



Abstracts for 2020 Symposium Sessions

A Collaborative Approach to Recover the Endangered Arizona Eryngo

Presentation Abstract

Arizona eryngo (*Eryngium sparganophyllum*, Apiaceae) is a rare species inhabiting marginal ciénegas in the Sonoran and Chihuahuan Deserts. Only four populations are left in United States and Mexico.

Despite its narrow niche and endangered status, this species has the strength of occupying ciénegas of conditions often hostile to other wetland plants. It reproduces both sexually and asexually, is easy to propagate in nursery environment, and survives well after careful transplanting. I will provide the newest finding of its population size in U.S., its recruitment condition, and its interaction with other plant species. I will then highlight the collaboration between Pima County, Desert Botanic Garden, U.S. Fish and Wildlife Service, Bureau of Land Management, University of Sonora, and many other private and public entities in an effort to protect the current populations of Arizona eryngo and extend its population to other ciénegas through a propagation program.

Presenter: Yue "Max" Li

Brief Bio

Conservation Research Scientist, Arizona-Sonora Desert Museum and UA School of Natural Resources and the Environment

Ph.D. in Ecology and Evolutionary Biology at UA. Research focus on conservation of biodiversity

A Deeper Map: preview a public art project about prehistoric irrigation and agriculture along the lower Salt River

Presentation Abstract

Our project is called A Deeper Map. The culmination of 25 years of effort, A Deeper Map will take the form of a map-based mobile app showing current residents of the Phoenix metro area where ancient canal paths and irrigated fields once existed where they now live work or go to school. We have worked closely with both the archaeological and Tribal communities to bring this project to fruition.

Presenter: Richard Laugharn

Brief Bio

Richard Laugharn is a Phoenix based artist with an interest in the natural and cultural histories of the arid southwest. He holds an MFA from Arizona State University, and his work is held in several museum collections. He contributed a chapter to *Among Unknown Tribes: Rediscovering the Photographs of Explorer Carl Lumholtz*. In addition to his ongoing project on desert plants, he is currently developing a public art project that will take the form of a map-based mobile app on the subject of ancient irrigation in along the lower Salt River.



A Fantastic Journey to the Pinacates in 1928 by a Sonoita Schoolteacher and his Pals

Presentation Abstract

This talk describes the highlights of a fantastic journey to the heart of the Pinacate lava region that was recounted by Gumersindo Esquer in a 1928 publication entitled "Campos de Fuego." Who knew about lava tubes that are miles long, the skeletal remains of an early Spanish nun, and even a buried Spanish mission? Esquer himself was a fascinating renaissance man of the Sonoran frontier. This talk will also trace the saga of the publication, from 1928 to its new re-release in 2018.

Presenter: Gayle Harrison Hartmann

Brief Bio

Gayle Harrison Hartmann has worked as an archaeological editor, archaeologist, historian and conservationist for the past 35 years. She has always been attracted to the wide open spaces and fascinating history of the Western Papaguera, especially Tinajas Altas and the Sierra Pinacate. Currently, she is a Research Associate at the Arizona State Museum, University of Arizona. She is also president of Save the Scenic Santa Ritas, the non-profit organization that is leading the opposition to a proposed open-pit copper mine in the Santa Rita Mountains southeast of Tucson.

A Small Place with a Bouncy Name and Big Stories: Why Quitobaquito History Should Be Preserved

Presentation Abstract

The history of Quitobaquito, a border oasis in Organ Pipe Cactus National Monument resists the easy caricatures that underlie current border debates.

In contrast to rhetoric that divides people by race, national origin, partisan loyalties, and other markers, Quitobaquito's waters have attracted a rich blend of peoples for 12,000 years. At the turn of the 20th century, for example, the oasis's several dozen inhabitants included Jews, Frenchmen, Mexicans, white and black Americans, Asian migrants, and Hia C'ed O'odhams.

Among the latter, the Orozco family irrigated fields on both sides of the border. They remained after Franklin Roosevelt designated the national monument in 1937. They erected buildings, hunted game, cultivated nonnative plants, and cut wood. They could not prove title to their land or citizenship in either the US or Mexico.

Early park staff objected that the family's activities spoiled the ideal of a people-less wilderness that had inspired the monument's creation. As the government built a border fence that would sever the homestead, the Orozcos protested through a white friend to Arizona senator Carl Hayden. Hayden prodded the park to build a gate to allow the family access to its holdings south of the border. But disputes continued, and in 1959 the government bought them out and razed their buildings.

Quitobaquito's story features multicultural settlers, Indian homesteaders, people who simultaneously live on both sides of the border, white ranchers who defend Native resource use, and senators who facilitate transborder passage for brown-skinned people of uncertain citizenship. This is not how today's rhetoric casts such characters. Quitobaquito invites us to see ourselves and each other not through our divisions but as coinheritors of a diverse past. A national park with a serene pond, healthy ecosystem, intact archeological sites, and rich historical interpretation can help the Quitobaquito story to endure as part of



three nations' heritage.

Presenter: Jared Orsi

Brief Bio

Jared Orsi is Professor of History and Director of the Public Lands History Center at Colorado State University, where he teaches courses on borderlands history and environmental history. He is the author or editor of numerous books and articles, including, most recently, *National Parks beyond the Nation: Global Perspectives on "America's Best Idea"*, co-edited with Mark Fiege and Adrian Howkins (Oklahoma 2016,) and *Citizen Explorer: The Life of Zebulon Pike* (Oxford 2014). The work presented at the Sonoran Desert Symposium draws from research conducted on behalf of the National Park Service between 2013 and 2017 under a Cooperative Ecosystem Studies Unit project and will be revised and expanded into a book.

All Hail the Queen: rescuing the *Peniocereus greggii* var. *transmontanus*

Presentation Abstract

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.

The number one threat to native cactus species is habitat loss to development. *Peniocereus greggii* var. *transmontanus*, also known in English as the Arizona Queen of the Night or in Spanish as *Sarramatraca*, is one of the many endemic cactus species that is salvageable before development happens. *Peniocereus greggii* has a lifestyle strategy unique from most cactus in the Sonoran Desert that makes rescuing these wild plants from development sites a special challenge. Learn how to spot the cryptic plants in habitat, the correct approach to digging and how to care for wild plants in cultivation once they have been rescued.

Presenter: Jessie Byrd

Brief Bio

Jessie Byrd is the Native Plant Nursery Manager for Pima County Natural Resources, Parks and Recreation, which specializes in growing and salvaging native plant species for public projects. Jessie believes that using native plants in urban landscapes can help encourage biodiversity while also significantly reducing long-term maintenance inputs. She earned a Master of Landscape Architecture from the University of Arizona and a BA in Biology from Bryn Mawr College. She is a Tucson Cactus and Succulent Society board member and the president of the Tucson chapter of the Arizona Native Plant Society.



Birds, Lizards, and Bighorns: The Hohokam and Their Animal Icons

Presentation Abstract

The Hohokam had an intricate relationship with animals of the Sonoran Desert that is revealed in their artwork. Their realistic, playful, and abstract depictions of creatures on pottery, carved stone, shell, and rock art, show not only their close observations of the natural world, but how they viewed that world in a cosmological context. The Hohokam selected certain animals to depict. Horned lizards, snakes, water birds, bighorn sheep, canids, and toads or frogs were favorites, while rabbits and rodents seem never to have been illustrated. This presentation explores how the chosen creatures can be considered as Beings within the broader Mesoamerican-Southwestern belief systems of animism, transformation, duality, directionality, and world centering-world renewing practices.

Presenter: Linda Gregonis

Brief Bio

Linda Gregonis has a master's degree in anthropology from the University of Arizona. She has studied Hohokam archaeology for more than 40 years, with an emphasis on pottery analysis. Her research interests in iconography are focused on how Hohokam artists used images in different media (pottery, stone, shell, and rock art) and how the Hohokam are connected to West Mexican and other cosmological traditions.

Blankenship Ranch: Benjamin Blankenship's 1,700 mile Journey to the Borderlands

Presentation Abstract

Before the Gray family settled into the area that would become Organ Pipe Cactus National Monument, the Blankenship family had already started developing a cattle ranch. Benjamin "Buck" Blankenship was a true frontiersman; he could kill and skin bison, outsmart a panther, rope and brand cattle, run a farm, and manage a store. He and his wife Margaret Camp met and married in Texas, and then moved to Portales, New Mexico, where they lived for 13 years. They had three sons and a daughter. After several successes and failures, in 1915 the family left Portales for ranching endeavors in the Tucson area. Margaret and children moved to a deserted area along the border and started up a ranch. Margaret Blankenship, the daughter of Buck and Margaret, wrote down the family's story and the presentation will include some of her personal memories and experiences and some of the family's photos.

Presenter: Sue Rutman

Brief Bio

Sue Rutman is a plant ecologist who retired from Organ Pipe Cactus National Monument after working there for 19 years. She co-authored the *Flora of Southwestern Arizona* with Richard Felger. She is also a local history buff and co-authored *Cowboys and Cowgirls Around Ajo, Arizona*.

Borderlands Conservation

Presentation Abstract

We will address the work that environmental nonprofits are doing to protect wildlife, public lands and communities in the borderlands, specifically in the Sonoran Desert. Presentation sections will focus on



how our work is informed by natural resource experts, how the waiver of environmental and public health laws have impacted communities and wildlife in the borderlands, the latest updates on new wall construction, funding, and our lawsuits to stop wall construction.

Presenter: Dan Millis, Laiken Jordahl

Brief Bio

Dan Millis is the Borderlands Program Manager for Sierra Club Grand Canyon Chapter. Laiken Jordahl is the Borderlands Campaigner for the Center for Biological Diversity

Borderland Spirits: Cross-border Cultural Spirits

Presentation Abstract

Bacanora is a cross border cultural phenomenon ripe for cross border collaboration. Bacanora is a distilled spirit that has been a product of the "Sonorenese" Bio- Cultural region for 300 years. It is a true cross border product, distilled from Sonoran Desert agave from when the Opata of now Sonora, Mexico encountered the Spanish. There was even a distillery of Bacanora in Tucson on Congress Street in 1890-1915. I view Bacanora not only as a heritage product of the borderlands, but as an opportunity for cross border collaboration and understanding. I am proposing a cross border collaborative process involving the science, culture and history of bacanora under the umbrella of "The Borderlands Heritage Project.". I will present questions and problems that such an endeavor can address.

Presenter: Michael Hurley

Brief Bio

I have had a long career in all sciences related to water, starting in Arizona and extending to the West Coast of the US to Africa. This has included endangered and native fish in Arizona and the Pacific Northwest, a stint with national Park Service Research unit on high mountain lakes in the Pacific Northwest, and conceptual frames for ecosystem management and watersheds, and complex systems. More recent endeavors included cultural aspects of governance of water and fish, and aspects of transboundary governance and conflict management. My last science/policy endeavors involved an emphasis on culture and arts for cross cultural governance and collaboration. I continue this emphasis with my importing company, focusing not on liquid in a bottle, but a responsibility and opportunity to represent cultures, families and communities in cross border and cross cultural understanding and collaboration, which leads me to develop the Borderlands Heritage Project.

Buffelgrass expansion across multiple habitat types in the Sonoran Desert

Presentation Abstract

Exotic invasions in the southwestern United States are expected to cause drastic changes to the native landscape as we witness further changes in climate. Buffelgrass, in particular, has been a devastating exotic to the Sonoran Desert, increasing fire frequency and damaging native plant communities, such as, the iconic saguaro cactus and creosote shrub communities. Understanding how it invades landscapes, especially how humans may impact successful invasion, is crucial to informing effective management strategies. In 2018, I mapped invasion locations on and near the Barry M. Goldwater Air Force Range (BMGR). Using this data, I used remote sensing to identify patches of buffelgrass within the BMGR from



2010-2018. I then classified patches based on distance to roads and washes and estimated dispersal kernels based on patch expansion in the different habitat types. It's expected that patches in and near washes show greater overall expansion and new invasion than patches near roads. However, human disturbance, such as wind from passing vehicles, promotes patch expansion that is parallel to the roads as opposed to expansion perpendicular to roads.

Presenter: Emily Ernst

Brief Bio

I am a fifth-year PhD candidate at Iowa State University. I am a first-generation college student that found a passion for plant invasion ecology while studying ecology and evolution at my undergraduate institution.

CEDO 40 years thriving costal communities, sustainable livelihoods, and healthy ecosystems

Presentation Abstract

The Intercultural Center for the Studies of Deserts and Oceans (CEDO) is an active conservation, research, and education center that has been informing, inspiring, and empowering stewards for healthy Gulf of California ecosystems for nearly 40 years. "CEDO" comes from our Spanish name: Centro Intercultural de Estudios de Desiertos y Océanos. We first opened our doors in 1980 at our field station in Puerto Peñasco, Sonora.

Field research was among the first activities of our young institution, and through partnerships with visiting researchers from across the U.S. and Mexico, in addition to community-based monitoring projects, and our own studies, CEDO built an integrated research program from the ground-up. This collaboration quickly advanced our understanding of the northern Gulf of California- the Sonoran desert ecoregion and its biophysical, ecological and socioeconomic features.

CEDO's roots have grown deeper and stronger than ever, with community-led efforts for conservation, sustainable development, and environmental education that have gained the attention and support of decision makers and natural resource managers at the highest levels of government. CEDO's integrated approach combines a wide array of disciplines (education, capacity building, research & monitoring, climate-change assessment & adaptation, and economic initiatives), and is being scaled to address the needs of more than nine coastal communities where thousands of people make their living from small-scale fisheries, tourism and associated economies.

Presenter: Dra. Nélide Barajas Acosta and M. Sc. Paloma A. Valdivia J.

Brief Bio

CEDO Intercultural is a unique collaboration between Mexico and U.S. non-for-profit organizations. Board members are drawn from five cities across the U.S. and Mexico. Operation through a United Executive Committee and inspired by a shared vision, mission and program strategies, CEDO pools its resources and experiences to offer realistic environmental and community-base solutions that recognize, respect, and leverage the cultural, socio-economic and biological interactions between the U.S. and Mexico.



Desert Wildlife Waters, Wildlife, and Refining Water Supplementation Programs

Presentation Abstract

Water is limited and getting scarcer in many desert systems, resulting in negative consequences for at least some desert wildlife species. Wildlife managers have been addressing this lack of water by constructing water catchments that are managed along with natural sites for desert fauna. There has been some controversy about whether these constructed water sites are needed, but images from camera traps show a plethora of species across taxa taking advantage of the supplemental water, demonstrating its importance. Because the quality of this water varies by season and by whether the site was constructed or naturally formed, it is essential that we understand the links between site structure and the biological and chemical cycling (biogeochemistry), and the consequences of these variations in water quality on the biota using the resource. One of the most glaring differences between natural and constructed water sites, that can affect biota, is the level and timing of ammonia accumulation. Ammonia interferes with respiration, slows development, and reduces survival in aquatic organisms. Unfortunately, at least some species cannot differentiate between relatively good- and poor-quality water. I will discuss our current work on desert amphibians and efforts to improve water quality. I will also talk about the implications of the impaired water quality for mammals and how understanding this relationship could be used to make informed and efficient refinements to desert water supplementation programs. As water availability declines in these hot desert regions, wildlife water supplementation is likely to become increasingly important in supporting populations of desert species. Consequently, refining our understanding of these waters, the biogeochemical cycling, and impacts on the biota will improve our ability to provide supplemental water and enhance the resiliency of desert wildlife to the impacts of declining water availability.

Presenter: Kerry Griffis-Kyle

Brief Bio

Dr. Kerry Griffis-Kyle, Associate Professor at Texas Tech University and affiliated member of the South-Central Climate Adaptation Science Center, is a wildlife ecologist focused on improving management of water resources in arid and semi-arid systems. Her research in the Sonoran Desert is multidisciplinary and integrates a variety of spatial and temporal scales including projects on site quality and wildlife, wildlife habitat selection, spatial planning, and vulnerability assessments. She has worked on a variety of taxa including amphibians and reptiles, birds, mammals, and invertebrates. When Kerry isn't dragging her family to Ajo during the summer to conduct fieldwork, she enjoys camping and exploring new areas. Dr. Griffis-Kyle recently returned from Brazil where she gave a workshop on managing isolated desert waters for wildlife in Foz do Iguacu at the Centro Universitario Dinamica das Cataratas. She can be contacted at kerry.griffis-kyle@ttu.edu.

Developing a Destination: the Mission 66 Era at Organ Pipe Cactus National Monument

Presentation Abstract

For more than half a century, Organ Pipe Cactus National Monument (ORPI) in Southwestern Arizona has been a premier winter vacation destination for thousands of snowbirds and sightseers around the world. This large unit of the National Park Service (NPS) offers abundant recreational opportunities for nature enthusiasts, with easy and accessible international travel – all under the Sonoran Desert umbrella of temperate winter climate. While these things alone are responsible for ORPI's travel reputation, the park would have little to offer in terms of visitor services if not for an NPS development program known as Mission 66, which ran from 1956 to 1966.



Almost the entirety of ORPI – everything that exists today at the park – was developed or established during this 10-year window of time: roads, signs, buildings, campgrounds, service amenities and a template for interpretation methods and events. Without an all-encompassing program like Mission 66, ORPI would look and feel very different from what monument visitors and employees experience in 2020. This important period of ORPI development, which paralleled development at fellow parks around the country and is still visible to monument visitors today, illustrates the final goal of Mission 66 – that of long-term investment.

This presentation will introduce the Mission 66 program as an overview and discuss changes and improvements that occurred at ORPI during the program, including what infrastructure was replaced, and how it was received by ORPI staff, visitors and locals at the time. Some commentary on park history, local history and the future of park infrastructure will be included.

Presenter: Caitlin Beesley

Brief Bio

I'm a 26-year-old intern working for the National Park Service, with a background in architecture and history after graduating from the University of Idaho in 2018 with degrees in both fields. Originally from North-Central Idaho, I worked at Organ Pipe Cactus National Monument for almost 14 months between September 2018 and November 2019 - and am currently living in Santa Fe, New Mexico and continuing intern work for NPS.

Ecological and climatic influences on the population structure of desert mistletoe

Presentation Abstract

Desert mistletoe (*Phoradendron californicum*) is a geographically widespread, parasitic plant native throughout the Sonoran Desert. I use field and genomic methods to understand the relative effects of different ecological and environmental factors on desert mistletoe population structure across its range. Individual desert mistletoes obligately rely on a host (typically, a leguminous tree or shrub), pollinators (a generalist suite of insect), and dispersers (the specialist bird, *Phainopepla nitens*) for establishment and growth, reproduction, and dispersal, respectively. Additionally, both interactions with hosts and climatic conditions affect the flowering phenology of desert mistletoe. All of these factors are related to the population genomic structure of the parasite across its geographic range. In particular, I find that different flowering phenologies and communities of pollinators can lead to genetic divergence between mistletoes on different host species and that the degree of genetic divergence varies in geographic space and by host species identities. In total, these results provide unique insights into the relative contributions of biotic and abiotic factors to the population genomic structure of a Sonoran Desert parasite. Thereby, this work has implications for understanding how parasites may succeed or fail in adapting to the changing ecological and climatic conditions currently being experienced in our region.

Presenter: Kelsey Yule

Brief Bio

I am an evolutionary ecologist tackling questions at the intersection of ecology and evolution. In particular, my work connects ecological processes to the generation and maintenance of genetic and genomic variation. I obtained my PhD from the Department of Ecology and Evolutionary Biology at the University of Arizona in 2018. There my work focused on the eco-evolutionary consequences of interactions



between species, particularly the ecology and evolution of the Sonoran Desert native plant, desert mistletoe (*Phoradendron californicum*) and its interactions with host plants, insect pollinators, and seed dispersers (primarily *Phainopepla nitens*). Currently, I work in a natural history collections setting at the Arizona State University BioCollections and the National Ecology Observatory Network Biorepository. Outside of work, I am passionate about borderlands issues affecting the Sonoran Desert's human and ecological communities.

Effects of human activity on the behavior and physiology of the endangered Sonoran pronghorn

Presentation Abstract

The U.S. population of endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) has declined in recent decades as human activity has increased throughout the species' range. Wildlife managers are implementing an intensive recovery plan that includes captive breeding and forage and water supplementation. The effects of human activity on these recovery efforts and on the behavior, physiology, and demographics of Sonoran pronghorn are poorly understood. To address this, we partnered with state and federal agencies to conduct a 3-year study on responses to human activity over multiple spatio-temporal scales. We observed behavior of Sonoran pronghorn and collected fecal samples to quantify vigilance and a measure of the stress response, concentration of fecal glucocorticoid metabolites (fGCMs), respectively. We categorized human activity as immediate risk associated with the presence of a motorized vehicle, distance to road (predictable, controllable risk), and an index of unpredictable and uncontrollable risk, off-road vehicle tracks. We used generalized linear models to assess the effects of these categories of anthropogenic risk on vigilance, to detect trade-offs between vigilance and other behaviors, and to assess the effect of off-road vehicle tracks on fGCM levels. Vigilance increased as distance to the nearest road decreased and as immediate risk increased. The documented trade-off between vigilance and foraging implies increased vigilance could have food-mediated costs. Fecal glucocorticoid levels increased with off-road vehicle tracks, suggesting Sonoran pronghorn may exhibit a stress response to less predictable, less controllable human activity. Results have numerous applications to conservation and management and may help managers more effectively evaluate mitigation efforts.

Presenter: Stephanie Doerries

Brief Bio

Stephanie grew up in suburban St Louis, Missouri and earned her B.S. in Biological Sciences from the University of Notre Dame in 2008. After graduation, she moved to Ajo, AZ to work as an intern at Cabeza Prieta NWR through the Student Conservation Association. From 2009-2013, she was an employee of the Arizona Game and Fish Department, working as a Wildlife Technician at the Sonoran pronghorn captive breeding pen and then studying the efficacy of efforts to recover Sonoran pronghorn as a Wildlife Specialist. Stephanie began her PhD at the University of Arizona in 2013, researching the effects of human activity on Sonoran pronghorn. She expects to receive her doctorate in Natural Resources this academic year with a PhD minor in Statistics. In July 2019, Stephanie started her career with the U.S. Fish and Wildlife Service as the Wildlife Biologist and Sonoran Pronghorn Recovery Coordinator at Cabeza Prieta NWR.



Foods of the Desert: Cholla Bud Harvest time

Presentation Abstract

The Sonoran Desert has nourished people for millennia. Every season had and still has something different to offer. Saguaro fruit, cholla buds, agave hearts, mesquite pods are just a few of these. In this presentation we will discuss and show samples of many of these foods. Harvesting times and techniques will be covered, sometimes with demonstrations. We will have plenty of hands-on samples to see, feel and taste. Since the April is the time of the cholla bud harvest, we will focus on this particular plant. Nutritional aspects of these desert foods will also be discussed.

Presenter: Sonya Norman

Brief Bio

Sonya Norman is the Public Programs Coordinator at the Arizona-Sonora Desert Museum. She is a native southern Arizonan, has a degree in geosciences, and has spent much of her life outdoors. Her fields of particular interest are geology, ethnobotany, Spanish culture and its influence in the Southwest, invasive weed control, and neighborhood-scale rainwater harvesting.

Fugitive Dust: Five Desert Highway Poems

Presentation Abstract

In this presentation, I will read five interdisciplinary poems inspired by roads and highways located in the Sonoran Desert. In addition to using my own engagements with desert roads as source material for these poems, I also relied heavily upon archival research, such as early twentieth-century highway planning maps, National Park Service management documents, "dust management" program brochures, highway survey reports, and other technical and historical artifacts. Additionally, my own research in the environmental humanities, American desert literature, and infrastructure studies informs this series of poems. Roads, highways, and interstates in the Sonoran Desert have important stories to tell about human relations with arid environments, and during the reading I will discuss recent moves in the humanities to center infrastructure and maintenance.

Presenter: Jada Ach

Brief Bio

Jada Ach is a lecturer for the Faculty of Leadership and Interdisciplinary Studies at Arizona State University where she teaches courses in interdisciplinary and liberal studies. Her research often combines insights from the desert humanities, infrastructure and maintenance studies, animal studies, and environmental history. She is currently co-editing a collection of essays titled 'Reading Aridity in Western American Literature.' In 2018 Jada received a Charles Redd Center Award to conduct research at two nuclear history museums in northern New Mexico, and she recently presented that research at the Modern Language Association Convention as part of the New Nuclear Criticism panel. Her articles have been published in 'Western American Literature,' 'Studies in the Novel,' and 'Ecozona: European Journal of Literature, Culture, and the Environment.'



Human Impact on Wildlife Habitat

Presentation Abstract

The impact from anthropogenic activity on public lands within 100 miles of the Arizona-Mexico border has not been well documented in a comprehensive study.

US Border Patrol ATV/UTV, narcotics smuggling, undocumented immigration, humanitarian groups, and recreation all have a negative impact upon established wildlife waters, natural tank systems, wildlife and their habitat. This poses many challenges for restoration projects, since the damage is ongoing. Over the past 10 years, I have tracked and trailed all these user groups recording data on each group's impact upon the land and natural resources. I used traditional tracking methods, cameras, and a GPS unit to record illegal use. I have added soundscaping to this project and will be using it for biological inventory to record species presence and diversity at restoration and impact sites over a period of years. Ongoing field research, coupled with biological inventory using cameras and soundscape audio recording can identify and confirm avian, mammalian, amphibian and insect species diversity from the inception of a restoration project and conducted annually over a period of a decade or more.

Presenter: Rosemary Schiano

Brief Bio

Rosemary Schiano is a wildlife field biologist, tracker and researcher with over 40 years of experience with North and Central American mammals and raptor species. She is a wildlife biologist and educator with the U.S. Forest Service during the summer in the high Rockies of Colorado. For the past 11 years she has been conducting her own independent research studies in Arizona called Sonoran Desert Project. As SDP she observes human impact on the ground on borderlands, is recording soundscapes across the state, and is conducting two long-term projects on neotropical species and mountain lions in the eastern mountains of the state on a private wildlife preserve.

Imperiled Archaeological Sites on Cabeza Prieta National Wildlife Refuge

Presentation Abstract

Surveys in Cabeza Prieta National Wildlife Refuge at Las Playas have identified six archaeological sites along the International Border and three others nearby. Features at two of the sites are of particular interest because of their rarity, nature and location. The first is an intaglio, or a giant ground figure, that can most easily be viewed from above. This ground figure is less than 50 feet from the border and, therefore, well within the Roosevelt Reservation. The second site is a cist burial, a type of internment often associated with the O'odham. This site is within a few feet of the border and is entirely within the Roosevelt Reservation. The Roosevelt Reservation is a corridor of land on the north side of the border created by an Executive Order assigning "ownership" to the Bureau of Land Management. Waivers have been established recently due to a "military emergency" along the border. The waiver for Yuma County, where Las Playas is found, now assigns the corridor to the Department of the Army who will be responsible for constructing the wall. This presentation describes the intaglio and the cist burial, discusses their functions and importance to Native Americans and examines the characteristics of the other four sites in the construction corridor.

Presenter: Rick and Sandy Martynec

**Brief Bio**

Professional archaeologists in the Southwest with more than 70 years of combined experience, last 24 in the Ajo area.

Imperiled oases: conservation of perennial freshwater habitats and aquatic species in the Rio Sonoyta basin**Presentation Abstract**

Freshwater habitats are scarce in the Rio Sonoyta basin of the western Sonoran Desert. Historically, perennial water was found at multiple locations in the basin, but currently is limited to Quitobaquito Springs and a short reach of the Rio Sonoyta. Flow declines have already caused the extirpation of longfin dace from the basin, but endemic Sonoyta pupfish, Sonoyta mud turtles, and Quitobaquito springsnails persist. In 2016, we began several research projects in the basin to: (1) survey aquatic invertebrate biodiversity and food webs, (2) quantify population dynamics and genetic status of pupfish and mud turtles, and (3) understand how further flow declines will affect these ecosystems. We found at least 160 taxa of aquatic invertebrates at Quitobaquito and the Rio Sonoyta. Aquatic invertebrate communities in the Rio Sonoyta were depauperate compared to those in Quitobaquito, likely due to the loss of perennial surface flow in recent years. Despite their small size, Sonoyta pupfish occupied the top predator trophic role in the food web at Quitobaquito, consuming a variety of invertebrate prey. Furthermore, populations of Sonoyta pupfish have remained large across the years in both Quitobaquito and the Rio Sonoyta. Although populations of Sonoyta mud turtles were similarly robust and stable at Quitobaquito, the species experienced dramatic population declines in the Rio Sonoyta in 2019. Finally, despite the close proximity of Quitobaquito and the Rio Sonoyta (<2km), we found evidence of genetic differentiation between mud turtles inhabiting these locations. This pattern suggests that populations are not interchangeable and management actions should reflect that. Water levels in the river and springs will likely continue to decline due to groundwater withdrawals for agriculture, municipal use, and border wall construction. These declines in surface flow will lead to further losses of genetic and taxonomic diversity in the basin.

Presenter: Michael Bogan, Miguel Angel Grageda Garcia, Kelsey Hollien, Susan Washko, Karla Vargas, Melanie Culver, and Peter Holm

Brief Bio

I am an aquatic ecologist and assistant professor in the School of Natural Resources and the Environment at the University of Arizona. I have been studying streams and springs in western North America for the past 19 years, with an emphasis on aquatic invertebrates, fish, amphibians, and reptiles. I study the impacts of drought and other disturbances on aquatic biodiversity, food webs, and the life cycles of aquatic species. My co-authors and project collaborators for this presentation include several graduate students in my lab and collaborators at the University of Arizona, the U.S. Geological Survey Cooperative Research Unit, the Pinacate Biosphere Reserve, and the National Park Service.

Initial Efforts to Assess and Manage Erosion at Barry M. Goldwater Range East**Presentation Abstract**

In recent years, intense rainfall events have resulted in damage to sensitive natural, cultural, and military resources on the Barry M. Goldwater Range East (BMGR East). For example, flood-driven erosion has



rendered sections of road within training areas temporarily impassable or has partially washed them away, and at least one archaeological site has been damaged. In 2019, the Colorado State University Center for Environmental Management of Military Lands (CEMML) began a multi-phase project to assist natural and cultural resource managers at BMGR East to meet the goals and objectives pertaining to controlling and preventing soil erosion that are outlined in the installation's Integrated Natural Resources Management Plan. CEMML developed an approach to identifying and prioritizing areas prone to erosion that overlap with locations of sensitive resources (areas of concern [AOCs]) through use of Geographic Information System (GIS) data, high-resolution aerial imagery, and field evaluation. Phase I of the project included an initial field investigation of 37 AOCs and was completed in June 2019. Data were taken at each site, including the type, location, and severity of erosion, and a primary assessment for preventing and managing erosion was made. Initial findings suggest that low-cost modifications to current road maintenance practices may reduce the severity of erosion at many AOCs. Several very complex areas requiring further, multi-disciplined assessment were also identified during the field investigation. Future project objectives include conducting additional field assessments of AOCs, creating a guide of best management practices for use by road maintenance crews, and the design and implementation of site-specific plans to mitigate erosion at the most complex AOCs.

Presenter: Christi Gabriel

Brief Bio

Ms. Gabriel is a Natural Resources Specialist for the Center for Environmental Management of Military Lands (CEMML). She has over 10 years' experience developing, managing, and implementing natural resource monitoring and management projects. She has expertise in environmental compliance, threatened and endangered species surveys, performing wetland and watercourse delineations, aquatic resource permitting, and database design. Ms. Gabriel specializes in using GIS technology in the management of natural resources.

Labyrinth Glyphs of the American Southwest: Origins and Antiquity

Presentation Abstract

A distinctive unicursal, 7-course, 8-walled labyrinth image—often called “Troy Town” after the defensive walls of ancient Troy or also called the Minoan Maze—is carved into the plaster on the wall above the second floor of the central room at Casa Grande Ruins National Monument. This same glyph image has also been reported at a few sites in Mexico, at several places on the Hopi Mesas, at Arroyo Hondo in New Mexico, in southern Arizona at Cocoraque Butte, inside the lower room of Montezuma Castle, and inside the upper ruins at Tonto National Monument. Another example is in the Heard Museum in Phoenix, taken from a corral wall in 1936 from the Hopi mesas. The image is best known among the Tohono O’odham as the “Man in the Maze.” Intriguingly, this image is also commonly found all over Europe, showing up on an Etruscan wine pitcher, on a coin from ancient Crete and even on a wall at Pompeii, in a Medieval Irish monastery, and from Finland to Norway and even Iceland—among other places. Two recent versions have been located on the Utah/Wyoming state line at Minnies Gap, WY. How did this ancient image also come to be in the American Southwest and yet nowhere else in North America? My research into this image involves two research questions: (1) How did this image come to be in the U.S. Southwest; and (2) how old is it? My research has attempted to shed some light on the possible origins of this unique image in the Southwest, why it appears only in Arizona and New Mexico, its possible origins and relative age, and its connections for Native peoples.



Presenter: Kirk A. Astroth

Brief Bio

Kirk A. Astroth is a graduate student in the Applied Archaeology Master's program at the University of Arizona. He has been researching the labyrinth image for the past three years to learn about this unique image and why it appears in the American Southwest. Kirk's research interests are in studying petroglyphs and using historic inscriptions as a possible way to develop a relative dating timeline for petroglyphs.

Landscapes and Vegetation of the Cabeza Prieta National Wildlife Refuge

Presentation Abstract

The Cabeza Prieta National Wildlife Refuge encompasses about 860,000 acres of southwestern Arizona. In 1999, the author began mapping the vegetation of the refuge, spurred by concerns for the federally endangered Sonoran pronghorn. In 2019 he finally finished the job. This seems a very long time for what a casual observer would say is a single sort of vegetation: desert.

Yet observant visitors to the refuge will notice not-so-subtle changes in vegetation. Rocky passes hold the big-leafed limber bush. The Pinta Sands are home to club cholla. And the valley flats are the kingdom of creosote. A vegetation map shows these and many more communities – in color!

The vegetation map is presented here at the alliance, association, and the subassociation levels, reflecting the hierarchical structure of the National Vegetation Classification. Alliance is the broadest level, while subassociation is the finest level of vegetation mapping. Because soils greatly affect who lives where, a vegetation map of the desert southwest looks much like a soils map. The fine clays of floodplains, for instance, is not the place for teddy bear cholla, which is instead found well upslope on the well-drained soils of alluvial fans.

Landform is also a player – the inland deltas of the Growler Valley, for instance, below the sun-shattered desert pavements at the toe of the Granite Mountains. Finally, in a refuge as large as the Cabeza Prieta, climate also plays a role. As aridity increases from east to west, organ pipe and senita cactus vanish, as does a keynote species of Sonoran Desert's Arizona Upland community vanishes: triangle-leaf bursage. In their place, others flourish, including elephant tree and other species more typical of Mexico.

Presenter: Jim Malusa

Brief Bio

After graduating in the top 80% of the class of 1975 from Catalina High School in Tucson, Arizona, I worked as fry-vat lid opener at Kentucky Fried Chicken, steel bender at A&J Sheet Metal, and deconstructionist at Cro-Magnon Demolition. I later attended the University of Arizona, which eventually granted me a degree in botany. I still live in Tucson, and since 2009 have worked as a research scientist at the University of Arizona, making vegetation maps of the big dry wastelands along the Arizona/Mexico frontier.

Late Cretaceous-Early Cenozoic (Laramide) subduction-related arc magmatism in the SW section of the North America Cordillera: Evaluating the long-lived hypothesis on arc migration

Presentation Abstract

The presence of Permian granitoids (~284 Ma) in northwestern Sonora suggests that subduction-related arc magmatism started at that time in the SW section of the North America Cordillera. However, there is still confusion about the origin of the subducting oceanic plate that triggered this magmatism since it could have been a totally different oceanic plate from the one subducting during the Late Cretaceous and named, by the community, as the Farallon oceanic plate.

By Late Cretaceous, arc magmatism was undisputedly established in continental crust of the North America plate and it has been proposed/hypothesized that from this point on the magmatic arc migrated eastward toward the continent (away from the subduction trench). Our recent research efforts are focused toward testing this long-lived hypothesis of eastward arc migration established in the seventies because some preliminary age data from northwestern Sonora granitoids suggest that arc magmatism appears to be static for a large part of the Late Cretaceous.

To test this idea, we are collecting and dating (U-Pb geochronology) an extensive suite of Laramide granitoids at different distances from the subduction trench along several East-West transects on both sides of the US-Mexican border. One of the transects runs from San Diego (California), passing through Yuma (Arizona) and getting all the way to Douglas. A similar set of rock samples was collected in the Mexican side from Tijuana (Baja California), passing through San Luis Rio Colorado (Sonora) all the way to Nogales and Agua Prieta in northeastern Sonora. Some of the sampling occurred in restricted areas like the Barry M. Goldwater AFR, Cabeza Prieta NWR, Organ Pipe Cactus NM, and El Pinacate and Gran Desierto de Altar Biosphere Reserve (Sonora). Future granitoid sampling inside the Tohono O'odham Nation is being considered but pending on permission from local authorities and the community.

Scientific Project UNAM-PAPIIT-IN111718

Presenter: Alexander Iriondo

Brief Bio

Iriondo was born in northern Spain where he obtained his B.S. at the Basque Country University in Bilbao in Geology–Tectonics and Mineral Deposits. Soon after finishing, Iriondo moved to the USA to undertake graduate studies at the University of Colorado at Boulder where he got his M.S. and Ph.D. degrees. The scientific research for those degrees was undertaken in NW Sonora geology and was oriented towards solving some regional and tectonic problems including Precambrian basement distribution, time of juxtaposition of basement blocks, and the occurrence of Laramide orogenic gold deposits. The interesting results obtained in the graduate school years motivated Iriondo to pursue a 2-year Postdoctoral study at the U.S. Geological Survey in Denver to further expand the knowledge of Precambrian geology in NW Mexico through extensive U-Pb and Ar-Ar geochronology. Iriondo is a Professor at the Centro de Geociencias at UNAM in Querétaro, México, and currently on sabbatical at U of A (Tucson).

Left out to dry: Aquatic invertebrates of Anza-Borrego Desert State Park

Presentation Abstract

Aquatic invertebrates in arid regions have amazing adaptations to survive their harsh desert environment. These adaptations include behaviors that allow organisms to either withstand drying (via resistance



mechanisms) or recover from drying once water returns (via resilience mechanisms). Yet little is known about what exactly triggers these behaviors or how behavioral adaptations may affect the structure of entire communities. Here we present results from two complementary areas of research: 1) behavioral experiments examining how aquatic species respond to environmental cues associated with droughts, and 2) field sampling of aquatic invertebrate communities in Anza-Borrego Desert State Park (ABDSP), located in the Colorado Desert Subregion of the Sonoran Desert in southeastern California. Aquatic ecosystems in the Colorado Desert have received less attention than those of the Sonoran Desert of Arizona, despite varied habitats ranging from wide valley rivers to mountain springs to palm oases. We sampled and identified invertebrate communities from across ABDSP. We found that, although species diversity is lower in isolated habitats with extreme environmental conditions, these seemingly perilous habitats contain species that are found nowhere else and therefore represent a unique and important axis of diversity. The resistance and resilience mechanisms of these taxa can provide clues to how aquatic species might respond to the increasing frequency, duration and severity of droughts that are predicted for our region in the future.

Presenter: Kate Boersma

Brief Bio

Dr. Kate Boersma (she/her) is an assistant professor at the University of San Diego and aquatic ecologist working in desert streams. Her research examines aquatic insect adaptations to drying and their effects on aquatic community structure. She also develops quantitative methods to analyze functional trait information and applies these methods to understand the impacts of disturbances on biological communities. Boersma believes that human diversity is an essential part of the scientific process and works to increase the representation of women and underrepresented groups in the biological sciences. Instagram/Twitter: @kateboersma

The Pinacate geoglyphs: thoughts on the earth

Presentation Abstract

The biosphere reserve El Pinacate and Altar Great Desert is an area with a deep meaning for human groups since very old periods. This is a region that shelters surprisingly archaeological sites, evidence of human occupation long ago in a far away past. Julian Hayden made extensive explorations, disseminating its results but it never published a specialized archeology book with the exact information of the sites so this task is pending to be verified, systematized and updated, along with this are the geoglyphs sites. The Pinacate custody staff has located some of this sites; which in recent decades the National Institute of Anthropology and History has registered it. This work will present the geoglyph records, a rock art that is presented in the earth surface made with stones and clean areas that contrast with the floor color, the elements measure from 5 meters to a little more than one hundred meters. The paper objective is to visualize one of many incredible aspects of Pinacate.

Presenter: Jupiter Martinez Ramirez

Brief Bio

Archaeologist of the National Institute of Anthropology and History in Sonora, (INAH Sonora Center), He directs the Sierra Alta de Sonora Projects (Casas Grandes Culture) Cocóspera Mission (Historical Archeology of the Pimería Alta), Comparative Collections (registration of collections held by private individuals); UNISON Museum Register



Lower Colorado Buff Ware—History, Problems, and Possibilities

Presentation Abstract

Archaeologists working in the northwestern reach of the Sonoran Desert commonly employ Michael Waters' Lower Colorado Buff Ware typology when classifying and describing ceramics associated with the Lowland Patayan tradition. Introduced nearly 40 years ago, archaeologists have since identified important issues and inconsistencies when applying this typology. Much of the problem owes to the fact that this typology derives from several reworkings of Malcolm Rogers' unpublished fieldwork and notes and is thus steeped in a long, convoluted history. This presentation unpacks Waters' Lower Colorado Buff Ware typology to elucidate its origins, identify its shortcomings, and highlight potential avenues for revision.

Presenter: Rick Martynec, Linda Gregonis, Jill McCormick and Aaron Wright

Brief Bio

All four presenters are archaeologists who have worked in the Southwest for numerous decades. Our specialization is western Arizona.

Monitoring local and regional movements of lesser long-nosed bats (*Leptonycteris yerbabuena*) in the border region of U.S. and Mexico

Presentation Abstract

The lesser long-nosed bat is an important pollinator of the border region, a subset of which migrate between Mexico and southern Arizona. Although the species was listed in the U.S. as federally endangered from 1988-2018, there is much we still do not know about their movements and migratory patterns. In spring in south-central Arizona, bats give birth and raise young, feeding on flower nectar, pollen, and fruit of columnar cacti. In late summer, bats—mostly adult females and young of the year—occur throughout southeastern Arizona. During this period, bats feed on agaves, which flower later and are distributed more patchily than saguaros, before returning to Mexico. Bats also visit hummingbird feeders that are maintained by residents of the Tucson metropolitan area, and which provide a reliable food source after agaves have bloomed. To gain information on movements and migratory patterns, we marked bats uniquely with passive-integrated transponders (PIT tags). Bats need to be captured only once to implant the tag, and their data remain available throughout their lifetimes. Antennae and tag readers can be installed at locations used commonly by bats, such as hummingbird feeders and roost entrances, to detect and identify tagged bats continuously, and to record the date and time of each observation. From 2013-2019, we implanted PIT tags in 421 bats and increased our monitoring effort over time at feeders and roosts. We found that bats moved among roosts at distances up to 224 km, and have shown site fidelity to both feeders and roosts up to three years later. We hope to expand the project and partner with biologists in Mexico. Monitoring roosts and tagging bats in Sonora will help us identify key source locations of bats in Arizona and help define spring and fall migration routes between the two countries.

Presenter: Sandy Wolf

**Brief Bio**

I am an independent researcher and consultant who has worked with the lesser long-nosed bat, and other bat species, for over 20 years. This work includes locating and monitoring roosts, studying bat behavior at gated roost sites, identifying foraging areas through radio-telemetry, and investigating their use of hummingbird feeders. I'm currently partnering with the University of Arizona and the National Park service to continue a long-term project on local and regional migration patterns.

O'odham Hydrology**Presentation Abstract**

The subject of the presentation is 'O'odham Hydrology. The presentation will cover in detail 'O'odham terminology related to occurrence, distribution, movement and uses of water, with emphasis on the old way of life, hekyu himdag. We will begin with clouds and rainfall and go on to the movement, sources and storage of water. We will cover the movement of water through fields.

Presenter: Harry Winters

Brief Bio

I first met Tohono 'O'odham friends in 1956 in Koahadk village when I was 17. They began teaching me the language at that time. Ever since then I have made many 'O'odham friends, traveled with them throughout 'O'odham country, and learned a great deal from them. I have a Ph.D. in Geological Engineering from the University of Arizona. I owned mining industry consulting and engineering companies since 1972. In addition to the 'O'odham language, I have some speaking ability in Maricopa and Yavapai.

Our Story**Presentation Abstract**

Our Story, a brief intro of the O'odham, their lands, foods, games and people as they evolve in today's world without dismissing the past, present and future. Preservation of the history, culture and lands is at the hands of all.

Presenter: Verlon Jose

Brief Bio

Verlon Jose is an enrolled member of the federally recognized Tohono O'odham Nation in southern Arizona. He is currently serving a four year term appointment as Governor of the Traditional O'odham Leaders, a bi-national traditional council serving primarily the O'odham in Mexico with seventeen recognized communities in Sonora, Mexico. This Traditional Council has been around since the early 1920s when Community leaders united to protect the people and defend the traditional lands, mainly the sacred sites of the O'odham.

Mr. Jose had the privilege and honor to serve a four year term as the Vice-Chairman of the Tohono O'odham Nation. During his term he also served as the Treasurer of the Inter tribal Association of Arizona, treasurer of the Arizona Indian Gaming Association and Chairman of the Arizonans for Tribal Government Gaming. He is currently serving a second term on the National Indian Gaming Association. He has previously served as Chairman of the Chukut Kuk District, Board President of Baboquivari Unified



School District, Chairman and Vice Chairman of the Tohono O'odham Legislative Council, and as a Tribal Court Advocate and a legal assistant for the Office of the Tohono O'odham Nation's Attorney General.

Mr. Jose attended Business College in Tucson, Pima Community College, Phoenix Community College and the Tohono O'odham Community College where his studies focused on Indian Law, Judicial Studies and History/Native American Studies.

Mr. Jose enjoys time with his family, especially his 12 year old grandson Jojo. He is committed to his traditions, culture, education, youth and services to the people. He enjoys his time on the family ranch and traveling to rodeos supporting his nieces who ride steers and bulls. He enjoys many genres of music and loves to meet new friends.

Family is everything, as we are all related.

Painting Our Land: From Sonora to Mars

Presentation Abstract

This illustrated talk recounts experiences from a half-century of painting in our tri-national region, including the Pinacates, Sonoran towns, Ajo, the 50th anniversary of Kitt Peak National Observatory in the Tohono O'odham Nation, and other sites in Baja Arizona. Some images are on-site landscape paintings; others use our region as a proxy to paint phenomena other planetary bodies. Techniques and historic background are included.

Presenter: Bill Hartmann

Brief Bio

Bill Hartmann arrived in the Sonoran Desert as a graduate student in 1961, and is now known internationally as a planetary scientist, painter, and writer. His 1989 book, "Desert Heart," played a role in the establishment of the Pinacate Biosphere Reserve in 1993. He was one of the first to compare the Pinacate region to the moon and Mars, in terms of volcanic and desert terrains. He was the first winner of the Carl Sagan medal of the American Astronomical Society for communicating scientific work to the public, was given the Lucian Rudaux lifetime achievement award from the International Association of Astronomical Artists, and has an asteroid named for him. He illustrated the recent re-release of Gumersindo Esquer's 1928 novel, "Campos de Fuego," an imaginary journey into our Pinacate region.

People, Places and Songs of Pisinemo District

Presentation Abstract

Stanley Cruz, District Chairman of the Pisinemo District, will be sharing personal experiences of growing up in the community of Pisinemo on the Tohono O'odham Nation and learning about the names of mountains, animals, old villages and songs associated with the area. A powerpoint presentation will be used to describe the different locations, language and songs of the O'odham.

Presenter: Stanley Cruz

Brief Bio

Stanley Cruz lives in the community of Pisinemo in the Pisinemo District and has been living on the Nation most of his life with the brief exception of attending Sherman Indian High School in Riverside



California. After high school he volunteered in the Pisinemo community working with youth, helping out with community celebrations and volunteering with various boards on the Nation such as the Solid Waste and Museum Committees. His first job was in 1995 working for the Tohono O'odham Youth Services and in 1999 he was elected as District Chairman. After four years as the District Chairman his term ended and he went back to the Nation to work under the Child Welfare Division as a Family Preservation Specialist. After four years with the Nation he was re-elected as District Chairman in 2003 and is currently in his fourth term of office. He is interested in learning and sharing what he has learned during his lifetime. He has been married for 17 years and has four children, one foster child and eight grandchildren. He is a fluent speaker of the O'odham Language, can read some of the written O'odham language and sings songs in O'odham. He has served on the board of the International Sonoran Desert Alliance since 2018.

Prehistoric and Historical Period Agricultural Strategies in the Western Papageria

Presentation Abstract

This paper discusses prehistoric and historical period agricultural strategies in the Western Papageria, a vast area of southwest Arizona and Northwest Mexico that is the hottest and driest portion of the Sonoran Desert. Since 1996 archaeologists have surveyed nearly 200,000 acres and identified about 1,500 archaeological sites on the Barry M. Goldwater Range East. One of the biggest surprises was the presence of large villages and associated features that represent various agricultural strategies. Evidence of canal irrigation, ak chin farming, dry farming, and walk-in wells has been identified at large Formative period sites occupied from AD 1050-1450 in Cabeza Prieta and Organ Pipe Cactus NM. Historically, the Hia C-ed O'odham (formerly Sand Papago) moved between their small villages/basecamps scattered between the Gulf of California and the Gila River. Agriculture was practiced at some villages, such as Quitobaquito, and at temporales, as Suuvk in the Pinacate.

Presenter: Adrienne G. Rankin and David E. Doyel, PhD

Brief Bio

I have been working as an archaeologist in the Western Papageria for 30 years--first at Organ Pipe Cactus NM and presently at the Barry M. Goldwater Range. Co-editor of *Fragile Patterns: The Archaeology of the Western Papageria*.

Recording Culturally Significant Plants with the Tonto National Forest Tribal Monitors

Presentation Abstract

The Tonto National Forest Tribal Monitor Program (TMP) was established in early 2018 to increase Tribal participation in cultural resources baseline studies for the proposed Resolution Copper Mine near Superior, Arizona. While much of the focus of the TMP has been on recording ancestral archaeological sites, an increasing emphasis is being made on recording culturally significant plants that are important to the O'odham, Apache, Yavapai, Hopi, and Zuni peoples. The Tribal Monitors, in conjunction with archaeological and biological survey crews from WestLand Resources, Inc., have recorded culturally significant plants during survey of some 25,000 acres of land in east-central Arizona. The results of the tribal-monitor surveys are provided to the Forest Service and the involved Tribes as a component of the Section 106 tribal consultation for the Resolution Project. Several of the Tribal Monitors have also shared their traditional knowledge by leading workshops on plant identification for the rest of the TMP field crew. While the tribal botany component of the TMP is in its infancy, the recording of culturally significant plants



has provided a new perspective to the way archaeological and biological survey has been done in the past. In addition to these activities, we discuss Monitor involvement with The Emory Oak Collaborative Tribal Restoration Initiative (EOCTRI), which is currently in the early stages of studying and treating 13 Emory oak groves located on the Coconino and Tonto National Forests with the purpose of ensuring the sustainability of subsistence foods for Arizona tribes.

Presenter: Dawn Rocha; Daniel McNair

Brief Bio

Dawn Rocha has served in the the Tonto National Forest Tribal Monitoring Program since it's beginning in 2018 and studies the traditional uses of plants; Daniel McNair also studies plants and has collaborated with Dawn to organize workshops focused on plant identification and traditional knowledge about plants.

Rock pools of the western Sonoran Desert: a preliminary overview of hydrology and aquatic invertebrates

Presentation Abstract

Rock pools (locally called tinajas) are important ecosystems providing rare sources of surface water in arid regions. These pools occur in eroded depressions in rock outcrops and fill with rainwater during storms and slowly evaporate over time. Tucked away in canyons, they are well-known as waterholes for terrestrial desert fauna, but also host a community of aquatic invertebrates within their waters. Hydroperiod, or the duration of inundation, is one of the primary limiting factors for aquatic macroinvertebrates living in rock pools. Resident macroinvertebrates must complete their life cycles before pools dry, employing active or passive dispersal strategies to survive. Climate models for many desert regions predict decreased rainfall and increased temperatures, including in the western Sonoran Desert. These attributes could lead to overall shorter rock pool hydroperiods, potentially excluding some invertebrate taxa in the future. Our goals are to 1) understand the factors influencing hydroperiod and 2) characterize aquatic invertebrate community structure in rock pools of Organ Pipe Cactus National Monument and the Pinacate Biosphere Reserve. Preliminary data show that rock pools in the region can hold water for days to over a year, and that numerous aquatic insects and crustaceans inhabit the pools. Improving our understanding of the hydroperiod and the aquatic invertebrates in these rock pools will enhance predictions of climate change's impacts on these important desert waters and facilitate conservation planning in the region.

Presenter: Susan Washko, Miguel Angel Grageda Garcia, Michael Bogan

Brief Bio

My name is Susan Washko, and I'm a second-year PhD student in the School of Natural Resources and the Environment at the U of A. I am an aquatic community ecologist by training, and love learning about how the insects found in the water are tied to the habitats and resources available and how they contribute to the way the ecosystem functions.



Saguaros of the Sonoran Desert National Monument

Presentation Abstract

Saguaro cactus (*Carnegiea gigantea*) are considered a charismatic megafloora and a defining feature of the Sonoran Desert. Determining saguaro forest locations, age structures, and recruitment can assist land managers in decision making processes, specifically related to livestock grazing. We hypothesized that saguaro forests near livestock water locations will have fewer young saguaro than forests further from livestock water locations. Our study area was in the Sonoran Desert National Monument, Arizona, USA, a site that has received periodic livestock grazing in the past. Saguaro forests were measured using remote sensing and stratified random monitoring plots. A forest was defined as an area with at least 10 saguaro per acre and covered 15.4 square miles. Within those forests, elevation was a significant ($p < 0.05$, $R^2 = 0.61$) predictor of saguaro density. For every 100 feet of elevation gain, saguaro density increases by 9.5 saguaros per acre. Saguaro forests near livestock waters (<2 miles) were comprised of significantly ($\alpha = 0.05$, $p < 0.05$) fewer young saguaros (<30 years old) than saguaro forests further than 2 miles from livestock waters. In addition to environmental factors, such as elevation, livestock grazing appears to limit the recruitment of saguaro cactus in areas easily accessible to livestock. This information could be used to inform future decisions about water development and grazing strategies across the Sonoran Desert.

Presenter: Doug Whitbeck

Brief Bio

Doug is a rangeland management specialist for the BLM in Phoenix, Arizona. He has a masters degree in ecology and management of rangelands from the University of Arizona. He enjoys living and working in Arizona and studying human interactions with desert ecosystems.

Shell in O'odham Culture

Presentation Abstract

Our Hohokam ancestors used shell as adornment for both men and women. Historically, our O'odham men traveled to the Sea of Cortez on a salt pilgrimage where they encountered and collected shell. This presentation will explore the significance of shell in O'odham culture.

Presenter: Beverlene Johnson, Keith Norris and Dedric Lupe

Brief Bio

Beverlene Johnson is a Museum Specialist at Himdag Ki: and has worked there for almost three years. She is from the community of North Santa Rosa in the Gu-Achi District. Beverlene holds a degree in Cultural Anthropology from the University of New Mexico.

Keith Norris is the Museum Specialist at Himdag Ki: Cultural Center & Museum. He is from Kost Kug La:nju in the district of Chukut Kuk. Keith holds a degree in Secondary Education from Northern Arizona University and has been working at the museum for almost 2 years.

Dedric Lupe is an enrolled member of the White Mountain Apache Tribe of Arizona. While not enrolled, he is also Hopi as well as Tohono O'odham. Dedric received his bachelors in Museum Studies from the



Institute of American Indian Art in Santa Fe, New Mexico. Educating, both in and out of the museum, is but one of many reasons for his decision to obtain his Masters at the University of San Francisco. Along with repairing a lot of the bridges that were burned between indigenous peoples and museums, he also wants to start a model of indigenous collections care and ethics that can be used as the standard in all museums. Detric has worn many hats within the museum, from security guard to curator, and hopes to use that experience to help others tell their own story in the museum. He is currently Curator of Collections at the Tohono O'odham Nation Cultural Center & Muesum.

Sister Parks Project - Connecting Natural Reserves between Mexico and the US

Presentation Abstract

National parks and reserves along the US-Mexico border in Sonora, Baja California, and the southwestern United States share and protect a rich biological diversity with common threats and conservation goals. Through a collaboration between Sky Island Alliance, National Park Service, Sonoran Joint Venture and the National Commission of Natural Protected Areas (CONANP) in Mexico, the Sister Parks project was created in 2014 to understand and address loss of biodiversity. This project facilitates collaboration between park staff and resource managers from Mexico and the US to develop a strong international partnership that allows for collaborative monitoring and protection of biological diversity all throughout the binational region. We are now expanding our project objectives to include spring assessments, pollinator monitoring, and outreach and education activities.

Presenter: Emma Rocio Fajardo & Emily Burns

Brief Bio

EMMA ROCIO FAJARDO

Community Engagement Program Manager

Bachelor of Arts in Geography from the University of Arizona and Masters of Science in Human Dimensions of Natural Resources from Colorado State University

EMILY BURNS

Program Director

Most recently, she was the Science Director for Save the Redwoods League in California. Under Emily's leadership, Save the Redwoods League established a restoration program, grew the education program to teach more students how climate change affects their local forests, grew a stewardship program to care for thousands of acres of private redwood forestland, and sequenced the coast redwood and giant sequoia genomes to aid conservation efforts for the species. She received her doctorate in 2010 from the University of California in Integrative Biology and conducted postdoctoral research on drought tolerance in ferns at the University of California, Santa Cruz where she remains a research associate today.

Sonoran Desert Plant Propagation: Techniques, Tips, and Tricks

Presentation Abstract

The Pima County Native Plant Nursery is dedicated to growing Sonoran Desert plants to put back in our public landscape to combat habitat loss and increase species diversity. Truly focusing on native plants means many of them are not commercially available and growing information may be sparse. In Pima County almost all of these plants are grown from locally sourced seed. While some seeds may germinate

and grow readily, others can prove very challenging. Success can be determined by anything from planting depth to day length. Even after germination other obstacles can arise. This process is ongoing for a small 2-acre operation maintaining over 20,000 plants. Growing over 200 native species, including several endangered species, in light of these challenges means using different strategies to be successful. Discuss some of these techniques and learn what producing large amounts of plant material for restoration projects really looks like.

Presenter: Andrew Hatch

Brief Bio

Andrew Hatch has been the propagator at the Pima County Native Plant Nursery for over 2 years. In that time, he has grown thousands of Sonoran plants for public projects. With a degree in Sustainable Plant Systems from the University of Arizona and a passion for plants of all kinds he has slowly learned how to propagate many Sonoran Desert species. Armed with a low tech greenhouse and volunteer collected seed he enjoys trying to propagate any plant he can get his hands on. Eager to learn how to germinate any difficult seeds he is always looking for new growing strategies and happy to share techniques he has learned along the way.

Southwest Border Resource Protection Program

Presentation Abstract

The Southwest Border Resource Protection Program (SWBRPP) provides financial assistance to parks and partners along the US-Mexico border to mitigate impacts on cultural and natural resources and to further collaboration between Mexican and American land managers and their partners. For a variety of reasons, many NPS units on and near the border have experienced natural and cultural resource damage, the SWBRPP office located in the Intermountain Regional Office in Denver, Colorado, works with park staff and their Mexican counterparts, as well as educational institutions, nonprofit organizations and local, state, tribal and federal agencies to improve resource stewardship and to achieve international cooperation. The goal of this session is to provide information about the SWBRPP and how available resources can be leveraged to support effective cross-border resource management and protection.

Brief Bio

Krista Muddle has been the Intermountain (IMR) Regional Partnership Coordinator since July of 2008. Prior to joining the NPS, Krista worked for the Association of Partners for Public Lands (now Public Lands Alliance or PLA) as the Education and Administrative Services Coordinator for five years. Her focus at PLA was to establish engaging and inspiring educational opportunities for public land managers and their partners so they could accomplish innovative projects on public lands. Prior to her work at PLA, Krista worked as the Administrator of the Climate Policy Center, a small advocacy group in Washington DC. She has received bachelor's degrees in Russian and Political Science and a master's degree in Intercultural Nonprofit Management. She served in the Peace Corps from 1999 - 2001 consulting five nonprofit organizations based in Sibiu, Romania.



SUPERBLOOM: The Natural History of 150 years plus of Wildflower Blooms in the Mojave and Sonoran Deserts

Presentation Abstract

Every five to ten years if weather conditions are just right, and fall and winter storms bring enough precipitation, the Southwest Deserts can explode with colorful wildflowers. In recent years, social media has named these mass blooms Superblooms, and indeed some can cover enormous areas of desert. This presentation examines the environmental factors that are behind these giant wildflower blooms, describes the wildflower species making up the large "carpet blooms," and reviews the historical precipitation and photographic records of blooms from 1862 through the spring of 2019. The Sonoran and Mojave Deserts have never been more colorful!

Presenter: Ed Madej

Brief Bio

Ed Madej is a retired biogeographer and Geographic Information Systems specialist who became entranced with desert wildflowers after visiting Death Valley National Park during the giant Superbloom of 2005. As research volunteer with the National Park Service, he has been tracking big wildflower blooms ever since from Death Valley and Joshua Tree National Parks in the Mojave Desert through Anza Borrego State Park, Organ Pipe Cactus National Monument and places in Baja California.

Sustainability and Resilience in the Sonoran Desert: Lessons in food production from the Hohokam

Presentation Abstract

Despite increasing research indicating the contrary, many Hohokam archaeologists continue to posit that the agricultural practices of the Hohokam during the pre-Classic Colonial and Sedentary Periods relied primarily on corn, beans and other cultivars for sustenance. During the Classic period, Hohokam farmers began to rely more heavily on gathered wild foods for the greater portion of their diet. Some of the data used to interpret this change in prehistoric diet is based on the ratio between the archaeologically recovered plant species that are commonly interpreted as gathered wild plants versus those interpreted as cultivated crops. This shift has been interpreted as a diminishing sustainability for the Hohokam people's food supply during the Classic period.

In this paper we present additional data suggesting that rather than a decrease in agriculture during the Classic period of the Hohokam, there was instead an increase in agriculture. We propose that the increased presence of local plants does not reflect a diminished reliance on gathered resources, rather, that the increase use of local species reflects the expanded cultivation of local plant species and an increase in the domestication of local Sonoran Desert plants. Our proposal suggests that by the Classic period the agricultural palate of the Hohokam farmers had expanded to include a greater diversity of agricultural technologies and a much greater diversity in cultivated crops. The lessons from the Hohokam regarding the increase in agricultural sustainability and resilience through cultivation of native Sonoran Desert plants can provide insight into our current use and food production using plants native to the Sonoran Desert.

Presenter: Hoski Schaafsma, Teresa Rodrigues, Lorrie Lincoln-Babb

**Brief Bio**

Hoski Schaafsma has been conducting archaeological and ecological research in the Southwest for over thirty-five years. For the past twenty-five years he has been working in the Sonoran Desert with a focus on human-environment interactions through time. He currently works as a research archaeologist with Desert Archaeology, Inc.

Sustainable Tourism for the communities of the Sonoran Desert from the Solidarity Economy.**Presentation Abstract**

The development of sustainable tourism for the communities of the Sonoran Desert territory is a function of the potential of their natural and cultural resources, both tangible and intangible. To start this process, it is necessary to carry out a series of studies and participatory work with local communities, from a comprehensive, participatory, inclusive, supportive and sustainable approach.

In Mexico, recently created, the National Promoter of Solidarity Economy "PRONAES", is an interdisciplinary organization with a national presence, whose mission is to generate processes of integral development for social transformation from the solidarity economy, in whose center, is the fight against poverty and social inequalities through organizational processes with local groups, determined to work with a vision for collective well-being.

The rural communities located throughout the Mexican territory, contain in their great majority, elements with tourist potential and with territorial identity, both for their nature and for their culture, which makes them susceptible of being integrated in an orderly way in the tourist activity. The Sonoran Desert, in addition to its great natural wealth, PRONAES puts at the center, the communities that inhabit the territory, to jointly detonate, opportunities for the development of sustainable tourism.

Keywords: development, tourism, sustainable, solidarity economy.

Presenter: Olivia Bringas

Brief Bio

Mexican, Master in Promotion and Cultural Development. Director and founder of Tierra y Turismo México Consultores, S.C., National Tourism Coordinator of PRONAES. Expert in planning and development of tourism projects in rural areas and community tourism with a focus on gender, inclusion and sustainability.

Member of the CONACYT Register of Accredited Evaluators in the Tourism sector; Member of the Ibero-American Bank of Evaluators in the Tourism Sector. Friend member of the International Social Tourism Organization; Member of the World Gastronomy Institute.

Taming Invasive Plants based on Science and Cooperation: the Parallel Stories of Managing Buffelgrass and Sahara Mustard in Arizona**Presentation Abstract**

Few successful cases exist for containing highly invasive plants on a regional scale. Effective control of invasion across highly heterogeneous landscapes and complex jurisdictions require two key elements: 1)



an adaptive management program that adopts the most effective management approach based on evolving scientific understanding of an invasion and continuous monitoring of management effectiveness and 2) cross-jurisdictional cooperation that enables the implementation of a centralized regional management plan based on openly shared data, methods, and local management plans among participating agencies and organizations.

These two key elements have been adopted to improve the control of two highly problematic plant species: Sahara mustard (*Brassica tournefortii*) in southwestern Arizona and buffelgrass (*Pennisetum ciliare*) in southern Arizona. I will give an update of the management programs that focus on these two species, underscoring the social and technical infrastructure we are building to enable multijurisdictional cooperation and the scientific evidence we are acquiring to better target these two species.

Presenter: Yue "Max" Li

Brief Bio

Conservation Research Scientist, Arizona-Sonora Desert Museum and UA School of Natural Resources and the Environment

Ph.D. in Ecology and Evolutionary Biology from the University of Arizona. Research focuses on conservation of biodiversity

The Desert is Food and Desert Food Protects Water for Life

Presentation Abstract

Let me tell you some of what I have learned across this Sonoran Desert in over six decades of listening, looking, recording, researching, and publishing. We can better live in this desert making use of archeo and traditional knowledge to do something about water and food for the future. And thus, adapting agriculture can be the easiest of all the huge challenges: our own agaves, cactus fruits, desert palms, seawater grain, and big sacaton (*Sporobolus wrightii*), the most immediate of them all for the Dry West. Let me tell you what you can do.

Presenter: Richard Felger

Brief Bio

It is always a privilege to study and write about new aridland food crops, botany, and ethnobiology—in the Sonoran Desert, and deserts worldwide.

I am a researcher associated with the Herbarium, University of Arizona, Tucson. My work and interests can be seen on: DesertFoodPlants.org

Recent research, with support hosted by the International Sonoran Desert Alliance, can be seen in two forthcoming books:

Plants & Animals in the Yoeme world: Ethnoecology of the Yaquis of Sonora and Arizona. Richard Felger and Felipe Silvestre Molina. Special Publication from the Desert Laboratory, University of Arizona. (2020, open access & print available). *The Desert Edge: Flora of the Guaymas–Yaqui Region of Sonora, Mexico*. Richard Felger, Susan Davis Carnahan, & José Jesús Sánchez-Escalante. Special Publication from the Desert Laboratory, University of Arizona. (2020, open access and print available)



The People of the Sonoran Desert

Presentation Abstract

“Place-names are important on several levels. They show human and natural histories...and they incite our curiosity....They applaud the antepasados who came before.” Broyles et al, 1997.

As a resident of Ajo, the names of the mountains, mines and washes on Organ Pipe National Monument piqued my curiosity. I began searching online and print resources to find out who they were named after and what those people had contributed to Sonoran Desert life to deserve such an honor. I discovered a world of fascinating characters from Melchior Diaz, scout for the Coronado expedition, to Jose Juan Orozco, patriarch of the community at Quitobaquito Springs. Their biographies are like hidden treasures, and the Southwest has always been a mecca for treasure hunters. This presentation provides an introduction into the lives of Diaz, Orozco and other of Native American, Spanish, Mexican and US-American miners, ranchers and adventurers who made the Sonoran Desert their home. My goal is to spark curiosity and conversation about the ways in which people have interacted with and built community in the Sonoran Desert, to show how their lives intersected socially and economically and how they adapted to the desert environment, changes in access to water and shifting local and national borders.

Presenter: Joanne Coutts

Brief Bio

Joanne Coutts is a volunteer humanitarian aid worker with Ajo Samaritans and No More Deaths/No Mas Muertes. Prior to dedicating herself to full-time humanitarian aid she was an arts administrator, as Deputy Director of Step Afrika!, the first professional company dedicated to the African American tradition of stepping, and Director of Special Events for The Shakespeare Theatre Company in Washington DC. Joanne is also an independent artist and writer. She recently presented an exhibit, Desconocido, at the Detroit Institute of Arts to honor the lives of migrants who have died crossing the Sonoran Desert who have never been identified and her blog Immigration is Opportunity shares stories of her personal experience of the Sonoran Desert. Joanne is currently writing a book; The People of the Sonoran Desert: Hia C'ed O'odham, Mexican and US-American miners, ranchers and explorers 1539 to 2019. Originally from London, England, Joanne now divides her time between Ajo and Detroit.

The Pierpoint Site: A Thirteenth Century Elevated Site near Gila Bend, Arizona

Presentation Abstract

The Pierpoint site is a large late prehistoric site located about 9.5 mi (15 km) upriver from the Town of Gila Bend in southwestern Arizona. The site is also known as Fort Pierpoint and is registered in the Arizona State Museum site survey system. It is under BLM jurisdiction. The site covers an area of about 60 acres (24 ha). Years ago we initiated a site survey that recorded about 200 cultural features. The site is distinguished by two massive stone walls, the longest is 243 m, across the mouth of a canyon. Also present are 143 rock rings, 31 cleared areas, 14 rock shelters, 32 other features, plus 193 rock images and multiple trail systems. The distribution of architectural features and associated cleared areas seem to form small neighborhoods. The survey produced a total artifact count of 3,572 items. Present were a scattering of Tanque Red-on-Buff and unidentified red and plain wares. The site is thought to have been occupied between A.D. 1200 and 1300. Discussion will focus on these findings and implications for the historical sequence in the Gila Bend area.

Presenter: David Doyel

**Brief Bio**

David E. Doyel (Ph.D. University of Arizona) held positions in government agencies and private consulting firms in which he conducted archaeological research across much of the American Southwest from the U.S. - Mexico International border north to the Colorado plateau. He has over 100 publications in books, journals, and reports. His body of work has been recognized by a Lifetime Achievement Award from the Governor's Archaeological Advisory Commission and the Governor's Heritage Preservation Honor Award. He is also a recipient of the Byron S. Cummings Award for Outstanding Contributions in Archaeology, Anthropology, or Ethnology from the Arizona Archaeological and Historical Society. He is a recipient of the Professional Archaeologist of the Year Award from the Arizona Archaeological Society. He recently retired as archaeologist for the Barry M. Goldwater Range, East for the U.S. Air Force.

The use of shell ornaments at Early Agricultural Sites in the Tucson Basin**Presentation Abstract**

The advent of archaeological projects over the last several decades along the Santa Cruz River in the Tucson Basin have given us an opportunity to examine Early Agricultural (2100 BC-AD50) sites in this area. Along with other pieces of material culture such as flaked stone and ground stone tools, ornaments manufactured from marine shells were also part of the lifeway of the local inhabitants. Deriving from locales in California as well as northern Mexico, where established marine shell ornament manufacturing industries were thriving, the shell ornaments recovered from Early Agricultural sites in the Tucson Basin suggests that the local inhabitants played a part in maintaining social and economic networks outside of the immediate surroundings. It also reveals that these early populations placed a high value on their shell ornaments.

Presenter: Christine H. Virden-Lange

Brief Bio

Christine H. Virden-Lange is an archaeologist and shell specialist with Desert Archaeology, Inc in Tucson, AZ.

The Wilderness Act of 1964 and its role in current National Wildlife Refuge System Land Management**Presentation Abstract**

A law written and signed in a different era of public land management continues as a substantial piece of legislation that drives current management. In the present, the act lives alongside different legislation that brings different goals, objectives, and challenges. Your public land exists through many different mechanisms and the way it is managed is derived from these original and revised laws. The method of approach can be different and the challenges may range, but the management of public land is for the benefit of the people. See how management under these laws take shape.

Presenter: Alfredo Soto

Brief Bio

Born outside of Chicago and loved the outdoors. Went to school at Southern Illinois University



Carbondale for Zoology and got involved in research as well as the Wildlife Society Student Chapter. Spent a summer at Okefenokee National Wildlife Refuge working on mapping the massive fire that year along with Florida black bear surveys, red-cockaded woodpecker nesting box installation and banding, and post-fire surveys. Took a job at Arctic National Wildlife Refuge running the small mammal baseline survey research of a north-south transect of the refuge, handling the permitting program, and generally taking part in all other research and visitor services programs run out of the refuge headquarters. Moved to Ajo with my amazing wife, two wonderful daughters, and two hound dogs. Have been managing the visitor services program including the Youth Conservation Corps and the Volunteer Program, the invasive species management program, and many other administrative and management needs.

Transient Connectivity windows across space and time in the Sonoran Desert: Spatio-temporal changes in connectivity for native, at-risk, and invasive species

Presentation Abstract

Desert waters are rare resources that act as literal oases to support a number of endemic, rare, or sensitive species. Water supplementation is thus a commonly used management tool for wildlife in arid regions like the Sonoran Desert. Climate change is predicted to reduce the total available water for resources in the Southwest, while also increasing temperatures, creating serious problems for wildlife managers. These increases in extreme conditions results in increasing vulnerability of endemic species in which evolution cannot keep pace to help animals adapt. Wildlife managers have responded historically by providing wildlife with artificial waters to compensate for lost resources due to climate change, habitat fragmentation, and water extraction. Examining wildlife water networks at multiple spatial scales, we used graph and circuit theory to explore the influence of permanent and ephemeral wildlife waters at multiple dispersal distances. These explorations of structural and functional connectivity show that the guzzlers constructed by management agencies on the Barry M. Goldwater Range and the Sonoran Desert in general may play an outsized role in countering the natural isolation between water resources. However, this reduction in isolation could harbor unintended consequences by providing low-suitability habitat for native amphibians and by facilitating the spread of invasive species and zoonotic diseases. Simulated removal of existing waters and addition of proposed waters allowed the prioritization of waters depending on management concerns, from invasive species mitigation to ungulate water resource provisioning. Such an approach could help produce an inventory of waters found to be important for conservation of wildlife of various dispersal capabilities in the face of habitat degradation or climate change; such a method could be adopted in situations where quantitative assessments of connectivity among habitat patches and management options are needed.

Presenter: Joseph Drake; Dr. Nancy McIntyre; Dr. Kerry Griffis-Kyle

Brief Bio

I am currently a PhD student at the University of Massachusetts - Amherst, having received a natural resources management M.Sc. from Texas Tech University. Spending multiple field seasons in the area around Ajo, I explored the ecologies of water sites looking at connectivity, quality, and biodiversity. For more information find me at my website: <https://secretlifeofafieldbiologist.wordpress.com/> or follow me on Twitter/Instagram @fieldbiojoe



Trends in vegetation and dynamic soil factors in U.S. national parks and refuges

Presentation Abstract

With more than a decade of consistent monitoring of terrestrial vegetation and soil factors across 16 U.S. national parks and 3 U.S. Fish and Wildlife Refuges, we have detected substantial change within and across this network of protected lands. Recovery from drought, the consequences of wildfire, and the impact of land management activities are reflected in vegetation and biological soil crust composition and productivity, soil cover and aggregate stability, and the rise of particular species, including both established and new invasive exotic plants. We will present and discuss emerging patterns from across the broad geographic extent of this monitoring effort in the local context of our results from Organ Pipe Cactus NM and Cabeza Prieta NWR, and discuss the implications for resource protection.

Presenter: Andy Hubbard, Cheryl McIntyre, Sarah Studd, and Bethany Derango

Brief Bio

Andy Hubbard, Cheryl McIntyre, and Sarah Studd are ecologists with the National Park Service - Sonoran Desert Network, which conducts natural resource inventories and long term monitoring in 11 U.S. National parks. Bethany Derango is a plant ecologist with the U.S. Fish and Wildlife Service focused on invasive plant management and ecosystem restoration.

UNESCO Biosphere Reserves Structure and Application in the Sonoran Desert

Presentation Abstract

The United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the Man and the Biosphere (MaB) Programme in 1971 with the aim to improve people's relationship with their environment including ecological, social and economic dimensions through the recognition and designation of biosphere reserves. This session will explore the founding principles of the MaB Programme and track some of the key moments of transition over the program's history. Presenters will explore the sometimes challenging history of the program in the United States through the lens of the Organ Pipe Cactus National Monument, a first generation UNESCO biosphere reserve. Content will include a brief history, current status and possible future for the Organ Pipe Cactus Biosphere Reserve.

Presenter: Rijk Morawe and Aaron Cooper

Brief Bio

Rijk Morawe is Chief of Natural and Cultural Resources Management at Organ Pipe Cactus National Monument. He has spent 29 years with the National Park Service, 7.5 of those at Organ Pipe. CV is biology and geology. He has worked with UNESCO MAB concerning ORPI since 2013.

Aaron Cooper is a returned PeaceCorps Volunteer, a former secondary school educator and the current executive director for the International Sonoran Desert Alliance. He has worked with Organ Pipe Cactus National Monument concerning the MAB Programme since 2018.



Updating Organ Pipe's Vegetation Map: Project Updates and Highlights

Presentation Abstract

The Sonoran Desert Network (SODN) is tasked with classifying and mapping vegetation communities at 11 park service units in southern Arizona and New Mexico. At most units, no preexisting vegetation map exists or one was created so long ago that a completely new map is warranted. At Organ Pipe Cactus National Monument, a map was published in the summer of 1981 by Warren et al. The SODN determined that this map was done to a high enough standard to be used as a baseline for an updated map of the monument. The goal of this project is to update the vegetation classification to match current standards (USNVC), adjust and update the digital map boundaries as needed, and to integrate with the similar maps on adjacent lands including the Cabeza Prieta NWR. A complete and up-to-date vegetation inventory map can be of great utility to the park service for land management and ecological research. It can provide a lasting historical baseline against which to compare the current status and can pave the way for thinking about the future under varying climatic or management conditions.

Presenter: Jeff Galvin and Sarah Studd

Brief Bio

Jeff Galvin: Ecologist with the Sonoran Desert Network

Sarah Studd: Ecologist with the Sonoran Desert Network

Using camera traps to assess human development affecting the Sonoran pronghorn population in the Pinacate Biosphere Reserve, Sonora, Mexico

Presentation Abstract

The Sonoran pronghorn (*Antilocapra americana sonoriensis*) is one of the recognized subspecies of pronghorn, endemic to the Sonoran desert and considered as threatened by Mexican law and CITES. The main threats for this subspecies are the altered and fragmented habitat structure due to human disturbance, reduction of forage availability, predation, loss of genetic diversity, and high mortality rate due to death and poaching. Sonoran pronghorn population in El Pinacate Biosphere Reserve in Sonora, Mexico has been isolated for the decades being highways effective barriers on the Northern and Eastern boundary of the Reserve. In an effort to better understand the effect of human development on the pronghorn population and habitat use, we deployed camera traps in the Eastern part of the Pinacate Reserve to analyze habitat use and interactions with livestock. Camera traps were set at different distances from the roads and highways to evaluate if they reduce undisturbed space and connectivity effects of human disturbance from roads and physical barriers influence how pronghorn and other wildlife are affected by roads and barriers. The results obtained during the first year of sampling will be analyzed and discussed during the presentation.

Presenter: Miguel Angel Grageda

Brief Bio

I am currently a graduate student at the School of Natural Resources and Environment at the University of Arizona. I was Coordinator of Natural Resources Management in the El Pinacate Biosphere Reserve in Sonora for three years. Also, I have been part of the nonprofit organization PROFAUNA A.C. for seven years collaborating with wildlife conservation projects in northern and central Mexico.



When Kware'epa Tricked Yuku: Ethno-herpetology and Conservation of the Sonoran Desert Toad (an update)

Presentation Abstract

Discovery of 5meoDMT in the Sonoran Desert Toad (*Incilius alvarius* syn. *Bufo alvarius*) has led to a cult following of entheogen users and practitioners that have increased in the wake of the recent psychedelic renaissance. This has led to an increased demand on the toad apart from many of its preexisting threats, as well as false narratives and cultural appropriation of indigenous societies.

Presenter: Robert A. Villa

Brief Bio

I'm a proud Spanish-speaking Tucsonan deeply in love with the Sonoran region—studying, exploring, and documenting its biocultural diversity (often with violin in tow) most of my 33 years (2019). I'm especially interested in amphibians, reptiles, plants/horticulture, ethnoecology, archaeology, and regional gastronomy.

I consider myself a follower in the footsteps of Sonoran naturalist explorers such as Howard Scott Gentry, Paul Martin, Charles Lowe, Tom Van Devender, Mark Dimmitt, Richard Felger, and others, documenting and espousing the land where north and south embrace.