

2024

# N-GEN SUMMIT

*Reconnecting the Sonoran Desert*

Benjamin T. Wilder, Lydia Lozano,  
Jennifer MacKay, Charlie de la Rosa,  
Enriquena Bustamante, Diana Zazueta

SUMMIT ORGANIZING  
COMMITTEE AND EDITORS



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N-Gen Summit 2024: Reconnecting the Sonoran Desert © 2024 Next Generation Sonoran Desert Researchers

Benjamin T. Wilder, Lydia Lozano, Jennifer MacKay, Charlie de la Rosa, Enriquena Bustamante, Diana Zazueta (Summit Organizing Committee and Editors)

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Photo on left: Ramón Ojeda



# N-GEN SUMMIT 2024

## RE-CONNECTING THE SONORAN DESERT

After almost ten years since our last gathering as a community at the N-Gen Summit in 2015 in Guaymas, Sonora, it was time to reconnect. In the intervening years, many things changed, with great and increasing challenges. However, what remained constant is the backbone of a vibrant, dynamic, and brilliant community of individuals committing their passions and lives to understanding and conserving the greater Sonoran Desert. The pandemic brought seismic change across the world, with great hardship and loss for so many. Social distancing and isolation were required, though antithetical to the actions and vision of N-Gen.

As we collectively emerged into the post-pandemic era, the nature of work, collaboration, and communication had been rewritten. Virtual. Instantaneous. Voluminous. While it has never been easier to connect with colleagues across the region or the world, the power and dynamism of in-person interactions remain vital.

Contemporaneously, the political and environmental realities of our shared borderlands have experienced increasing upheaval. A wall now stands between the United States and Mexico, slicing through the majority of the greater Sonoran Desert. Once unimaginable, this symbol and act of division has scarred the landscape and challenges our fundamental tenets of cross-border and cross-cultural collaboration. The tenor of societal and political discourse engenders false narratives and narrows the space for meaningful dialogue. All corners of the Sonoran Desert are experiencing the social and ecological effects of an increasingly erratic climate system. The period of 2020–2021 saw the most extreme heat and drought event our region has experienced in centuries. Collectively, our work shows great social and environmental change, and in many cases, loss. The need for a space of science diplomacy, an open flow of ideas, data, new approaches, and new opportunities at all levels – the core of N-Gen – has never been more important.

Our community, however, has not been idle in this time of change. The number of organizations, working groups, initiatives, publications, and innovative approaches to the challenges of our time are inspiring and overwhelming. The same questions that were at the root of N-Gen’s foundation, who is doing what and where, remain fundamental to effective collaboration.

For all of these reasons, we reconvened our community of actors for the 2024 N-Gen Summit in Álamos, Sonora. Nearly 300 of us gathered where the desert meets

the tropics for four days of immersive discussions across 58 sessions and nearly infinite ideas.

Many of those ideas are captured and shared here in the session proceedings. They represent insightful summaries of the state of action and need in topics across the disciplinary and geographic scope of the Sonoran Desert. They show and help us understand where things are now. In many cases, they represent the nucleus of ideas and efforts that will expand and blossom.

This Summit provided an opportunity to reconnect friends, perspectives, alliances, visions, and shared efforts. It created a renewed momentum for cohesion and transdisciplinary and innovative action for the years to come. It has been a celebration of our region and those who dedicate their lives to its endless wonders.







N-Gen Summit 2024  
Álamos, Sonora



# ACKNOWLEDGMENTS

The undertaking of the 2024 Summit was made possible by many individuals and institutions. We are forever grateful to the truly magical city and community of Álamos. You opened your doors and kitchens to all of us who had the pleasure to attend and reinforced the power and beauty of community. A core staff of volunteers dedicated enormous energy and passion to making this event a success. Gilberto Díaz Álvarez, Miguel Antonio Gastélum Flores, Rosario Mares García, Alejandra Monsiváis Molina, Claudia Navarro, Fernanda Pérez Alarcón, Nalleli Rivera Sánchez, thank you. The Summit venue, the Centro Comunitario Nelita Bours (CCNB), helped define and create this gathering. Thank you, Joaquín and Wenny Bours, and CCNB Director, Elena del Carmen Amaya Hernández, for creating such a vital community space, and inviting and allowing us to host this Summit there. We were privileged to have the support and partnership of local host organizations: Parque La Colorada, Naturaleza y Cultura Sierra Madre, Hotel El Pedregal, and Estudiantes Conservando la Naturaleza.

The scope of this Summit, especially the full fellowship support of 60 early-career and Indigenous fellows and 30 agave producers, was made possible by the generous support of many organizations and a core set of individuals through private donations. Thank you for your belief in N-Gen and the greater Sonoran Desert research community.

Finally, our local organizing committee members Jennifer MacKay and Lydia Lozano dedicated months of energy and years of friendships in undertaking this event. You opened your town and hearts and gave more than could have been dreamed. Thank you.





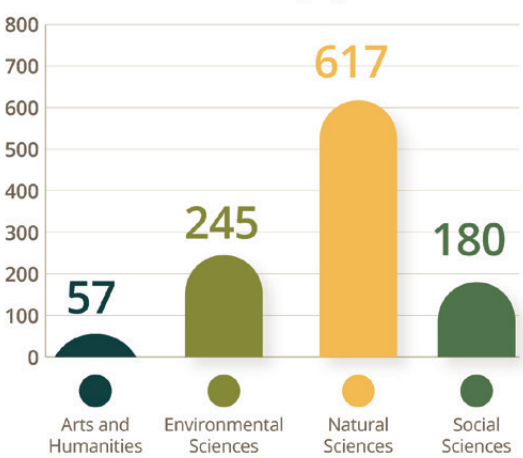
# N-GEN NETWORK OVERVIEW

N-Gen is a multinational, inter-institutional, multi-sectoral, and cross-border network comprising over 1,100 individuals. This is a community that includes students and specialists from the sciences, arts, and humanities—people who, from various disciplines, contribute to the science and conservation of the Sonoran Desert in all its corners.

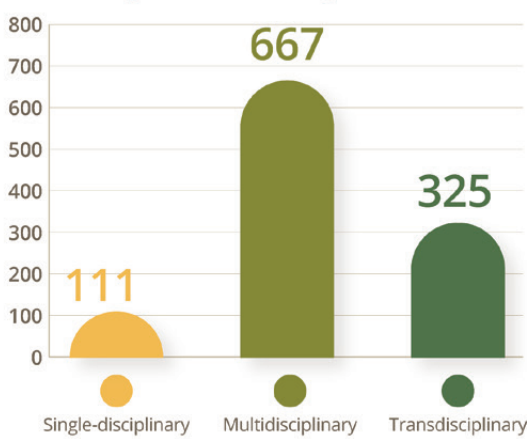
1,112 INDIVIDUALS | 41+ DISCIPLINES |  
21+ REGIONS OF THE SONORAN DESERT

An individual becomes a member of N-Gen by creating a profile on our website, [www.nextgensd.com](http://www.nextgensd.com). Since our origin in 2012, we have developed a searchable database where individuals can specify their disciplines and regions of focus. This tool allows users to discover who is doing what and where, fostering collaboration across the network. The goal of this dynamic platform—and N-Gen in general—is to catalyze collaboration.

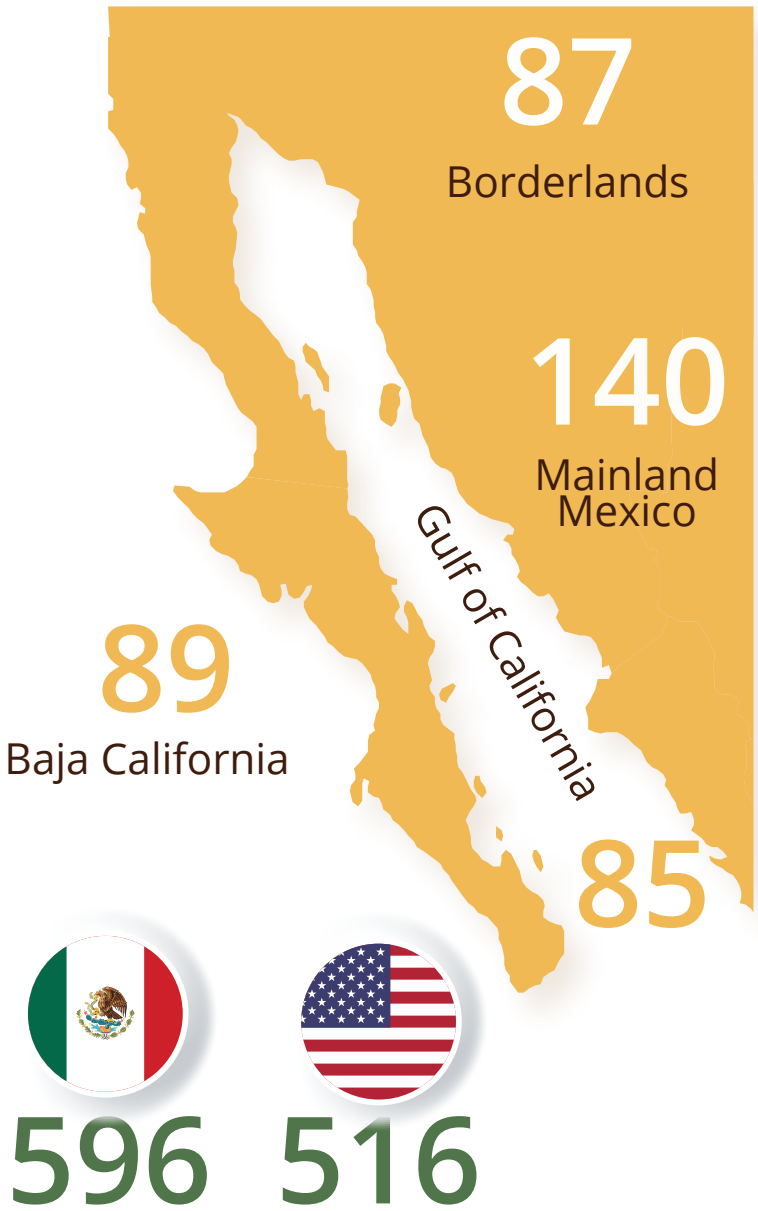
## Scientific Approach\*2



## Disciplinarity\*3



# Regions\*1



1. Specific region information is available for 405 profiles.  
2. The four categories of scientific approaches contain the related specific disciplines identified in member profiles.  
3. Disciplinarity is defined as an individual having only one discipline (single-disciplinary), more than one discipline within one scientific approach (multidisciplinary), or more than one discipline across multiple scientific approaches (transdisciplinary).



# N-Gen

Pre-Summit Members' Survey

Sept. 2023 - July 2024

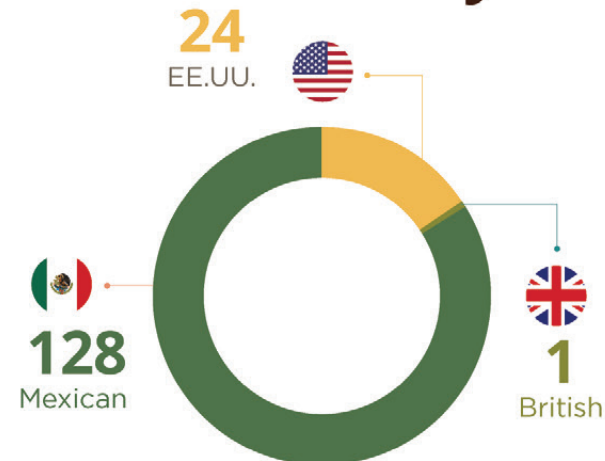
153  
responses

As a lead up to the 2024 **N-Gen Summit**, we conducted a more detailed survey of our members to gain a better understanding of the composition of our network.

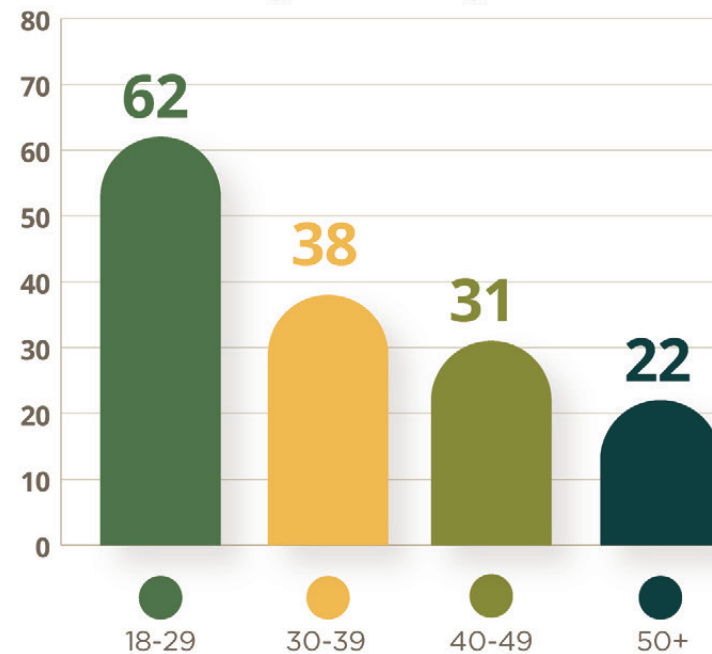
This representation reflects the swell of interest, particularly from students in Sonora, in response to the call for fellowships and general interest in the 2024 Summit in Álamos.

**N-Gen** activations and calls for action generate significant interest, especially at the regional level. In turn, these initiatives help us highlight, identify, and better understand the diversity within the **Sonoran Desert community**.

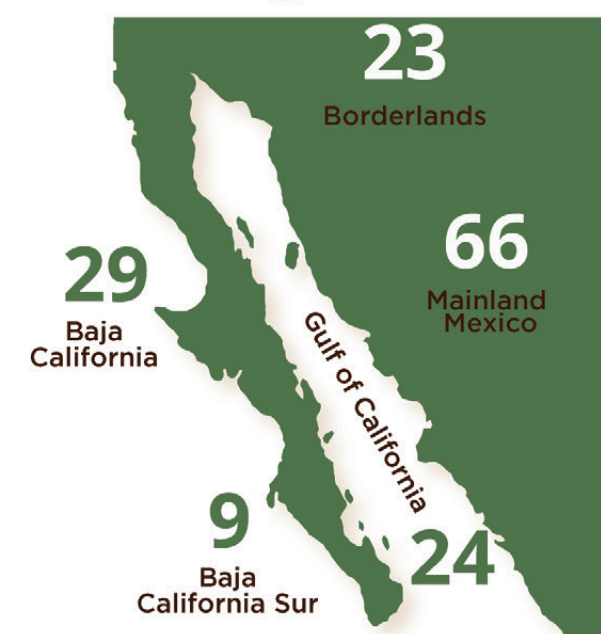
## Nationality



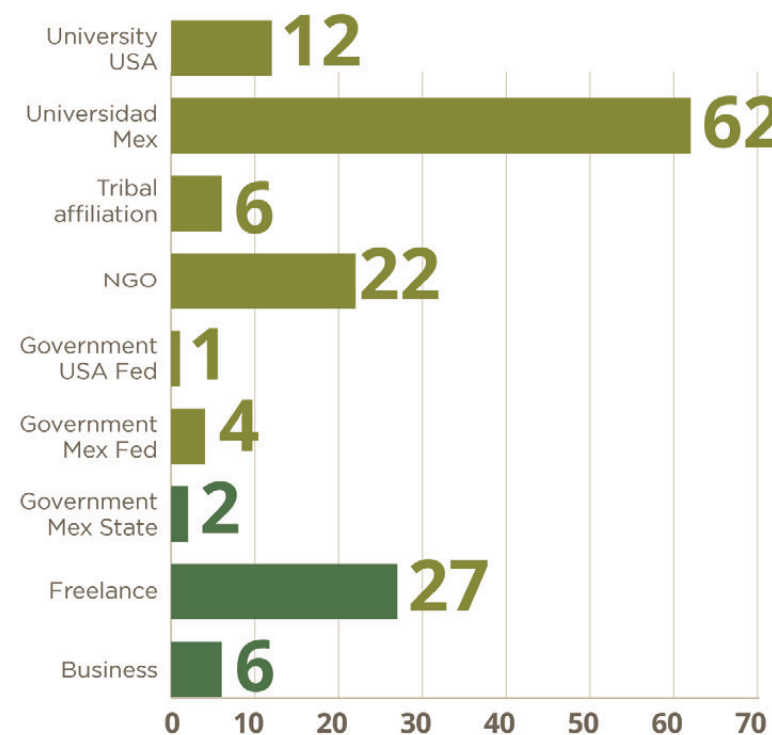
## Age Range



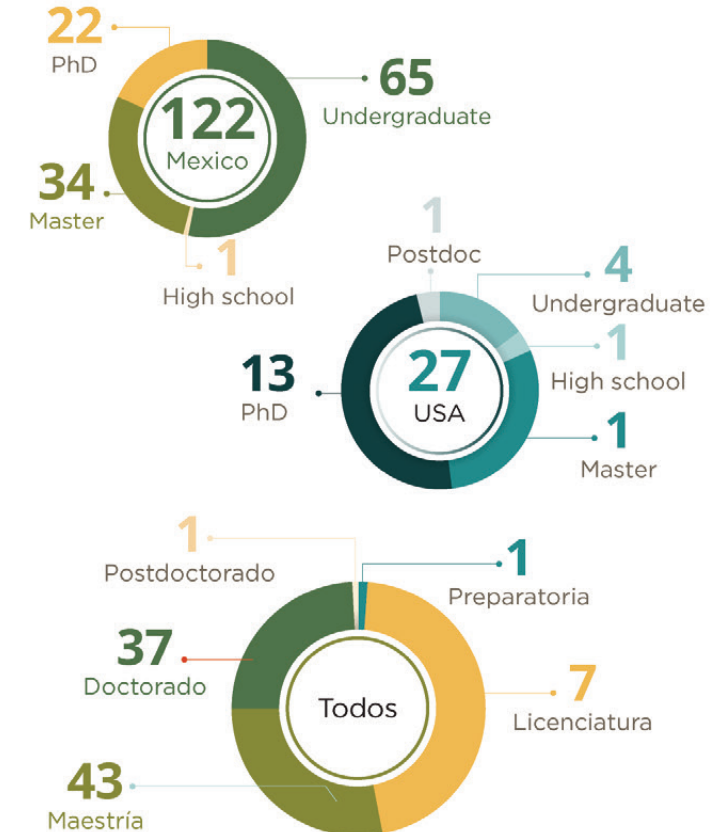
## Regions



## Affiliation



## Highest Degree Earned





# THE SUMMIT

The 2024 N-Gen Summit was a four-day gathering held in Álamos, Sonora, from April 24–27, 2024, for over 275 members of the Sonoran Desert research community.

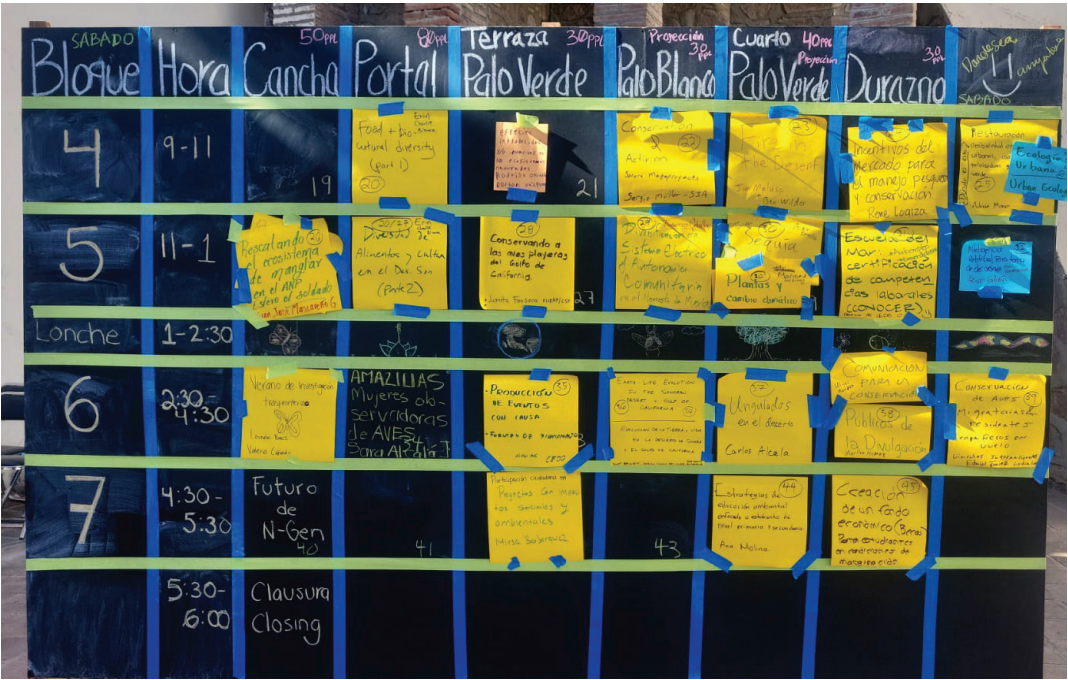
N-Gen Summits are watershed events that provide the space and time to advance collaborative action on the key scientific and conservation topics of the Sonoran Desert.

## Format

The gathering followed an (un)conference format where the agenda is dynamically created by all participants at the outset of the meeting and focuses on shared priorities through roundtable discussions in sessions, the core of the Summit.

An (un)conference format takes a normal scientific gathering and flips it on its head. It focuses on the best part of a conference—talking to the people you want to about the topics most important to you—and makes that the whole event.

Sessions, the core of the Summit, were 1.5-2 hour collaborative discussions focused on relevant topics. 58 distinct sessions covering a wide range of subjects were convened.



## The four principles

1. Whoever comes is the right people.
2. Whatever happens is the only thing that could have.
3. Whenever it starts is the right time.
4. When it's over, it's over.

## The one rule: the law of two feet

If you find yourself in a situation where you are neither learning nor contributing, use your two feet and go somewhere else.







	April 24 Wednesday	April 25 Thursday	April 26 Friday	April 27 Saturday
<b>MORNING</b>		Opening and session proposals ... Session Block 1 ... Agave Summit with AHF	Special Sessions ...	Session Block 4 ... Session Block 5 ... Lunch
<b>AFTERNOON</b>	...	Session Block 2 ... Session Block 3 ...	Field Trips ...	Session Block 6 ... Session Block 7 ...
<b>EVENING</b>	Welcome Happy Hour	La Recua film screening	Janos en Álamos & Dinner on own	Wrap up Session ... Closing dinner

## Venue

The N-Gen Summit took place at the charming Centro Comunitario Nelita Bours (CCNB), located in the heart of Álamos, Sonora. This historic building not only provided us with ample space but also enveloped us in its inspiring charm, creating the perfect setting to foster discussions and advance collaborative actions on key scientific and conservation issues for the Sonoran Desert. We deeply appreciate the support and warm attention of all of its staff!

## Zero Waste Summit

At the N-Gen 2024 Summit, we reaffirmed our commitment to the environment by hosting a ‘zero-waste’ event. We encouraged all participants to bring their own zero-waste kits (reusable cup, mug, utensils, plate, and napkins) and provided washing stations so they could reuse them while enjoying local delicacies.

We carefully managed our organic waste, sending it to *Los Bayos Farm*, where it was transformed into compost by *Reciclaje y Sustentabilidad*, minimizing our ecological footprint.

Additionally, we ensured that all materials used (banners, boards, pens, flipcharts, etc.) were reused by the community. Our approach not only demonstrated our commitment to conserving the Sonoran Desert but also served as a practical example of sustainability.



# CAREER RECOGNITION AWARDS

During an emotional closing ceremony, N-Gen honored four outstanding individuals for their remarkable contributions to the knowledge and conservation of the Sonoran Desert. These individuals inspire all of us and support and shape the work of the generations to come.

The award recipients were Peggy Turk Boyer, Ileana Espejel, Exequiel Ezcurra, and Humberto Romero Morales, who with their work and dedication have left an indelible mark on our region.





Visionary of tides By Victor Arturo Ricárdez García  
Words for Peggy Turk-Boyer

Talking about Peggy means talking about the Intercultural Center for the Study of Deserts and Oceans (CEDO). It is impossible to discuss this civil association of Mexico and the United States’ without mentioning Peggy Turk Boyer, one of the most influential figures in implementing environmental policies and conservation programs for ecosystems and priority species, as well as for the sustainable and inclusive development of the coastal communities of the Upper Gulf of California. She was one of the first to realize that there would be no future well-being without a healthy environment, and that exhausting nature and assuming technology would somehow resolve everything later was a fundamental misunderstanding of the essence of life. It ignored the fact that humans are part of an ecosystem, part of biodiversity, and our dependency is absolute.

Although she completed her undergraduate and master’s studies in biological sciences at the University of Arizona, where she also served as an associate researcher, it has been the coastal communities of Baja California and Sonora that have been her most prominent teachers. They gave her the sensitivity and empathy necessary to recognize that vulnerability is greater in localities with poverty, governance challenges, and limited access to services and resources; in places where levels of conflict and violence are much higher. This vulnerability results in inequalities, marginalization, gender gaps, discrimination, and inequities.

Convinced of sustainable and inclusive development and aligned with nature conservation, her work has been key to establishing the Mexican and UNESCO Biosphere Reserves (Upper Gulf of California/Colorado River Delta and El Pinacate/Gran Desierto de Altar) and two internationally recognized Ramsar sites in the wetlands of the Gulf of California. She has been instrumental in developing conservation and management programs and encouraging local community participation in managing these protected natural areas.

She has been a pioneer in Environmental Impact Studies as a tool for managing fishery resources in three communities in the Upper Gulf of California and in marine and coastal spatial planning for managing ecosystems and fisheries in six communities in northern Sonora. She has directed efforts and resources toward training fishermen and cooperatives in self-management and co-management, as well as teachers in rural

communities in environmental education. Moreover, she has promoted the participation of children and youth in seeking solutions to local socio-environmental problems.

Without a doubt, her keen vision of the world, her deep understanding of the facts, her leadership exercised with love, and her unwavering will to align her life project with her professional career are the strongest foundations of CEDO. All her profound lessons are treasures that remain in the memory and hearts of those who are part of its ever-changing essence and history.



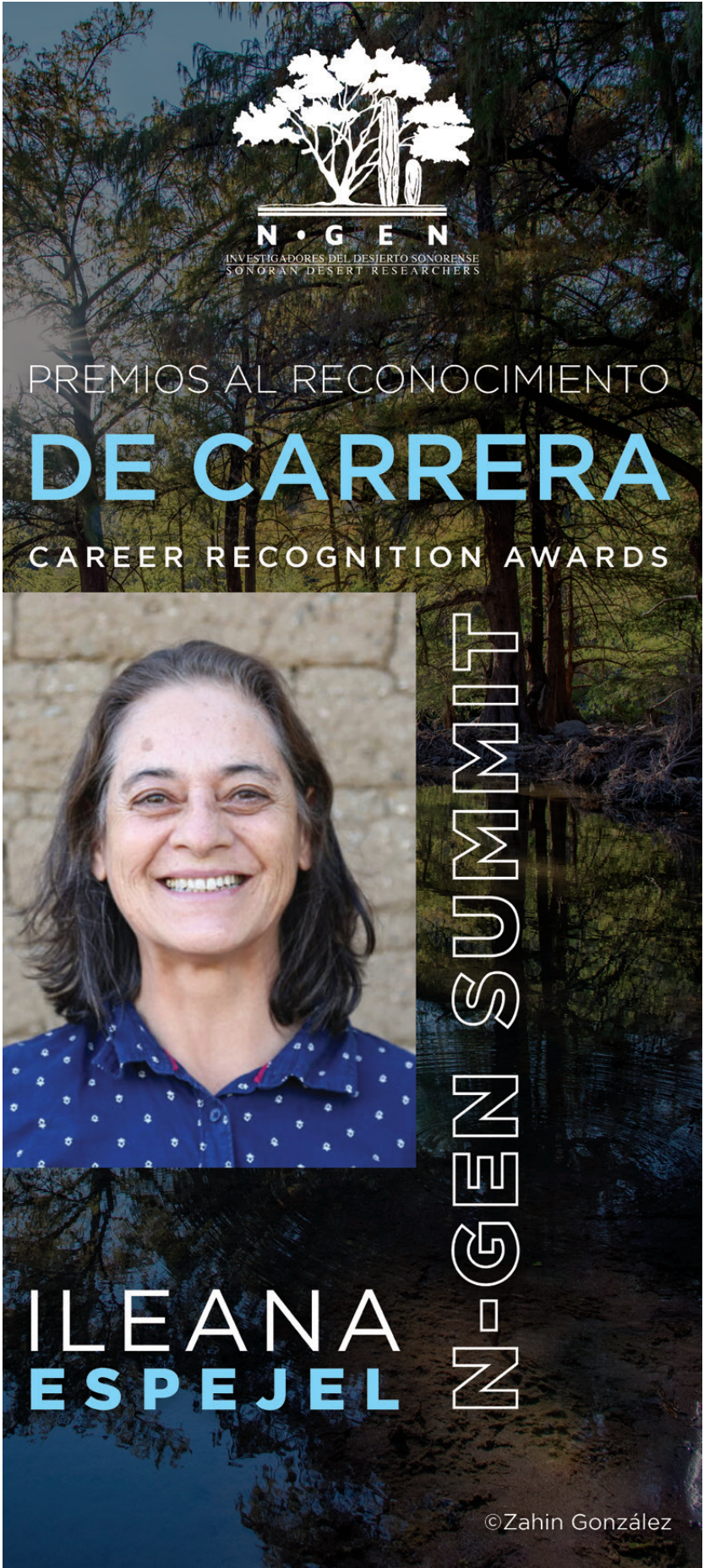


Artisan of utopias By Victor Arturo Ricárdez García  
Words for Martha Ileana Espejel Carbajal

More than a witness, Ileana is a protagonist of the world and its most rapid and hopeful transformations. More than a prolific author, Ileana is a creator of utopias, the most beautiful ones, due to their sense of reality and their ability to inspire others, like me, not to give in to mediocrity; to recognize and rectify when we make mistakes, and to get up if we fall. More than a manager of ecosystems, a specialist in socio-ecological systems, and an expert in coastal dune management, Ileana is a landscape artist. I swear, without exaggeration, that from the footprints she leaves in the sand, I have seen the most beautiful flowers bloom for the most diverse and varied pollinators of the desert, because Ileana does not walk alone, but as part of a team.

After studying biology at the National Autonomous University of Mexico, she pursued her master’s studies at the Universidad Veracruzana, where she founded and directed the Ethnobotany Yucatec Program. At El Colegio de México, she specialized in environmental and development studies and earned her Ph.D. in plant ecology at Uppsala University in Sweden. A critic of patriarchal academia and basic science; bold and visionary, she founded and coordinated the Master’s in Ecosystem Management of Arid Zones and contributed with other extraordinary individuals in creating the bachelor’s in environmental sciences and the Ph.D. in Environment and Development. These are multidisciplinary/interdisciplinary programs at the Autonomous University of Baja California aimed at proposing creative and alternative solutions to complex development problems. In this way, she has taught us that sometimes it is not necessary to conquer spaces but to create them.

Of course, her experience transcends the academic realm. An expert in integrating and coordinating multi and interdisciplinary work teams, she has cultivated her gifts and talents by linking scientific knowledge with traditional knowledge in the execution of a wide variety of projects that promote the conservation of ecosystems and priority species; the integral management of natural and cultural resources in urban and rural contexts, as well as sustainable and inclusive development at local, regional, and national levels. She has been a pioneer in land use planning, community observatories for citizen science, and ecological and territorial zoning programs, eventually establishing herself as an expert in evaluating environmental policies. In this regard, her career honors the words of French sociologist P. Bourdieu regarding social structures and schemas, when he stated that it is possible to change social reality if we can change its representation. However, Ileana, always more direct, has shown us by her example that indeed, if we can change, we can transform the world.





Everything is possible By Ben Wilder

Words for Exequiel Ezcurra

I had just returned from Mexico City in 2010 where I met Carolyn O’Meara, and we found a shared interest in seeing if there was a larger community of young researchers interested in the study and conservation of the Sonoran Desert. We developed an idea for a conference, the Next Generation Sonoran Desert Researchers. I took this seed of an idea to my major advisor, Exequiel Ezcurra, whom I had the honor of studying with at UC, Riverside. I shared our sense that we did not know who was doing what and where, and felt disconnected from our colleagues across the region and in different disciplines. Were we crazy? Was this something worth pursuing? Exequiel met my questions with a wave of excitement and encouragement. He instantly validated the idea and, in true Exequiel fashion, shared with me the historical context of previous cross-border initiatives such as the Reunies del Mar de Cortés and the International Sonoran Desert Alliance in the 1990s. However, those initiatives had faded and since the hardening of the border following 9/11 in 2001 the Sonoran Desert research community was indeed becoming increasingly fragmented. Yes, such a meeting as we were proposing was needed and Exequiel committed at that moment to making it happen. He provided \$20,000 of initial funding and wrote a letter challenging the foundations of the region to match his investment.

I will never forget leaving Exequiel’s office that day, my head spinning. As in so many things, what starts as a dream, a far-flung idea, or an inkling becomes reality once Exequiel touches it. With him, anything is possible.

Simply put, Exequiel is the most consequential scientist, thinker, and conservationist the Gulf of California and the Sonoran Desert have ever had.

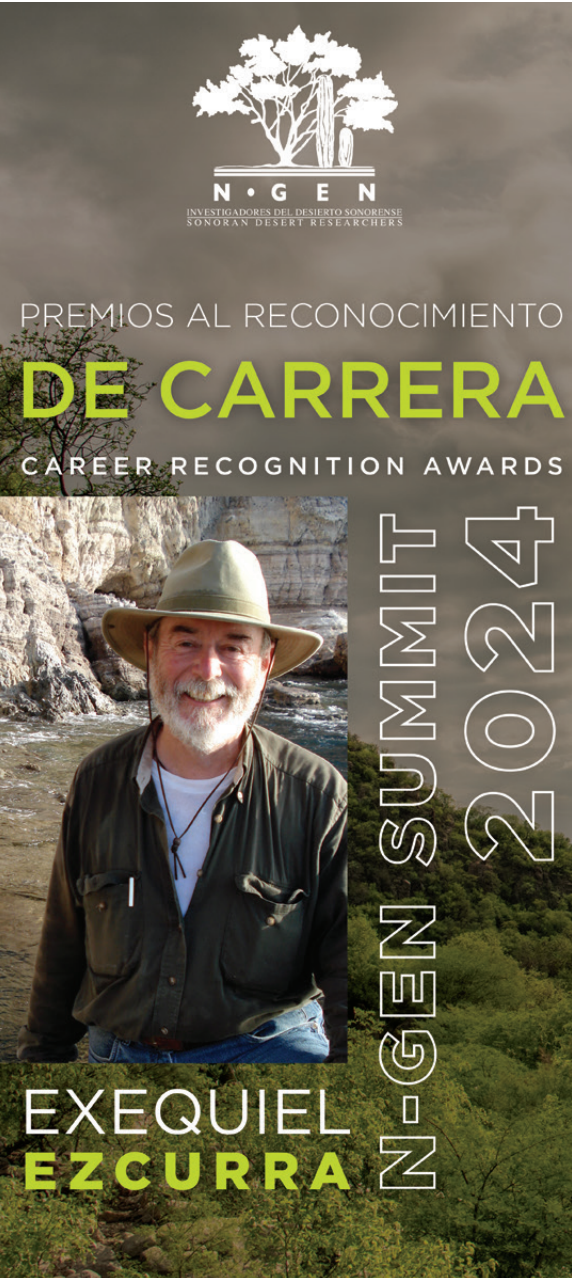
The imprints of Exequiel’s efforts extend across our desert and sea, throughout Mexico, and across the globe. They are evidenced in the tens of thousands of acres conserved through his leadership within and outside of the Mexican government, from the Pinacate y Gran Desierto de Altar Biosphere Reserve, to the Vizcaino desert, condors soaring in the Sierra San Pedro Mártir, and protected waters and islands of the Gulf of California. His words shape how we look at the desert. I think I can safely guess his general writing featured in dozens of books and films has inspired each of us here many times over. They capture the intangible quality of the Sonoran Desert that fuels our passion better than any other writer I know. Yet, he also underscores these words in over 200 scientific articles and book chapters that reveal novel and

fundamental aspects of how the desert and sea function. These are almost always done in concert with his dozens of students and collaborators, never with his name first, though many should be. As any collaborator of Exequiel can tell you, what begins as a pile of data you have painstakingly collected for years, though can’t discern, becomes an elegant and statistically robust paper that not only addresses the question you had in mind, but has far broader impacts than you imagined. Anything becomes possible.

Among the many topics he has focused on, his work has elevated our understanding of the critical role of mangroves for fisheries and blue carbon, the ecophysiology and brilliant adaptations of dozens of desert plants, how global scale climatic phenomena are manifested in the behavior and demography of seabirds and plants on desert islands, the imprints of the previous glacial cycles on the patterns of biodiversity we see today, and the cosmology and calendar systems of the early inhabitants of the heart of Mexico – always connecting these results to conservation.

Perhaps the most wonderful part of Exequiel is how fun it is to work with and learn from him. As those of us that are lucky enough to have the privilege to call him a teacher and a friend know, any opportunity to be with him in a zoom meeting, a call, and if you are especially fortunate - the field - is a gift we will always treasure. You will learn more than you could have imagined, and in every possible direction from history, statistics, population theory, ethics, and of course botany and ecology.

When Exequiel speaks, people listen. His career transcends borders and political agendas to find a common ground between nature, scientists, and government. In an interview for Nature magazine, Exequiel said: “I learned that when you do good science to build a good case, the opportunity to use it will eventually arise”. The model Exequiel exemplifies and sets for us – pursuing knowledge and making people care – anchors us in the fact that anything is possible.





A teacher as never seen before By Ben Wilder  
Words for Humberto Romero Morales

Humberto opens new worlds.

He did it for me when I found him through the help of Cathy and Steve Marlett with questions of what plants occur on, Tahejöc, Isla Tiburón. I found my way to his house in Punta Chueca, just across from the largest island in Mexico. I was a completely young and green researcher. I introduced myself, told him I was working with botanist Richard Felger, and of my interest to learn what plants occur on Tiburón. Almost immediately Humberto said, “OK, let’s go to the island” and was instantly ready as I, in shock, assembled my loads of field gear, bags for collecting, and plant presses.

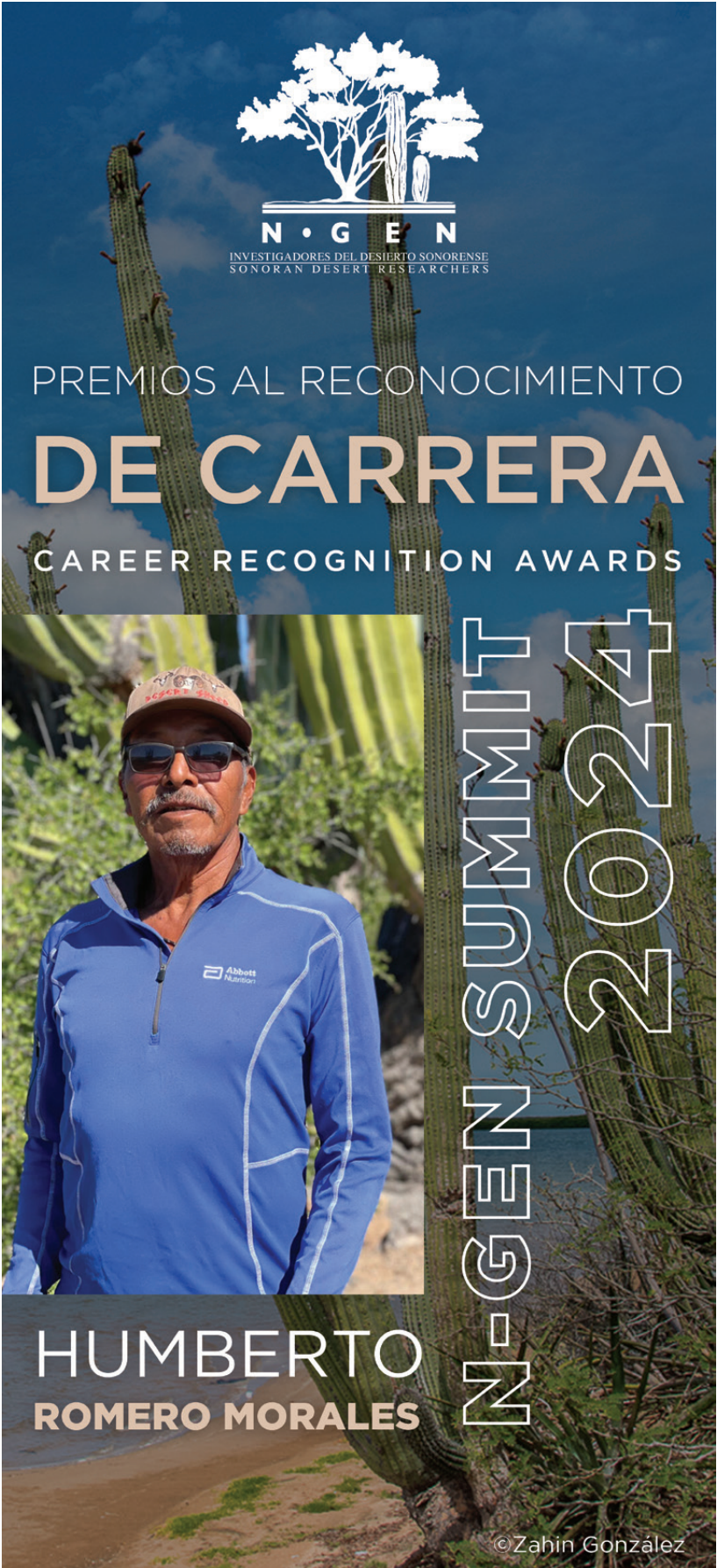
I am still amazed at how quickly we were whisked across the Canal de Infiernillo to the island, then into one of the SUVs used in bighorn sheep hunting on the island, and up to the base of the towering Sierra Kunkaak. We dismounted from the car and I tried to keep up with Humberto as he set a blistering pace through the dense desertscrub. Past steep hillsides, we emerged upon a beautiful view of an arroyo and the Sierra. It was quite green compared to the rest of the island’s vegetation. Humberto stopped, and I could tell we had reached our destination. He sang a song in Cmiique litom (the language of the Comcaac) for the vegetation. He finished and said, “OK, where do you want to go.”

That day in late 2004 marked the beginning of the most rewarding collaboration and dear friendship. Over the dozens of trips and projects since, Humberto has consistently and unwaveringly shared his knowledge and insights into the plants and landscapes of his homeland. His knowledge is vast and spans multiple foreign languages (especially Latin), world views (tradicional y occidental), and generations. I have never met anyone who is as voracious for new information and who so readily absorbs it. “What is the new name for *Acacia greggii*,” he asked me just a couple months ago after botanists changed its scientific name again. After telling him the new name once, *Senegalia greggi*, he had it committed to memory, while I am still working to recall these new scientific names.

I am lucky enough to have found my way to Humberto’s side, where we instantly connected to a shared passion for discovery. Some of my best times have been when we would climb the highest peaks of the island, him showing me plants he had seen years prior on bighorn sheep hunts or us seeing them together for the first time. With herbarium specimens in hand, we would later, most often with Richard, put names to

these species - almost always new records for the island’s flora and range extensions. Otro más en la mochila, Humberto would say.

I am far from alone from having benefited from Humberto’s generosity and expansive knowledge and wisdom. After being one of the first buceos for calle de hacha among the Comcaac out of Desemboque, captaining his first boat at the age of 16 and collecting about 40 kilos of callo a day, Humberto changed his trajectory at 35. Bighorn sheep had just been introduced (re-introduced) to Tiburón and hunting efforts were just starting. Humberto started as a chauffeur on the hunts, but quickly rose to a guide and leader of the hunting effort for many years to come. Around that same time, in 1998, Gary Nabhan and Lori Monti offered the first courses on para-ecology with the Comcaac. That is where the knowledge about the plants he had learned from his mother in his youth connected with a broad external framework for understanding, and for him instantly clicked. From there he kept exploring, observing, and connecting his observations and discoveries to what he taught himself from the Seri Ethnobotany. Our subsequent work then built on his incredible platform to further document the plants of the islands.





As Humberto recently explained to me, he sees the compilation of Comcaac and Western knowledge systems as the vehicle to extend the limits of what others can learn and achieve. This is vibrantly manifested in Humberto’s drive to educate. He is a powerful medical healer, using the plants and their long-held knowledge to alleviate ailments for many in his community - though keeping some secret recipes. He is a natural teacher and leader and readily shares his knowledge with whomever is lucky enough to ask.

I was fortunate to accompany Humberto on a brief trip to Desemboque last spring. It was during a time of elections and a bit of division within the community. I was taken aback by the outward affection and respect everyone showed to Humberto, and how recognized and honored he and his efforts are. There was a similar outpouring of support and recognition for Humberto when we announced his receipt of this award, from all across the region.

His current project, Jardín Botanico Xasscla Án (garden of columnar cacti), just outside of Punta Chueca creates a space for research, conservation, education, and culture. It is an investment in the younger generation and a place where people can connect to the multiple ways of knowing the plants of the desert.

Humberto preserves and ceaselessly passes along millennia of knowledge. He does it in a way that has never been seen before. He sets a precedent for how to document, preserve, and share understanding that bridges distinct world views. His efforts have opened new worlds for those fortunate enough to learn from him, and will continue to inspire and guide for decades to come.

# N-GEN AWARDS

We celebrated the extraordinary work of individuals, organizations, and projects making a difference in the Sonoran Desert, the Baja California Peninsula, the Gulf of California, and the Mexico-United States border.

The winners by category were:

## N-GEN AWARDS 2024





**DR. JESÚS ADRIÁN BOJÓRQUEZ VALDEZ**

ADVANCES IN THE UNDERSTANDING OF THE STRUCTURE AND FUNCTION OF THE MEXICAN PACIFIC TROPICAL DRY FOREST (BTS).

**CARING FOR THE PACIFIC RED KNOT AND THE GULF GRUNION**

COLLECTIVE MADE UP MOSTLY OF WOMEN FROM THE GULF OF SANTA CLARA, SAN LUIS RÍO COLORADO, SONORA.





**CLIMATE CHANGE AND COLLAPSING THERMAL NICHES OF DESERT REPTILES AND AMPHIBIANS: ASSISTED MIGRATION AND ACCLIMATION RESCUE FROM EXTIRPATION.**

AUTORES: BARRY SINERVO (†) , RAFAEL A. LARA RESÉNDIZ, DONALD B. MILES, JEFFREY E. LOVICH., PHILIP C. ROSEN (†), HÉCTOR GADSDEN, GAMALIEL CASTAÑEDA GAYTÁN, PATRICIA GALINA TESSARO, VÍCTOR H. LUJA, RAYMOND B. HUEY, AMY WHIPPLE, VÍCTOR SÁNCHEZ CORDERO (†), JASON B. ROHR, GABRIEL CAETANO, JUAN C. SANTOS, JACK W. SITES JR., FAUSTO R. MÉNDEZ DE LA CRUZ

**ASTRID ARELLANO**

SONORAN JOURNALIST SPECIALIZED IN ENVIRONMENT, INDIGENOUS PEOPLES, AND TERRITORIAL DEFENSE.



THE NEXT GENERATION SONORAN DESERT RESEARCHERS

31





DR. JESÚS ADRIÁN  
BOJÓRQUEZ VALDEZ

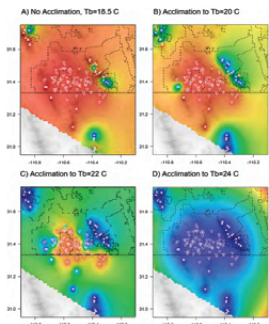
Postdoctoral researcher at the Instituto Tecnológico de Sonora (ITSON), professor and acclaimed mentor  
ADVANCES IN THE UNDERSTANDING OF THE STRUCTURE AND FUNCTION OF THE MEXICAN PACIFIC TROPICAL DRY FOREST (BTS).



CLIMATE CHANGE AND COLLAPSING THERMAL NICHE OF DESERT REPTILES AND AMPHIBIANS: ASSISTED MIGRATION AND ACCLIMATION RESCUE FROM EXTIRPATION.



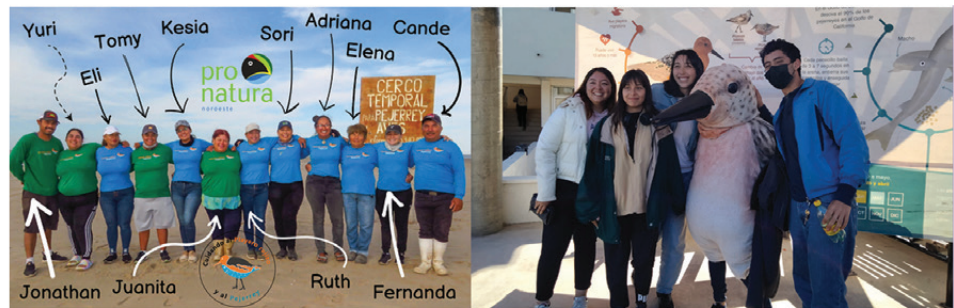
AUTORES: BARRY SINERVO (†) , RAFAEL A. LARA RESÉNDIZ, DONALD B. MILES, JEFFREY E. LOVICH., PHILIP C. ROSEN (†), HÉCTOR GADSDEN, GAMALIEL CASTAÑEDA GAYTÁN, PATRICIA GALINA TESSARO, VÍCTOR H. LUJA, RAYMOND B. HUEY, AMY WHIPPLE, VÍCTOR SÁNCHEZ CORDERO (†), JASON B. ROHR, GABRIEL CAETANO, JUAN C. SANTOS, JACK W. SITES JR., FAUSTO R. MÉNDEZ DE LA CRUZ



CARING FOR THE PACIFIC RED KNOT AND THE GULF GRUNION

COLLECTIVE MADE UP MOSTLY OF WOMEN FROM THE GULF OF SANTA CLARA, SAN LUIS RÍO COLORADO, SONORA.

[/PlayerorojizoyPejerrey](#)  
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ASTRID ARELLANO

Sonoran journalist specialized in environment, indigenous peoples, and territorial defense.



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# AGAVE SUMMIT

In collaboration with the Agave Heritage Festival (AHF) N-Gen held the 2024 Agave Summit. This day-long gathering, at the beginning of the N-Gen Summit, focused on creating a space for understanding and action with agave producers. Topics included economic opportunities, the status of the bacanora denomination of origin, the holistic use of agave, the effects of climate change on production, and more.

Over 275 participants took part in 18 sessions on diverse topics that were proposed in the morning and then convened throughout the day. The proceedings of these sessions, which span the environmental and human dimensions of the Sonoran Desert, can be found towards the end of this volume, along with the rest of the Summit sessions.

Following the inaugural Agave Renaissance Summit at the 2023 Agave Heritage Festival, the primary goal of this gathering was to include and elevate the voice and role of agave producers in Mexico, particularly in Sonora. We had over 30 producers in attendance, leading and participating in sessions and sharing their products during a pop-up happy hour at the end of the day.

Next steps involve consolidating these topics through a new N-Gen working group on agave and planning a focused Agave Summit at the 2025 AHF in Tucson, dedicated to creating actionable outcomes.





# SCREENING OF “LA RECUA”

We had the honor of collaborating with Trudi Angel, the legendary explorer of Baja California, to present her latest film, “*La Recua*”.

This documentary took us on a fascinating mule journey of over 300 kilometers along the Old Camino Real. Throughout the journey, Don Darío Higuera shares his invaluable ancestral wisdom with the young muleteers Azucena and Ramoncito.

The film allowed us to reflect on the challenges of the past and the frenetic pace of our modern lives. It also gave us the unique opportunity to converse with Trudi about the challenges and magical moments of filming along the Old Camino Real, as well as to send a warm greeting to Don Darío.

The screening took place at the historic Casa de la Cultura María Félix Güereña, where we also enjoyed moments to learn more about local crafts and taste regional products.



Photo on right: Benjamin T. Wilder





# FIELD TRIPS AND WORKSHOPS

## Field Trips and Workshops

The Summit included a day full of exploration and learning in the field. Attendees discovered and learned about the landscapes and people of Álamos through a variety of themed field trips:

**Rancho Agua Nueva:** A historical and current tour of this Bacanora production site, initiated in 1850 and proudly revived in 2020.

**Parque La Colorada:** A hike in this conservation area located in the dry tropical forest, aiming to connect humans with nature.

**Reserva Monte Mojino:** A trip to Rancho El Guayabo, exploring valuable tropical deciduous forests and conservation efforts in collaboration with local communities.



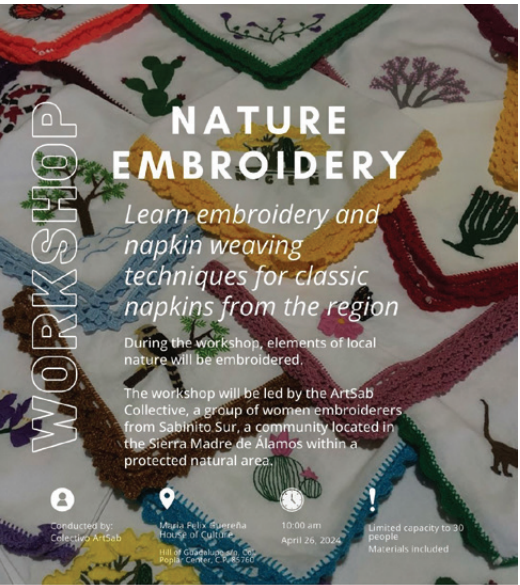
Animal photos: Zahin González





In addition, we offered themed workshops led by local community members at another iconic site of Álamos: the Casa de la Cultura María Félix Güereña:

1. EMBROIDERY AND NAPKIN WEAVING TECHNIQUES with elements of local nature, taught by the *Colectivo ArtSab*, a group of women embroiderers from Sabinito Sur, a community in the Sierra Madre of Álamos located within the Protected Natural Area.
2. ANCESTRAL PALM WEAVING TECHNIQUES FOR GUARIS, coordinated by Elisa Zaila Rodríguez and taught by Mrs. Elvira Rodríguez Bacasehua and Mrs. Manuela Rodríguez Almamea, from the Guarijío community in the Sierra Madre of Álamos.
3. TEXTILE DYEING WITH PIGMENTS MADE FROM NATIVE THORN SCRUB PLANTS, taught by sisters Norberta and Francisca Yocupicio Hernández from the indigenous community of Teachive in the Mayo-Yoreme region.





# GASTRONOMY

The N-Gen Summit offered an unforgettable culinary experience. Each day began with breakfasts prepared in Álamos, featuring coffee, fresh bread, and fruit. The lunches were equally delightful; thanks to the talented local cooks, we enjoyed a variety of traditional dishes that reflected the rich culinary culture of the region. Additionally, to keep us energized and motivated during the intense days, we always had a coffee break available.

As part of the Summit, we hosted *Janos en Álamos*, a fundraising dinner for student scholarships, organized with the support of Jennifer Mackay and award-winning chef *Janos Wilder* from Tucson, Arizona, at *El Pedregal - Hotel en la Naturaleza*. We savored the iconic flavors of the southwestern U.S. and northeastern Mexico with dishes like:

- Yellowtail aguachile with dragon fruit ponzu sauce
- Magdalena squash soup with piloncillo, cinnamon, chipotle, and porcini mushroom cream
- New York steak with southwestern seed mole, cholla buds, and refried black beans
- Chocolate cake with coffee ice cream and amarena cherries

Additionally, chef Janos Wilder, in collaboration with Jennifer Mackay and Bacanora Agua Nueva, delighted us at the closing dinner at Rancho Real de Álamos with magnificent dishes made from local ingredients, accompanied by beer and bacanora. We celebrated with a silent auction and toasted to new collaborations, closing the N-Gen Summit on a high note.



Photos: Diana Zazueta



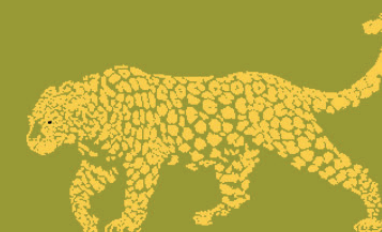




# N-Gen Summit 2024

24–27 April

Álamos, Sonora







CATEGORY	THEME	SESSION NAME
ENVIRONMENTAL	Biodiversity and Natural History	Earth-life evolution across the Sonoran Desert and Gulf of California: Important drivers, recent findings, and future research
		Wild ungulates in the Sonoran Desert
		Introduced species [no session notes]
	Ecological Conservation	Enhancing conservation strategies for bat caves in the Sonoran Desert
		Strengthening the process of creating new Protected Area
		Ecology and urban restoration
		Conservation of migratory and resident birds: Partners in Flight, international links
	Global Change	Impacts of climate change and drought over plants across the Sonoran Desert and adjacent regions
		Fire in the Sonoran Desert
		Making the invisible visible: water in the desert
	Marine and Coastal Conservation	The ecological health of the Gulf of California
		Blue carbon in the Comcaac community
		Market incentives for fishery management and conservation
		Preserving shorebirds in the Gulf of California
		Wetlands and climate change [no session notes]
		Restoring coastal and magrove ecosystems [no session notes]
Socio-Ecological	Ecosystem Based Management	The ecological health of the Gulf of California
		Agroecology
		Environmental monitoring for conservation and restoration
	Environmental Education	Cross-border summer research
		The Coastal Solutions Fellows Program in the Gulf of California region
		Escuela del Mar: certification of labor competencies
		“Desert pupfish” (pupo) shelter
		Strategies to promote environmental education in primary school students (formal and non-formal)
		Creation of an economic fund (scholarship) for economically disadvantaged university students.
		Production of events with purpose [no session notes]



CATEGORY	THEME	SESSION NAME
Human Dimension of the Sonoran Desert	Biocultural Diversity	Food and biocultural diversity in the Sonoran Desert
		Exchange of experiences in traditional and scientific knowledge aimed at conservation
		Artistic and musical encounters as frameworks for interdisciplinary research
	Community Diversity and Resilience	Worker conditions in the agave industry and social justice
		Amazilias: network of women birdwatchers in Mexico
		Diversification of the electricity system and community autonomy
	Protecting our Desert	Conservation from activism, megaprojects in Sonora
		Citizen participation in projects with social and environmental impacts
	Challenges and Multinational Cooperation	Border wall: scars in nature
Social	Science Communication	Communication for conservation
		Scientific outreach in social networks and how to monetize your knowledge
	Research Actions	Field stations and you
		Artificial intelligence for conservation decision-making
		N-Gen network analysis
		The future of N-Gen





## EARTH-LIFE EVOLUTION ACROSS THE SONORAN DESERT AND GULF OF CALIFORNIA: IMPORTANT DRIVERS, RECENT FINDINGS, AND FUTURE RESEARCH

Convener(s): Scott Bennett, Adrian Munguía Vega, Ben Wilder, Enriquena Bustamante Ortega

**Keywords:** Earth science, Biologic science, Landscape evolution, Evolution of species, Genetics, Geology, Plate tectonics

**Thesis:** In the Sonoran Desert and Gulf of California, geologic and climatic events over the past ~30 million years have driven dramatic changes to the landscape and are intimately linked with the distribution, diversity, and evolution of species.

This 2-hour Earth-Life evolution session was attended by 44 participants and co-conveners, who discussed the co-evolution of landscape and life across the Sonoran Desert and Gulf of California region. The session focused on how geological and climatic events over the past ~ 35 million years have driven significant changes to the landscape, that are intimately linked with the distribution, diversity, and evolution of species.

The session aimed to achieve three main goals: (1) foster an open discussion about how Earth and life have evolved together across the Sonoran Desert and Gulf of California, (2) discuss recent and important geological and biological discoveries, and (3) contemplate future opportunities for Earth-life research in the region.

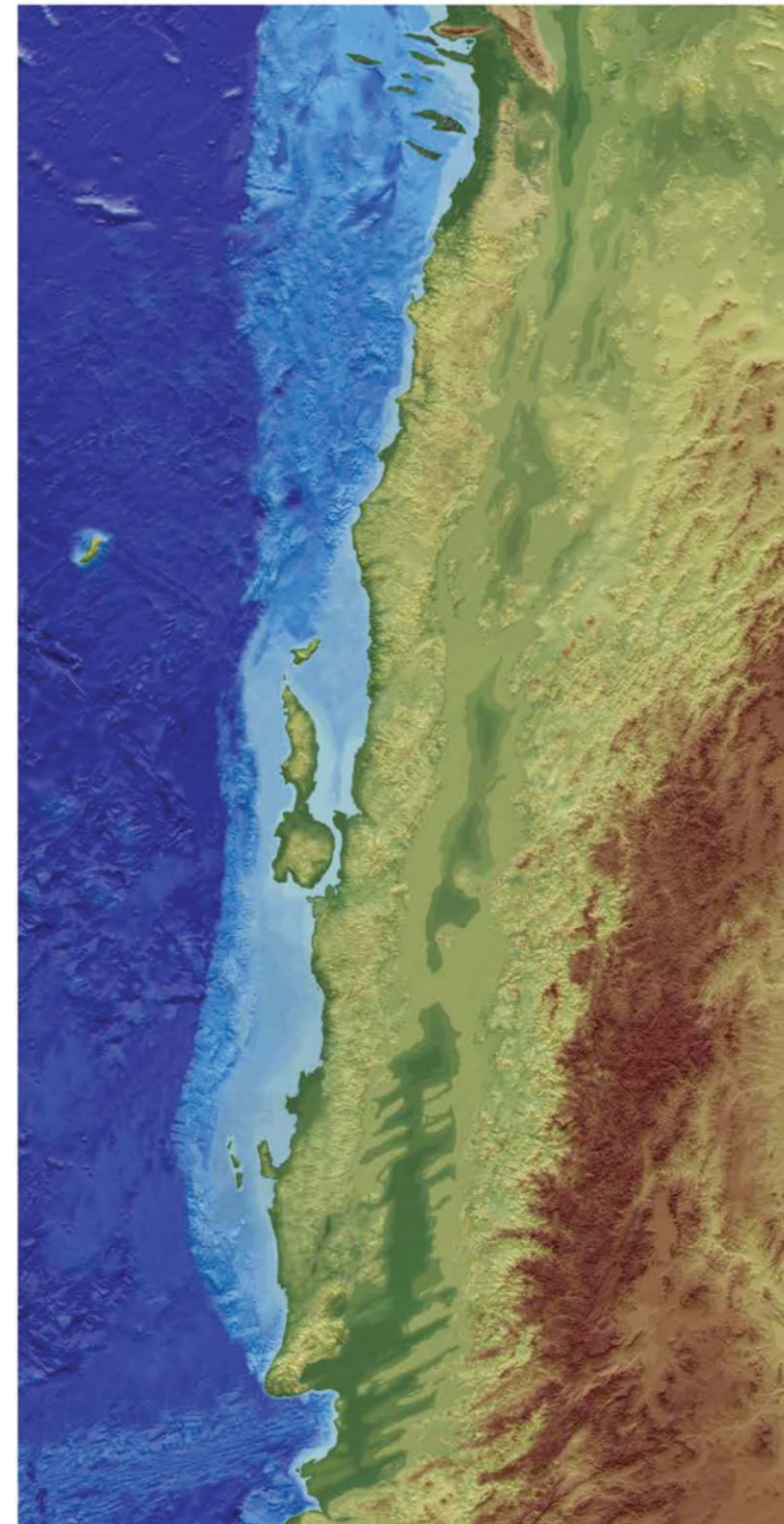
Scott Bennett provided a brief overview of the geological history over the last ~35 million years, presenting several maps and animations illustrating the evolving geological and plate tectonic landscape, including an animated reconstruction of paleogeography over the last 10 million years. This led to a lively discussion on regional geology, tectonics, leading to several insightful questions from participants. Common geological misconceptions were clarified during the session.

Co-conveners posed questions to participants regarding the formation of habitats in terrestrial and marine environments, changes in these habitats over geological time,

Image: Scott Bennett and Tom Baumgartner



## RECONSTRUCTION OF PALEO-GEOGRAPHY: 10 MA







and the potential divergence (or lack thereof) of species as a consequence. Biologists shared examples of species that exist on both sides of the Gulf of California, the ranges of many of which appear to reconnect after you restore the tectonic motions (e.g., cirios, pinion pines, cacti, etc.). Other examples highlighted species whose ranges seemingly remain unaffected by tectonic movements, suggesting alternative non-geologic explanations, particularly for plant species whose pollinators and dispersers are capable of long-distance travel, such as bats which have a documented co-evolutionary history with these plants (e.g., columnar cacti, agaves).

Adrian and Scott presented preliminary geological and biological findings from the Baja GeoGenomics research team, including recent discoveries indicating no geological evidence for a transpeninsular seaway near San Ignacio-Santa Rosalia. They also discussed that the observed genetic divergence in the mid-peninsula region requires some other explanation, such as glacial refugia fluctuations or differences in precipitation timing. A recent paper speculating on the relationship between oceanic fracture zones and the latitudinal position of major genetic breaks in the USA and Mexico was discussed. Geologists in the session expressed skepticism about causation because fracture zones do not remain at the same latitude over time and there is no obvious mechanism for oceanic fracture zones to affect the distribution of terrestrial flora and fauna. The session briefly touched upon the differing timescales of geological (slow) and biological/evolutionary (fast) processes.

The timing for the onset of the monsoon (possibly as old as 24 million years ago) was discussed as an important factor. Future research ideas included enhancing understanding of the distinct biologic/genetic breaks observed between the Cape Region of southernmost Baja California Sur (south of La Paz) and areas in the north. Another proposed research idea was to further document and compile (e.g., review paper) genetic information reflecting the flooding of the Gulf of California, an event carefully documented by geologists to have occurred approximately 6.3 million years ago.

The PPT slides shared by Scott Bennett during the session can be accessed [here](#).

Animation available here: <https://youtu.be/-dNWRu8uXCk>

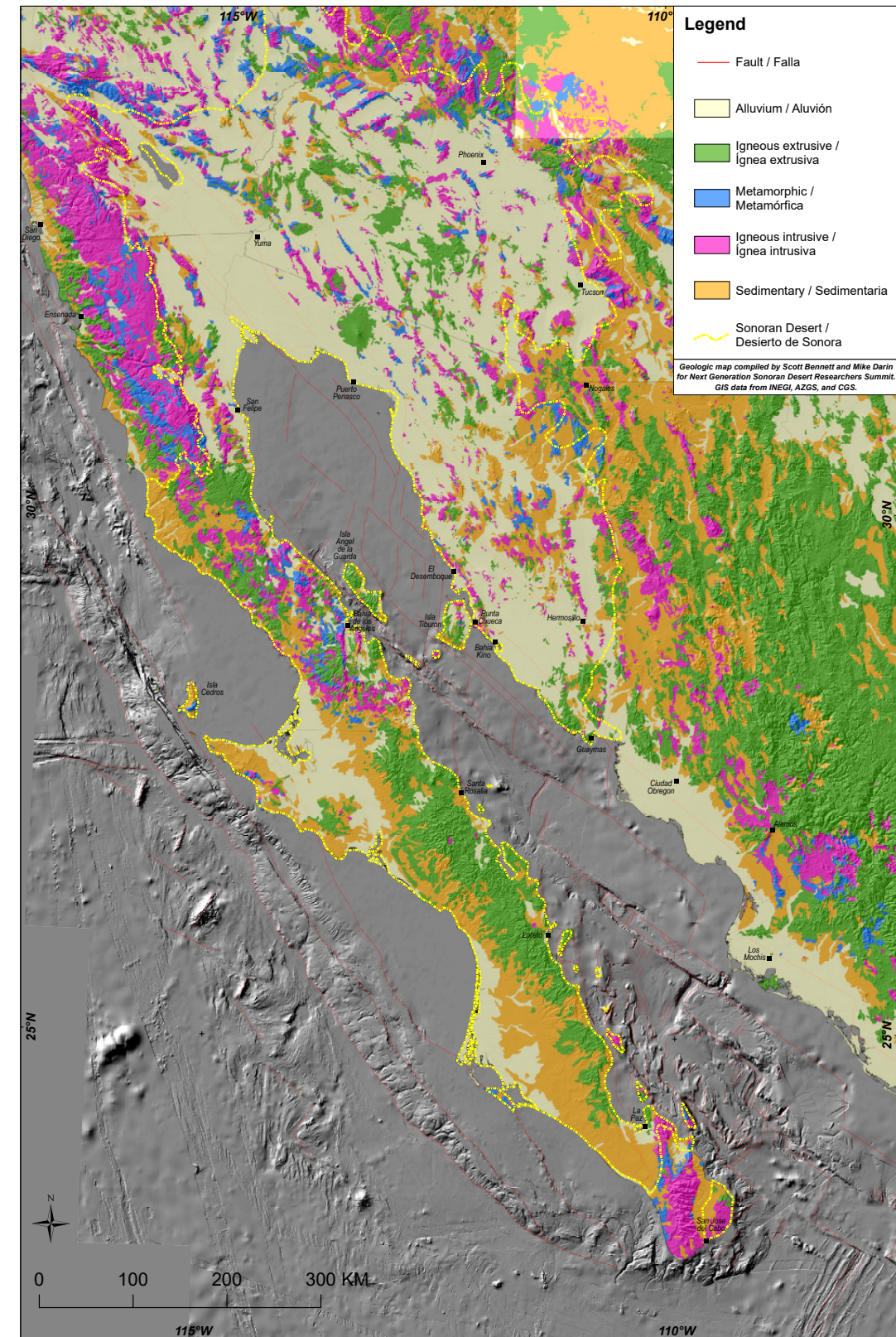


Image: Scott Bennett and Mike Darin





## WILD UNGULATES IN THE SONORAN DESERT

Convener(s): Carlos Hugo Alcalá Galván

**Keywords:** Sonoran pronghorn, Bighorn sheep, Mule deer, White-tailed deer

**Thesis:** Knowledge of the ecological and economic values of wild ungulates in the Sonoran Desert is crucial to understanding their conservation status, management practices, and the significant role of hunting incentives in habitat protection and population recovery.

During the session, the ecological and economic values of wild ungulates in the Sonoran Desert south of the Sonora-Arizona border were discussed. Data on the conservation status and current management of populations of Sonoran pronghorn, desert bighorn sheep, mule deer, and white-tailed deer were presented.

The management and use of these species are governed by a legal framework that includes a plan for sustainable hunting, as well as a market for the supply and demand of hunting trophies for wild species. Due to their endangered status, commercial hunting of the Sonoran pronghorn is not authorized.

In general, an outstanding recovery of harvestable populations is documented compared to pronghorn populations. The economic incentive generated by hunting motivates landholders to protect populations and improve habitat conditions to maintain the availability of game species.

Data on the number of annual hunts were provided, and the information needed to ensure the actual sustainability of hunting wildlife in Sonora were discussed.



Photo on left: Patricio Robles Gil / Minden Pictures / National Geographic Creative  
Photo on right: above, George Steinmetz / National Geographic Creative; below left, Drew Rush / National Geographic Creative; below right, Rich Reid / National Geographic Creative





## ENHANCING CONSERVATION STRATEGIES FOR BAT CAVES IN THE SONORAN DESERT

Convener(s): Omar Calva, Denisse Díaz, Ana Cristina Zayas, Luis de la Fuente

**Keywords:** Speleology, Caves, Subterranean habitats, Chiroptera, Conservation, Festival, Documentary

**Thesis:** Highlight collaborative efforts in research, conservation, and environmental education concerning caves and bats in the Sonoran Desert.

During the 2015 N-Gen Summit, a dedicated session delved into the potential of speleology in Sonora, illuminating the science behind, exploring and studying subterranean environments such as caves and caverns. Nine years after, this new session focused on highlighting the achievements, discoveries, and projects stemming from the creation of the Grupo Pionero Espeleológico de Sonora (GPES) that came out of the 2015 Summit. GPES is a multidisciplinary collective that brings diverse perspectives to the study of caves and their inhabitants.

Activities undertaken during this period included conducting faunistic inventories of two caves in the Central Region of the Sonoran Desert, identifying caves serving as maternity roosts for bats, producing a documentary to advocate for the conservation of these environments and their species, along with conducting cleaning campaigns inside caves and artistic exhibitions. These endeavors were aimed at fostering new collaborations with the upcoming generation of Sonoran Desert researchers.

A lack of information is identified in the Sierra region of Sonora, where mining activity can offer conservation opportunities. It is suggested to work with the mining industry to close mining areas and shafts, allowing bat colonies to use them as habitat. In addition, it is proposed to modify legislation to force mining companies to implement conservation measures in abandoned mines.

Following this session in Álamos, three new objectives emerged: to nominate three caves as significant sites for bat conservation within the Latin American and Caribbean Network for Bat Conservation; to collaborate with state agencies, non-governmental organizations, and environmental clubs to organize the Bat Festival 2024; to establish a network of individuals engaged in bat-related work across the Sonoran Desert region.



Photos: above and below left, Héctor Cossio; below right, Anna Zaandas





## STRENGTHENING THE PROCESS OF CREATING NEW PROTECTED AREA

Convener(s): Gilberto Díaz

**Keywords:** Conservation, Protected Areas, Strategies, Diagnosis, Obstacles, Management

**Thesis:** Strengthening the processes for creating protected areas (*áreas naturales protegidas*, ANP) through experience and feedback based on successful examples of PA creation.

The goal of the session was to create a space with a diverse group of participants with different areas of expertise. This included academics, undergraduate, master's, and doctoral students, conservationists, and experts in the creation, operation, and management of protected areas (*áreas naturales protegidas*, ANP). The group was well-suited to reflect on and share knowledge about the creation of ANPs.

ANPs are a conservation tool intended to preserve natural environments and fragile ecosystems to ensure the balance and continuity of evolutionary, ecological, and cultural processes.

Creating ANPs at different jurisdictional levels (federal, state, and municipal) requires the implementation of technical, social, and management activities, all in accordance with relevant laws and regulations. These processes, which can take years, are complex and generally face constant obstacles. Therefore, it is important to have clarity about the activities to be carried out according to the political and socio-environmental context of the area.

Different contexts determine the creation of an ANP: when the area to be protected does not have population centers or communities and is not related to extractive activities, its creation is simpler. Additionally, the more significant the values of the site, the easier it is to obtain the declaration. Conversely, the process becomes more complicated and requires different follow-ups when communities are involved. Activities must be carried out jointly with them, generating diagnostics that identify problems and provide key information for the development of the conservation activities. This information is crucial to communicate in the right messaging that helps promote the acceptance of the creation of an ANP. Often, the barriers that arise are in the

management and processes with government agencies, where there is no follow-up on the creation processes of ANPs.

It was identified that it is important to have a diagnostic of the site to be promoted as an ANP that includes: an overview of the project's viability; the role of academia in generating information to support or provide reasons for the relevance of creating new ANPs; community work; transparent processes that do not create distrust with communities; and collaboration with colleagues who can provide advice on these processes. All are crucial.



Image: CONANP, 2024





## ECOLOGY AND URBAN RESTORATION

Convener(s): Delia Marina Acuña Acosta, Carlos Adrián Morán Martín, Óscar Enrique López Bujanda

**Keywords:** Urban, Ecology, Environment, Native species, Green areas, Research.

**Thesis:** Urbanization in the Sonoran Desert: perspectives of a multidisciplinary community.

In urban ecosystems, as in natural ecosystems, physical and biological components constantly interact with each other. However, these interactions are influenced by a new factor: humans. Human activities aimed at the development of population centers are known as urbanization, and currently, these activities often lack adequate sustainable development plans, leading to various socio-environmental problems. The objective of the session was to create a forum for discussing these problems, needs, and areas of opportunity in the study of urban ecosystems in the Sonoran Desert.

The discussion was broad and enriching, highlighting issues such as the introduction of exotic species in urban areas, the lack of trees, and poor practices in garden management. The most detrimental effects identified were the displacement of native species, the increase of heat islands, loss of ecosystem functionality and continuity, and a decrease in natural ecological interactions.

The need to conduct research on the functioning of urban trees to compare the roles of native and exotic species was emphasized, with the goal of promoting the use of species appropriate to the region. Concrete actions were proposed, such as the purchase of land for conservation with the support of international NGOs and tax incentives for the maintenance of green areas. Finally, the importance of more sustainable and conscious management of the urban environment to mitigate negative impacts on biodiversity was highlighted.

### Issues:

- Bird strikes on buildings.
- Exotic species: exotic trees, Chilean mesquites, displacement of native birds by the Argentine parrot.
- Overpopulation of dogs and cats

- Light pollution: interrupts bird migration due to noise
- Poor practices: leaf sweeping, poor pruning
- Lack of green areas and vegetation cover
- Ecosystem discontinuity
- Heat islands
- Loss of functionality
- Excessive pruning of trees and shrubs
- Poor quality of life for public workers
- Countryside areas
- Impacts of vertical growth on wind currents

### Positive Aspects:

- Use of native trees such as palo verde

### Areas of Opportunity:

- Legislative changes to protect urban trees
- Studies to obtain data to defend native plants
- Use iNaturalist to define ecological relationships between exotic and native species.
- Avoid demonizing introduced species
- Purchase land for conservation with support from international NGOs
- Tax incentives to maintain green areas in homes
- Green infrastructure



Flowering Palo verde (*Parkinsonia praecox*), May 2024. Example of shade, habitat for fauna, food for pollinators and aesthetic landscape, in harmony with urban gray infrastructure (building, sidewalk and street) and automobiles.



Tecolotes Llaneros (*Athene cunicularia*, Burrowing Owl). Taken at the University of Sonora.

Photos above, below: Carmen Esquivel and Óscar Enrique López Bujanda





## CONSERVATION OF MIGRATORY AND RESIDENT BIRDS: PARTNERS IN FLIGHT, INTERNATIONAL LINKS

Convener(s): Edwin Juárez, Lydia Lozano

**Keywords:** Conservation without borders, Conservation alliances, International linkages, Shared birds, Partners in Flight, Full life cycle conservation

**Thesis:** The conservation of our shared bird species throughout their life cycles requires collaborative efforts through international linkages, which promote conservation strategies via the development and application of various tools and mechanisms.

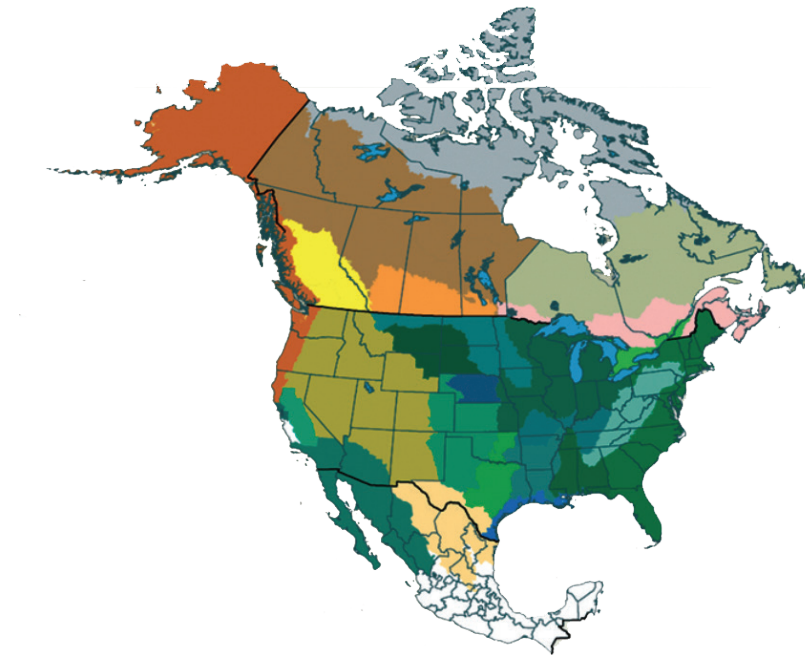
A wide array of landbird, shorebird, and waterbird species—both migratory and non-migratory—rely on diverse habitats across the Western Hemisphere. Partners in Flight, a dynamic and inclusive network of over 150 organizations, aims to protect, restore, and enhance the status of landbird populations and their habitats throughout the hemisphere.

The connections between birds and their habitats need international collaboration to develop and implement strategies for conserving both migratory and resident bird species throughout their life cycles. Our collaborative efforts focus on:

1. Identifying challenges collectively, synthesizing information, and generating actionable solutions.
2. Classifying and ranking species based on their vulnerability.
3. Identifying and supporting research and monitoring needs.
4. Developing, promoting, and implementing bird conservation plans.
5. Creating guidelines for site and ecosystem management.

These strategies are advanced through key mechanisms, including the promotion of conservation alliances and international linkages, all within a framework of open and equitable participation.

Bird photos: *Bendire's thrasher* / Cuitlacoche piquicorto, Edwin Juárez







## IMPACTS OF CLIMATE CHANGE AND DROUGHT OVER PLANTS ACROSS THE SONORAN DESERT AND ADJACENT REGIONS

Convener(s): Peter Breslin, César Hinojo, Marina Acuña, Ben Wilder

**Keywords:** Climate change, Droughts, Extreme weather, Ecology, Ecophysiology, Plants, Cacti, Mortality

**Thesis:** Recent observations indicate that climate change and drought are having widespread consequences on plants across the Sonoran Desert, with impacts that span physiology, population and community structure, and ecosystem function. However, much more solid research and action is needed.

Climate is changing rapidly and droughts are becoming more frequent and severe. These climatic changes, especially the compounding effects of heat and drought, may be impacting the plants of our region in many ways. However, research on these impacts is still scarce.

This session brought together experts, practitioners, and students to discuss:

- (1) the impacts of drought on plants across the region at all ecological levels, and
- (2) current and near-future needs and opportunities for understanding and potentially mitigating these impacts.

The discussion was rich and diverse, spanning topics such as physiological alterations due to water and temperature stress; observations of changes in tissue color; stem and plant mortality in cacti, agaves and other succulent plants; biomass loss or death caused by warmer droughts and frosts; and changes in species and vegetation phenology. These effects, whether short-term or long-term, can significantly impact plant populations by causing significant mortality rates and reduced recruitment, influencing species interactions (e.g., pollinators), and causing changes in spatial distribution, community composition, biome shifts, and ecosystem health and services.

Specific species were identified that have been observed to have severe and direct drought impacts:

Photo on right: Bill Hatcher



- *Stenocereus thurberi* along the coasts of the Gulf of California and in the Guaymas region. Not seen at the southern part of their range in the Álamos area.
- *Ipomea arborescens* in La Colorada, Hermosillo and along the highway towards Álamos.
- Oaks in the Sierra de Álamos. In lower elevations, they are dropping their upper stems and resprouting from below.

The discussion highlighted the need for increased efforts to scientifically document these impacts across our region and for more integrative approaches, such as mechanistic, trait-based, and interdisciplinary methods. The importance of traits and thresholds in understanding the changes with extreme weather was underscored.

We concluded that it is crucial to establish interdisciplinary networks, embrace open science and data sharing, and engage community science in our efforts. To support these goals, we have established an iNaturalist project to document plant stress across the Sonoran Desert using a standard five category health scale.

<https://www.inaturalist.org/projects/sonoran-desert-plant-drought-stress-es-tres-en-plantas-por-sequia-en-el-desierto-sonorense-a73c86c9-eca2-4b63-a437-08899d7f0d31>







## FIRE IN THE SONORAN DESERT

Convener(s): Jim Malusa, Fernanda Bustamante Demara, Carlos H. Alcalá Galván

**Keywords:** Wildfires, Buffelgrass

**Thesis:** Fire is increasingly common in the Sonoran Desert, mainly because of increased ignitions by people and exotic species such as buffelgrass.

This session explored the evolving situation of fire in the Sonoran Desert and the different contexts between Arizona and Sonora.

There were three presenters:

- Fernanda Bustamante Demara, from Magdalena de Kino, presented on a 30,000-hectare wildfire in the hills east of town that burned her ranch and several others at elevations above the desert.
- Jim Malusa, from Tucson, presented on repeat photography in three areas of Arizona's Sonoran Desert.



- Dr. Carlos H. Alcalá Galván, from UNISON-Hermosillo, presented on the relationship between buffelgrass, wildfires, and grazing. He also gave an overview of the occurrence of non-prescribed fires in the Lower Sonoran Desert. The incidence of unwanted fires in the Sonoran Desert is closely related to the availability of fine fuels, ideal environmental conditions, improper management, and lack of grazing, which is concentrated along roadways. Historical and current data on fire occurrences was presented for Sonora. Buffelgrass areas, south of the Sonora-Arizona border, reveal no significant association between fire incidence and buffelgrass areas. This is thought to be the result of extensive grazing. Fires in Sonora are usually located next to highways, where buffelgrass shows a greater accumulation of stems and leaves, favored by better water catchment, exclusion of livestock, mowing, or intentional burning under the pretext of maintenance.

Studies indicate that areas with buffelgrass in Sonora experience significant declines in productivity and erosion problems, with 73% tending to deteriorate and between 15% and 20% nearly disappearing. Under these conditions, there is no continuity in the availability of fine fuels, which could influence the frequency and magnitude of fires in these areas.

Photos: Jim Malusa







## MAKING THE INVISIBLE VISIBLE: WATER IN THE DESERT

Convener(s): Juan Carlos Barrera Guevara

**Keywords:** Water, Groundwater, Human right, Alternative sources, Empowerment, Community, Cultural change, Climate change

**Thesis:** Water is a common good, and a fundamental human right necessary for a dignified life.

Water is a source of life, it is part of the land, it shapes the landscape, and serves as a cultural reference for many peoples. Its multifunctional and irreplaceable nature demands that it be treated as a common good and a shared heritage.

Climate change, scarcity, pollution, and overexploitation make immediate action essential at all levels—from personal and collective efforts to urban and regional planning, as well as the formulation and enforcement of policies for the sustainable use of water.

It is crucial that we are aware and informed about the importance of having access to safe water and the availability of simple, effective techniques for saving it, capturing, infiltrating, and harvesting rainwater, as well as the growing use of atmospheric water. These practices are essential to ensuring human well-being and resilience in the face of climate change.

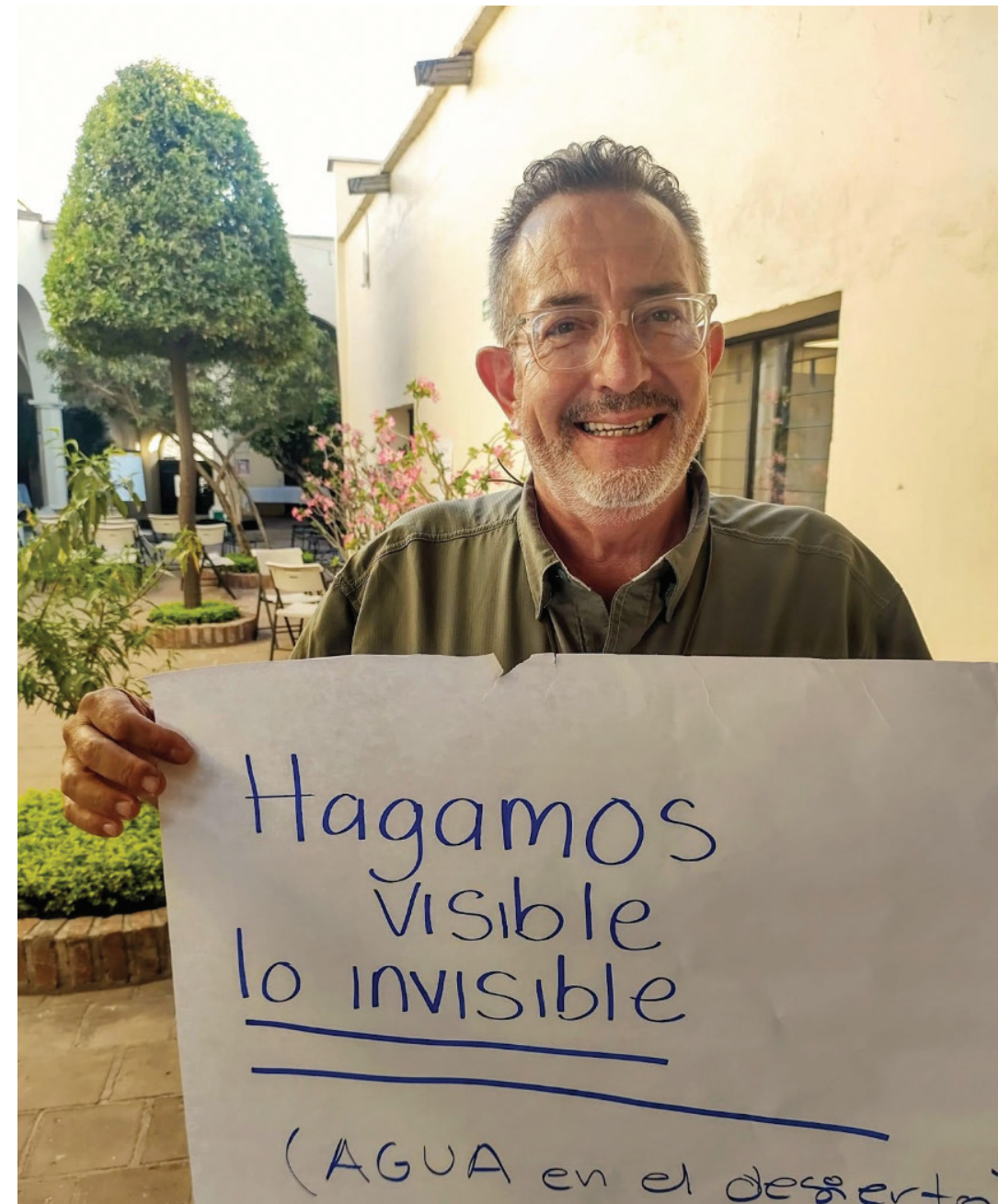


Photo on left: Benjamin T. Wilder

Photo above: Juan Carlos Barrera Guevara





## THE ECOLOGICAL HEALTH OF THE GULF OF CALIFORNIA

Convener(s): Ben Wilder, Lorayne Meltzer, Elvis Emanuel Soriano Moreno

**Keywords:** Marine ecosystem, Coastal ecosystem, Gulf of California, Ecological dynamics, Datasets

**Thesis:** What is the ecological health of the marine and coastal ecosystems of the Gulf of California? This marine realm has a wealth of long-term ecological studies — scientific gold — yet they remain largely independent or obscure. Here, we begin to identify the studies available, present what they are showing, and identify what is missing.

What is the health status of the marine and coastal ecosystems of the Gulf of California? All life in the Gulf of California, both marine and terrestrial, is intricately connected to climatic and oceanographic cycles spanning years to decades. Similarly, connections between ecosystems drive much of the region's productivity and ecological dynamics.

There is widespread uncertainty among the public, policymakers, managers, and scientists regarding the overall status and trajectory of life in the Gulf of California. While change and variability are a constant, what impact are large-scale fishing industries having? What effects are being observed in response to global change and increasing variability in sea surface temperatures? What are the population dynamics of individual species?

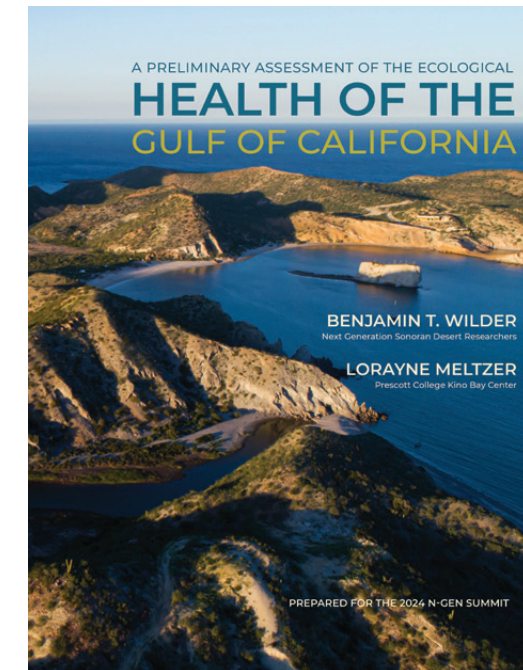
Answering these large questions can often seem impossible. However, in the Gulf of California, there are dozens of long-term ecological studies focused on various regions and species. Each of these studies, remarkable on their own, can help establish baselines to present data that address such significant questions.

These data are invaluable, not just for science, but for all stakeholders invested in the past and future of the Gulf of California. Despite increasing coordination and outreach efforts, these datasets often remain unknown, unrecognized, or inaccessible within academic silos.

This session presented and discussed the [preliminary report](#) based on a total of 24 researchers who submitted information on 30 studies during the initial survey



window. This discussion resulted in a consensus on the importance of this effort and offered several important suggestions, which were incorporated into a second version of the survey. A final version of the report will be developed to serve as an initial attempt and platform for subsequent efforts to assess the ecological health of the Gulf of California.



Photos: above right, Benjamin T. Wilder; below, John (Verm) Sherman





## BLUE CARBON IN THE COMCAAC COMMUNITY

Convener(s): Erica Barnett, Zulia Sánchez

**Keywords:** Mangrove, Seagrass, Canal del Infiernillo, Seri, Comcaac

**Thesis:** One of the mitigation strategies for climate change is the conservation and management of mangroves and seagrass. The Comcaac carry out monitoring and restoration activities to contribute to the mitigation strategy.

The Infiernillo Channel is a shallow, naturally formed channel, running two to five miles wide between the Mexican mainland and Isla Tiburón in the Gulf of California. It plays a unique ecological role as nursery grounds, a reservoir for biodiversity, and a natural marine sanctuary spanning the Sonoran coast of Mexico, and within the territory of the Comcaac Indigenous Community, known also as the Seris.

For more than 2000 years, the indigenous Comcaac have been stewards of this region, using their extensive ecological traditional knowledge to maintain their current habitats, fisheries, plant foods, medicines, and livelihoods.

Erica Barnett, a member of the Comcaac community, shared her experience of how the idea to conserve their coastal ecosystems was conceived.

During the first phase of this project the team collected mangrove pods, propagated them in low-cost, innovative vertical nurseries and transplanted thousands of seedlings during a period of four months during 2020-21. To improve the survival rate of the seedlings, a team of 20 Comcaac extended the cultivation period to one year to grow larger, hardier plants and expand the nursery to accommodate the growth of larger plants. Mangrove pods were collected for propagation during late summer 2022.

In the fall of 2023, the team transplanted between 1,000-1,500 24-inch plants over 10–15 hectares in protected areas where sea level rise is anticipated to erode or inundate tidal mudflats. The team monitored the growth of these plants and repeated this process during 2024 to reach a goal of 20–30 hectares of established mangrove plants. To support a restorative economy and create conservation-based jobs, we will assess the feasibility of growing and selling mangrove plants to support mangrove restoration initiatives by organizations in the region.

Participants asked for Erica's advice on how to start similar activities.



Photos: Servando López Monroy





## MARKET INCENTIVES FOR FISHERIES MANAGEMENT AND CONSERVATION

Convener(s): René David Loaiza Villanueva, Eleazar López Gallegos

**Keywords:** Value Rescue Model, Preferential market, Small-scale fisheries, Incentive for fisheries sustainability, Social responsibility, Market-based conservation

**Thesis:** Fishing less and earning more: fisheries sustainability and resource conservation is possible through the application of integrated models.

Mexico is a global leader in seafood production. However, a significant portion of fishermen lack access to market benefits. Accordingly, their options remain limited as raw material suppliers and they receive only modest profits compared to the high value of fish products in the final markets. This disparity drives a race for resources, leading to overexploitation, and combined with environmental degradation, presents a bleak outlook for small-scale fishers.

To address this issue, a comprehensive model has been designed and implemented to recover the value of fishery products. This innovative approach has been recognized by the United Nations through the Ocean Innovation Challenge. The model seeks to generate incentives for investment, technology, entrepreneurial skills, and business transparency—rooted in local learning—aimed at accessing high-value preferential markets. By implementing improvements in fisheries, it promotes sustainability and social responsibility.

The Value Recovery Model (VRM), designed by Smart Fish and currently implemented by CEDO, consists of four main stages: Survey, Diagnostic, Advisory and Training Program (ATP), and Appropriation. This model requires environmental endorsement to ensure the conservation of resources and has been applied in eight fishing organizations, encompassing 126 people in the northern Gulf of California. In particular, four groups have made progress in ATPs, helping these fishers access markets that value sustainable products.



Photos: R. Loaiza





## PRESERVING SHOREBIRDS IN THE GULF OF CALIFORNIA

Convener(s): Juanita Fonseca Parra, Medardo Cruz-López

**Keywords:** Monitoring, Training, Shorebirds

**Thesis:** Monitoring migratory shorebirds in the Gulf of California is essential to understanding their populations and focusing conservation efforts.

The Gulf of California provides essential resting and feeding sites for migratory shorebirds, whose populations are declining worldwide. In Mexico, 15 of the 20 key shorebird sites within the Western Hemisphere Shorebird Reserve Network (WHSRN) have been designated in the Gulf of California. While various conservation efforts are underway in the region, there is an urgent need to expand the network, identify additional important sites, and integrate diverse sectors for more effective conservation.

The objective of this session was to establish a collaborative network that brings together professionals, academics, NGOs, and others interested in the study and conservation of shorebirds in the Gulf of California. Among the needs highlighted during the session were training in shorebird monitoring and identification, managing disturbances, using apps to share species information, unifying conservation efforts, and securing funding sources.

Despite ongoing efforts to conserve shorebird habitats, their populations continue to decline. As a result, it was suggested that the criteria for nominating WHSRN sites be reconsidered. Additionally, the issue of knowledge extractivism was discussed, and ideas were shared on disseminating information and involving community members in research and monitoring for more effective conservation. Lastly, a contact list of attendees was compiled to build this support network, with plans to present progress at the next N-Gen Summit.



Photo: Alan Harper





## ECOLOGY AND CONSERVATION OF TROPICAL DRY FOREST LANDSCAPES

Convener(s): Jesús Adrián Bojórquez Valdez, Alfredo Leal Sandoval

**Keywords:** Dry tropical forest, Landscape fragmentation, Anthropogenic disturbance, Extreme climatic events

**Thesis:** In the current landscape, where ecosystem uncertainty has increased due to climate change and anthropogenic disturbance, how can we address the conservation of dry tropical forest landscapes?

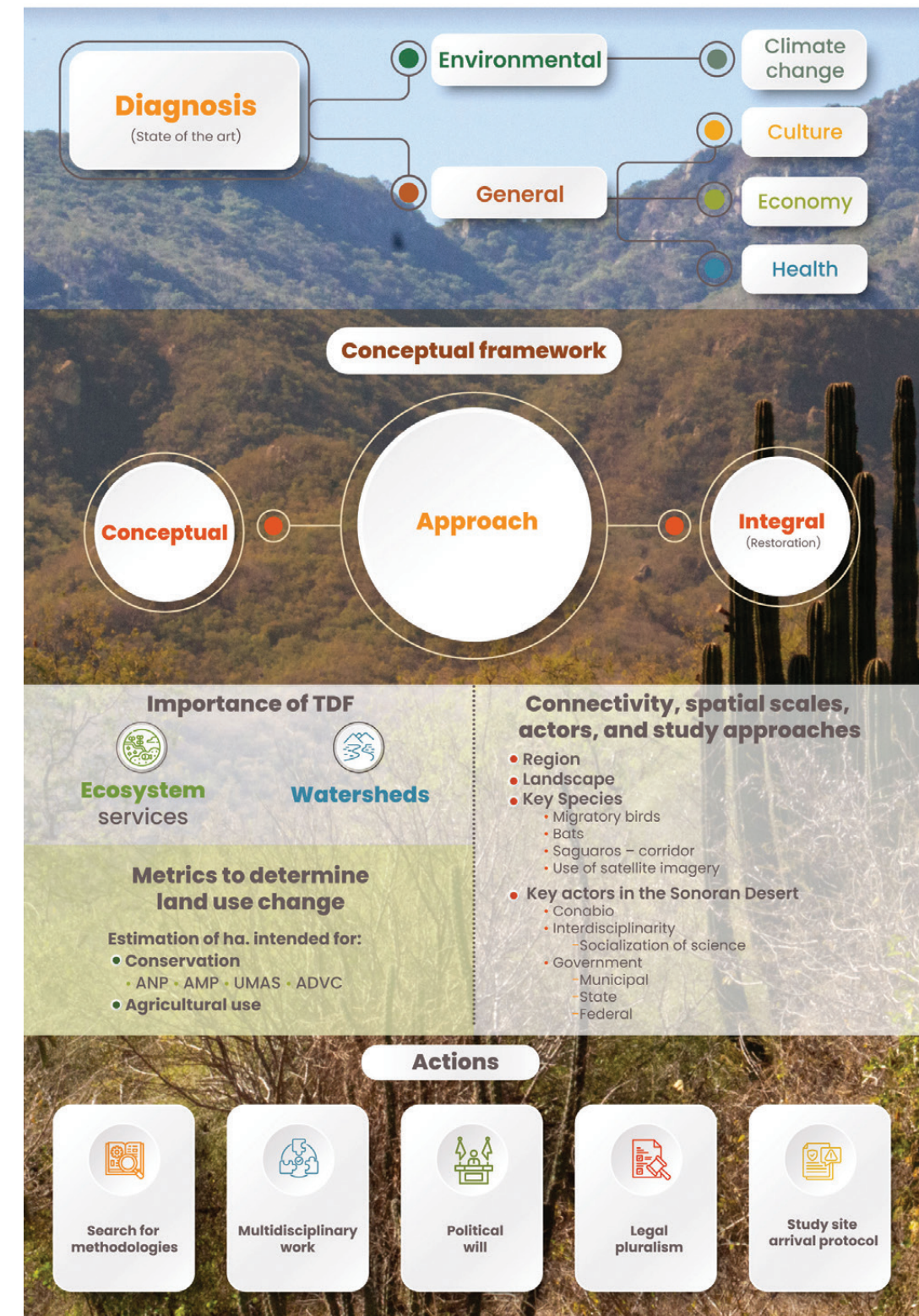
Tropical Dry Forests (TDF) ecosystems have historically been threatened by anthropogenic disturbance and land-use change, and more recently, by extreme climatic events as a consequence of climate change. This has increased the vulnerability of the TDF, as extreme climatic events have induced the loss of these ecosystems, contributing to the fragmentation of landscapes and causing the forest matrix of the dry neotropics to be made up of mature forests, secondary forests and areas of agricultural and livestock use.

Therefore, it is essential to understand the conservation status of TDF in this new scenario, where anthropogenic disturbances and extreme climatic events synergistically induce catastrophic changes in ecosystems.

A discussion panel was organized to address the current state and strategies to ensure the connectivity and health of TDF ecosystems. The discussion covered a wide range of economic, social, political, environmental, and climate change topics. As a result, a conceptual framework was proposed that includes all of these aspects.

Additionally, it is crucial to acknowledge that there are differences in scales and between regions regarding all the mentioned topics. Consequently, clear actions must be generated to achieve the conservation of TDF landscapes, especially within the framework of ecosystem and watershed conservation, which are essential topics for social well-being in many of the regions where this ecosystem is distributed.

## Current status and strategies to ensure the connectivity and health of tropical dry forest (TDF) ecosystems



Conceptual framework with elements and actions discussed during the session, Diana Zazueta with information from Jesús Adrián Bojórquez





## AGROECOLOGY

Convener(s): Martín de Jesús Chávez Valenzuela

**Keywords:** Agroecology, Ejidos, Seeds, Food sovereignty, Market

**Thesis:** Agroecology is a concept that must be approached from many points of view (social, political, economic, etc.) in order to understand the problems and opportunities of each agricultural region and to seek solutions together with all the actors in the agrofood system, such as academics, producers, consumers, among others.

Why agroecology? The current agricultural scenario presents a series of challenges, including low water availability, rising temperatures, unequal access to productive resources, difficult markets, high input prices, and low profitability. As a response to these issues, agroecology has emerged as a movement. This philosophical-productive discipline within the agro-food system offers a complex approach to agricultural systems, studying the interrelationships of economic, social, political, and ecological factors in productive regions.

One of the problems highlighted was the situation of the ejidos in today's Mexico. Opportunities for production have become so limited that many ejidatarios (communal landholders) are opting to relinquish their rights as ejidatarios and convert their lands to a "Full Domain" modality. This modality leads them to sell the land or leave it as collateral to obtain credit. In this way, the collective organization of the Mexican countryside was gradually lost and left in the hands of agroindustrial individualism.

Direct-to-consumer sales are an optimal way to find fair prices, while trying to shorten the distribution line (cut down on middlemen). Seed banks are an option to share genetic material adapted to different productive regions, as well as to reduce production costs in an agricultural system. Hermosillo could be a meeting point for this type of productive dynamics in the community, as well as the examples exposed in Native Seeds Search in Tucson, AZ.

It is necessary to emphasize and share diverse points of view to reach an integral understanding, thereby facilitating the discussion of specific problems and successes. Given that the agrifood system includes various types of actors (academics, producers,

consumers, etc.), it is important to involve the greatest diversity of participants in these discussions.

This discussion session included teachers, students, producers, activists, general stakeholders, consumers, and others. They addressed a variety of topics such as the socio-political structure of agricultural producers in Mexico, agroecological concepts, agricultural market dynamics, seeds, business models, and production techniques. Additionally, they presented proposals, projects, success stories, and opportunities relevant to the northwestern region of Mexico and the southeastern United States.

An atmosphere of respect and harmony was maintained throughout the session, with the intention of continuing these discussions and proposals in the future. This aims to achieve the goals of each participant using agroecological approaches.



Image: M.C. Martín de Jesús Chávez Valenzuela







## ENVIRONMENTAL MONITORING FOR CONSERVATION AND RESTORATION

Convener(s): Juan Manuel Haro Medina, Cesar Hinojo Hinojo, Martha Graciela Montes Bojorquez

**Keywords:** Vegetation, Fauna, Global change, Open data, Geographic information systems, Remote sensing, Conservation, Restoration

**Thesis:** What are the challenges and opportunities of environmental monitoring for conservation and restoration?

The collection of environmental data and its subsequent analysis are of utmost importance for informing decision-making in conservation and restoration.

In this session, we aimed to align the efforts and needs of the scientific community and those working directly in conservation and restoration to advance towards a common goal: improving the status of species and ecosystems in the region.

The discussion highlighted that monitoring should generate a baseline of knowledge, which cannot be achieved without proper systematization and standardization of monitoring through effective communication between organizations and scientists. It was noted as a priority to optimize monitoring efforts, which requires establishing open-access databases.

The need to strengthen organizations' data processing and analysis capacities was also emphasized, which requires establishing training programs. Participatory monitoring is increasingly seen as a necessary opportunity to strengthen environmental monitoring. Involving communities, and especially women, in these activities has proven to be very effective. A clear example was the bird monitoring carried out by women's groups in Baja California.

We concluded that greater links between academia, organizations, and the community are necessary to improve the status of the region's species and ecosystems in the face of the current environmental crisis.

Photo above: Benjamin T. Wilder

Photo below: Alan Harper







## CROSS-BORDER SUMMER RESEARCH

Convener(s): Leonela Báez, Valeria Cañedo

**Keywords:** International exchange, Student support

**Thesis:** The need to provide opportunities for training and professional experience in the biological sciences for Mexican students, regardless of the usual requirements of exchange programs, stands out as an imperative to equalize access and promote inclusion and an enriching educational training.

The session focused on the need to create opportunities for Mexican students in the biological sciences to gain training and professional experience, even if they do not meet the typical requirements of exchange programs. Several key topics were addressed, including sources of funding for these programs, the availability of scholarships, the creation of a directory of researchers and organizations willing to host students during the summer, the importance of hands-on experience, and the transformative impact of previous exchange experiences on students' educational trajectories.

This approach aims to level the playing field, ensuring that more students, even those who do not fit the traditional criteria for exchange programs, have access to valuable opportunities in the life sciences and professional development.

Photos: Borderlands Restoration Network







## THE COASTAL SOLUTIONS FELLOWS PROGRAM IN THE GULF OF CALIFORNIA REGION

Convener(s): Medardo Cruz-López, Juanita Fonseca-Parra, Laura Ibarra

**Keywords:** Conservation, Coastal habitats, Shorebirds, Multidisciplinary projects, Pacific Flyway

**Thesis:** The Coastal Solutions Fellows Program is an example of how multidisciplinary projects help conserve the coastal wetlands of the Gulf of California region.

The Coastal Solutions Fellows Program builds and supports an international and multidisciplinary community of early-career professionals with the aim of designing and implementing solutions that address current coastal challenges along the Pacific Flyway in Latin America.

Its primary goal is the conservation of coastal habitats and shorebird populations. The program focuses on the implementation of collaborative projects across various disciplines and sectors, developing the knowledge, resources, and skills of these Latin American professionals in their areas of expertise. In this way, it seeks to create a network of professionals capable of positively influencing the conservation of coastal habitats, addressing both present and future challenges associated with development.

Images: Coastal Solutions, Cornell Lab







## ESCUELA DEL MAR: CERTIFICATION OF LABOR COMPETENCIES

Convener(s): Paloma Alejandra Valdivia Jiménez

**Keywords:** Self-employment, Certification, Competences, CONOCER, Escuela del Mar, Entrepreneurship

**Thesis:** Certifying skilled laborers is a valuable way to ensure excellence, while officially validating the knowledge, skills, and values of community partners involved in conservation projects or the sustainable use of natural resources.

CEDO's Escuela del Mar is a space dedicated to capacity building, technical advice, and certification of labor competencies. We are accredited as a Certification and Competency Evaluation Entity (ECE475-21) under the Federal CONOCER Program, which enables us to guarantee operational excellence and high-quality services among our community partners. This minimizes environmental impacts while enhancing benefits for local communities, officially validating their skills and experience with certifications recognized by the Ministry of Public Education.

We are accredited for the certification of the following competency standards:

- EC0072: On-site visitor care during guided tours.
- EC0076: Evaluation of candidate's competencies based on established competency standards.
- EC0217.01: Delivery of human capital training in group face-to-face sessions.
- EC0301: Design of group face-to-face human capital training courses, their evaluation tools and course manuals.
- EC0578: Application of best practices in handling fishery products aboard small boats.
- EC0820: Monitoring of small-scale fishing activity.

We are currently receiving training in the following standard:

- EC1401: Community biodiversity monitoring in Natural Protected Areas for management and conservation purposes.

We invite civil society organizations, academic institutions, and government authorities to collaborate with us and take advantage of Escuela del Mar to certify the

labor competencies of individuals working in nature conservation and the sustainable use of natural resources. Together, we can equip these stewards with the necessary tools to meet the challenges posed by the globalized market.



Photos: Paloma A. Valdivia-Jiménez





## “DESERT PUPFISH” (PUPO) SHELTER

Convener(s): María Isela Gamboa Hernández

**Keywords:** Conservation, Reproduction, Desert pupfish, Pupos, Refuge, Colegio de Bachilleres del Estado de Sonora, Sonoyta, COBACH

**Thesis:** Conservation of desert pupfish is a project that promotes species recovery, environmental education, and community engagement.

In 2008, the Colegio de Bachilleres del Estado de Sonora, Sonoyta campus, built a pond to protect and conserve an endangered endemic species of the Sonoyta River, known as the Pupo desert pupfish (*Cyprinodon eremus*). This pond has become one of only five refuges in the world for this species.

The pond not only supports the species’ recovery but also serves as a Transversality Project, providing students with opportunities to develop competencies in various subjects, including Ecology, Environmental Studies, Biology, Mathematical Thinking, Probability and Statistics, Literature, English, Artistic Activities, Humanities, and Computer Training.

Moreover, the educational project has strengthened community connections by inviting schools from various educational levels to visit the pond. This outreach helps raise awareness about the importance of preserving the desert’s unique and rare natural resources.

In addition, the educational project has served as a link with the community. Schools from different educational levels are invited to visit the pond, promoting awareness of the importance of preserving the exotic and rare natural resources of the desert.



Photo: Grigory Heaton



Currently, the pond houses a population of 700 specimens. Between the months of April and July (2024), these fish will be in the reproductive stage, and the population is expected to increase by at least 300 additional fish.



Photo above: El Puente; below, Socorro Barajas





## STRATEGIES TO PROMOTE ENVIRONMENTAL EDUCATION IN PRIMARY SCHOOL STUDENTS (FORMAL AND NON-FORMAL)

Convener(s): Ana Molina Izaguirre

**Keywords:** Environmental education, Ethnoeducation, Ethnobiology, Indigenous tribes, Awareness

**Thesis:** Early environmental education in schools is crucial for young people to perceive themselves as an integral part of ecosystems.

Based on the principles of environmental education, a national project called Ethnobiological Gardens (JEB) was launched, with applications developed in various states of Mexico. In Sonora, the Ethnobiological Garden is located in Bahía de Kino, a municipality in Hermosillo. This JEB collaborates with three Indigenous communities in the state: the Comcaac, Yaquis, and Mayos.

The collaboration aims to preserve the ancestral knowledge of botanic medicine from different tribes to create a “living pharmacy” where visitors to the JEB can learn about plants and their medicinal properties. This project is funded by the National Council of Science and Technology, managed by the Universidad Tecnológica de Hermosillo, in collaboration with the Universidad Estatal de Sonora and the Universidad de Sonora, for the development of manuals on the identification and use of regional medicinal plants.

For the Comcaac region, work was done directly with Comcaac elders, who shared their botanical, medicinal, and traditional knowledge about plants of interest. Additionally, photographic evidence was collected for the creation of a manual that will be used by environmental educators with primary school children from the Comcaac to promote environmental education and ethnoeducation. The goal is to ensure that the tribe’s ethnic knowledge is not lost over time and that both tribe members and outsiders can use the manual, as it is bilingual, written in both Spanish and Cmiique Itom, the Comcaac language.

The session also featured some members of Community Group Leaders from Bahía de Kino, who shared their environmental education projects, including the “Ahorita

Photos: Jorge H. Valdez Villavicencio; below left, Alan Harper



no Joven” program. This program informs restaurant diners in Bahía de Kino about closed fishing seasons and trains restaurant staff to answer diners’ questions. Additionally, they discussed strategies to promote environmental education in the “Escuelita de Mar,” which focuses primarily on children and uses interactive games, educational materials, and discussions on environmental topics, mainly related to the sea.

In the exchange of experiences, the importance of early environmental education in schools was emphasized. It is crucial for new generations to understand what is happening in their surrounding environment and to be educated with greater awareness and empathy towards their planet and its inhabitants.

Moreover, the need to educate a new generation concerned with both their well-being and environmental well-being was highlighted. It is essential that young people perceive themselves as an integral part of ecosystems rather than as external or invasive entities, as this perception is vital in social ecology.







## CREATION OF AN ECONOMIC FUND (SCHOLARSHIP) FOR ECONOMICALLY DISADVANTAGED UNIVERSITY STUDENTS

Convener(s): Francisco Jaime Martínez Reyes

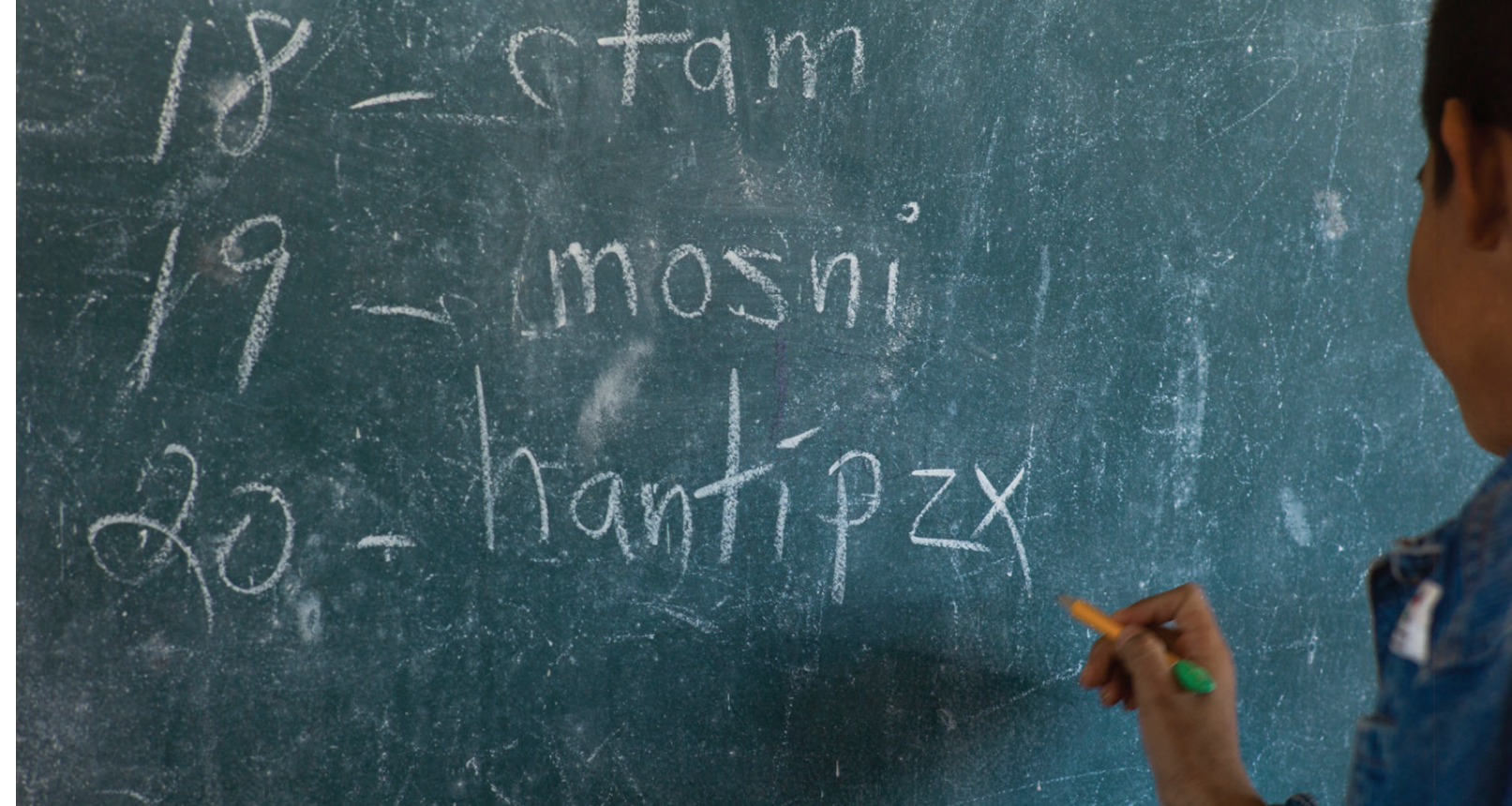
**Keywords:** Marginalization, Scholarships, Opportunities, Youth

**Thesis:** Historically, young people from isolated communities living in poverty and marginalization have been excluded from access to higher education. Creating opportunities for them must be considered both a responsibility and a professional commitment.

The Comcaac communities of Punta Chueca and Desemboque, in the state of Sonora, possess immense biological and cultural wealth. Despite this, the conditions of marginalization and neglect by the authorities are neither unfamiliar nor unknown. Many young people from these communities do not have access to higher education. This perpetuates a model of social and economic stagnation within these communities, a pattern seen in most Indigenous groups in our country.

During this discussion, we addressed the creation of an economic fund for scholarships to be granted to low-income individuals from the Comcaac community. We talked about the logistical, legal, and other inherent details involved in this type of process. The Prescott Center had a similar program in the past, which will be reactivated for the next cycle, incorporating the lessons learned from this conversation.

Photos: Lynn Johnson / National Geographic Creative







## FOOD AND BIOCULTURAL DIVERSITY IN THE SONORAN DESERT

Convener(s): Erin Riordan, Charlie de la Rosa, Bianca Bonilla

**Keywords:** Biodiversity, Culture, Food, Conservation, Food sovereignty

**Thesis:** The Food and Biocultural Diversity Session created a space to identify themes, challenges, and successes related to food, culture, biodiversity, and conservation in the greater Sonoran Desert Region.

At a time when habitats, traditions, and livelihoods are increasingly under threat, can food lead to holistic solutions? Food is a fundamental cultural building block, underpinning livelihoods and connecting communities with local environments. However, the increasing demands of a growing human population are straining ecosystems to the limit. The Food and Biocultural Diversity Session created a space to identify key research themes and collaborative action on food-related topics in the greater Sonoran Desert Region.

The session aimed to address the following questions: What is the relationship between food, biodiversity, and resiliency in the Sonoran Desert? What are the greatest needs, barriers, and opportunities in the region? How can we engage our communities?

Topics included food production systems, food traditions, food and seed sovereignty, conservation, sustainability, climate change, and nutrition. Participants discussed challenges including the disconnect between policy and the needs of small farming communities and environmental protection and conservation; the adverse impact of industrialized agriculture on health, biodiversity, rural economies, and traditional knowledge and livelihoods; lack of familiarity with local and traditional foods; inaccessibility of locally adapted seeds and difficulty sharing seeds; and shifting food and flavor preferences. Opportunities include community building, where farmers can share knowledge and resources, and engage youth in farming; and marketing to connect consumers with local growers. Multiple participants spoke about successful outreach and education, improved accessibility of native and traditional foods.

Photo: Charlie de la Rosa

Academia and research can play a role in identifying solutions, however, there needs to be more transdisciplinary work, more direct connection with communities, and greater acceptance of broader knowledge systems.







THEME	SUCCESS/ OPPORTUNITY	BARRIER/ CHALLENGE
<b>Policy</b>	Land-back, ejidos  Land trusts, Mexican land set aside for agriculture  UNESCO's "intangible cultural heritage"	Policy, environmental and natural resource challenges in fishing communities  Government disconnect with small farmers, subsidies, and programs are framed for large-scale producers
<b>Economics</b>	Pair production with processing, value added products	It's cheaper/easier to shift to macro or industrial and this has changed culture and tastes
<b>Changing farmer demographics</b>	Many examples of youth coming back to land who are interested in organic foods	Losing farmers and knowledge, youth are not interested in farming
<b>Connecting products with consumers (market development)</b>	Markets, direct from producers  Collectives, CSAs (community-supported agriculture)	Access to markets  Public unfamiliar with crops/flavors/ways to prepare
<b>Social-ecological</b>	Balance between food production and conservation	
<b>Movement of seeds</b>	Hyper regional seed banks, conservation of genetic diversity and locally adapted material	Illegal to cross international borders
<b>Food justice</b>		Lack of justice along the whole pipeline of food production
<b>Wild foods/food tradition</b>	Outreach/education with info on how to plant, eat, cook, etc. (desert foods booklet)  Education campaigns about health dangers of processed foods, benefits of nutrient dense native and local foods/food traditions	Public is unfamiliar with foods/crops and flavors, ways to prepare  Have the food in the landscapes but not the cultural knowledge



Photo: Bill Hatcher





## EXCHANGE OF EXPERIENCES IN TRADITIONAL AND SCIENTIFIC KNOWLEDGE AIMED AT CONSERVATION

Convener(s): Luis Roberto Moreno, Aarón Barnett, Ana Molina

**Keywords:** Local ecological knowledge, Western knowledge, Environmental conservation strategies

**Thesis:** Does knowledge sharing support environmental conservation?

During this session, we engaged in a dialogue about the importance of integrating local and Western knowledge for environmental conservation. We presented examples of Comcaac knowledge, highlighting how their songs and stories about various species of flora and fauna interweave natural history with social and artistic values. In this context, we explored the connection between conserving the natural environment and preserving cultural heritage. We also discussed local strategies for addressing socio-environmental challenges and reviewed ongoing conservation projects.

The discussion also delved into ethical dilemmas related to researchers' roles within local communities, raising critical questions such as: What are we truly contributing? What are we taking from these communities, and how are we utilizing it? How can we advance towards more equitable collaboration? This conversation emphasized the need for dialogue between different knowledge systems and the importance of research as an ongoing exchange of information that empowers local actors to address their community's challenges.

Additionally, we addressed structural issues in scientific work, including the inclusion of local consultants as co-authors and the equitable distribution of economic resources to the local communities involved in studies.



Photo: Benjamin T. Wilder





## ARTISTIC AND MUSICAL ENCOUNTERS AS FRAMEWORKS FOR INTERDISCIPLINARY RESEARCH

Convener(s): Gabriela Ocadiz

**Keywords:** Interdisciplinary research, Art, Music

**Thesis:** The study of human relationships with the environment, their communities, each other, and nature itself can be conducted through various artistic and musical encounters, which serve as interdisciplinary and participatory research processes.

Through various artistic and musical encounters, it is possible to gain insights into human relationships with the environment, their communities, and each other. By employing an interdisciplinary approach that emphasizes reflection and dialogue, it is feasible to create participatory research frameworks centered around these encounters, thus enhancing our understanding of these relationships.

The session focused on dialogue and reflection. We explored different qualitative research methods using art and music, applying these experiences as research frameworks and methods. During the session, participants first reflected on diverse methods of using art and music as tools for exploration. They also shared their areas of study and research and, finally, designed interdisciplinary project proposals related to the Sonoran Desert and its inhabitants, utilizing art and/or music as research frameworks or methods.

Participants shared ways in which music or the arts (photography, drawing, or painting) have been valuable for the dissemination of their research, facilitating community participation in conducting research in remote areas and with Indigenous peoples. They also reflected on how these creative practices have enriched their personal and professional lives.

The conversation highlighted the need for collaboration between professionals in the natural, social, and visual arts—an important consideration for connecting research and better understanding the differing perspectives and possibilities for reconceptualizing our roles as researchers, academics, and scholars.

Participants also shared insights into traditional knowledge and music. For example, certain songs can facilitate fermentation processes (like pulque songs), while for

example the regional folk musical style Son Jarocho often draws inspiration from flora and fauna, and how learning *versada* can potentially help understand and connect to species preservation poteaiding in species preservation (e.g., La Guacamaya, El Pájaro Cú, La Iguana). We also discussed how Indigenous music can vary according to the ecosystem in which it is performed, such as the Pirekuas Purépechas and the Sones Abajeños, which have a less festive tone compared to the Sones Jarochos.



Photos: Benjamin T. Wilder





## TOOLS FOR COMMUNITY EMPOWERMENT AND SOCIO-ENVIRONMENTAL DEVELOPMENT

Convener(s): Elia Polanco, Johana Nieblas

**Keywords:** Inclusive participation mechanisms, Community development, Social cohesion, Social-environmental leaders, Conservation, Environmental education, Community leadership

**Thesis:** The implementation of community conservation programs, tools, and movements promote social participation mechanisms, strengthen communities, advances their self-management and the exchange of experiences.

CEDO presented its Community Well-Being program, designed to strengthen communities and promote their self-management. This is achieved through social participation mechanisms adapted to the specific needs of each community, thus achieving significant results and progress, among them: the construction of safe and inclusive spaces to listen to all members of the community and work together. Once needs are identified, solutions and capacity-building programs are developed based on those needs, leading to implementation.

Case studies were presented from the Upper Gulf of California, where various participatory mechanisms were implemented:

“Social Participation Committees” for the manifestation of environmental impact in coastal fisheries.

the “Community Agendas” for community development.

the “Economic and Community Development Committee for the Upper Gulf”, made up of environmental and fishing authorities from the three levels of government, community leaders and civil society organizations.

the “Grupo Intercomunitario de Pescadores Ribereños”, formed by fishermen elected by their own communities to make decisions and build a fisheries’ management proposal.

The presentation by the Center for Cultural and Ecological Studies (Prescott College) focused on the exchange of experiences among diverse groups that encourage the creation of community conservation movements. These movements seek to make



Photo: CEDO

visible the processes of conformation and growth among them, inspiring the attendees interested in learning about strategies to integrate people and institutions in initiatives similar to those promoted by the Center.

Despite the limited time for the session, there was significant participation and interest from the attendees. They discussed the strategies, weaknesses, and strengths among institutions and communities, as well as the challenges that have hindered the formation of solid community groups with consistent projects.

Attendees expressed the need for support, training, recommendations, and contacts that will enable them to continue their efforts to form these groups. They highlighted the many areas of opportunity within their communities to achieve successful participatory processes that promote joint conservation efforts between the community, various associations, and the government.

We concluded that each community and each process requires integral and inclusive spaces for participation and training to make informed decisions that consider all members of the community.





## AMAZILIAS: NETWORK OF WOMEN BIRDWATCHERS IN MEXICO

Convener(s): Sara Alcalá Jiménez

**Keywords:** Women birders, Avifauna, Sorority, Sisterhood, Feminism, Autonomy, Parity, Inclusion, Collectivity, Integrators, Inspiring environmentalists, Passionate defenders, Adventurers, Body-Territory

**Thesis:** Amazilias, a network of women birdwatchers in Mexico, promotes and highlights the strengths of women and girls, fostering collectivity and creating spaces for birdwatching that are free from any form of violence and discrimination.

Red de Amazilias is a network of women, by women, and for women. In just four years, we've grown to approximately 250 members across Mexico. Our mission is to empower women through birdwatching, ecosystem conservation, and science outreach, while weaving networks of collectivity among women throughout the country.

We operate from a feminist perspective, striving for positive change that is not only sustainable but regenerative, embracing our diverse contexts, communities, and ecosystems; making women's work visible, and facilitating personal and collective development through participatory processes.

Currently, we have nine working commissions, each formed based on the interests, skills, and knowledge of our members:

**Amazilias en Comunidad:** Creating local birdwatching groups for women.

**Art and Culture:** Linking the arts with birds through activities like reading, drawing, singing, and other creative disciplines.

**Avitourism:** Sharing experiences and knowledge that promote the growth of birdwatching tourism.

**Chicas en Vuelo:** An introductory virtual course on birdwatching for girls and adolescents.

**Bird Knowledge:** Facilitating information and resources for the formal study of birds.

**Dissemination:** Communicating activities, programs, working groups, and other events organized by the Network.



**Events:** Participating in forums and meetings to present our Network, its lines of action, knowledge, and experiences.

**Feminism:** Strengthening autonomy, consolidating objectives and ideals to achieve gender parity, incorporating a gender perspective, and advocating for women's participation in decision-making processes in society.

**Capacity Building:** Continuous training and improvement in management and organizational development.



Photo: above, Galería de Amazilias; below, Olivia Cocova





## DIVERSIFICATION OF THE ELECTRICITY SYSTEM AND COMMUNITY AUTONOMY

Convener(s): Jesús Francisco Ceballos Bañaga

**Keywords:** Autonomy, Electricity, Fossil fuel, Renewable energies, Rurality, Communities, CERCA, Baja California Sur

**Thesis:** Energy autonomy: a pillar of community self-governance.

The Baja California peninsula is marked by its isolation, with much of the territory functioning almost like an island. This remoteness is even more pronounced in Baja California Sur, where the importation of goods is essential for the survival of all productive sectors.

Raw materials, food, machinery, labor, and fuel are constantly being imported, as very few items are actually produced locally. One exception is electricity, which is generated at local plants within the state—however, these plants are fueled by imported fossil fuels, leading to polluting emissions that exceed official Mexican standards.

The participation of Yinna Aldama, a Kumiai member from Baja California, was particularly noteworthy, as her community lives disconnected from the electricity grid. She emphasized how this lack of access affects education and modernization in daily life processes. Although her community has survived for generations without electricity, she stressed the urgency of adopting autonomous electricity generation systems to foster self-governance.

Baja California Sur has a unique electrical situation in Mexico, being home to the only two electrical systems that are isolated from one another and from the national grid. This isolation results in the prioritization of economic resources for electricity supply being directed toward the most populated areas. As a result, at least 63 rural communities in the state remain off the grid, creating energy vulnerabilities that hinder their social and economic development.

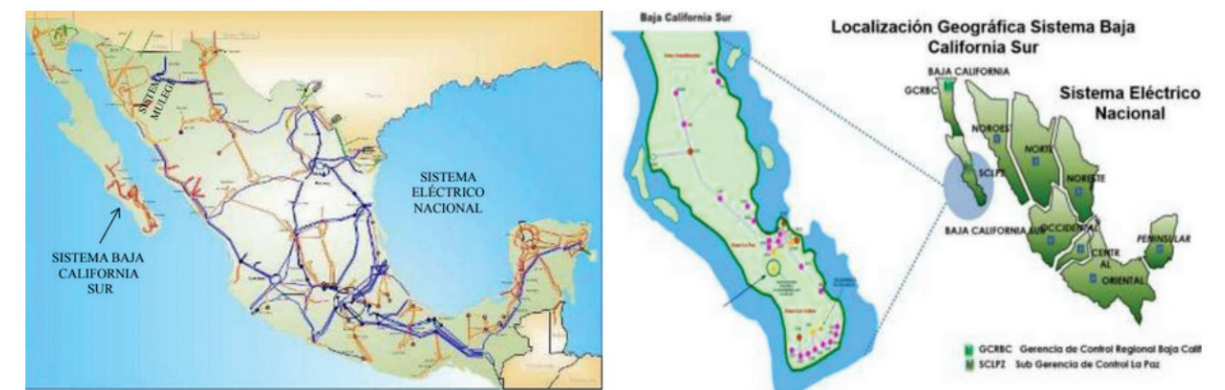
When a population is primarily focused on meeting its basic survival needs, critical issues such as education, health, environmental protection, and economic innovation risk being neglected. This can undermine the autonomy of rural communities, driving them to migrate to urban centers in search of better opportunities. This cycle of

dependency could largely be broken by diversifying the electricity system through the implementation of renewable energy solutions at both state and local levels.

This session aimed to highlight the peninsula's challenges, facilitate the exchange of experiences, and propose solutions geared toward fostering community autonomy throughout the Sonoran Desert.



SISTEMA ELÉCTRICO MÉXICO Y BCS



Images: CERCA





## CONSERVATION FROM ACTIVISM, MEGAPROJECTS IN SONORA

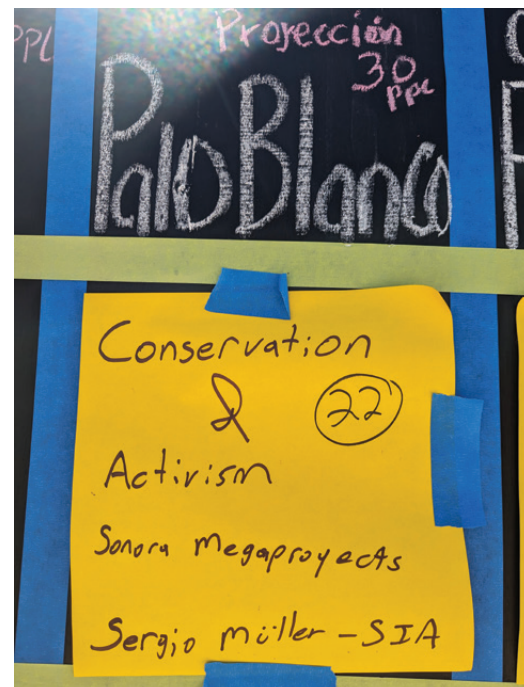
Convener(s): Sergio Müller

**Keywords:** Conservation, Activism, Megaprojects, Greenwashing, Photovoltaic plants, Cocospera Train, Native Plants

**Thesis:** Activism as a strategy to contribute to environmental conservation.

The Sonoran Desert faces multiple development projects that threaten its integrity, making it imperative for activism to become a fundamental tool for its conservation.

It is crucial to establish clear strategies for each objective, evaluate the available resources, and define the appropriate lines of action. Additionally, it is essential to maintain open channels of communication with other stakeholders and to strengthen the capacities of the affected communities.



Photos: Sergio Muller







## CITIZEN PARTICIPATION IN PROJECTS WITH SOCIAL AND ENVIRONMENTAL IMPACTS

Convener(s): Mirsa Bojórquez Ochoa

**Keywords:** Citizen participation, Megaprojects, Access to information, Ecological Gazette, Escazú Agreement

**Thesis:** Citizen participation in projects with social and environmental impacts is foreseen in the Mexican legal framework under the context of the Escazú Agreement. Despite this, its implementation is still in its infancy. This talk addressed some of the tools that exist for accessing project information.

The concept of citizenship has historically been tied to one's place of origin, granting rights and obligations only to individuals residing in a specific area. However, global challenges such as pollution, biodiversity loss, and climate change necessitate a broader perspective, leading to the development of the concept of global citizenship.

The Escazú Agreement is the first environmental agreement in Latin America. Signed and ratified by Mexico, it is legally binding and should be incorporated into national legislation. However, the current mechanisms for ensuring this right in Mexico allow only a limited timeframe for citizens to provide comments on projects. Moreover, there is no guarantee that these suggestions, comments, or concerns will lead to changes in the project's design, layout, or implementation.

The process is as follows: All federal projects submitted to SEMARNAT or ASEA for environmental impact assessment are published weekly in the Gaceta Ecológica. The logbook number for accessing the project's environmental impact assessment (MIA) is published there. Once published in the gazette, the public has 10 days to request a public consultation. If approved, the MIA will be available for review and comments for 15 days.

It is essential to reform the legal framework to ensure that public input genuinely influences the development of projects.



Photo: Mirsa Bojórquez Ochoa





# BORDER WALL: SCARS IN NATURE

Convener(s): Naturalia AC, CEDO Intercultural

**Keywords:** Wall, Barrier, Biological corridor, Connectivity, Transboundary cooperation, Culture and society, Impact, Risk, Restoration

**Thesis:** The border wall between Mexico and the United States has repercussions on society and biodiversity. What are we doing from the perspective of society, our representatives, and international cooperation?

In a unilateral decision, the United States began constructing a wall that divides the Sonoran Desert ecoregion under the pretext of national security (protecting its borders from migration and organized crime). This led to the construction of more than 750 km of a 6-meter-high steel wall, leaving an indelible scar on the landscape.

The wall has caused incalculable consequences in terms of erosion, soil and water loss, severely affecting the natural processes of species and ecosystems. It represents a monument that drastically limits connectivity, a mistake we must not repeat, and has generated economic damage, tearing apart the social fabric, fracturing international cooperation relations, and above all, death: not only of thousands of migrants but of wildlife species whose loss has yet to be accounted for.

Death accompanies the wall: human remains that have lost their identity, mountains that have been severed, oases that have dried up, and species we do not know. Additionally, there are heartbreaking stories about the wall’s impact on jaguars, wolves, bears, pronghorns, sheep, beavers, and freshwater species.

The wall does not divide two countries but three nations, and among them, perhaps the most affected is the Tohono O’odham Nation, as this barrier of metal columns breaks the desert landscapes and harms Mother Earth.

Nature knows no borders: transboundary cooperation is a key factor for the conservation, restoration, and sustainable use of biodiversity (UNGA Resolution 2021, A/75/L.73).

Photos: Bill Hatcher







## COMMUNICATION FOR CONSERVATION

Convener(s): Martha Patricia Alcaraz Flores, Isadora Clark Ordóñez

**Keywords:** Communication, Visibilization, Awareness, Conservation

**Thesis:** The understanding of the characteristics of a target audience guides the development of a communication strategy and the design of communication elements.

During the session, participants shared their interest and personal needs in communicating about their socio-environmental projects and activities. Throughout the discussion, several strategies for effective communication were identified.

Firstly, participants emphasized the importance of distinguishing between the dissemination of scientific knowledge and popular science communication. These two approaches target different audiences—specialized versus non-specialized groups. Secondly, the need for consistent communication about ongoing projects or activities through multiple channels or media was identified.

Numerous participants agreed that a successful communication strategy should involve planning activities and designing communication materials based on the audience and the stakeholders involved in the project or activity. To achieve this, the following approaches were suggested: (1) convene a group of decision-makers to help consolidate the project (such as government authorities, representatives of institutions, academics, etc.); (2) convene a separate group consisting of representatives of funding sources; and (3) a dedicated session with the community being engaged to clarify issues such as benefits and participation.

Other strategies that were shared included:

- Engaging with the community (“if the community sees you, they will join the project”).
- When language presents a barrier, use alternative communication elements.
- Utilize documentation, such as photo exhibitions.
- Raise awareness through pictorial murals and regional music, such as corridos.
- Simplify messages to suit fast communication formats like social media.
- Spark curiosity in the public and listen to their opinions to identify their idiolect and preferences.

- Apply the principles of “Design Thinking”, which involves empathizing with the audience, then defining, ideating, prototyping, and testing.

Finally, as a group, we recognized that the majority of our activities and intervention projects have the ultimate goal of conserving biodiversity and territories. Therefore, we concluded that “we communicate for conservation”.



Image: Isadora Clark and Martha Alcaráz







## SCIENTIFIC OUTREACH IN SOCIAL NETWORKS AND HOW TO MONETIZE YOUR KNOWLEDGE

Convener(s): Miguel Antonio Gastélum Flores, Rosario Mares Gracia

**Keywords:** Outreach, Science, Social media, Monetization

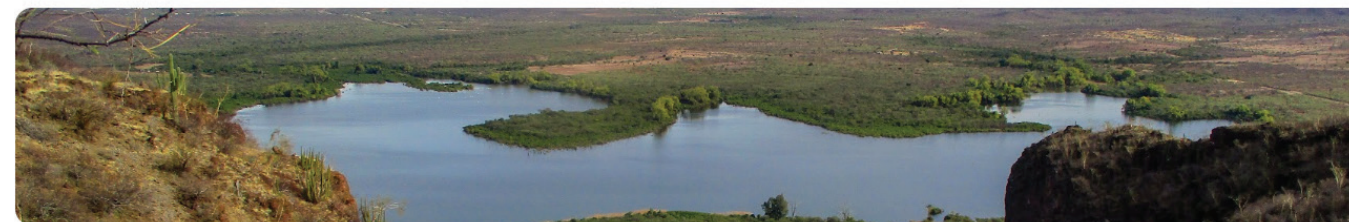
**Thesis:** Creating a collective awareness about environmental care is crucial, and leveraging social networks is one of the most effective ways to achieve this.

The talk focused on environmental education through social networks and explored how to monetize this knowledge. We covered how to start a Facebook page, grow your follower base, and utilize various tools to expand organic reach. Additionally, we discussed different methods for monetizing educational content on social networks, including videos, photos, and memes.

We also examined other social networks, strategies for monetizing educational content on these platforms, and the benefits and impacts that science communicators can bring to society through social media.

Creating collective awareness about environmental care is essential, and social networks are among the most effective tools for achieving this. These platforms not only allow us to reach students but also individuals in remote communities. Social networks offer valuable tools for education, and if we can generate income through them to support ongoing scientific dissemination, it is an added benefit.

Photos above: Zahín González



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## FIELD STATIONS AND YOU

Convener(s): Nidia Ramírez, Sula Vanderplank, on behalf of UNEC

**Keywords:** Field stations, Network, Strength, Science, Community

**Thesis:** What do field stations mean to you, and how can we strengthen the network?

The session began with a presentation on UNEC (Unión del Noroeste de Estaciones de Campo). UNEC exists to unite efforts and amplify the voice of environmental conservation and research in northwestern Mexico through science communication and community participation ([www.unec.org.mx](http://www.unec.org.mx)).

Various concepts about field stations were discussed, focusing on what they represent for participants, users, and leaders of the field stations. There are different types of field stations, some with fees for their services, and some offer education and training. The broad inclusion of research in all disciplines and of all people who value these workplaces was highlighted.

The discussion also covered volunteer programs, safety protocols, and compliance with the NOMs (Mexican Official Standards) of the Mexican Ministry of Labor and Social Welfare. A field station can range from logistical support for research activities without requiring physical infrastructure to a fully equipped facility where researchers can stay overnight during their studies.

Additionally, the possibility of field stations expanding their roles beyond research was explored. They could also cater to scientific tourism, offering services to those interested in these activities, as well as serving as centers for environmental education and training.

The need for each field station to develop a clear business model was highlighted to ensure sustainability and reduce dependence on foundations or donations.

Field stations that took part of the session:

- NCI - Monte Mojino Sonora
- Navopatia, Sonora
- Centro Biodiversidad Marina y Conservación AC, El Barril, Baja California
- Rancho Encinalito, Sierra de la Laguna, Baja California Sur



- Investigación en la Cuenca de los Planes y Rancho Cacachilas, Baja California Sur
- Pronatura Noroeste, Bahía Santa María, Sinaloa
- CEDO, Sonora
- Pronatura Noroeste, Bahía de Los Ángeles, Baja California Sur
- Terra Peninsular, San Quintín, Baja California
- Siempre Viva, San Quintín, Baja California
- Patronato de la Agricultura de Sonora A.C.
- Prescott College, Bahía Kino, Sonora
- Eco-Alianza de Loreto, CEMA, Loreto, Baja California Sur
- San Felipe, Baja California



Photo: Benjamin T. Wilder





## ARTIFICIAL INTELLIGENCE FOR CONSERVATION DECISION-MAKING

Convener(s): Kevin Manuel Galván Lara

**Keywords:** Artificial intelligence, Conservation, Decision-making

**Thesis sentence:** The importance of using artificial intelligence to streamline data analysis for decision-making.

In recent years, artificial intelligence (AI) has experienced an unprecedented boom, driving innovation across various industries. Tools such as ChatGPT, Gemini, and LaMDA have democratized access to cutting-edge technology, facilitating tasks and opening up a world of possibilities. One of the most significant benefits of AI is the development of decision-making tools, which transform data analysis into crucial information to better understand situations and make well-informed decisions.

These tools enable the analysis of large volumes of data, extracting valuable insights and uncovering hidden patterns that would otherwise be difficult to detect. This deep analytical capability allows for a comprehensive understanding of complex situations, providing a solid foundation for sound decision-making.

AI not only provides data insights but also assists in decision-making. By processing data and evaluating different options, AI systems can offer accurate recommendations and predictions, minimizing human biases and optimizing outcomes.

An emblematic example of this technological integration is found in the article “3-Minute Data Science Dashboards with ChatGPT-4 and Dash” by María Elena Martínez Manzanares, published on Medium by MCD-UNISON. In this article, she explores how artificial intelligence facilitates the creation of interactive data science dashboards, designed to communicate complex stories in a way that is accessible and engaging for specific audiences. The combination of ChatGPT-4 and Dash, two powerful tools in this domain, enables a dynamic and visually captivating experience that turns data into clear, understandable narratives. This ability to tell stories through data visualization promotes deeper insights and informed decision-making, enhancing the value and utility of AI in various contexts.

As AI continues to evolve, its impact on this field will grow even more significant, driving the development of more efficient, informed, and prosperous organizations



and societies. During the session, attendees were encouraged to explore AI tools for decision-making and discover how they can transform both their business and personal lives. AI is now within everyone’s reach and can be an invaluable ally in helping them achieve their goals.



Image: Big Data Marketer





## N-GEN NETWORK OVERVIEW

Convener(s): Víctor Arturo Ricárdez García

**Keywords:** General overview, Sonoran Desert, Transdiscipline, Environment, Development

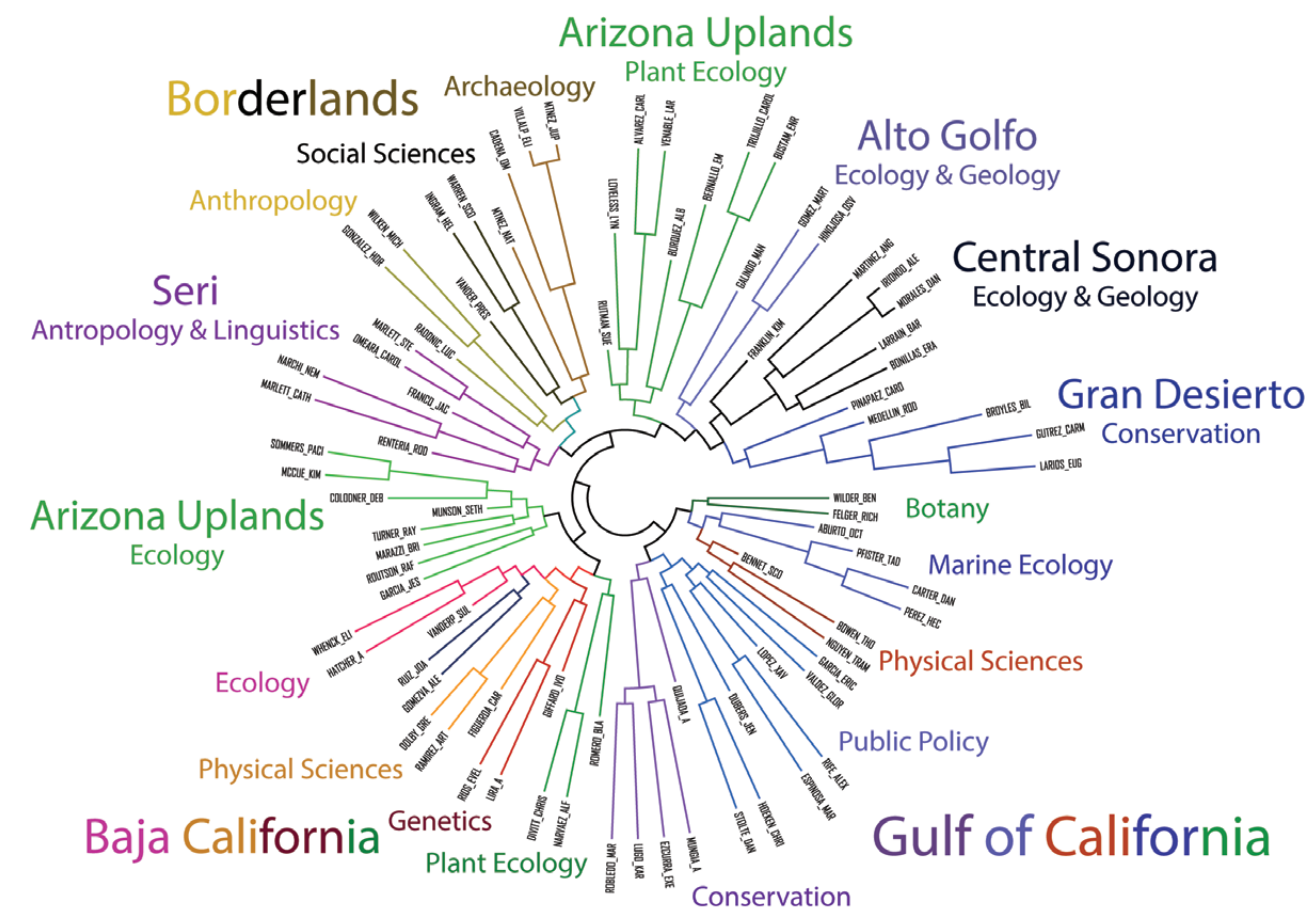
**Thesis:** Who we are and what we do in the transboundary and multinational region of the Sonoran Desert.

The New Generation of Sonoran Desert Researchers (N-Gen) represents a multinational, inter-institutional, multi-sectoral, and transboundary effort to create a community composed of community and Indigenous leaders, student researchers, and specialists in the arts, sciences, and humanities. All members are dedicated to environmental management and development, with a strong commitment to social justice and sustainability in the region.

1. To gain insights into our network of key actors, we conducted a self-diagnosis through a survey. The primary objectives were to:
2. Understand the demographics and background of our members;
3. Identify the main areas of interest of our members;
4. Identify issues and problems currently being addressed in different Sonoran Desert landscapes;
5. Evaluate N-Gen's strengths and weaknesses.

The survey was initially dated in September 2023, and we received 152 responses.

You can see the results on pages 10–13 of this report.







## THE FUTURE OF N-GEN

Convener(s): Ben Wilder

**Keywords:** Community, Organic, Multi-institutional, Connections, Shared experiences, Dialogue, Transborder, Transdisciplinary, Trans-sectoral

**Thesis:** How does N-Gen continue to support and create a space for dialogue across borders and perspectives that empowers individuals and our collective efforts?

Since the establishment of the network and board of directors in 2012 following the initial Summit, N-Gen has followed a model of working with fiscal sponsors for administrative support, led by a largely volunteer board. N-Gen has supported the creation of a network of ca. 1,000 members focused on science and conservation actions in the greater Sonoran Desert and has led multiple projects and actions (summits, biodiversity expeditions, student grants, workshops, art-science programs, publications). Now entering its thirteenth year, what is the future of N-Gen?

This session raised this question to explore the possible directions and core qualities that make N-Gen unique, which include:

- Organic nature
- Binational organization at a political level
- Community involvement
- Beyond academia
- Multinational
- Student-oriented
- Multi-institutional
- A forum for discussion
- Scientific diplomacy: cross-border dialogue, dialogues without borders

Participants shared that these qualities justify the existence of N-Gen and the organization's efforts alone. Everything else that emerges is extra. There is great importance in having an entity that offers and maintains transborder dialogue and understanding in the context and tenor of societal and political pressures of the current era. Questions about next steps focused on ways to maintain momentum and provide benefits for N-Gen members that elevate individual and collective efforts.

N-Gen plays a unique role as independent from, yet interconnected with, academia, business, government, and society. As a catalyst, in many ways, the most important results of N-Gen will be the ones we never know.

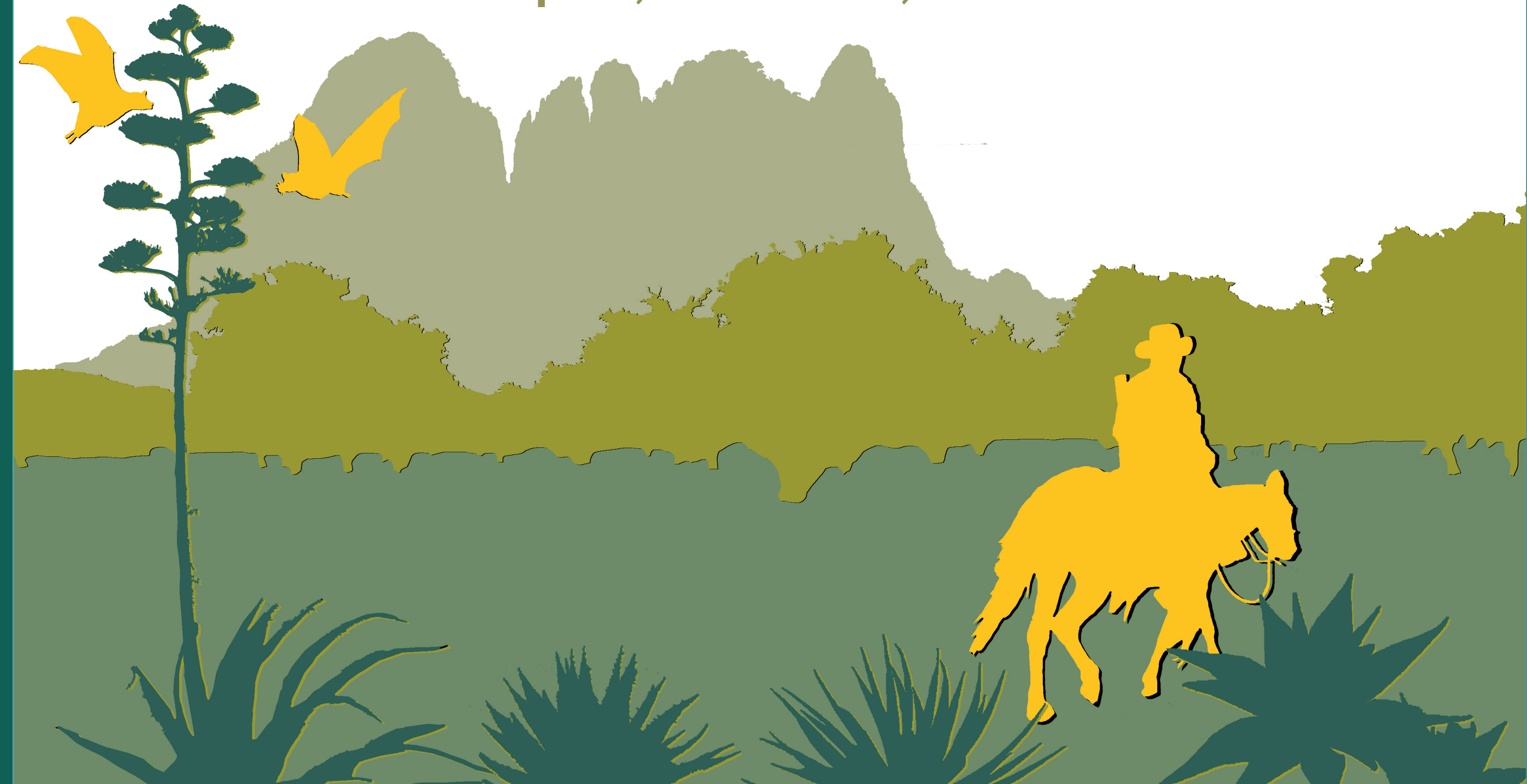






# Agave Summit 2024

## 24 April, Álamos, Sonora







CATEGORY	THEME	SESSION NAME
Environmental	Ecological Conservation	No bats no bacanora
		The agaves are in the forest
		Agave bovicornuta, cultivation, transplantation, reforestation, and landscape conservation [no session notes]
	Biodiversty amd Natural History	Mapping the distribution of Agave in Sonora [no session notes]
	Global Change	Climate Change
Socio-Ecological	Ecosystem Based Management	Agave Agroforestry
		Addressing the challenges of farmers and producers with economical and ecological solutions
		Quality control in Agave production [no session notes]
		Establishment of technologically advanced plantations for sustainable bacanora production in Sonora [no session notes]
Human Dimension of the Sonoran Desert	Biocultural Diversity	Fermentation
		Millenary historical use and management of agave: the case of the Yumano people
	Community Diversity and Resilience	Worker conditions in the agave industry and social justice
		Bacanora's Denomination of Origin: how to protect it?
		Gender perspective. Rural women in the bacanora industry [no session notes]
		The branding of Bacanora [no session notes]
Social	Challenges and Multinational Cooperation	Biopiracy
	Research Actions	Open questions in agave research

Photo above: Bill Hatcher  
 Photo below: Benjamin T. Wilder







## NO BATS NO BACANORA

Convener(s): Valeria Cañedo

**Keywords:** Conservation, Bats, Agaves, By-products, Community empowerment

**Thesis:** “Sin murciélagos no hay bacanora” emphasizes the essential ecological relationship between bats and agaves in Sonora’s ecosystems, promoting conservation efforts, agro-ecological practices, and cultural appreciation within the bacanora industry.

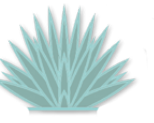
The session provided insight into the historical and environmental context of the bacanora industry. This included a discussion of conservation efforts in Sonora, focusing on key species in the production process, such as bats and agaves. The session not only aimed to inform the community about the critical relationship between bats and agaves but also provided individuals with practical skills for agave cultivation.

Additionally, the session highlighted the potential to utilize by-products from bacanora production, contributing to a restorative economy in rural communities. The success story of the “Empowerment of Rural Women through the Elaboration of Bacanora By-Products” project in Mátape-Villa Pesqueira, Sonora, was presented as a case study.

The overall objectives of the session were to raise awareness about the conservation of the ecological interaction between agave plants and bats in Sonora’s ecosystems. It was also intended to promote agroecological practices in the bacanora industry, and to foster a sense of cultural belonging within the community.



Photo: Tom Vezo, Minden Pictures



Photos: David Suro





## THE AGAVES ARE IN THE FOREST

Convener(s): Alfredo Leal

**Keywords:** Bats, Agave, Forest, Landscape

**Thesis:** Agaves are found in the forest, and bats are essential to these ecosystems as they provide important services for agave production.

We discussed bats and the need to amplify the information related to their ecosystemic role. In general, much of the information we have about the complex ecological processes involving mammal-plant interactions, particularly in agave pollination, comes from interpreting numerous specific studies.

There is a broader perspective required for understanding the impact of the bacanora boom and other agave distillates within an environmental context.

To effectively ground ideas, methods, and tools to address this need, academic and non-academic efforts need to engage actors involved in agave production so they can share their realities. This collaborative approach will enable a deeper understanding of the biology of the organisms involved, their role in the landscape, and how they can positively influence their particular activities.

Photo: Benjamin T. Wilder



Photo above: Alfredo Leal. Photo below: Bill Hatcher







## CLIMATE CHANGE

Convener(s): César Iván Ojeda Linares

**Keywords:** Agave, Climate change, Cultural shift, Economic development, Reforestation, Agroforestry practices

**Thesis:** Climate change impacts the production systems of various agave species

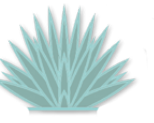
In this session, we explored how climate change impacts the production systems of various agave species. Participants highlighted the potential problems related to climate change, with the most significant concerns being temperature changes. Rising temperatures and the inability of plants to adapt to these drastic changes were emphasized as major issues. Factors such as floods and strong winds may also contribute to the decline in agave system quality.

These changes can be reflected in altered plant phenology and disruptions in interactions with pollinators and soil microbiology. Such disruptions might lead to irreversible changes in mechanisms needed to maintain plant diversity. This could result in reduced quality and quantity of sugars produced by the plants, an increase in pests, and potential risks to the fermentation process, all of which could have economic impacts on producers.

Another issue discussed was the cultural shift, with younger communities showing less interest in participating in the production process due to its demanding nature and perceived lack of economic reliability. To address climate change, it was suggested to avoid monocultures of agave, provide shade with local tree species, prevent the burning of certain parcels, improve public health and social security for workers, and implement reforestation practices.

Educational efforts within local communities and the adoption of agroforestry practices, such as demonstration parcels or rotational agroforestry, were also recommended.

The complex interactions between plants, microorganisms, and humans may be threatened by the new dynamics introduced by climate change. Therefore, integrative actions should be undertaken to address these factors and protect the intricate human-plant-microbe interactions, as no single action will suffice.



Photos: Bill Hatcher







## AGAVE AGROFORESTRY

Convener(s): Randy Young, Michael Hurley, Elvis Soriano

**Keywords:** Agroforestry, Biodiversity, Microbiome functions, Restoration, Agave agroforestry

**Thesis:** Agave agroforestry systems can restore degraded ecosystems and economies.

Agaves are a powerful partner for restoration work in arid regions. Due to the popularity of agave distillates like our regional bacanora, people who might not typically be interested in restoration methods are drawn to projects involving agave planting.

Agaves have low water use, thanks in part to their CAM photosynthesis. Well-designed and implemented agave agroforestry systems can start generating profit for landowners within 1 to 2 years, whereas relying solely on agaves takes 5 to 6 years to become profitable. This quick return on investment is a major selling point of agroforestry systems.

Creating profitable, ecologically beneficial agroforestry systems is critical to avoiding the environmental devastation seen with agave monoculture plantings in central and southern Mexico. A diverse planting system also enhances soil life, biodiversity, and resilience. Additionally, it protects the main crop by providing alternative browsing options for herbivores.

Bacanora producer Dr. Manuel Chacon has experienced minimal loss of planted agaves and attributes this success to agroforestry systems. Using flowers and other pollinator plants within the system attracts predator insects and birds, offering powerful biological pest control. Creating biologically diverse systems of production has great potential to regenerate degraded lands and avoid the clearing of additional areas for agave monoculture production.

Additionally, the interaction of all the components, such as soil, microorganisms, the environment, and the native fauna-flora of an agroforestry system, allows for greater health in agave. These ecological interactions provide greater resilience to biotic and abiotic factors.

Photo above: Bill Hatcher  
Photo below: Benjamin T. Wilder







## ADDRESSING THE CHALLENGES OF FARMERS AND PRODUCERS WITH ECONOMICAL AND ECOLOGICAL SOLUTIONS

Convener(s): Ian Beger

**Keywords:** Agave farming, Bacanora producers, Agave producers, Plant specialist, Economical solutions, Ecological solutions, Bacanora

**Thesis:** We focused on understanding the main challenges faced by agave farmers and spirits producers, and presenting economic and ecological solutions for them.

Often, farmers, producers, educators, and academics operate in silos. Therefore, we are trying to break down these barriers and encourage conversations to address these issues in both economic and ecological ways. Some main challenges and their corresponding solutions presented were:

- **HEAT:** Intercropping, mesquite cover, and using varieties that can withstand heat.
- **INSECT DAMAGE:** Beneficial insect hedgerows, diversity, and sap analysis.
- **TEMPERATURE FLUCTUATIONS:** Intercropping, plant diversity, and using a temperature gun to understand microclimates.
- **WATER:** Ensuring water quality, using swales, and promoting groundwater infiltration.
- **ANIMALS (JAVELINA):** Creating animal corridors, providing alternative water and resources, selective removal, and using living fences like *Agave americana*.
- **PLAGUES:** Promoting diversity and plant health.
- **PLANT SPACING:** This depends on the context.

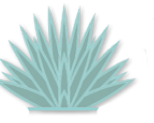


Photo: Bill Hatcher





## FERMENTATION

Convener(s): César Iván Ojeda Linares, Michael Hurley

**Key words:** Fermentation, Fermentation vats, Microbial storage

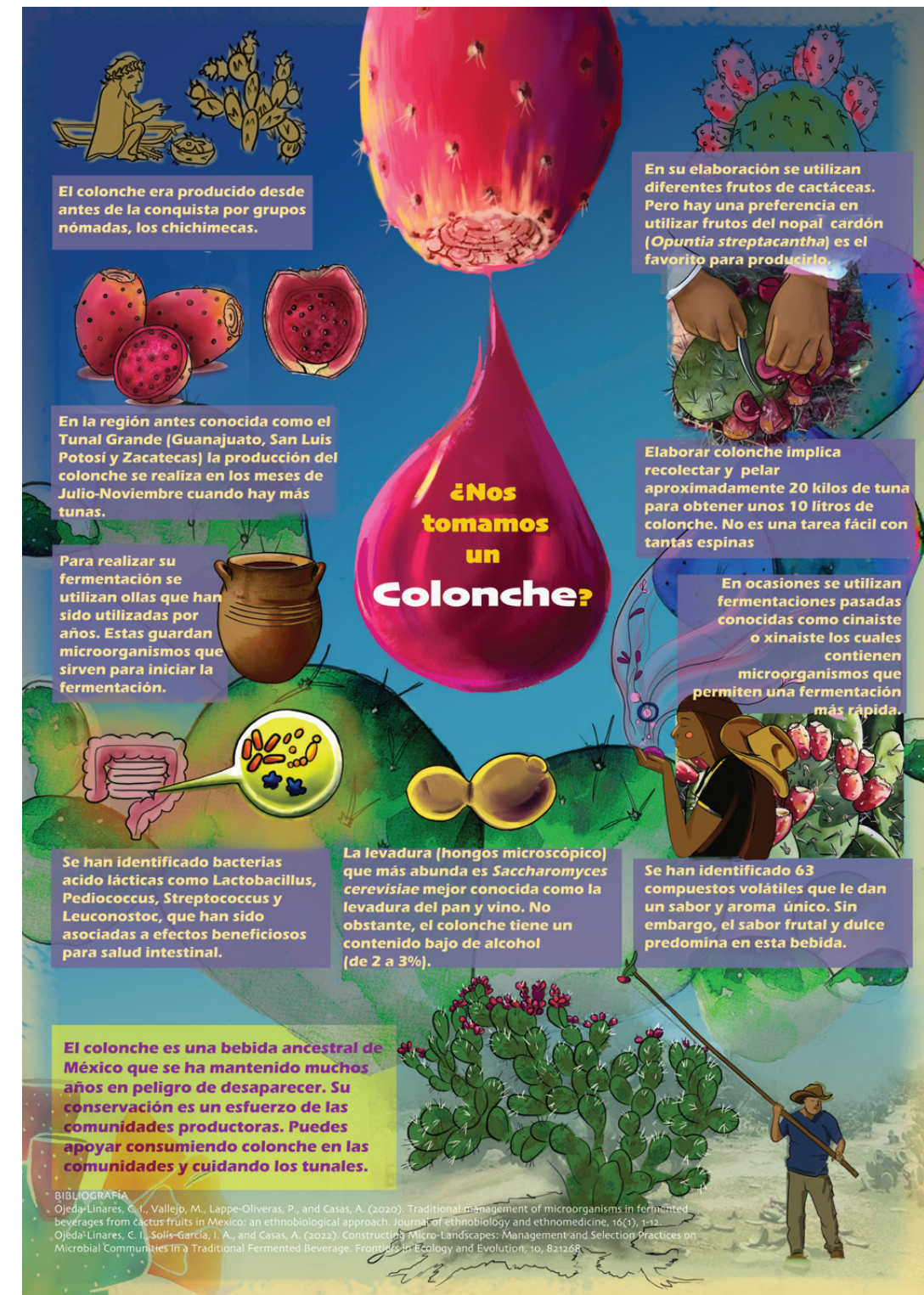
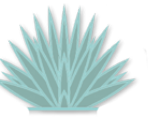
**Thesis:** There is an underlying traditional ecological knowledge (TEK) in microbial management practices in fermented products such as pulque, mezcal, bacanora, and sotol. These practices highlight the importance of maintaining cultural and environmental traditions.

Fermentation involves a variety of practices to promote microbial communities. Specifically, bacanora producers employ different techniques to achieve fermentation. We discussed one of the oldest practices on record: fermentation in “barrancos.” Barrancos is a solid fermentation stage where no water is added; fermentation takes place in a stone and in a mudhole and takes more time. After this stage, fermentation continues in plastic containers with added water for several more days. This technique is particularly interesting because only a few producers continue to utilize it.

We also talked about containers. Containers play an important role in fermentation in various regions, depending on cultural heritage. For example, some producers use wood or clay, but plastic seems to be a practical container for fermenting bacanora, as it is easier to move. Many doubts arose about how to maintain yeast diversity in the fermentation facilities and containers. One consensus idea was the importance of maintaining and cleaning these containers and avoiding their use in case of spoilage. Though, practices such as using the same equipment for fermentation might help maintain yeast communities closer to the facilities.

Furthermore, producers recognized the importance of maintaining corridors of diversity to support pollinators or other vectors, such as the fly “borrachitos,” to keep yeast populations near the fermentation vats. In contrast, tequila producers or standardized bacanora producers emphasized that maintaining standard products requires avoiding production heterogeneity and controlling fermentation. Here, we identified that the fermentation process varies across different regions. There are several practices that producers apply to maintain optimal fermentations and particularly to preserve yeast diversity, which is part of the unseen agrobiodiversity.

Poster designed by: César Iván Ojeda-Linares







## MILLENNARY HISTORICAL USE AND MANAGEMENT OF AGAVE: THE CASE OF THE YUMANO PEOPLE

Convener(s): Marcela Sandoval Velasco, Yinna Almaraz Muñoz

**Keywords:** Agaves, History, Archaeology, Indigenous communities, Yumano people

**Thesis:** Agaves have been significant plants for the people of the Americas for thousands of years. They have been used for a variety of purposes, including food, drink, building materials, ornamentation, and as a source of fibers, among many other uses, some of which still persist today. The Yumano people continue to preserve some of their agave-use traditions.

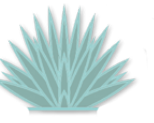
This session was designed as an open conversation to highlight the importance of agaves beyond the production of distilled beverages. It aimed to raise awareness and restore some of the cultural and historical significance that agaves have had and still hold for all of Mexico, the southwestern United States, and specifically for the Sonoran Desert region.

Agaves have been crucial plants for the people of the Americas for more than 10,000 years. They have been used for a wide variety of purposes, including food and drink (as sources of carbohydrates and fibers), building materials (houses and furniture), tools, fibers (for ornaments and clothing), and medicine, among others. While recent appreciation and use of agaves have been limited mainly to the production of distilled beverages, all these traditional uses remain alive in Indigenous communities. The Yumano people continue to preserve some of their agave-use traditions.

The session began with a discussion on the millennia-long history of agave use by humans in Mexican territory. We explored how historical sources, such as multiple pre-Hispanic codices, illustrate with pictorial representations how the agaves were used by Mesoamerican cultures for various purposes. In addition to historical sources documenting these uses and their cultural significance, the archaeological record in Mexico contains physical evidence of these different uses, as agave remains in various forms (cords, textiles, basketry, clothing, food, etc.) have been recovered from diverse archaeological sites throughout the country. The archaeological evidence of the varied uses of agaves clearly speaks to the importance these plants have held for thousands of years.

Photo above: James Cornett. Photo below: Deborah Small

These uses are not merely relics of the past; Indigenous communities in Mexico continue to keep multiple agave-use traditions alive, producing crafts, clothing, soap, and building materials from these versatile plants.







## WORKER CONDITIONS IN THE AGAVE INDUSTRY AND SOCIAL JUSTICE

Convener(s): Francisco Jaime Martínez Reyes

**Keywords:** Bacanora, Working conditions, Family production, Social security, Support from authorities, Fair market, Informed consumer

**Thesis:** As in many industries, the last thing on people's minds is the workers' conditions, even though it should be a priority.

Most of the sessions at the Agave Summit focused on production, distribution, ecology, and other aspects of the agave industry, without mentioning or considering one of the primary components of any industry: the workers.

The participants came from various backgrounds: producers, distributors, students, and researchers from diverse fields. We decided to focus on the bacanora industry.

Production continues to be carried out within family units, often without pay, social security, and on a temporary basis. The discussion centered on how to change this so that the development of the growing bacanora market goes hand-in-hand with the development of its workers, aiming to avoid the pitfalls seen in similar agave industries, such as mezcal or tequila. Some key points from the conversation were:

- Creating a network for monitoring working conditions with support from relevant authorities, which would include:
  - Legal advice
  - Publicizing the worker regularization process
  - Easing the conditions or requirements
- Informing and educating consumers about the origin of the product
- Promoting a fair market that allows for the inclusion of small and medium-sized producers
- Establishing a network or guild of producers to enable mutual support and sharing of experiences

Photos: Bill Hatcher







## BACANORA'S DENOMINATION OF ORIGIN: HOW TO PROTECT IT?

Convener(s): Sarahí Armenta Reyes, Sara Lowden

**Keywords:** Bacanora, Sierra, Denomination of origin, Biocultural heritage

**Thesis:** Bacanora's denomination of origin must be maintained to protect artisanal production and the biocultural heritage of La Sierra in Sonora.

The session focused on the threat of expanding the Bacanora Denomination of Origin (DO) beyond the 35 municipalities in La Sierra, amid political pressure from regions outside the DO (e.g., Hermosillo, Navojoa, Caborca, Obregón). Participants emphasized the importance of safeguarding bacanora's social, ecological, historical, and cultural heritage.

Advocates for expanding the DO argue that there is insufficient raw material (*Agave angustifolia*) within the current boundaries. However, many producers affirmed that there is ample land and potential for sustainable planting and harvesting, though resources to facilitate this are lacking. Producers require better access to raw materials and infrastructure (e.g., seeds, greenhouses, land, government loans). Another key issue is water—agave cultivation requires significantly less water than cattle ranching and offers ecological benefits. With cattle ranching increasingly unsustainable, communities need alternative economic opportunities, especially given the environmental damage from ranching, severe water shortages, and the impacts of climate change.

The session reached a consensus on the importance of preserving bacanora's historical, geographical, and traditional roots in La Sierra—roots that have endured through prohibition when production was clandestine, and continue to this day.

Many participants agreed that the Bacanora Regulatory Council is under-resourced. This highly political body sees new leadership with each gubernatorial election, often resulting in a director who may lack industry knowledge and advocacy skills for producers.

The Bacanora DO has the potential to sustain local communities and the environment, provided there is sufficient political support. Maintaining high-quality, sustainable, artisanal production and enforcing effective regulation are essential to protecting both the DO and the communities in La Sierra.



Photo: Rancho Tepua

### Key discussion points:

- In 2000, the Mexican government approved the Denomination of Origin, which includes 35 municipalities in La Sierra in the eastern part of the state of Sonora, which is the most economically depressed area in the state.
- Europe, for example, does not extend its DOs geographically.
- Some view the rapid expansion of the Tequila DO as a warning; Bacanora producers prefer to avoid following the path toward industrialization and aim to maintain artisanal production.
- One strategy for the state is to stabilize and support producers in planting agave, but they require financing (e.g., loans) for investment.
- Planting agave on one hectare costs about 120,000 Mexican pesos.





## Needs:

- There is a need for representatives in each municipality to support and formalize the industry, as well as for additional resources to assist informal producers.
- An independent Bacanora Council, separate from the government, like those for tequila and mezcal.
- Ranchers have more resources and land—how can both large and small producers be supported (e.g., through a collective of small producers)?
- The issue of sugar was raised repeatedly —what is the Consejo doing about this? Some producers are adding sugar to increase yields, but there are no regulations in place. Commercial enterprises are also adding sugar, exploiting small producers by purchasing cheaply, mixing the mezcal, and selling it at higher prices.
- A focus on different production phases and community needs within the DO is crucial.
- Producers are aware of the vital relationship between bat pollinators and agaves, but protecting them is difficult when they struggle to meet basic production needs and lack sufficient support or land to safeguard these species.
- While there is discussion around bat-friendly certifications and sustainability measures, the support from NGOs and researchers is insufficient to implement these at scale.
- Who holds the knowledge? How is local, empirical knowledge being utilized, and who benefits? Producers, who know the land best, often feel ignored by both “expert” researchers and NGOs, as well as by the government.
- Educated consumers who support artisanal and environmentally sustainable production.
- A community-produced map that shows production/producers, vinatas, reforestation projects, available land, within the DO to help visualize current activities and future opportunities.

Fotos above: Kendal Blust / KJZZ; Photo below: Rancho Tepua







## BIOPIRACY

Convener(s): Diana Carolina Pinzón

**Keywords:** Biopiracy, Biodiversity, Nagoya Protocol

**Thesis:** The high demand in the market for mezcal and agave distillates has opened a limbo where, in order to adapt to the consequences of climate change, many enthusiastic agave farmers outside of Mexico are beginning to remove around 40 species of endemic and microendemic agave, that is traditionally used to make distillates. In the long term, this can generate patent processes that put at risk the right to use these species by the traditional mezcal communities of Mexico. Therefore, a problem of plundering biodiversity and biocultural heritage of Mexico.

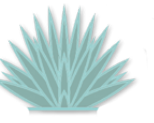
The Biological Diversity Convention established the Nagoya Protocol in 2014. This protocol defines biopiracy as the practice of extracting natural resources outside their distribution area without legal permits and without community consultation processes.

Mexico is recognized as one of the most biodiverse countries in the world, with invaluable cultural wealth. Due to its rich tradition of mezcal production, many agave and mezcal enthusiasts have visited the country over the last decade, increasingly falling in love with the complexity of this distillate and the species used in its preparation.

However, the mezcal boom, as an economic activity generating almost \$1 billion dollars a year, has also attracted many “enthusiasts” looking to profit from this industry.

Farmers and distillers from various parts of the world have promoted the idea that, due to the consequences of climate change, agave species are a viable option that easily adapts to extreme droughts, which are becoming more frequent in their regions. This would not be a bad idea as long as these farmers cultivated their endemic species or used and implemented the management of species that they should have considered invasive for a long time, such as the case of *Agave americana*.

Unfortunately, detailed documentation reveals a different reality. Nearly 40 agave species, mostly endemic and micro-endemic, used for making agave distillates, have been removed from Mexico without legal documentation. In almost all cases, the



residents of the communities where these species are distributed were not consulted, no payments were made for seeds or plants, and no community or legal processes were developed to allow the extraction, movement, and use of these species.

Some enthusiasts, farmers, and distillers have started organizing councils outside of Mexico, thereby ignoring Mexican laws, showing a lack of understanding of socio-ecological sciences, and casting doubt on their genuine interest in the long-term cultivation of these agave species.

Publicly, these actors have stated through various media that they can compete with the Mexican distillate market, thus admitting that the effects of climate change are just an excuse.

It is essential to raise awareness about this situation, communicate the challenges faced by many agave and mezcal producers in Mexico, explore legal avenues to set a precedent for the protection of these species, launch a media campaign to reduce these harmful actions against Mexican agave and mezcal producers, and document the species of agave and their deep connection with the biocultural heritage of the mezcal and agave communities in Mexico.

Fight until dignity becomes custom.

Photo: Bill Hatcher







## OPEN QUESTIONS IN AGAVE RESEARCH

Convener(s): Arely Viridiana Pérez López

**Keywords:** Research, Agave, Uses

**Thesis:** There is a great need and interest in biological studies and research related to agave.

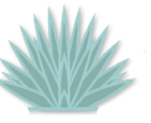
The session aimed to explore the group's knowledge about agaves and their interests in biological studies and research related to these species. Questions were posed regarding topics of interest, and some participants shared their responses. The goal was to understand the concerns and importance of studies on these plants in Mexico and the United States.

During the discussion, the relationship between agaves, humans, and their environment was emphasized. Topics such as traditional and contemporary uses of agaves, their propagation, and physiology were addressed. However, the primary focus was on the impact of human activities on these ecosystems and the challenges they face due to climate change.

The various roles played by agaves in the ecology and culture of the regions where they are found were discussed. The effects of human practices, such as agriculture and urban development, on these plants and their habitats were analyzed. Possible solutions and strategies to mitigate negative impacts and conserve the biodiversity of agaves were also explored.

In summary, the session provided a space to share knowledge, experiences, and concerns about agaves, as well as to reflect on the importance of conserving these ecosystems in the face of current and future challenges.

Conceptual framework with elements and actions discussed during the session, Diana Zazueta with information from Arely Viridiana Pérez López. Photo: Benjamin T. Wilder





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The majority of participants also have profiles at [www.nextgensd.com](http://www.nextgensd.com) where you can learn more about these incredible individuals. Note, some late-registrations may not be captured in this list, for which we apologize.

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# Álamos, Sonora





