



## Southwest Biological Science Center Monthly Update

As a unit of the U.S. Geological Survey (USGS), the mission of the Southwest Biological Science Center (SBSC) is to provide quality scientific information needed to conserve and manage natural and biological resources, with an emphasis on the species and ecosystems of the southwestern United States. The SBSC has two research branches: *Terrestrial Dryland Ecology* (TDE) and *River Ecosystem Science* (RES, which includes the Grand Canyon Monitoring and Research Center (GCMRC)). Both branches conduct research on the biology, ecology, and processes of the Southwest. SBSC has two field stations in Arizona (Flagstaff and Tucson) and one in Moab, Utah. You can find the SBSC online at: <https://usgs.gov/centers/sbsc>.

### WELCOME

Below are recent products and activities coming from the SBSC, and **SBSC personnel have an asterisk after their names**. If you would like more information about the SBSC or with anything in this month's update contact Todd Wojtowicz ([twojtowicz@usgs.gov](mailto:twojtowicz@usgs.gov)).

### IMAGE OF THE MONTH



Double rainbow over the San Francisco Peaks during this past monsoon season.  
(Photo credit: Ken Sheehan, USGS)

## OUTREACH

### Media, Broadcasts, and Films

#### Find us on Twitter

Look for us on Twitter (<https://twitter.com/usgsaz>). We post photos depicting field work, restoration approaches, arthropods, wildlife, flowers, and beautiful natural areas. Additionally, we provide links to our website and highlight some of our recent science.

#### Climate, wildfire, erosion, sediment, and watersheds

NAU News, a news outlet for Northern Arizona University, published an online story about the remote sensing research of NAU's Teki Sankey.

The story also mentioned a recently published paper that Teki Sankey co-authored with SBSC's Joel Sankey\* and Erich Mueller\* and other USGS, Forest Service, and university scientist about the effects of climate, wildfire, and erosion on sediment in western watersheds. NAU's story can be found here:

<http://news.nau.edu/snowmelt-remote-sensing-technologies/>. The paper on watershed sediment can be found here: <http://onlinelibrary.wiley.com/doi/10.1002/2017GL073979/abstract>.



Rangeland in Arizona.  
(Photo Credit: Molly McCormick, USGS)

#### Long-term restoration trends

NAU News published a story titled, "Wildfire and invasive species driving increased size, costs of public land restoration efforts". The piece focused on a recently published paper about the long-term restoration trends in the Southwest. SBSC scientists Stella Copeland\* (lead author and Northern Arizona University post-doctoral scholar), John Bradford\*, and Seth Munson\* are co-authors on the paper. Stella and Seth were quoted in the piece, which can be found here: <http://news.nau.edu/land-restoration-efforts/>. The study can be found here: <http://onlinelibrary.wiley.com/doi/10.1111/rec.12574/full>.

#### Biological soil crusts and dust

Jayne Belnap\* was featured in a slideshow that was part a story about a new amendment (Minute 323) to the water treaty between the U.S. and Mexico. The photos and text focus on the importance of biological soil crusts on the Colorado Plateau. The story with the embedded slideshow was published by AZ Central and can be found here: <http://www.azcentral.com/story/opinion/editorial/2017/09/27/mexico-water-deal-minute-323-pay-off-arizona/710712001/>.



Grasses and well-developed biological soil crusts (dark patches of moss, lichen, and cyanobacteria between the grasses) in Utah. (Photo Credit: Hilda Smith, USGS)

## Public, Partner, and Youth Outreach Activities

### **Moab, Utah Festival of Science**

SBSC's Sasha Reed\* and Erika Geiger\* helped lead Moab's second annual Festival of Science from September 28th through October 2nd. The festival was again a huge success with numerous events, such as hands on STEMonstrations for kids of all ages, BLM-led tours of the Mill Canyon dinosaur tracks, a USFS talk on the La Sal Mountains, DOE tours of the uranium mine tailings remediation site, and a keynote talk by SBSC's Jayne Belnap\*.

### **Flagstaff, Arizona Festival of Science**

The SBSC was part of an open house on the final day of Flagstaff Festival of Science. Kirsten Ironside\*, Molly McCormick\*, Dave Ward\*, and Todd Wojtowicz\* assisted in the open house, which had displays about mountain lion research, native seed and plant restoration, and native fish of the Colorado River. AZ Water Science Center and Astrogeology Science Center also participated in the open house.

### **Fish show and tell for high school students**

David Ward\* held a fish show and tell and talked about the effects of dams on fish populations for approximately 30 high school students and 6 adults near the Little Colorado River on October 6. The students were from High Tech High, located in San Diego, CA. The school focuses on hands-on teaching.

## SCIENCE

### Published Papers, Reports, Data Releases, etc.

Bernhardt, E.S., Heffernan, J.B., Grimm, N.B., Stanley, E.H., Harvey, J.W., Arroita, M., Appling, A.P., Cohen, M.J., McDowell, W.H., Hall, R.O., Jr., Read, J.S., Roberts, B.J., Stets, E.G., and Yackulic, C.B.\*, 2017, **The metabolic regimes of flowing waters**: *Limnology and Oceanography*, <http://dx.doi.org/10.1002/lno.10726>.

Bradford, J.B.\*, Schlaepfer, D.R., Lauenroth, W.K., Yackulic, C.B.\*, Duniway, M.\*, Hall, S., Jia, G., Jamiyansharav, K., Munson, S.M.\*, Wilson, S.D., and Tietjen, B., 2017, **Future soil moisture and temperature extremes imply expanding suitability for rainfed agriculture in temperate drylands**: *Scientific Reports*, <https://www.nature.com/articles/s41598-017-13165-x>.

East, A.E., Jenkins, K.J., Happe, P.J., Bountry, J.A., Beechie, T.J., Mastin, M.C., Sankey, J.B.\*, and Randle, T.J., 2017, **Channel-planform evolution in four rivers of Olympic National Park, Washington, USA: the roles of physical drivers and trophic cascades**: *Earth Surface Processes and Landforms*, v. 7, p. 1011-1032, <http://onlinelibrary.wiley.com/doi/10.1002/esp.4048/abstract>.

Feng, X., Uriarte, M., González, G., Reed, S.\*, Thompson, J., Zimmerman, J.K., and Murphy, L., 2017, **Improving predictions of tropical forest response to climate change through integration of field studies and ecosystem modeling**: *Global Change Biology*, <http://onlinelibrary.wiley.com/doi/10.1111/gcb.13863/full>.

Griffiths, R.E.\*, and Topping, D.J.\*, 2017, **Importance of measuring discharge and sediment transport in lesser tributaries when closing sediment budgets**: *Geomorphology*, v. 296, p. 59-73, <https://doi.org/10.1016/j.geomorph.2017.08.037>.

Lovich, J.E.\*, Averill-Murray, R.C., Agha, M., Ennen, J.R., and Austin, M., 2017, **Variation in annual clutch phenology of Sonoran desert tortoises (*Gopherus morafkai*) in central Arizona:** *Herpetologica*, <http://www.hljournals.org/doi/abs/10.1655/HERPETOLOGICA-D-17-00007.1?code=herl-site>.

Lovich, J.E.\*, Thomas, M., Ironside, K.\*, Yackulic, C.\*, and Puffer, S.R.\*, 2017. **Spatial distribution of estuarine diamond-backed terrapins (*Malaclemys terrapin*) and risk analysis from commercial blue crab (*Callinectes sapidus*) trapping at the Savannah Coastal Refuges Complex, USA:** Cooperator Report. Cooperative Agreement Number G15AC00057 between the U.S. Geological Survey and Davidson College and Cooperative Agreement Award Number F14AC01211 from U.S. Fish and Wildlife Service to Davidson College. 24 pp.

Palmquist, E.C.\*, 2017, **Riparian vegetation and environmental variables, Colorado River, 2014—Data:** U.S. Geological Survey data release, <https://doi.org/10.5066/F7V986X3>.

Palmquist, E.C.\*, Ralston, B.E., Merritt, D.M., and Shafroth, P.B., 2017, **Landscape-scale processes influence riparian plant composition along a regulated river:** *Journal of Arid Environments*, <http://www.sciencedirect.com/science/article/pii/S0140196317301830#>.

Shanafield, M., Jurado, H.G., Burgueño, J.E.R., Hernández, J.R., Jarchow, C.J.\*, and Nagler, P.L.\*, 2017, **Short-term and long-term evapotranspiration rates at ecological restoration sites along a large river receiving rare flow events:** *Hydrological Processes*, <http://onlinelibrary.wiley.com/doi/10.1002/hyp.11359/full>.

Thomas, K.A.\*, Jarchow, C.J.\*, and Crawford, J.A., 2017, **Survival of the endangered Pima pineapple cactus: does clearing before prescribed fire alter survival postfire?:** *The Southwest Naturalist*, v: 3, p., 200-206, <http://www.bioone.org/doi/full/10.1894/0038-4909-62.3.200>.

Zappalorti, R.T., Tutterow, A.M., Pittman, S.E., and Lovich, J.E.\*, 2017, **Hatching success and predation of bog turtle (*Glyptemys muhlenbergii*) eggs in New Jersey and Pennsylvania:** *Chelonian Conservation and Biology*, <http://www.chelonianjournals.org/doi/abs/10.2744/CCB-1237.1?code=chrf-site>.

### **Presentations, Posters, Lectures, Workshops, and Panels**

Lovich, J.E.\*, 2017, **Going the distance: endurance and serendipity in long-term studies** [presentation]: The Wildlife Society Symposium.

Sankey, J.\*, 2017, **Climate, wildfire and erosion ensemble foretell more sediment in western USA watersheds** [presentation]: Pacific Northwest Drought & Climate Outlook Webinar Series.

Sigafus, B.\*, Muths, E., and Hossack, B., 2017, **Research on amphibian diseases under the Amphibian Research and Monitoring Initiative** [lecture]: University of Arizona.

Wojtowicz, T.\*, 2017, **From the Grand Canyon to dust and drought: the science of the Southwest Biological Science Center** [presentation]: Museum of Northern Arizona University, Flagstaff Festival of Science.

Yackulic, C.B.\*, Yard, M.\*, Deemer, B.\*, Dibble, K.\*, Kennedy, T.\*, Korman, J., Dzul, M.\*, Dodrill, M.\*, Voichick, N.\*, Muelhauer, J.\*, and Hall, B., 2017, **Drivers of fish population dynamics in Grand Canyon – the current, and potential future, roles of interspecific interactions, temperature, and phosphorous** [presentation]: Northern Arizona University.

## OTHER NOTABLES

### Trip to the Netherlands

Pamela Nagler\* spent several weeks in the Netherlands in October to present her research about evapotranspiration patterns in riparian systems, meet with faculty and department chairs, and discuss future research projects. She gave several presentations to the Departments of Water and Engineering and Management and Geography at the University of Twente, including talks about the USGS, research on tamarisk and tamarisk beetles, and on the pulse flow of the Colorado River that released water to the Colorado River Delta in Mexico as per the Minute 319 agreement. Additionally, Pamela presented her work on remote optical sensing-based evapotranspiration work from the last 12 years to the faculty of Geo-Information Science and Earth Observation (ITC) in Enschede, Netherlands, and discussed co-chairing next year's Hydrology and Remote Sensing meeting held in Cordoba, Spain from May 8-10, 2018 with Bob Su from University of Twente.

### Interest in the Restoration Assessment & Monitoring Program for the Southwest (RAMPS)

Molly McCormick\*, RAMPS coordinator, gave several presentations in October about the dryland restoration/rehabilitation program lead by SBSC researchers. Molly gave presentations to the Natural Areas Conference, National Park Service Sonoran Desert Network, and Southwest Vegetation Managers Association. Information about RAMPS can be found here: <https://usgs.gov/sbsc/ramps>.



Experimental restoration plots with different treatments to be tested.

(Photo Credit: Molly McCormick, USGS)

### Department of Interior briefing about dryland agriculture

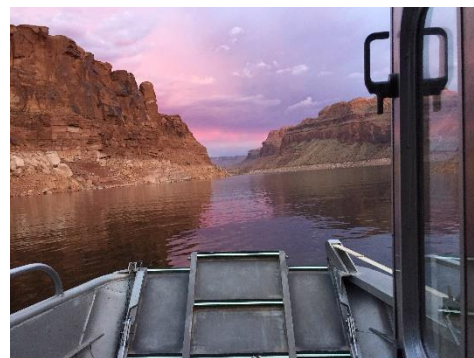
John Bradford\* and Dave Lytle\* provided a briefing for the Department of the Interior on October 16 about the findings of John's recently published paper. John's paper models future distributions of non-irrigated, dryland agricultural regions. The paper is titled, "Future soil moisture and temperature extremes imply expanding suitability for rainfed agriculture in temperate drylands", and can be found here: <https://www.nature.com/articles/s41598-017-13165-x>.

### Installation of a mine rehabilitation field trial

Mike Duniway\* and Rebecca Mann\* worked with partners from the Bureau of Land Management (BLM), Natural Resources Conservation Service, and industry in the field on October 25 and 26 to install a mine rehabilitation field trial on BLM lands north of Grand Canyon National Park. Field trials include comparisons traditional and native seed mixes, different seed application approaches, and application of biological soil crust inoculum.

## Grand Canyon Monitoring and Research Center water-quality program review

SBSC's Grand Canyon Monitoring and Research Center (GCMRC) held a review of its water-quality program in Page, AZ from October 24-26. The purpose of the review was to evaluate the soundness of water-quality approach and methods, suggest improvements to collection protocols and procedures, look for ways to maximize cost/time efficiency, and provide input on future science directions. The goal of the review was to provide the GCMRC with guidance it needs to insure that the science information produced is of the highest quality. GCMRC staff (Mike Moran\*, Bridget Deemer\*, and Charles Yackulic\*), stakeholders, and non-USGS scientists gave technical presentations.



View of Lake Powell from research boat.  
(Photo Credit: Bridget Deemer, USGS)

**For more information about the Southwest Biological Science Center:**

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<https://www.usgs.gov/centers/sbsc>

