SOUTH CENTRAL
CLIMATE ADAPTATION SCIENCE CENTER

WEST TEXAS
STATE VISIT SUMMARY

APRIL 25 - 27, 2023

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ACKNOWLEDGMENTS

Our visit to West Texas was made possible by the individuals and agencies who met with us, especially with the extra efforts of the individuals who coordinated with their teams and hosted us. We are grateful to those from the Rio Grande Joint Venture and the Big Bend National Park who shared their knowledge of key climate challenges they are aware of and to the researchers from Texas Tech University for sharing their ideas in finding solutions.

The South Central Climate Adaptation Science Center (SC CASC) would like to extend a special thank you to a few folks specifically. Dr. John Zak for his extraordinary execution in coordinating and organizing our visit to Texas Tech University, which allowed us to meet with multiple researchers individually, provide a presentation to a group of researchers, and tour a couple of research labs.

Steve Lantz for coordinating a meeting with his team at Big Ben National Park as well as providing a tour of multiple areas of the park, allowing us to have a deeper understanding of some of the climate challenges they are facing.

We are grateful to everyone who took the time to meet with the South Central CASC team.

SUMMARY

A small team of staff members from the South Central CASC conducted a state visit to West Texas from April 24-27, 2023 to meet with researchers from Texas Tech University (TTU) in addition to resource managers from Rio Grande Joint Venture (RGJV) and Big Bend National Park (BBNP). This visit provided the opportunity for the staff to learn about the impacts of climate change experienced in the region, understand climate-related research needs, explore areas of collaboration, and meet new partners. This report provides an overview of climate-related activities, research needs, and summaries from meeting notes.

Texas Tech University

The state visit began at TTU in Lubbock, Texas, on April 25. The purpose was to meet with SC CASC affiliate researchers and other researchers interested in climate-related science and to inform them about the SC CASC funding opportunities. During the meetings, we learned about researcher areas of expertise, current projects, and ideas for future endeavors, including:

- How dust storms impact human health and natural systems
- Zoonotic and other pathogenic agents and wildlife species of south-central Texas
- Distribution of harmful algal blooms
- Spread and impact of the Mexican chicken bug on Golden Eagles
- Westward distribution of the zebra mussels

While at TTU, the team also toured the Natural Sciences Research Laboratory to learn about the center's research and the biological collections. These collections are made available to researchers worldwide to investigate the impacts of various factors, including climate change, on the collected species.

Rio Grande Joint Venture

The SC CASC team had an introductory meeting with staff members from the RGJV in Alpine, Texas, on April 26. During this meeting, the team introduced themselves and explained the services the center can provide, such as climate projections services. .

RGJV staff discussed their need for climate models of evapotranspiration in the grasslands, stream statistics for Texas, and outreach material focused on the importance of trees near rivers and streams.

Big Bend National Park

The state visit concluded with a day trip to the BBNP on April 27. The BBNP informed the SC CASC team of the park's multiple climate science research needs and provided a list of specific projects they would like to address through collaboration with researchers. These projects include climate change vulnerability assessments for the park's water supply and select species, best practices in transforming badlands into grasslands, and the impacts of abandoned livestock water tanks on invasive species. The BBNP also provided a guided tour of specific locations in the park to help contextualize the challenges.

The West Texas State Visit allowed the CASC to learn about the unique climate adaptation challenges experienced in this specific part of the region, better understand managers' climate science needs, and explore collaboration opportunities. Instant connections were made, such as connecting Big Bend National Park personnel with researchers from Texas Tech University.

SC CASC Team

Dr. Mike Langston
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Dr. Cait Rottler
Climate Adaptation Specialist
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Codie Winn
ORISE Fellow
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To connect or collaborate with the identified people or projects in this report, contact Dr. Cait Rottler at (caitlin.m.rottler@ou.edu).

INTRODUCTION

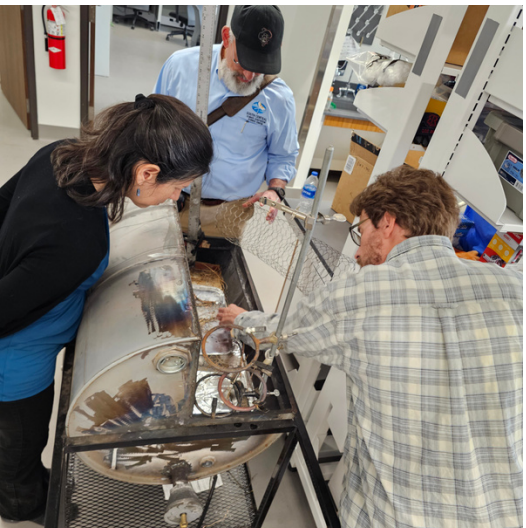
State and site visits provide an opportunity to build and strengthen relations and partnerships with natural and cultural resource managers and affiliated researchers. The CASC staff gain an in-depth understanding of the unique climate adaptation challenges in a specific part of the region, better understand the climate science needs of managers, explore opportunities for collaboration, and share information on climate activities with other interested parties. The information gained from these visits is vital in ensuring that SC CASC-funded research priorities align with the needs of managers throughout the South Central region. Key relationships and partnerships are built and strengthened. This report summarizes notes from the SC CASC's State Visit to West Texas.

TEXAS TECH UNIVERSITY

LUBBOCK, TEXAS

TUESDAY, APRIL 25, 2023

The SC CASC staff had the opportunity to meet with a few TTU researchers, tour research facilities, and provide an informational presentation. Below is a general agenda of the visit, and throughout this section are notes from the multiple meetings.



RESEARCHERS

Dr. Karin Ardon-Dryer
Department of Geosciences

Dr. Emma Roberts
Department of Biological Sciences

Dr. Reynaldo Patiño
USGS Texas Cooperative Fish & Wildlife Research Unit

Dr. Clint Boal
USGS Texas Cooperative Fish & Wildlife Research Unit

LABORATORY TOURS

Natural Sciences Research Laboratory
Lead by Dr. Robert Bradley

ECOHealth Lab Facility
Led by Dr. Natasja van Gestel

PRESENTATION

SC CASC Funding and Research Priorities
Lead by Codie Winn

DR. KARIN ARDON-DRYER

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Dr. Ardon-Dryer studies aerosol-cloud interactions and investigates aerosols' effect on the climate, the environment, and human health. She is also looking into the impacts of dust events. She welcomes interdisciplinary collaboration to address some of her research interests listed below.

RESEARCH INTERESTS

- Dust storm events - how and when they form.
- Interested in the health impact of dust events. After dust events there is an increase in reported diseases. Would like to investigate what the dust is carrying like diseases including zoonotic pathogens.
- Impacts on natural systems such as plants or snow packs. These events shred plants, impact photosynthesis capabilities, decrease lichens survival.

LIMITATIONS

- There are only three measuring systems in West Texas - all without measurements at Particulate Matter 10 (PM10) which is ideal. Sensors at a higher level are needed.
- There needs to be more interest at a higher administration level.

OTHER NOTES

- She has built her own measuring system with the needed sensors. This is just one system though

DR. EMMA ROBERTS

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Dr. Roberts is looking into determining the effects of climate change on zoonotic and pathogenic agents and wildlife species across latitudinal and temporal gradients, as well as different ecosystems in the south-central United States. During the meeting with Emma, the SC CASC team learned about her proposed research project.

RESEARCH PROJECT

Genetic testing of various species (including Big Horn Sheep) of South West Texas through pooled testing which will lower costs and then allow them to see if there is something of importance to investigate further. Pooled testing is to combine samples from multiple species and conduct one test. If the results come back positive for a type of pathogen or disease of interest, then they can spend more time and resources testing each specimen individually and scrutinize the data future.

OTHER NOTES

- She is working in Dr. Robert Bradley's lab.
- They have a lot of mammal tissues in the Natural Sciences Research Laboratory of general populations for Big Horn Sheep and Black Bears to study phenology.
- They would like to do work in the Big Bend/Rio Grande area.
- Many acres of the land are managed by federal and state agencies. Who are they and how to work with them?
- This would probably be a great interest to Big Bend National Park. Could lead to big Horn sheep protection.
- During the meeting the team identified a few people to connect Emma with.

TEXAS COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT

The SC CASC team met with the Texas Cooperative Fish and Wildlife Research Unit staff to discuss their current research projects and future research interests. Drs. Reynaldo Patiño and Clint Boal were available for the meeting. Dr. Jane Rogosch was unavailable, but Patiño provided information on her behalf.

DR. REYNALDO PATIÑO

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Dr. Patino is working to finalize a research project investigating harmful algal bloom distribution. He is working with a team, including other USGS researchers.

They have created concentration maps and gathered original data. They may produce a fact sheet accessible to various communities after publication.

DR. CLINT BOAL

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Dr. Boal is interested in the spread and impact of the Mexican chicken bug, a blood-sucking parasite, which has been detected in the area and affects Golden Eagles' nests and their offspring. He would like to investigate whether climate change has brought on their new presence, and if so, will it increase their presence?
He is also interested in creating a rain simulation irrigation system for Prairie Chickens during drought periods to see if it would increase their chances of survival.

DR. JANE ROGOSCH

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Dr. Rogosch is investigating the increased connected risk of water recreation popularity and habitat sustainability and how that impacts the expansion of zebra mussels westward toward Louisiana, Texas, and New Mexico. A great deal of water quality data have been collected through this project, which might be of use to others.

RIO GRANDE JOINT VENTURE

ALPINE, TEXAS

WEDNESDAY, APRIL 26, 2023

In a park setting, the SC CASC team had a lunch meeting with a few members of the RGJV. Since both organizations are assisting in the planning of the 2024 Rio Grande/Bravo International Forum, the main goal of this meeting was to formally introduce them to the SC CASC and what resources we can provide. We were also able to gather some insight into their climate science needs, though there will be a follow-up meeting to discuss these needs more in-depth.

RGJV STAFF

Rebekah Rylander | Science Coordinator
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Karen Chapman | Coordinator
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Jeff Bennett | Habitat Restoration Hydrologist
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CLIMATE SCIENCE NEEDS

- Interested in climate models for grasslands as well as for evapotransportation.
- They need stream stats for Texas. The data currently is not available or does not exist.
- They have a need for public education and outreach toward the importance of trees around rivers and streams. It has been ingrained into the communities that trees utilize too much water. The exposed water is lost faster and of course, leads to other impacts.

BIG BEND NATIONAL PARK

BIG BEND NATIONAL PARK, TX

THURSDAY, APRIL 27, 2023

The SC CASC team spent a day with a couple of Big Bend National Park researchers to discuss the park's challenges and potential research projects. Most of the day was dedicated to a guided tour of the park to gain a deeper understanding of the park's unique climate patterns and the impact they have on the ecosystem and develop ideas for collaborations to address them.

Read through this next section to learn more about the various research needs of the Big Bend National Park. Via a follow-up email, the staff provided titles and descriptions for the first five projects listed below, and the other projects were identified through discussion while viewing the park.

BBNP STAFF

Steve Lantz | Natural Resource Program Manager, Physical Scientist
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Carolyn Whiting | Botanist
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Bob Krumenaker | Superintendent
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Herbert Young | Chief of Science & Resource Management
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RESEARCH NEEDS IDENDITIED BY THE STAFF

CLIMATE CHANGE INTERPRETATION

Opportunities exist to use the interpretation platform of the NPS to tell the story of climate change incorporating messaging developed or in development by the CASC.

EFFECTS OF CLIMATE CHANGE ON SKY ISLAND

Big Bend would be an excellent place to study the effects of climate change on sky islands. The Chisos Mountains vegetation communities are relicts of colder climates. Does this make the Chisos ecosystems the most vulnerable to climate change within the Park? If so, they do not have many management tools to improve the resiliency of those ecosystems, but we can control the fire regime and (hypothetically) the use of spring water.

STOCK TANK EFFECTS

The park would like studies on how the water tanks and berms (raised soil barriers created to direct water flow) affect the ecosystem and support invasive species. There are more than fifty earthen and metal tanks around the park, remnants from the ranchers before the park acquired the land. A better understanding of how they affect the ecosystem would support a strong project proposal for restoration funding. Below are potential items to investigate around the tanks and berms.

- Look into how much support the tanks are for invasive animal species (feral hogs, elk), as captured by wildlife cameras around the park.
- Investigate how the berm modifications to the topography affect the vegetation communities and erosion rates.
- Identify and collect the location of all of the berms have been located or location data collected.

VULNERABILITY ASSESSMENT FOR WATER SUPPLIES

The park needs a more robust long-range plan to secure water supplies. A parkwide climate change vulnerability assessment for all existing water systems and the possible alternatives is essential to do this. There are four separate water supply systems in the four main developed areas of the park, Panther Junctions, Castolon, Chisos Basin, and Rio Grande Village, which are relied on by increasing numbers of visitors. Each supply system has different recharge areas that face unique climate vulnerabilities.

THE WATER SUPPLY ISSUES

- Panther Junction Water Supply - the Chisos Mountains supports multiple wells and drainage areas at its base. This area has been subject to low productivity during periods of drought.
- Castolon Water Supply - The Rio Grande alluvium supports two shallow wells, and the river level affects the productivity and quality of the water.
- The Chisos Basin Water System - utilizes Oak Spring, a natural spring, at the base of the Chisos Mountains, which has been subject to low productivity during periods of drought.
    - A recent vulnerability assessment for this spring informed necessary upgrades that are now underway to improve system performance with an estimated ~20-year system lifetime.
        - Upgrades could be costly compared to possible alternatives.
- The Rio Grande Water Supply - dependent on a deep well that has proven to be dependable, but the backup system is a spring water complex that supports the Big Bend Gambusia, the last remaining population of federally endangered fish.

ALTERNATES TO INVESTIGATE

- The Lone Mountain Well, located near Panther Junction, is a high-producing water source currently not utilized by the park. It could produce enough water to exceed the current demand for the Chicos Basin, Rio Grande Village, and Panther Junction.

BADLANDS TO GRASSLANDS

Areas of the park have degraded to the point that they are bare-grounded due to various reasons such as overgrazing and tilling, causing changes to soil pH, water flow changes over the lands, and climate change. The system is now in an alternative stable state. Re-vegetation projects, specifically in the northern part, are of interest. Previous restoration projects done in the past have resulted in some success by hydro mulching with grass seeds and then

spreading a thin layer of woody debris (branches from shrub and tree fuel reduction projects) on top. Though these projects resulted in some success, there is missing or incomplete available data on when and where all the sites occurred or the complete method of the process.

WHAT IS NEEDED

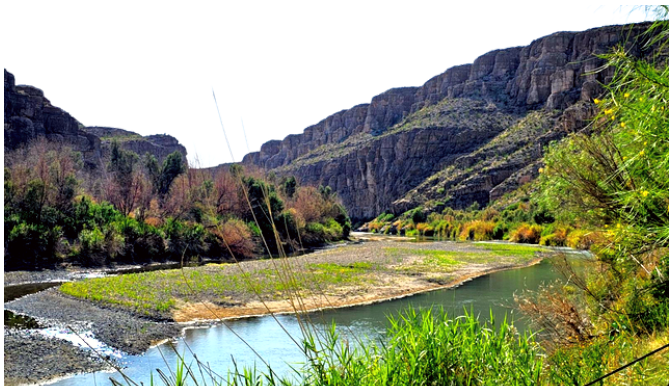
- Collection of lost data through interviews with those who led the previous projects.
- A formal investigation into the kind of vegetation previously present in these areas to create a clear restoration goal.
- Climate change projections.

OTHER CLIMATE RELATED CONCERS

CULTURAL STUCTURES

- They have a few structures that need repair, especially the adobes
  - impacted by strong rain events and micro-bursts of winds that are damaging the roofs
- Currently, there is not a Cultural Resources Specialist, though they are hoping to hire someone soon

UPDATE WILDERNESS AND VULNERABILITY ASSESSMENTS



MUSSELS OF THE RIO GRANDE

Assess critical habitat and river flows compared to climate models concerning three different mussels species in the Rio Grande

MAMMAL GENETIC TESTING

Investigate the genetics of the Big Horn Sheep and the Black Bear to gain a better understanding of the populations.

CUCKOO IMPACT ASSESSMENT

Cuckoos are susceptible to noise pollution. Their habitat, critical for nesting, is impacted by road work, but infrastructure needs updating, which is right through the nesting site.

- They would like to have genetic testing done to see if the populations from the East and the West are related
  - One population seems to be impacted at a higher rate

Texas Tech University (TTU) Contact List				
Name	**Title**	**Organization**	**E-Mail**	**Notes**
Dr. John Zak	Professor, & Associate Dean	Texas Tech University	john.zak@ttu.edu	Coordinated TTU visit for SC CASC Team
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Dr. Karin Ardon-Dryer	Assistant Professor	Texas Tech University	karin.ardon-dryer@ttu.edu	
Dr. Robert Bradley	Professor and Associate Chair	Texas Tech University	robert.bradley@ttu.edu	Provided a tour of the Natural Sci. Research
Dr. Natasja van Gestel	Assistant Professor	Texas Tech University	natasja.van-gestel@ttu.edu	Provided a tour of the EcoHealth Lab
Attendees of the SC CASC presentation at Texas Tech University				
Wenxuan Guo	Assistant Professor	Texas Tech University	wenxuan.guo@ttu.edu	
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Texas Cooperative Fish and Wildlife Research Units Program (Housed at TTU)				
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Dr. Clint Boal	Assistant Unit Leader	USGS	cboal@usgs.gov	
Dr. Jane Rogosch	Assistant Unit Leader	USGS	jrogosch@usgs.gov	Did not meet. Research project captured in

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Rebekah Rylander	Science Coordinator	RGJV	rrylander@abcbirds.org	

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