PRAIRIE ZEPHYR

Newsletter of the Southern Plains Network

September 2023

Welcome!

During my first May in New Mexico we experienced some notably wet weather. This tempted some meteorologists to refer to it as the Maysoon. At the Las Vegas, NM airport weather station, May rains were estimated at approximately 145% of the 1991 to 2020 average. Similarly, the weather station at Sayre, Oklahoma recorded an above average amount of rain in May (approximately 120% of the 1991 to 2020 average). While this was welcome news for most of us, the heat arrived in June and July. This heat has been particularly hard across the Southwest—see graphic on next page—and many parks are setting historical records. A weak monsoon and above average temperatures have now erased the moisture of May. These combined conditions serve as a reminder of how climate, an area's long-term integration of temperature and precipitation patterns, has historically maintained, and will continue to maintain, a powerful hold on grasslands and surface water in the Southern Plains.

Drought has shaped the landscape for at least 2,000 years in the Southern Plains. In fact, climatological data suggest that severe multi-year droughts "of a magnitude at least equal to those of the 1930s and 1950s have occurred with some regularity over the past 400 years" (Woodhouse and Overpeck 1998). Given this information and projections of future climate for the region (see Tercek et al. 2023 in the Science Spotlight), our

understanding of natural resources across the Southern Plains must not look past the influence of climate controls. To that end, SOPN is working to deliver web-based climate summaries (see reporting section below) to characterize recent conditions experienced in individual parks. Climate Analyzer, a web-based data portal, shares near real-time summaries of weather and hydrological data from weather and U.S. Geological Survey (USGS) gaging stations near each park. Finally, we are working with Dr. Mike Tercek and the Climate Change Response Program to develop climate resource briefs for Southern Plains parks.

Andrew Ray, SOPN Program Manager

Woodhouse, C. A., and J. T. Overpeck. 1998. 2000 years of drought variability in the central United States. Bulletin of the American Meteorological Society 79:2693–2714.
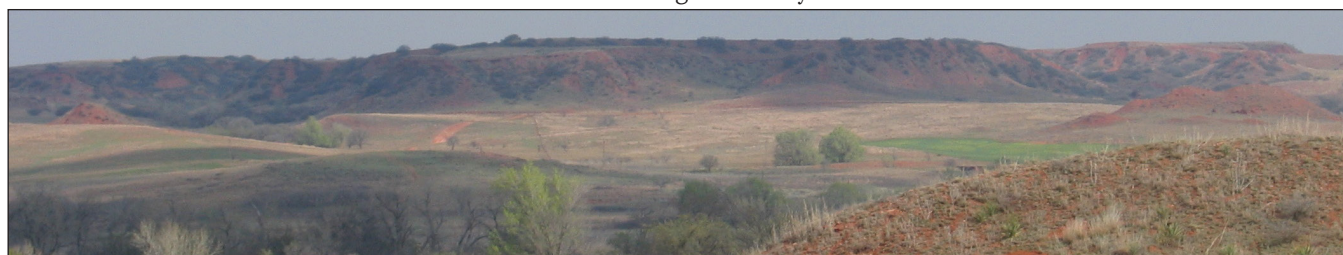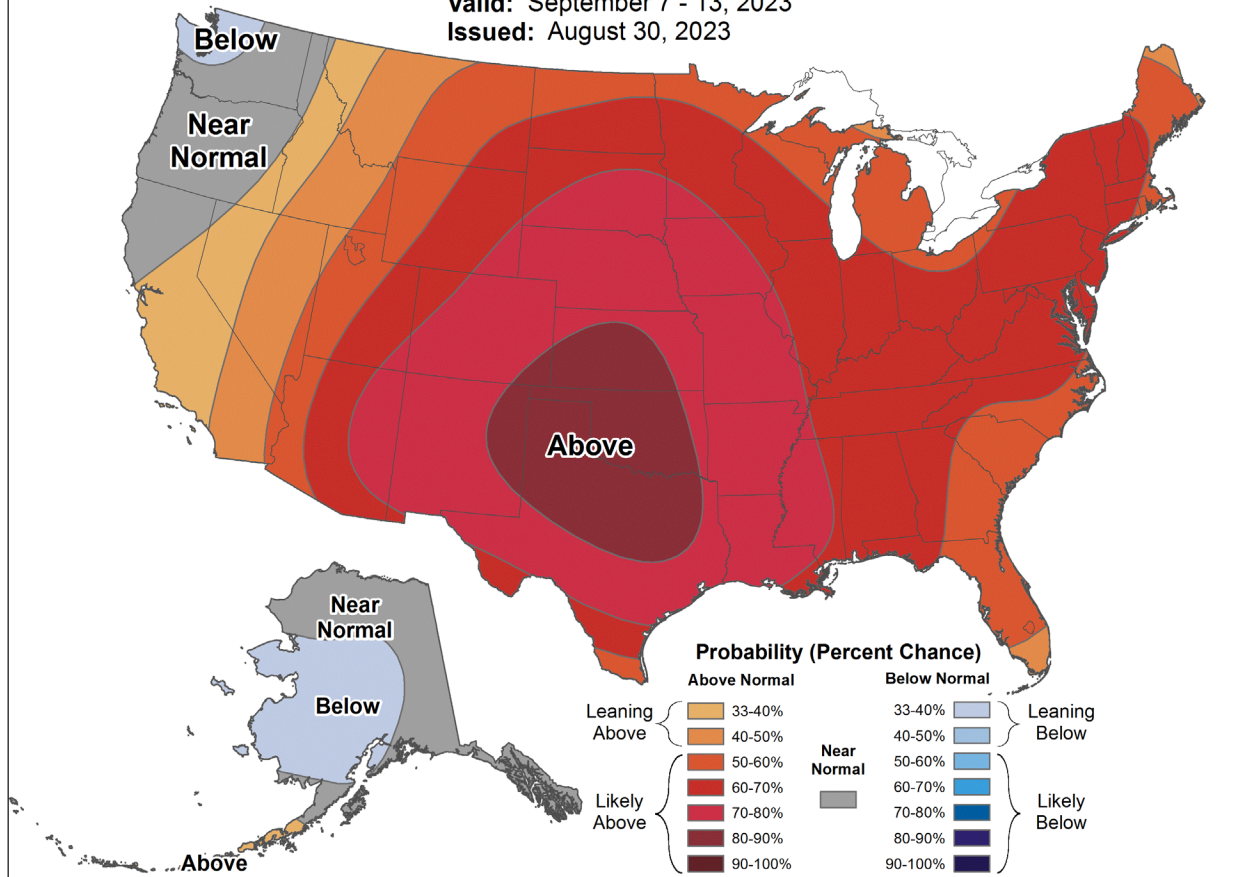
8-14 Day Temperature Outlook

Valid: September 7 - 13, 2023
Issued: August 30, 2023

SOPN field crews experienced above-average temperatures for most of the 2023 field season. In fact, global temperatures during the period from June through August 2023 surpassed previous records. This graphic shows the 8- to 14-day forecast and a strong probability of continued above-average temperatures for much of the Southern Plains. Source: Climate Prediction Center, 8 to 14 Day Outlooks (https://www.cpc.ncep.noaa.gov/products/predictions/814day/).

STAFF UPDATES

Andrew Ray – Program Manager

I grew up in the Midwest and attended Purdue University for my undergraduate degree. From there, I traveled to the Upper Peninsula of Michigan for graduate school, and for my graduate work I studied the plant and vertebrate communities that colonized beaver ponds. Next I moved to southeast Idaho to pursue a PhD evaluating the ability of constructed wetlands to treat irrigation return flows on the Snake River Plain. I've held positions with state, tribal, and federal natural resource agencies and was introduced to the National Park Service through my work at the Crater Lake National Park's Science and Learning Center. Since 2011, I worked with the NPS's Greater Yellowstone Inventory & Monitoring Network, and I've been with the Inventory and Monitoring Division ever since. My family and I are enjoying our time in northern New Mexico, and I'm excited to get to know the parks and park staff across the Southern Plains.

Scientists in Parks (SIPs)

The NPS SIP program places interns with parks and programs to assist with resource management activities. SOPN shares some SIP positions with the other Southwest Network Collaboration (SWNC) networks. SIPs work on SOPN monitoring crews and assist with the network's GIS and data management needs.

Carson Barry—In June 2023, Carson wrapped up a year-long SIP ecological assistant position with SOPN/CHDN (Chihuahuan Desert Network). She was duty stationed in Santa Fe, NM, but traveled all over the Southwest to explore and assist with ecological monitoring. Carson grew up in Ashland, Oregon and completed a Bachelor of Science (BS) in Environmental Science at Pitzer College in Claremont, California.

Carson worked previously at the California Botanical Garden as a Field Research and Restoration Intern, at Green Cedar Farm, and Sanctuary One animal refuge. Carson joined our team with an interest in exploring the Southwest; understanding desert plants, soils, and ecological communities; and the societal implications of conservation work. Carson has now added a big interest in grassland communities and how to avoid biting insects. While Carson has completed her internship, she is staying in northern New Mexico.

Adam Pingatore—Adam joined SOPN, CHDN and the greater SWNC as a SIP ecology assistant in July 2022 and has completed his assignment. He was based out of Las Cruces, New Mexico and assisted SOPN and CHDN field crews, as well as processed acoustic data collected at Fort Davis National Historic Site (FODA) using BirdNet-Analyzer.

Adam received his BS in Ecology from the University of California, Los Angeles in 2022. His interests include botany, birding, and the Red Hot Chili Peppers (both the music and the food).

Elora Ormand—Elora joined SWNC (SOPN, SODN [Sonoran Desert Network], and CHDN) as a SIP ecology assistant in November 2022. She is excited to help collect and manage data for the long-term ecological monitoring of SWNC parks. Elora previously worked as a wildlife technician for the U.S. Forest Service in Oregon. While there, she used bioacoustic recorders to survey spotted owls, live trapping to sample small mammal populations, and surveyed stream habitat for fish.

Elora graduated from Oregon State University in 2020 with an honors scholar BS in Zoology, with a minor in Fisheries and Wildlife. Elora enjoys traveling to new places, hiking, backpacking, camping, kayaking, and skiing.

Megan Tomerlin—Megan has been working as a SIP ecology assistant with SWNC since January 2023. She loves desert plants and is enjoying fieldwork with our team in national parks across the Southwest. In addition to spending time in the field, Megan has been working on data analysis and visualization projects. Megan earned a BS in Environmental Science from Loyola University Chicago in 2019. She collected native seeds for the Bureau of Land Management in 2019, and led riparian vegetation monitoring crews for the U.S. Forest Service from 2020–2023. Megan loves swimming and spending time outside.

Shelly Valdovinos—SOPN is excited to welcome Shelly as an ecology assistant through the SIP program this fall. This summer, Shelly has been conducting rare plant surveys in Rocky Mountain National Park. Stay tuned to learn more about Shelly.

Volunteers

Owen Brown, Stanford CareerEd Fellow—Owen worked as a volunteer intern with SOPN and SODN during the summer of 2023. He is originally from Paradise, California, and will be a junior in the fall studying Earth Systems at Stanford University. He began the summer with a
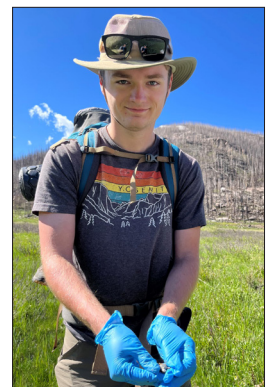
USGS crew in Rocky Mountain National Park doing visual encounter surveys for the boreal toad. He was next stationed for a month at the Desert Research Learning Center in Tucson working on eDNA surveys at Gila Cliff Dwellings National Monument and water quality monitoring at several different parks. His academic and professional interests include terrestrial ecosystems, herpetology, climate change, and environmental policy. In his free time, he enjoys swimming, hiking, and reading.

The Stanford CareerEd Fellows program provides funding for Stanford undergraduates who are participating in qualifying, unpaid internships during the summer quarter. The purpose of the program is to bridge the gap between classroom learning and real-world experiences, while exploring different organizations, learning new skills, and making professional connections.
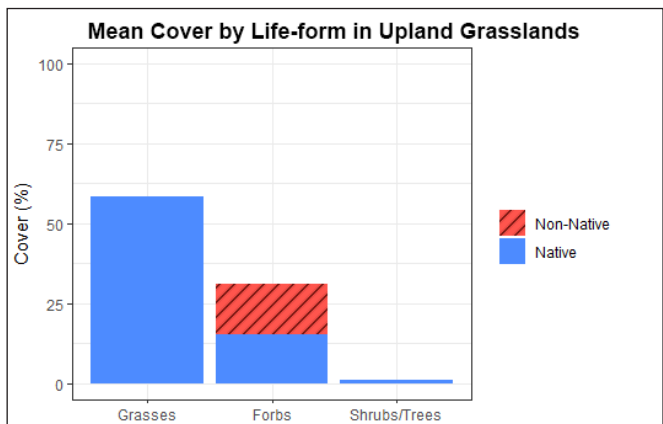
VITAL SIGNS UPDATES

Grasslands

SOPN will conduct vegetation monitoring at each of our network parks this year (see table below). So far, it has been a successful season. We have established some new long-term plots at a few of our parks and plan to add a few more next year. We are also looking at expanding the size of our plots and the type of data we collect to better characterize the vegetation and detect trends.

Example graphic showing the amount (% cover) of native vs non-native cover for grasses, forbs (wildflowers), and shrubs.

2023 Grasslands and exotic plant monitoring schedule and work.

Dates	Park Unit / Location	Grassland Plots	Exotic Plant Work
5/15 to 5/19	Las Cruces (orientation)	Training plots	NA
5/24 to 5/31; 9/3 to 9/6	LAMR	9; 4*	Panel 1
6/7 to 6/14	WABA	9	Panel 3
6/21 to 6/28; 7/10 to 7/12	CHIC	6	Panel 1
7/5 to 7/9	FOLS	7	Panel 3
7/19 to 7/26	SAND	10	Panel 3
8/2 to 8/10	BEOL	12	Grid Point Survey
8/16 to 8/19	CAVO	4	Panel 1
8/20 to 8/23	FOUN	4	Panel 1
8/30 to 9/2	PECO	5	Panel 1
9/13 to 9/16	LYJO	1	NA

* LAMR bottomland plots

With the help of our SIP interns this past winter, we began developing web reports. We are putting together short, informative summaries of data collected at our long-term grassland monitoring plots. These summaries will depict the species composition of the different grassland communities monitored at each park, the amount of natives vs non-natives, and include information on climate patterns (i.e., precipitation and drought indices) for the data time period. An example of the type of graphic we are including is shown above.

Exotics

We have continued to update and adapt our exotic plant monitoring within the Southern Plains. We monitored roads and trails at several of our parks this year, but inclement weather and short staffing prevented us from monitoring every park. In the coming years, we plan to switch our focus to early detection of invasive plants new to the region, or to new populations of high priority species within a given park. We would also like to incorporate different areas into our monitoring, namely waterways and lake shores. We hope to continue pro-

ducing short reports to alert parks to any infestations for which we recommend treatment.

As a reminder, our full catalog of exotic plant data can be found on the SWNC Exotics Dashboard, hosted on the NPS ArcGIS Portal. The dashboard is a user-friendly place to download spatial files showing exact locations and sizes of infestations mapped by SOPN crews as far back as 2009. If you are not already a member of the SWNC Exotics Dashboard group, contact SOPN to be added.

Water

Water quantity and quality monitoring activities will continue this summer and fall on the Arkansas River at Bent's Old Fort National Historic Site and the Pecos River at Pecos National Historical Park. Activities were delayed in the spring, but we will be in both parks in early August.

The SWNC (SOPN, CHDN, and SODN) will be hosting a Water Summit in December of 2023 (tentatively in Santa Fe) to convene a group of water scientists from across the SWNC and larger Intermountain Region. The goal of the meeting is to have conversations about the future of the water monitoring work at SWNC and opportunities to move water quality and quantity information out to parks and the public more quickly. We are also exploring ways to summarize existing USGS gaging station data (look for a link to this report in the fall). We will provide an update on the meeting in the near future.

SWNC will be welcoming a 52-week SIP hydrology assistant this fall. Stay tuned to learn more about the internship.
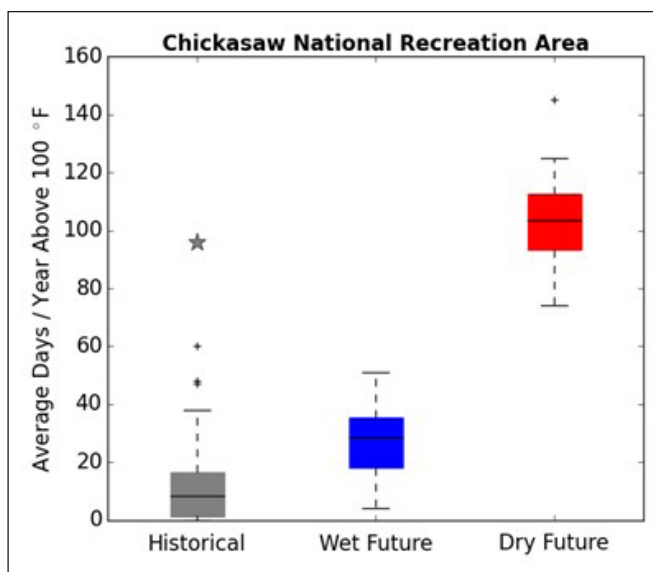
Climate

SOPN continues to support The Climate Analyzer, a website that supports custom graphics and tables from weather station data, satellite imagery, and other climate data sources. The data are updated daily and publicly accessible at http://www.climateanalyzer.us/. Dr. Mike Tercek presented details about The Climate Analyzer at SOPN's March 2023 Board of Directors meeting, and we would be happy to invite him to participate in future Technical Committee or Board meetings.

SWNC hydrologist Kara Raymond has been producing Climate and Groundwater reports for SOPN parks (see reporting section below). Graphics are produced using The Climate Analyzer and provide summaries of

previous years' conditions. For Water Year 2022, Kara has completed short web reports for seven SOPN parks. We would be excited to hear feedback on these reports and learn how we can best deliver climate information to you.

Finally, SWNC is working with Dr. Tercek to produce Climate Assessment Briefs for SWNC parks. The first set of briefs includes projections for Chickasaw National Recreation Area (SOPN), Big Bend National Park (CHDN), and Organ Pipe Cactus National Monument (SODN). Climate projections are not meant to predict the temperature or rainfall on a particular day or year in the future, but they generally capture future long-term (decades to centuries) trends in the average annual and seasonal patterns that we might expect. There are over 40 climate projections available (output from 20 different global climate models and two CO_2 scenarios), and the briefs will help synthesize these futures for individual parks. At Chickasaw, all of the futures call for some amount of future warming (e.g., see graphic below), but there is disagreement on whether precipitation will increase or decrease. As future warming interacts with changes in precipitation, it will change the amount of water that is available for plants and animals found in the park. Our goal will be to work with Dr. Tercek and individual park units to produce similar assessments for all SOPN parks in coming years.

Graphic from the Climate Assessment Brief for Chickasaw NRA showing the annual number of days per year with temperatures above 100 degrees Fahrenheit. The gray star marks the highest historical count (96 days in 2011). This historical count is similar to the Dry Future median (103 days, horizontal line in red boxplot). The Wet Future median (28 days) is double the historical median (14 days).

REPORTING UPDATES

2022 Exotic Plant Reports

- Owen, M. and Others. 2023. Bent's Old Fort National Historic Site Exotic Plants Monitoring Summary—2022. National Park Service, Southern Plains Inventory and Monitoring Network, Pecos, New Mexico.

- Owen, M. and Others. 2023. Capulin Volcano National Monument Exotic Plants Monitoring Summary—2022.

- Owen, M. and Others. 2023. Chickasaw National Recreation Area Exotic Plants Monitoring Summary—2021.

- Owen, M. and Others. 2023. Chickasaw National Recreation Area Exotic Plants Monitoring Summary—2022.

- Owen, M. and Others. 2023. Fort Union National Monument Exotic Plants Monitoring Summary—2022.

- Owen, M. and P. Valentine-Darby. 2023. Lake Meredith National Recreation Area Exotic Plants Monitoring Summary—2022.

- Owen, M. and P. Valentine-Darby. 2023. Lyndon B. Johnson National Historical Park Exotic Plants Monitoring Summary—2022.

- Owen, M. and Others. 2023. Pecos National Historical Park Exotic Plants Monitoring Summary—2022.

- Owen, M. and Others. 2022. Sand Creek Massacre National Historic Site Exotic Plants Monitoring Summary—2022.

- Owen, M. and Others. 2022. Washita Battlefield National Historic Site Exotic Plants Monitoring Summary—2022.

Which parks should expect to see an FY23 exotic plants report? All of them. For 2023 we will summarize the past several years of monitoring along our preexisting set of transects, before we begin to survey new areas. In the following year, we will begin monitoring our parks on a rotation and focus on early detection of invasive species.

Climate and Groundwater Reports

WY21

- Water Year 2021: Climate and Weather Monitoring at Bent's Old Fort National Historic Site.

- Water Year 2021: Climate and Water Monitoring at Pecos National Historical Park.

WY22

- Water Year 2022: Climate and Weather Monitoring at Bent's Old Fort National Historic Site.

- Water Year 2022: Climate and Water Monitoring at Capulin Volcano National Monument—Available soon.

- Water Year 2022: Climate and Water Monitoring at Chickasaw National Recreation Area.

- Water Year 2022: Climate and Weather Monitoring at Fort Larned National Historic Site.

- Water Year 2022: Climate and Water Monitoring at Fort Union National Monument—Available soon.

- Water Year 2022: Climate and Water Monitoring at Pecos National Historical Park.

- Water Year 2022: Climate and Weather Monitoring at Washita Battlefield National Historic Site—Available soon.

Chickasaw NRA Climate Assessment

Climate Resource Brief for Chickasaw National Recreation Area (by Mike Tercek)—The draft is complete and will be finalized soon.

Long-term Flow Summary

Pecos River long-term flow summary—Look for a link to the report this fall.

Pecos National Historical Park Vegetation Management Plan

This report is nearly complete.

The Science

Tercek, M. T., J. E. Gross, and D. P. Thoma. 2023. Robust projections and consequences of an expanding bimodal growing season in the western United States. Ecosphere 14:e4530.
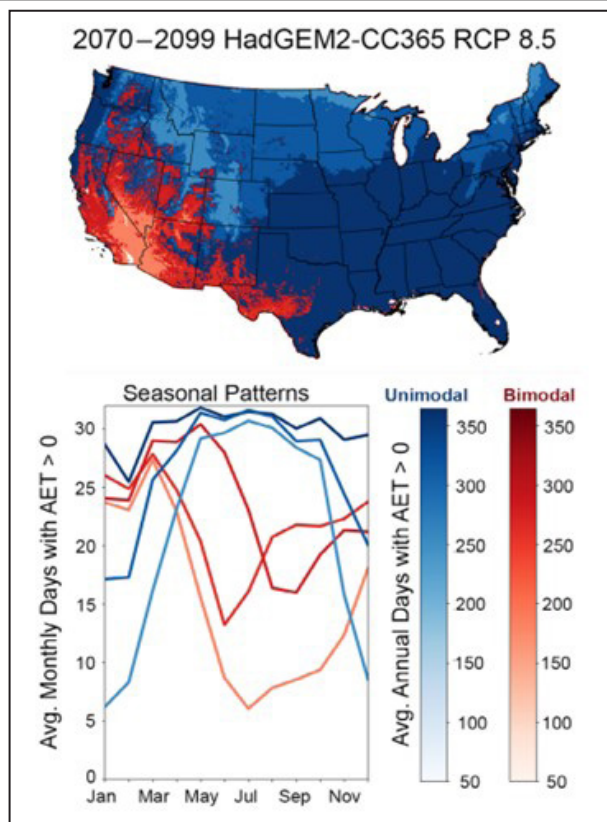
Abstract

Plant growth is restricted to times of the year when actual evapotranspiration (AET) is greater than zero because AET requires both the presence of water in the soil and temperatures warm enough to allow transpiration. Locations where water rather than temperature limits plant growth, such as semi-arid areas of the southwestern United States, often have a bimodal growing season, such that distinct AET (growth) peaks occur in the spring and late summer, with a period of very limited plant growth occurring during the intervening summer months. We hypothesized that future warming will increase the zone containing bimodal growth seasons, likely resulting in significant changes in the competitive relationships between plant species that differ in their tolerance of a bimodal seasonality. This will likely alter plant distributions.

Using climate projections to drive a water balance model, we mapped geographic regions within the continental United States projected to experience bimodal growing seasons in the future. The area containing bimodal seasonality increased under all 13 general circulation models (GCMs) and two representative concentration pathways (RCPs) examined. This robust result (seen in all alternative futures examined) nevertheless showed considerable variability depending on the GCM examined. The bimodal zone was projected to increase 13%–212% (49,000–792,000 km^2) by the late 21st century relative to 1981–2010 estimates. Climate futures that contained the greatest temperature increases and greatest precipitation decreases projected the greatest expansion in the bimodal zone. For plant species that depend on relatively long, consistent time periods that are favorable to growth each year, the projected shift in seasonality may be an acute disturbance that could cause widespread mortality. These changes will likely have cascading ecological and management implications, including changes in the dominant plant life history strategies that occur in affected areas.

Why it Matters

This paper highlights how water-limited regions of the southwestern United States that produce distinct plant communities tolerant of warm-season (July to September) water stress are expanding. The authors note that this future expansion of the regions characterized by a distinct bimodal growing season bracketing a warm-season pause could be triggered by either warming temperatures, changes in precipitation regimes, or both. Regardless of the trigger, the drivers of warm-season water limitation are expected to intensify through the next century in areas across the Southwest—encompassing most of the Sonoran and Chihuahuan deserts and including western portions of the Southern Plains (see above figure from Tercek et al. 2023).

For land management agencies, the expanding presence of a prolonged warm-season pause in plant growth in areas where it had not occurred in the past may signal an increased risk of exotic plant invasion and wildfire. Preparing for and anticipating the manifestations to grasslands (e.g., shifts toward annual grasses at the cost of perennial grasses and forbs), woodlands (e.g., recent and widespread pinyon-juniper mortality across the Southwest), and riparian areas will assist in considering strategies to resist, accept, or direct future change. There will be more about the RAD framework in the next newsletter.

Robust projections and consequences of an expanding bimodal growing season in the western United States. Source: Tercek et al. (2023 [Ecosphere, Volume 14, Issue 5]).

SOPN Parks

Alibates Flint Quarries National Monument
Bent's Old Fort National Historic Site
Capulin Volcano National Monument
Chickasaw National Recreation Area
Fort Larned National Historic Site
Fort Union National Monument
Lake Meredith National Recreation Area
Lyndon B. Johnson National Historical Park
Pecos National Historical Park
Sand Creek Massacre National Historic Site
Washita Battlefield National Historic Site

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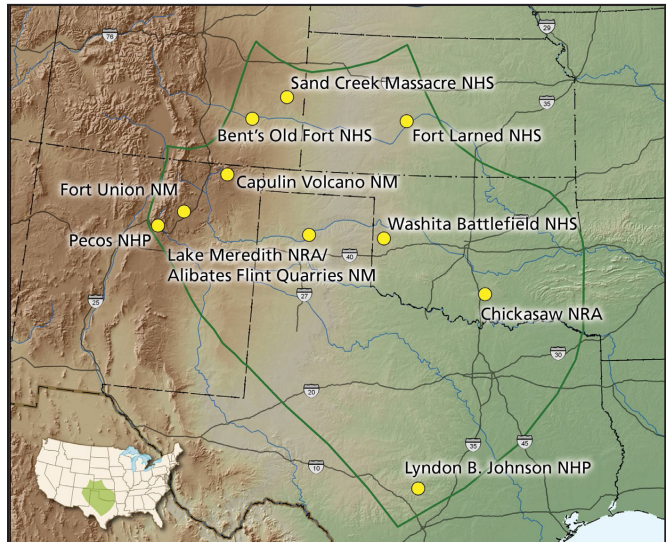patricia_valentine-darby@partner.nps.gov

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