all three biocontrols, documenting activity across Trans-Pecos Texas and southeastern New Mexico.

A review of the current status of the Rio Grande Monkeyface (*Quadrula couchiana*; Bivalvia, Unionidae) from Texas, New Mexico, and northern Mexico

Ned E. Strenth¹, Mary P. Jones² and Robert G. Howells³, ¹Department of Biology, Angelo State University, San Angelo, TX; ²Howard College, San Angelo, TX; and ³BioStudies, Kerrville, TX

The original type series of the Rio Grande Monkeyface (*Quadrula couchiana*) was collected by Jean Berlandier during the early 1800s from the Río Salado in Nuevo León in northern Mexico. These specimens were later obtained by Lt. Darius Couch (U.S. Army) during the Smithsonian Expedition of 1853/54 to Mexico and transferred to the United States. Based upon “half a dozen odd valves,” this species was formally described by Isaac Lea in 1860. Possibly fewer than 30 specimens from Texas and New Mexico are known from malacological collections here in the U.S. and it remains questionable whether this species has ever been observed alive by a modern worker. While never common, the species is now presumed extinct by the Texas Parks and Wildlife Department and United States Fish and Wildlife Service. Recent field work in the state of Coahuila has produced a series of valves that support the possibility of a more recent existence of this species in the region of the western drainage of the Río Salado. A review of the results of these recent collections from late 2017 (one valve) and early 2018 (four valves) will be presented, as well as our future plans for the continuation of this project.

Movement patterns of the red swamp crayfish (Crustacea: Decapoda) in the South Concho River of west-central Texas

Michael Lucero and Ned E. Strenth, ¹Department of Biology, Angelo State University, San Angelo, TX

The red swamp crayfish (*Procambarus clarkii*) is a common and widespread species that is extensively used in aquaculture, which has led to its introduction worldwide. This study was performed at Anson Springs, the headwaters of the South Concho River, in Tom Green County, Texas, and represents the first use of radio telemetry to determine the movement patterns of *P. clarkii* within its native range in the south-central United States. Eight specimens were fitted with radio receivers and their locations were tracked in-stream six times a day, from August 10–23, 2017, weather permitting. Results suggest that reproductive males undertake movements less often than females. Results also suggest that the majority of movements for both males and females occurs after 6:00 pm when the crayfish leave their daytime refugia to forage or mate.

Geologic field and remote sensing studies of the Christmas Mountains complex

Joshua Krnavek, Department of Physics and Geosciences, Texas A&M University–Kingsville, Kingsville, TX

Today in the Christmas Mountains complex there is topography that shows evidence of a collapsed caldera. This is different than most due to its development over a rather thin laccolith as opposed to over a deep pluton of magma. This structure is called a laccocaldera. The geology of the area consists of Tertiary volcanics that include various tuffs and igneous intrusions and also tilted Cretaceous limestones. Over the last 42 million years the Christmas Mountains have gone through several geologic events. Together in this region, Rio Grande rifting, Basin and Range, and Ouachita structures are preserved in the landscape. The area in the complex has been extremely fractured during periods of deformation. Data were collected during an expedition to the Christmas Mountains in the spring of 2017 that were used to construct a geologic map while gathering various types of contact and fracture data. The field map was later digitized in GIS-ArcMap. Fracture data were plotted on statistical software to identify trends. Field data are consistent with Basin and Range and Rio Grande rifting events. Our results suggest fracture data may be related to the Tascotal Mesa fault, which is thought to be related to the Rio Grande Rift. We can also observe within the study area the dome-like geometry that can be seen in the tilted limestone and other field-related data. Currently I am continuing my research using remote sensing analyses of satellite data to look more closely at changes in mineralization and faulting. I have also worked with digital elevation data to better understand the geometry of the dome that we see today.

Assessing the structural history of the Christmas Mountains in relation to the greater Trans-Pecos region

Veronica Sanchez and Joshua Krnavek, Department of Physics and Geosciences, Texas A&M University–Kingsville, Kingsville, TX

The irregular dome we see today making up the high topography of the Christmas Mountains is part of a complex geologic history involving volcanism, intrusions of magma bodies and faulting. In this presentation we will discuss major structural-geomorphologic features of the greater “tectonically active” western United States, but center on the geology of the Christmas Mountains. In more recent times, the topography of the Trans-Pecos region has been subjected to faulting associated with Basin and Range deformation, but we also argue that there is evidence for faulting or complex fracturing related to the Rio Grande Rift. We will pose questions regarding the nature of rifting in continental settings and present our recent results from geologic field mapping to support our hypothesis that signatures of the Rio Grande Rift may be found in this region and perhaps as far south as northern Mexico. We hypothesize that the structures involved are inherited in nature, meaning they were first initiated perhaps as far back as Precambrian times. Our results complement the overall understanding of relationships between structure and igneous activity in the west Texas/Trans-Pecos region.

Geomorphic change along a section of Alamito Creek

Kevin Urbanczyk and David Hallum, Department of Biology, Geology, and Physical Sciences, Sul Ross State University, Alpine, TX

As part of a geologic, hydrologic, and geomorphic assessment of a section of Alamito Creek located on the Dixon Water Foundation Alamito Creek property, we have collected data for a detailed geomorphic change detection (GCD) analysis. The property is located approximately 51 km south of Marfa, Texas, immediately north of where highway 169 crosses the creek. Alamito Creek is an intermittent stream with headwaters in the Davis Mountains 30 km north of Marfa. From here, it flows 130 km south to the confluence with the Rio Grande 8 km east of Presidio. Analysis of available orthophoto imagery (1994 to 2016) reveals a significant lateral migration (~40 m) of a selected section of the creek at the expense of a ~6 meter cutbank composed of fine grained fluvial sediment (part of the Altar-Bodecker-Riverwash association). To study this phenomenon in detail, we collected high resolution topographic data and orthophoto imagery of this area on an annual basis in spring 2016, 2017 and 2018 using an unmanned aerial vehicle and structure from motion (SFM) technology. Results include the observation of 30 m of cutbank migration between 1996 and 2004, an additional 5 m from 2006 to 2008 and 4 m between 2012 and 2014. We used the GCD technique to calculate volumes of sediment gained/lost using each of the high resolution SFM datasets (0.05 m grid cell size). In the local study area that included a 200 m section of the creek, we observed an overall loss of 388 m³ (555 m³ loss, 167 m³ gain) between 2016 and 2017 and an overall loss of 5 m³ (225 m³ loss, 220 m³ gain) between 2017 and 2018. These volumes correspond to fairly small lateral changes of the cutbank of up to 2 m and suggest that the larger migrations from previous years likely involved much larger changes in sediment volume. This understanding of geomorphic change and sediment mobility is important in tracking sediment contributions to the Rio Grande and in planning for future restoration activities aimed at improving water retention.

Facies and depositional environments of the Lower Cretaceous Presidio Formation, Cibolo Creek Ranch, Presidio County, Texas

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The Lower Cretaceous Presidio Formation was deposited during the Zuni transgression in the Chihuahua trough and records the first deposition onto eroded Permian Basin rocks. In the study area, located on Cibolo Creek Ranch, the Presidio Formation unconformably overlies the Permian-age Cibolo Formation. The Presidio Formation consists of 109 m of interbedded siliciclastic and carbonate strata. The base of the formation is primarily conglomerate and sandstone and the top of the formation is a distinctive cap of rudist floatstone. The middle of the formation has alternating clastic-rich units and carbonate-rich units. The formation is composed of six lithofacies: 1) conglomerate lithofacies, 2) sandstone lithofacies, 3) wackestone/packstone lithofacies, 4) lime mudstone lithofacies, 5) grainstone lithofacies and 6) floatstone lithofacies. Most beds are not laterally continuous and therefore the lithofacies interfinger. The formation represents deposition in marginal marine (clastic-dominated base) to shallow marine environments (carbonate-dominated top). Clastic sediments were brought in by fluvial systems. Carbonate sediments were produced offshore in a shallow shelf/lagoonal setting. Waves, tides and/or currents mixed the sediments in a zone between the two source areas. Sea level fluctuations during deposition were probably responsible for the alternation of clastic units and carbonate units. The clastic-rich beds possibly indicate short-term sea level fall and progradation of marginal marine conditions into the basin. The carbonate-rich beds possibly indicate short-term sea level rise and transgression of shallow shelf marine conditions onto the continent. Overall, the Presidio Formation records the long-term transgression of the Cretaceous sea onto the continent.

A study of leucobands in the Wax Factory Laccolith, Big Bend Ranch State Park, Texas

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The Wax Factory Laccolith (WFL) is located in Big Bend Ranch State Park, TX. A laccolith is an intrusive igneous rock. The WFL is approximately 32 Ma in age and is part of the Trans-Pecos Magmatic Province (TPMP), which was formed between 48 and 17 Ma. The WFL is composed mostly of monzonite, but has numerous light colored bands ("leucobands") of syenite with various shapes including irregular "blebs" up to 2 meters in size and horizontal bands approximately 10 cm thick. Prior studies of the laccolith lacked an adequate interpretation of the light colored bands. A previous hypothesis suggested that the bands were caused by alteration of the rock by local spring water. Scanning electron microscopy and x-ray fluorescence analysis conducted on the leucobands reveals that the syenitic leucobands have an overall similar mineralogy to the monzonite, but a distinct difference in mineral composition, contradicting the earlier hypothesis. We conclude that the variation has been caused by crystal fractionation, a conclusion confirmed by major and trace element models. The models use a parent monzonite composition that evolves to the syenite composition with the removal of approximately 50% by mass of the observed minerals plagioclase, pyroxene, Fe-Ti oxides and apatite. In this model, the host monzonite magma formed originally and crystallized to a partially solid crystal framework. Subsequently-evolved syenite magma intruded into this framework in the form of the blebs and horizontal bands. This study contributes to our understanding of the petrogenetic history of the WFL and our overall understanding of the TPMP.

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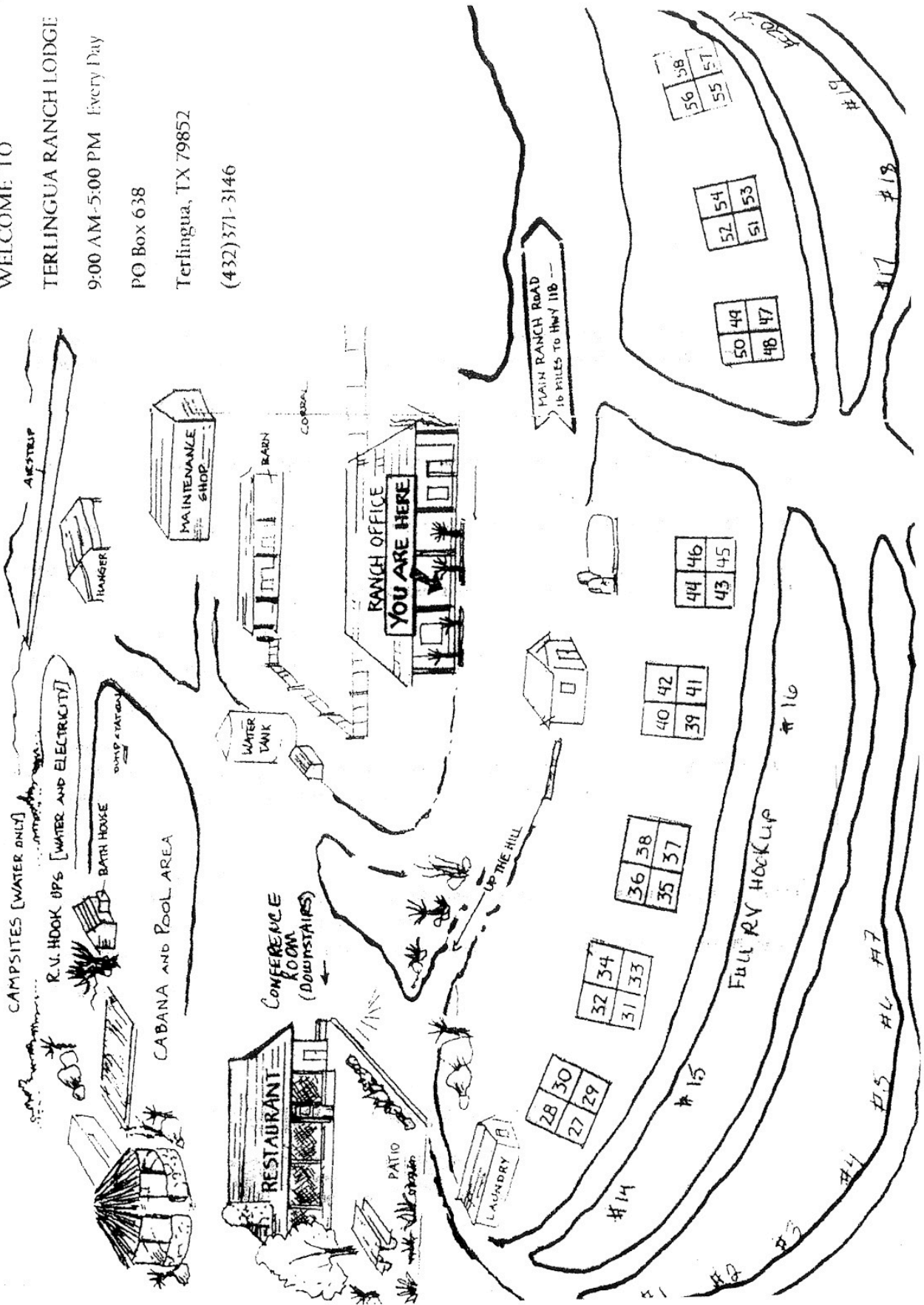
www.terlinguaranch.com

Office open daily 8:00 am to 5:00 pm

- **Check-in** time is 3:00 pm. If you need additional towels or linens, please come to the Front Desk.
- **Check-out** time is 11:00 am. If you wish to extend your stay, please notify the Front Desk prior to check-out.
- **The Bad Rabbit Café** is open from 7:00 am to 7:00 pm Mondays and Tuesdays, 7:00 am to 9:00 pm Wednesday through Saturday, and from 7:00 am to 2:00 pm on Sunday (hours are extended for holidays, special occasions, and hunting season).
- **Security and Assistance** – for after-hours emergencies, please contact Security in the Security house located across the parking lot from the main office or phone (432) 371-2960. A **911** phone is located on the patio next to the pool.
- **Pets** must be on a leash in common areas.
- **Pool hours** are 10:00 am to 10:00 pm. The bath house is open 24 hours, seven days a week.
- **Laundry** is open 10:00 am to 10:00 pm.
- **Water** is scarce – please conserve.
- **Burn ban** is currently in effect for Brewster County with warm temperatures and dry, windy conditions. Please confine outdoor cooking to the use of propane stoves. See the Front Desk for more information regarding burn bans.
- **Smoking** is allowed outdoors only. Please dispose of cigarettes in butt cans located throughout the Lodge.
- Please obey posted **speed limits**.
- Please respect **No Trespassing** and **No Hunting** signs throughout the ranch.

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2019

Terlingua Ranch Headquarters

May 20th–22nd, 2019

Front cover illustration: Mottled rock rattlesnake (*Crotalus lepidus*) at the base of a candelilla plant (*Euphorbia antisyphilitica*). Usually non-aggressive, rock rattlers tend to rely on their camouflage for protection and will often not strike or even rattle unless physically harassed. The color pattern of these snakes varies greatly, but usually reflects the color of the rocks in their environment. Snakes found in areas of limestone tend to be grayish; this specimen, from an area of igneous outcroppings, was more orange-brown in color. Original photo taken by D. Lemke in the Christmas Mountains.