



## 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



Cattle corral near Paria River drainage.  
(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.

#### Effects of climate, wildfire, and erosion on sediment in the West

SBSC's Joel Sankey\* (lead author) and Erich Mueller\* are authors on a paper that has been generating some recent news. The paper focuses on the impacts of climate, wildfire, and erosion on sediment in watersheds in the West. The other co-authors are Jason Kreitler (USGS, Western Geographic Science Center), Todd Hawbaker (USGS, Geoscience and Environmental Change Science Center), Jason McVay (Northern Arizona University), Mary Ellen Miller (Michigan Tech Research Institution), Nicole Vaillant (U.S. Department of Agriculture, Forest Service), Scott Lowe (Boise State University), and Temuulen Sankey (Northern Arizona University). Below are links to media activity about this paper. The paper can be found here:

<http://onlinelibrary.wiley.com/doi/10.1002/2017GL073979/abstract>.

- 1) Greenwire: "Worsened by climate, blazes will hurt western water— USGS", <https://www.eenews.net/greenwire/2017/09/08/stories/1060060133>
- 2) NewsDeeply: "The West's wildfires are taking a toll on reservoirs", <https://www.newsdeeply.com/water/articles/2017/09/20/the-west-s-wildfires-are-taking-a-toll-on-reservoirs>
- 3) Arizona Public Media (AZPM): "USGS: Wildfire-caused erosion endangers western watersheds", <https://www.azpm.org/p/home-articles-news/2017/9/11/116544-usgs-wildfire-caused-erosion-endangers-western-watersheds/>
- 4) Southern California Public Radio (KPCC): "More wildfires mean more dirt flowing into your drinking water supply", <https://www.scpr.org/news/2017/09/25/75907/more-wildfires-means-more-dirt-flowing-into-your-d/>



Flowering prickly pear cactus.  
(Photo Credit: Ken Sheehan, USGS)

### Public, Partner, and Youth Outreach Activities

#### Flagstaff Festival of Science

Multiple science centers from the USGS Flagstaff Science Campus participated at Flagstaff's Science in the Park in September, which is part of the Flagstaff Festival of Science. The SBSC had activities for younger folks like a native and nonnative fish show and tell; a giant flathead catfish that was larger than many of the children; arthropod displays; wax cutouts so kids could make their own "bees"; using soil, organic material, and native plant seeds to create seed balls; a demonstration of a hyper-spectrometer; and coloring activities. David Ward\*, Ben Vaage\*, Kim Dibble\*, Moriah Evans\*, Molly McCormick\*, and Laura Durning\* from the SBSC participated.

## SCIENCE

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

Antoninka, A., Bowker, M.A., Chuckran, P., Barger, N.N., Reed, S.\*, and Belnap, J.\*, 2017, **Maximizing establishment and survivorship of field-collected and greenhouse-cultivated biocrusts in a semi-cold desert**: Plant and Soil, <http://dx.doi.org/10.1007/s11104-017-3300-3>.

Copeland, S.M.\*, Munson, S.M.\*, Pilliod, D.S., Welty, J.L., Bradford, J.B.\*, and Butterfield, B.J., 2017, **Long-term trends in restoration and associated land treatments in the southwestern United States**: Restoration Ecology, <http://onlinelibrary.wiley.com/doi/10.1111/rec.12574/epdf>.

Feng, X., Uriarte, M., Gonzalez, 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://dx.doi.org/10.1111/gcb.13863>.

Lü, X.-T., Reed S.\*, Hou, S.-L., Hu, Y.-Y., Wei, H.-W., Lü, F.-M., Cui, Q., and Han, X.-G., 2017, **Temporal variability of foliar nutrients: responses to nitrogen deposition and prescribed fire in a temperate steppe**: Biogeochemistry, v. 133, no. 3, p. 295-305, <http://dx.doi.org/10.1007/s10533-017-0333-x>.

Payn, R.A., and Kennedy, T.\*, 2017, **Metabolic-hydraulic model—Data: U.S. Geological Survey data release**, <https://doi.org/10.5066/F76T0KG2>.

Pitt, J., Kendy, E., Schlatter, K., Hinojosa-Huerta, O., Flessa, K., Shafroth, P.B., Ramírez-Hernández, J., Nagler, P.\*, and Glenn, E.P., 2017, **It takes more than water: restoring the Colorado River Delta**: Ecological Engineering, <http://www.sciencedirect.com/science/article/pii/S0925857417302914#!>.

Sankey, J.B.\*, 2017, **Climate, wildfire, and erosion data, western US: U.S. Geological Survey data release**, <https://doi.org/10.5066/F7BV7DS8>.

Sankey, J.B. \*, Kreitler, J., Hawbaker, T.J., McVay, J.L., Miller, M.E., Mueller, E.R. \*, Vaillant, N.M., Lowe, S.E., and Sankey, T.T., 2017, **Climate, wildfire, and erosion ensemble foretells more sediment in western USA watersheds**: Geophysical Research Letters, <http://onlinelibrary.wiley.com/doi/10.1002/2017GL073979/full>.

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

Andrews, C.A. \*, Bradford, J.B. \*, and Gleason, K.E., 2017, **The influence of density on forest response to soil moisture and its implications for drought** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Baker, B., Ironside, K.E. \*, Holton, B., Hall, D, Boydston, E., Longshore, K., Arundel, T. \*, and Drost, C. \*, 2017, **Mountain lion, *Puma concolor*, response to wildland and prescription fire in the southwestern United States** [poster]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Bair, L.S.\*, Neher, C.J., Rogowski, D.L., Duffield, J.W., Patterson, D.A., and Neher, K., 2017, **Economic value of angling and whitewater boating on the Colorado River: using revealed and stated**

**preference methods to inform adaptive management** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Bair, L.S.\*, Yackulic, C.B.\*, Springborn, M.R., Reimer, M.N., Bond, C.A., and Coggins, L.G., 2017, **Enhancing endangered species population abundance via cost-effective invasive species control strategies: adaptive management in the Grand Canyon** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Balazs, K., Munson, S.M.\*, Kramer, A., and Butterfield, B.J., 2017, **Plant functional traits and local climate variables predict restoration outcome across the Colorado Plateau** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Bedford, A., Sankey, T.T., Sankey, J.B.\*, Durning, L.E.\*, and Ralson, B.E.\*, 2017, **Remote sensing of tamarisk beetle (*Diorhabda carinulata*) impacts along 400 km of the Colorado River in the Grand Canyon, Arizona, USA** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Belnap, J.\*, 2017, **The Southwest Desert project: an overview** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Belnap, J.\*, 2017, **New biocrust research directions: exploring the devilish detail** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Bradford, J.B.\*, Betancourt, J.L., Butterfield, B.J., Munson, S.M.\*, and Wood, T.E., 2017, **Anticipatory natural resource management for a dynamic future** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Breshears, D.D., Adams, H.D., Barron-Gafford, G.A., Bradford, J.B.\*, Cobb, N.S., Garcia, E.S., Field, J.P., Fontaine, J.B., St.J. Hardy, G.E., Law, D.J., Ng, M., Martínez Yrizar, A., Ruthrof, K.X., and Swann, A.L.S., 2017, **Tree mortality and forest die-off: triggers and consequences of ecological drought** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Bunting, E.\*, Munson, S.\*, and Bradford, J.B.\*, 2017, **Understanding spatiotemporal relationships between plant production and water balance across dominant communities and deserts of the southwestern U.S.** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Caster, J.\*, Kasprak, A.\*, and Sankey, J.B.\*, 2017, **Automating the mapping and measurement of geomorphic response to river regulation: a case study in Grand Canyon** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Copeland, S.M.\*, Bradford, J.B.\*, Duniway, M.C.\*, and Schuster, R.M., 2017, **Potential impacts of overlapping high intensity land-use and aridity trends on the Colorado Plateau** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Copeland, S.M.\*, Munson, S.M.\*, Pilliod, D.S., Welty, J.L., Bradford, J.B.\*, and Butterfield, B.J., 2017, **Long-term trends in restoration and associated land treatments in the Southwest United States** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Dibble, K.L.\*, Yackulic, C.B.\*, and Kennedy, T.A.\*, 2017, **Drought may facilitate the recovery of natural temperature regimes downriver of dams across the western US, but such changes may not favor native fish species** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Duniway, M.\*, Hoover, D.\*, Pfennigwerth, A.\*, and Belnap, J.\*, 2017, **Edaphic controls, landscape heterogeneity, and drought in the southwestern US** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Durning, L.E.\*, Sankey, J.B.\*, Bedford, A., and Sankey, T.T., 2017, **Riparian species classification map derived from May 2013 high resolution multi-spectral imagery within Grand Canyon, Arizona** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Dzul, M.\*, Yackulic, C.B.\*, and Korman, J., 2017, **Combining continuous remote detections with traditional sampling to estimate the migratory flux of fish between a main river and a tributary** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Fairley, H.C.\*, and Fairley, A.H., 2017, **Documenting Glen Canyon Dam effects to culturally-valued riparian vegetation using repeat photography** [poster]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Faist, A.M., Antoninka, A.J., Barger, N.N., Belnap, J.\*, Bowker, M.A., Duniway, M.C.\*, Giraldo Silva, A., Garcia Pichel, F., Nelson, C. Reed, S.C.\*, and Velasco Ayuso, S., 2017, **Biological soil crust restoration: understanding community structure and ecosystem function through separate inoculum types and soil stability treatments** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Ferrenberg, S.\*, Tucker, C.L.\*, Howell, A., Reibold, R., and Reed, S.C.\*, 2017, **Disentangling the effects of biocrust community state and climate change on dryland soil fertility** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Howell, A.\*, Tucker, C.\*, Belnap, J.\*, McHugh, T., Weber, B., Gill, R., Darrouzet-Nardi, A., and Reed, S.\*, 2017, **Environmental controls, timing, and rates of CO<sub>2</sub> cycling in biological crusted soils on the Colorado Plateau** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Jarchow, C.J.\*, Nagler, P.\*, and Glenn, E.P., 2017, **Three years after the pulse: response of riparian vegetation to the Minute 319 environmental pulse flow to Mexico** [poster]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Kasprak, A.\*, Buscombe, D., Caster, J.C.\*, East, A.E., Grams, P.E.\*, and Sankey, J.B.\*, 2017, **Linking fluvial and aeolian sediment transport along the Colorado River in Grand Canyon** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.



- Li, J., Wang, G., Ravi, S., and Sankey, J.\*, 2017, **Fire and wind erosion induced redistribution of soil carbon and nitrogen at different microsites in a grassland-shrubland ecotone** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.
- Lupoli, C.A., Sabo, J.L., Kennedy, T.A.\*, Muehlbauer, J.D.\*, and Yackulic, C.B.\*, 2017, **Hydropower and the aquatic-terrestrial dynamic along the Colorado River** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.
- Mann, R.K.\* , Duniway, M.C.\* , Reed, S.C.\* , Ballenger, L., and Miller, M., 2017, **Using connectivity modifiers to restore degraded grasslands in Canyonlands and Arches National Parks** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.
- Massatti, R.\* , 2017, **Informing native plant materials development with molecular techniques: case studies from the Colorado Plateau and Great Basin** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.
- McCormick, M.L.\* , Munson,S.M.\* , Bradford, J.B.\* , Butterfield, B.J., 2017, **Restoration Assessment and Monitoring Program for the Southwest (RAMPS)** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.
- McIntyre, C.L., Archer, S.R., and Belnap, J.\*, 2017, **Grass germination and establishment on biocrusts: the role of awns and seed placement** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.
- Munson, S.M.\* , Bunting, E.L.\* , Bradford, J.B.\* , Gremer, J.R., and R.H. Webb, R.H., 2017, **A long-term perspective on ecological drought from monitoring with permanent plots and remote sensing** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.
- Naftz, D.L., Walton-Day, K., Gardner, W.P., Goble, D., Duniway, M.C.\* , and Bills, D., 2017, **Utilizing radon monitors, time-lapse photography, and on-site meteorological data to understand changes in radon concentration during mining and reclamation, Pinenut uranium mine, AZ** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.
- Nagler, P.\* , Nguyen, U., Bateman, H., Jarchow, C.\* , Glenn, E., Waugh, W., and van Riper III, C.\* , 2017, **Northern tamarisk beetle (*Diorhabda carinulata*) impacts on tamarisk (*Tamarix spp.*) water use** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.
- Nauman, T.W.\* , Duniway, M.C.\* , and Belnap, J.\* , 2017, **Elevated rangeland dust emissions threaten ecosystem services with continued grazing and vehicle disturbance and increasing drought** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.
- Nauman, T.W.\* , Duniway, M.C.\* , Villarreal, M.L., and Poitras, T.B. **A Disturbance Automated Reference Toolset (DART): Assessing ecological recovery from energy development on the Colorado Plateau** [presentation]. 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Palmquist, K.A., Bradford, J.B.\*, Schlaepfer, D.S., and Lauenroth, W.K., 2017, **STEPWAT2: a new tool for exploring the joint influence of climate change and disturbance on dryland plant communities** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Palmquist, E.C.\*, Ralson, B.E.\*, Merritt, D.M., and Shafroth, P.B., 2017, **Landscape-scale processes influence riparian plant composition along a regulated river** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Reed, S.C.\*, Belnap J.\*, Sherry, R., Ostoja, S., and Shafroth, P., 2017, **Riparian soil fertility, stability, and salinity: how beetle-induced saltcedar defoliation and mortality are setting the stage for the riparian community that comes next** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Reed, S.C.\*, Duniway, M.C.\*, Nauman, T.W.\*, Villareal, M., and Belnap, J.\*, 2017, **Air quality issues related to energy development on the Colorado Plateau: assessing impacts and exploring opportunities** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Reed, S.C.\*, Grossiord, C., Collin, S.\*, Ferrenberg, S.\*, Wertin, T., McDowell, N., and Belnap, J.\*, 2017, **Beyond low water supply: how elevated temperatures and altered nutrient cycles contribute to ecological drought to affect dryland structure and function** [presentation]: Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Reed, S.C.\*, Tucker, C.\*, Ferrenberg, S.\*, and Bowker, M.A., 2017, **Using biological soil crusts as restoration substrates for and indicators of soil function following disturbance** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Sankey, J.B.\*, Kasprak, A.\*, and Caster, J.\*, 2017, **Riparian vegetation management for sand and cultural resource conversation in the Grand Canyon** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Sankey, T.T., Sankey, J.B.\*, Bedford, A., Durning, L.\*, and Ralston, B.\*, 2017. **Remote sensing of tamarisk biomass, insect herbivory, and defoliation: lidar and multispectral image fusion in the Grand Canyon, AZ** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Shriver, R.K.\*, Bradford, J.B.\*, Andrews, C.\*, Arkle, R., and Pilliod, D., 2017, **Connecting short-term ecohydrological dynamics to long-term sagebrush recovery following disturbance in the Great Basin** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Solazzo, D., Sankey, T.T., Sankey, J.B.\*, and Munson, S.M.\*, 2017, **Spatially explicit estimates and uncertainties of sand dunes with unmanned aerial vehicles and high resolution satellite imagery on the Paria Plateau, AZ, USA** [presentation] 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Tennant, L., and Ward, D.\*, 2017, **Use of gape and body depth relationships to improve native fish conservation in the upper Verde River** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Thomas, K.A.\* , Stauffer, B.A., Jarchow, C.J.\* , and Arundel, T.R.\* , 2017, **Vulnerable plant communities across the Southwest: a view through two CCSM4 scenarios** [poster]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Thomas, K.A.\* , and Redsteer, M.A., 2017, **Tumbleweeds on the southeastern Colorado Plateau: a check-in on their seasonal dynamic** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Torres-Cruz, T.J., and Reed, S.C.\* , 2017, **Species specific nitrogen fixation in biological soil crust lichens from the Colorado Plateau** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Tucker, C.L.\* , Reed, S.C.\* , Antoninka, A., and Bowker, M., 2017, **Restoration of biological soil crust on the Colorado Plateau in a warming climate** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

van Riper III, C.\* , 2017, **GEOSCAPE: a new technique to ID small bird origins for tracking zoonotic disease and heavy metals on the Colorado Plateau** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

Villarreal, M.L., Waller, E.K., Poitras, T.B., Nauman, T.W.\* , Miller, M.E., and Duniway, M.C.\* , 2017, **Remote sensing time series approaches for assessing vegetation recovery on abandoned oil and gas pads on the Colorado Plateau** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Walton-Day, K.\* , Naftz, D., Bern, C.R., and Duniway, M., 2017, **Variations in soil-trace element concentrations and gamma radiation at breccia pipe uranium mines during the mining-life cycle** [presentation]: 14<sup>th</sup> Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region.

Yackulic, C.B.\* , 2017, **Inferring species interactions to inform endangered species management in the Grand Canyon** [presentation]: 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau and Southwest Region.

## PUBLICATIONS HIGHLIGHTED BY OTHER SCIENTISTS & ORGANIZATIONS

A recently published paper on long-term restoration trends in the Southwest was highlighted in the monthly news publication of the Society for Ecological Restoration (<http://campaign.r20.constantcontact.com/render?m=1101952074862&ca=01bfe4ff-77ab-46ae-9098-354360e368fe>). The paper is authored by Stella Copeland\* (first author, SBSC and Northern Arizona University), Seth Munson\* (SBSC), David Pilliod (USGS, Forest and Rangeland Ecosystem Science Center (FRESC)), Justin Welty (FRESC), John Bradford\* (SBSC), and Brad Butterfield (Northern Arizona University), and can be found here: <http://onlinelibrary.wiley.com/doi/10.1111/rec.12574/full>.



USGS researchers setting up a seeding experiment as part of restoration experiments. (Photo Credit: Seth Munson, USGS)



## OTHER NOTABLES

### Grand Canyon Monitoring and Research Center

- 1) Michael Moran\* from SBSC's Grand Canyon Monitoring and Research Center (GCMRC) hosted a session on rivers of the Southwest at the Biennial Conference of Science & Management on the Colorado Plateau & Southwest Region in Flagstaff, Arizona. The session examined how science and monitoring results can be used to inform effective decision-making that achieves management objectives. Speakers were from a variety of government, private, and non-profit organizations with experience in a broad diversity of science and management themes.
- 2) Scott VanderKooi\*, Chief of GCMRC, Dave Lytle\* SBSC Center Director, Mike Moran\*, GCMRC Deputy Chief, and GCMRC staff attended the summer meeting of the Glen Canyon Dam Adaptive Management Program's Adaptive Management Working Group (AMWG) in Tempe, AZ on September 20, 2017. VanderKooi presented an overview of the final draft of GCMRC's next Triennial Work Plan (FY2018-20), which the AMWG recommended to the Secretary of the Interior for approval, and an update on the status of key biological and physical resources in the Colorado River ecosystem relative to a potential fall 2017 high flow experiment.
- 3) Lucas Bair\*, Ted Kennedy\*, Scott VanderKooi\*, David Ward\*, and Charles Yackulic\* from GCMRC and Mike Runge (USGS, Patuxent Wildlife Research Center) helped convene a September 21-22 workshop in Tempe, AZ regarding recent increases in populations of non-native brown trout (*Salmo trutta*) in the Lees Ferry reach of the Colorado River. The workshop was facilitated by Mike Runge and was attended by representatives from the National Park Service, Bureau of Reclamation, US Fish and Wildlife Service, Arizona Game and Fish Department, and stakeholder groups from the Glen Canyon Dam Adaptive Management Program. The workshop included presentations by Bair, Kennedy, and Yackulic on the root causes of the brown trout increase, potential risks to native fish populations, and management options for reducing brown trout populations.



Glen Canyon Dam.  
(Photo Credit: Todd Wojtowicz, USGS)

### 2014 pulse-flow to the Colorado River Delta

Pamela Nagler\* is one of the editors of a special issue published by the journal *Ecological Engineering* titled, *Environmental Flows for the Colorado River Delta: results of an experimental pulse release from the US to Mexico*. This special issue contains several manuscripts by SBSC authors including Pamela Nagler\*, Chris Jarchow\*, Erich Mueller\*, David Topping\*, Paul Grams\*, and Charles van Riper III\*. The special issue can be found here: <http://www.sciencedirect.com/science/journal/09258574/106?sd=1>.



Measuring streamflow and collecting sediment in a normally dry part of the Colorado River.  
(Photo Credit: Erich Mueller, USGS)

## Landscape Conservation Designs workshops

John Bradford\* contributed to the organization and delivery of workshops presenting results of recent Landscape Conservation Designs on behalf of the Southern Rockies Landscape Conservation Cooperative in the Four Corners region (Durango, CO; August 29-30) and the Upper Rio Grande region (Taos, NM; September 6-7).

## Other items from the 14<sup>th</sup> Biennial Conference of Science & Management on the Colorado Plateau

- 1) Seth Munson\*, Molly McCormick\*, and Brad Butterfield (Northern Arizona University) organized the dryland restoration session in the Southwest session at the conference.
- 2) Ted Melis\* and Rylan Morton-Starner (Forestdale Farms) organized a field trip focused on rain harvesting to Forestdale Farm for the conference.
- 3) John Bradford\* and Seth Munson\* organized the “Ecological drought and climate change in the southwestern U.S.” session of the conference. Erin Bunting\* and Caitlin Andrews\* were two of the panelists for the session.
- 4) Mike Duniway\* and Miguel Villarreal (USGS, Western Geographic Science Center) organized the “Energy development in the southwestern US: ecosystems, economics, and society” session of the conference.
- 5) Scott Ferrenberg\* and Sasha Reed\* organized the “Biological soil crust ecology in an era of rapid change” session of the conference.
- 6) Rob Massatti\* and Northern Arizona University’s Tom Whitham and Helen Bothwell organized the “Genetics-based migration” session of the conference.
- 7) Charles Yackulic\*, Lucas Bair\*, and Jamie Sanderlin (USDA Forest Service, Rocky Mountain Research Station) organized the “Ecological modelling to inform management decisions” session at the conference.
- 8) Kirsten Ironside\* and Randy Swaty (The Nature Conservancy, LANDFIRE Team) held a LANDFIRE workshop and help session at the conference.



Randy Swaty from The Nature Conservancy, LANDFIRE team (left) and Kirsten Ironside (right) from the SBSC at their LANDFIRE workshop.

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

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

