Inventory and Monitoring

National Park Service
U.S. Department of the Interior

SCPN NEWS

Newsletter of the Southern Colorado Plateau Network

Changing leaves herald fall at Lockett Meadow in the San Francisco Peaks north of Flagstaff, Arizona. Creative Common photo by dagnyg at https://www.flickr.com/photos/dagnygromer/15507209402/in/album-72157648642923722.

FY 2018: A time of change for the Southern Colorado Plateau Network

The leaves aren't the only thing changing in Flagstaff this fall. At SCPN we're experiencing a number of changes as well.

Stacy Stumpf started his new role as **Aquatic Ecologist** in October. Stacy has worked in the Water Resources Program at SCPN for more than 10 years, first as a Water Resources Crew Leader in 2007, and, beginning in 2012, as a biological technician. In his new position, Stacy will manage the Aquatic Macroinvertebrate and Water Quality Monitoring Programs.

Megan Swan began serving as the Project Manager for the Integrated Upland Monitoring Project in October. She has been the SCPN botanist working with the IUM project since 2007. With the first decade of sampling now complete, she looks forward to streamlining the data reporting process and beginning work on trend analysis and reporting.

Lisa Thomas retired at the end of October. Dusty Perkins has stepped into the role of acting program manager for SCPN for the next year. He will continue to manage NCPN as well.

Over the last 14 years, it's been a privilege for me to work with you to build the SCPN from the ground up. Delving into past research, discussing current resource management issues, and working with ecologists from around the region has taught me so much about the diversity and functioning of these systems. I have great confidence in the SCPN staff and know that the resource record they are building will be relevant to park managers for decades to come. It will also be used by researchers to build a more predictive understanding of ecological change.

For me, the beauty and rich cultural history of our Southern Colorado Plateau parks amaze me still. I've grown attached to landscapes, to particular streams and mountains, and to seasonal milestones like the arrival of the monsoon, and so Matt and I plan to visit often. We will also spend much of the year in Newport, Oregon, where we can absorb a little more moisture and explore the Northwest's forests.

Thank you all for your support and encouragement over the years!

---Lisa Thomas

We will miss you, Lisa!

Photo by Tyler Nordgren

Starry nights over Chaco Culture National Historic Park

SCPN's video, ***Starry Nights over Chaco Culture NHP*** premiered at the park's Second Annual Astronomy Festival in September, and was shown multiple times throughout the 3-day festival. It was especially enjoyed by visitors and CHCU staff, who got to see in the video some of their former colleagues who have since moved on.

Here is one viewer's comment :

You have made a truly outstanding video about the night skies over Chaco, and you have done an excellent job of describing the importance of the night sky in a short 11 minute video. Congratulations!

Robert L. Gent, Lt Col, USAF, Ret.
Past President, International Dark-Sky Association

The video was created by SCPN writer/editor Jean Palumbo and NAU videographer Dan Boone, and funded by Chaco Culture NHP, SCPN, and the NPS Natural Sounds and NIght Skies Division.

View the video at:
http://go.nps.gov/9n11pm

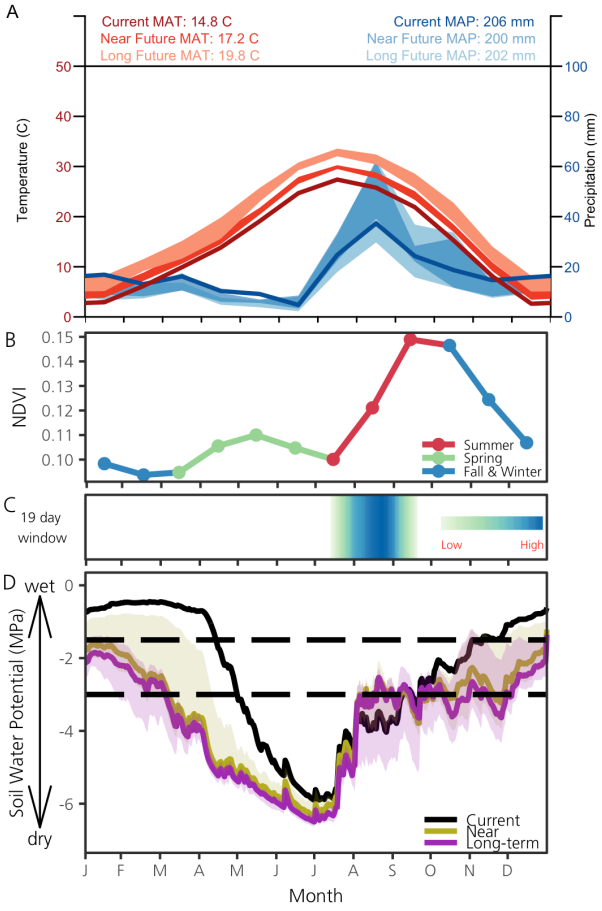
Identifying the ecosystems most prone to climate change

How will changing soil water availability, as a result of climate change, impact vegetation dynamics on the southern Colorado Plateau? To answer this question, SCPN's Jodi Norris teamed up with Caitlin Andrews and Dr. John Bradford of the U.S. Geological Survey (USGS) to model soil water availability under projected climate conditions in 9 SCPN parks where long-term vegetation monitoring is underway.

USGS scientists used the range of variation in historical climate data to assess the relative impact of projected future climate on soil water availability at different soil depths and during different parts of the growing season. They integrated plot specific monitoring data, including soil texture and depth, vegetation species and functional group cover, with daily and projected weather data using the SoilWat2 model (https://github.com/Burke-Lauenroth-Lab/SOILWAT2).

The resulting system-specific projections showed that while each ecosystem had different seasonal and historic patterns of soil water availability, all SCPN upland ecosystems were predicted to experience a shift to earlier drying of soils in the spring, leading to an extended period of water stress during the later spring and summer.

These projections will enable us to develop hypotheses about how the dominant species of plant communities will respond to changing soil water conditions. They will help park managers identify the ecosystems in their parks that are most sensitive to climate change, and develop strategies that will improve long-term ecosystem resistance and resilience.



Panel A. Average seasonal patterns of climate at Wupatki NM. Climate diagram showing mean monthly temperature (°C) and precipitation (mm) in dark red and blue lines, respectively, in the current period (1970-2010). Shaded red and blue areas indicate the range of potential values in the near (darker area; 2020-2059) and long-term (lighter area; 2060-2099) future periods. Mean annual temperature (MAT) and mean annual precipitation (MAP) are derived from the mean monthly values. Panel B. Monthly mean for normalized difference vegetation index (NDVI, 2001-2014). Panel C. Seasonal periods when soil moisture is related to fluctuations in vegetation productivity, depicted by correlations between NDVI and soil water potential (SWP), 2001–2014. Colors indicate the sum of significant correlations ($p < 0.1$) that overlap with each day of the year based upon window length (19 days identified as the most significant interval length). Darker blue indicates periods of greater cumulative correlation between NDVI and SWP. Panel D. Average daily SWP for the current period 1970–2010; black), near future (2020–2059; yellow), and long-term future (2060– 2099; purple). For future time-periods, thick lines represent the median value among climate models, while shaded areas represent the range of values across different climate models.

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The Southern Colorado Plateau Network (SCPN) is one of 32 National Park Service I&M Networks across the country established to collect, organize, analyze, and synthesize natural resource data and information about national parks, and provide the results in a variety of useful formats. SCPN comprises 19 national park units located throughout the diverse landscapes of northern Arizona, northwestern New Mexico, southwestern Colorado and southern Utah.

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Using R to generate data summaries

The SCPN data management team has completed validation and restructuring of the integrated upland field data and is now in the final stages of transitioning this data to a new SQL Server database. This new structure standardizes the data from 2007-2016, and has already proven to be very useful. Typically, data requests have required weeks to months to complete, but since the transition, we have been able to quickly satisfy data requests from SCPN parks (2 from MEVE), and from collaborators at USGS, the University of Arizona, NAU (3), and NRCA.

We have also started to standardize our data request deliverables to include information on the metadata, where the data came from, the steps taken to summarize the data for the data request, metadata for each field, and a standardized data disclaimer and citation.

We are working hard to finalize a script for producing automated annual data summaries for our Integrated Upland Vegetation and Soils Monitoring project. This will make it easy to generate information specific to a park or a year, or groups of parks and years. They will contain standard information about each of the ecosites we sampled in a given year, maps of the plots sampled, and summary figures and tables. When the scripts are complete, we will be able to generate information for all plots sampled at an ecosite for every year sampled with the push of a button. If we find issues with our data, or want to add new or different plots or tables, we can make the corrections or add the code to generate the plots or tables and regenerate all of the information for all ecosites for every year again in a few hours.

Studying unique plant communities

The Colorado Plateau is a land of great diversity. A wide range of elevation, a topography dissected by canyons and escarpments, precipitation and temperature that vary widely, and human habitation over the past 10,000 years have all conspired to create a mosaic of vegetation types. Within this mosaic are small patches of unique plant communities.

Unique plant communities often harbor rare species, have high species richness, and contribute to regional biodiversity. As the Colorado Plateau is expected to experience higher temperatures and less precipitation in the future, these small, isolated, unique plant communities will be at a higher risk of disappearing. Because they have not been well documented, the need to learn more about these special places has become more urgent.

Jesse Mike, a former SCPN field crew member studied seven unique plant communities within SCPN parks for his master's thesis at Northern Arizona University (NAU). He compared them to surrounding dominant communities using a modified SCPN sampling design, existing SCPN monitoring data, and available LiDAR data.

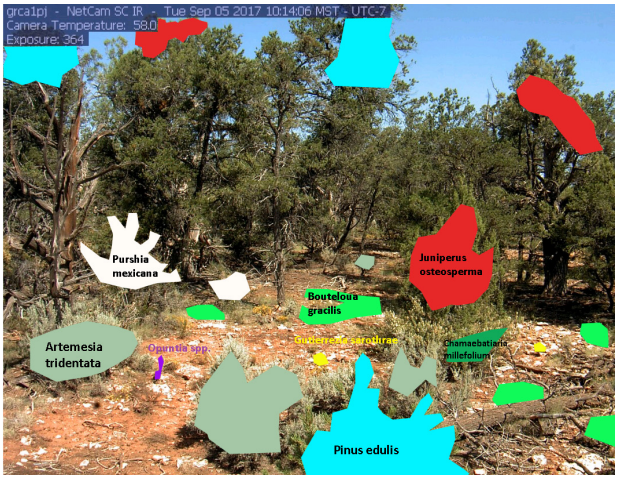
Mike successfully defended his thesis in April 2017. He recently began work on a Navajo Nation plant internship at NAU. We wish him the best of luck!

Aspen/wax currant woodland, a unique plant community found in El Morro NM. NPS photo.

Phenocam installed at GRCA

SCPN has been processing satellite phenology data for the ecosystems that we monitor in network parks. According to Jodi Norris, "...the best link we could have between the ground-based plot data and the satellite data would be a permanently mounted ground-based phenology camera (phenocam) so that we can tell when individual plant species are greening and senescing."

Serendipitously, a phenocam practically fell into her lap when USGS had a spare camera available this past summer. Norris installed the camera near one of SCPN's pinyon-juniper plots in Grand Canyon NP and hooked it up to the nationwide PhenoCam* project. Phenology curves for targets within the photo are processed, the photo and phenology curves are archived, and the data are made available online. Together with satellite data, the information we get from a phenocam will help us to flesh out what is happening in an ecosystem between monitoring visits.



Within the phenocam's field of view, botanist Megan Swan identified species areas of interest for 7 species that also occur in SCPN upland plots.

*Support for the PhenoCam project comes from NSF's Macrosystems Biology program (awards EF-1065029 and EF-1702697), DOE's Regional and Global Climate Modeling program (award DE-SC0016011), and the US Geological Survey (grant numbers G10AP00129 and G16AC00224).

Recent publications

In 2017, SCPN published the following reports, which can be found on the SCPN website, or on the NPS Integrated Resource Management Applications Portal (IRMA).

Protocols

Thoma, D., J. Norris, and P. Lauck. 2017. Satellite-based vegetation condition and phenology, and snow cover extent monitoring protocol for the Northern and Southern Colorado Plateau Networks. Natural Resource Report NPS/SCPN/NRR—2017/1533. National Park Service, Fort Collins, Colorado. Available on IRMA at https://irma.nps.gov/DataStore/Reference/Profile/2246068.

Aquatic Macroinvertebrate Monitoring

Stumpf, S. E. 2017. Aquatic macroinvertebrate and physical habitat monitoring for Capulin Creek and Rito de los Frijoles in Bandelier National Monument: 2015 summary report. Natural Resource Data Series. NPS/SCPN/NRDS—2017/1109. National Park Service. Fort Collins, Colorado. Available on IRMA at https://irma.nps.gov/DataStore/DownloadFile/581144 .

Stumpf, S. E. 2017. Aquatic macroinvertebrate and physical habitat monitoring for Hermit, Garden, and Bright Angel Creeks in Grand Canyon National Park: 2015 summary report. Natural Resource Data Series. NPS/SCPN/NRDS—2017/1110. National Park Service. Fort Collins, Colorado. Available on IRMA at: https://irma.nps.gov/DataStore/Reference/Profile/2230718.

Stumpf, S. E. 2017. Aquatic macroinvertebrate and physical habitat monitoring for the Mancos River in Mesa Verde National Park: 2015 summary report. Natural Resource Data Series. NPS/SCPN/NRDS—2017/1111. National Park Service. Fort Collins, Colorado Available on IRMA at https://irma.nps.gov/DataStore/DownloadFile/581153 .

Water Quality Monitoring

Dyer, M., S. A. Monroe, and S. E. Stumpf. 2017. Water quality monitoring for Rito de los Frijoles and Capulin Creek in Bandelier National Monument: 2014 Summary report. Natural Resource Data Series NPS/SCPN/ NRDS—2017/XXXX. National Park Service, Fort Collins, Colorado. *Submitted to the NRDS series and available from SCPN upon request from jean_palumbo@nps.gov.*

Dyer, M. 2017. Water quality monitoring for the Chinle Wash and Tsaile Creek in Canyon de Chelly National Monument: 2014 Summary report. Natural Resource Data Series NPS/MEVE/NRDS—2017/1131. National Park Service, Fort Collins, Colorado. Available on IRMA at https://irma.nps.gov/DataStore/Reference/Profile/2246139.

Dyer, M., S. A. Monroe, and S. E. Stumpf. 2017. Water quality monitoring for the Escalante River and Coyote Gulch in Glen Canyon National Recreation Area: 2014 Summary report. Natural Resource Data Series NPS/ SCPN/NRDS—2017/XXXX. National Park Service, Fort Collins, Colorado. *Submitted to the NRDS series and available from SCPN upon request from jean_palumbo@nps.gov.*

Dyer, M. and S. E. Stumpf. 2017. Water quality monitoring for Bright Angel, Garden, Pipe, and Hermit Creeks in Grand Canyon National Park: 2014 Summary report. Natural Resource Data Series NPS/SCPN/NRDS— 2017/XXXX. National Park Service, Fort Collins, Colorado. *Submitted to the NRDS series and available from SCPN upon request from jean_palumbo@nps.gov.*

Dyer, M. and S. Stumpf. 2017. Water quality monitoring for the Mancos River in Mesa Verde National Park: 2014 Summary report. Natural Resource Data Series NPS/MEVE/NRDS—2017/1132. National Park Service, Fort Collins, Colorado. Available on IRMA at https://irma.nps.gov/DataStore/Reference/Profile/2246158.