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 and Rivers Ecosystem Science (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. Underlined names indicate SBSC personnel. If you would like more information on anything in this month's update contact Todd Wojtowicz (twojtowicz@usgs.gov).

IMAGE OF THE MONTH

Juniper woodland in winter with the snow-capped La Sal Mountains in the background. Photo taken in Canyonlands National Park, UT in January 2016.
(photo credit: Ed Grote, USGS)

NEW WEBPAGE

The Southwest Biological Science Center recently launched its new webpage. To find out more about SBSC science, publications, news items, etc. go to: **https://usgs.gov/centers/sbsc**. Our webpage will be updated frequently with new science projects, results, scientific papers, reports, images, news, and more.

OUTREACH

Media, Broadcasts, and Films

The Arizona Daily Sun published an article on December 3, 2016 highlighting recent advances in research on how biological soil crusts could be used in dryland restoration efforts. The article focused on the pioneering work of Northern Arizona University scientist Matt Bowker (who is also a member of SBSC), and highlighted research by SBSC scientists Colin Tucker and Sasha Reed. For more information, please contact Colin at *ctucker@usgs.gov*, and you can find the article using the following link: *http://azdailysun.com/news/local/nau-ecologist-tends-to-garden-of-biocrust/article_9478bdd4-48e2-52f1-879d-5de890c1d94c.html.*

KNAU, a local affiliate of NPR, produced a story about high flow experiments (HFE) in the Colorado River in Grand Canyon, including the most recent one that started on November 7, 2016. SBSC's Paul Grams was interviewed and he discussed the effects of HFEs on sandbars. Online link to the article and audio piece is here: *http://knau.org/post/wake-experimental-floods-scientists-track-grand-canyon-s-vanishing-sand.* More information on river sediment dynamics and sandbars can be found on our webpage (https://www.usgs.gov/centers/sbsc/science/fluvial-river-sediment-dynamics?qt-science_center_objects=1#qt-science_center_objects and https://www.usgs.gov/centers/sbsc/science/grand-canyon-sandbar-monitoring?qt-science_center_objects=0#qt-science_center_objects).

A video put out by CBS discusses some of the ecological issues of Arches and Canyonlands National Parks in UT such as nonnative annual grasses, disturbance caused by cattle grazing, and the difficulty of getting native, perennial grasses established. The video focuses on the research of SBSC's Rebecca Mann and Mike Duniway. Mike and Rebecca use connectivity modifiers (ConMods), which are short mesh screens that function as miniature fences that modify patches of bare ground by limiting wind and water erosion and create microsites for native grass seed germination. The CBS piece is called, "**Saving the Desert: Push to Restore Arches & Canyonlands National Parks",** and the link to the video is here: *http://www.cbs.com/shows/cbs_this_morning/video/7YlcD9T8jWzNzZbycOZ_PbOO_p1zglt5/restoring-arches-and-canyonlands-national-parks/*. More information on the ConMons project can be found on our webpage: https://www.usgs.gov/centers/sbsc/science/new-approaches-restoring-colorado-plateau-grasslands?qt-science_center_objects=1#qt-science_center_objects.

SCIENCE

Presentations, Posters, Lectures, Workshops, and Panels

Alonso-Rodriguez, A.M., Reed, S., Cavaleri, M.A., Uriarte, M., Carter, K., Bachelot, B., and Wood, T.E., 2016, **Severe drought constrains seedling and sapling growth in a Puerto Rican tropical rainforest** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/188256.*

Andrews, C., 2016, **Climate change on the Colorado Plateau – What do we know?** [presentation]: Canyon County Science and Management Symposium.

Belnap, J., **Soil surface disturbance: impacts on soil stability and fertility** [presentation]: Canyon County Science and Management Symposium.

Bradford, J., 2016, **Arid forest sustainability** [presentation]: Canyon County Science and Management Symposium.

Callegary, J.B., Norman, L., Eastoe, C.J., Sankey, J.B., Youberg, A., 2016, **Post-wildfire potential for carbon and nitrogen sequestration in the southwestern United States in restored ephemeral and intermittent stream channels** [presentation]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/169157.*

Dennison, P.E., Kokaly, R.F., Daughtry, C.S.T., Roberts, D.A., Thompson, D.R., Chambers, J.Q., Nagler, P.L., Okin, G.S., and Scarth, P., 2016, **Estimating achievable accuracy for global imaging spectroscopy measurement of non-photosynthetic vegetation cover** [presentation]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/151104*.

Dukes, D., Ravi, S., Grandstaff, D.E., Gonzales, H.B., Li, J.J., Sankey, J.B., Wang, G., and van Pelt, R.S., 2016, **Quantifying post-fire aeolian sediment transport using rare earth element tracers** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/135185.*

Duniway, M., and Nauman, T., 2016, **New tools for assessing recovery of oil and gas pads on the Colorado Plateau** [presentation]: Canyon County Science and Management Symposium.

East, A.E., Jenkins, K.J., Happe, P.J., Bounty, J., Beechie, T.J., Mastin, M.C., Sankey, J.B., and Randle, T.J., 2016, **Physical drivers vs. effects of wolf-elk trophic cascade on fluvial channel planform, Olympic National Park, Washington** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/117606*.

Gonzales, H.B., Ravi, S., Li, J.J., and Sankey, J.B., 2016, **Aeolian sediment trapping efficiencies of sparse vegetation and its ecohydrological consequences in drylands** [poster]: American Geophysical Union meeting. Online link to abstract *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/163780*.

Grams, P.E., Schmeeckle, M.W., Mueller, E.R., Buscombe, D., Kasprak, A., and Leary, K.P., 2016, **Experimental demonstration of 3-dimensional flow structures and depositional features in a lateral recirculation zone** [presentation]: American Geophysical Union meeting. Link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/188943.*

Hamill, D.D., Buscombe, D., Wheaton, J.M., and Wilcock, P.R., 2016, **Recreational-grade sidescan sonar: transforming a low-cost leisure gadget into a high resolution riverbed remote sensing tool** [poster]: American Geophysical Union meeting. Link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/186343.*

Head, E., Grams, P., Parnell, R.A., and Mueller, E.R., 2016, **Channel narrowing and the relationship between geomorphic change and native fish habitat on the Colorado River in Canyonlands National Park, Utah** [poster]: American Geophysical Union meeting. Link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/190777.*

Jarchow, C., Nagler, P.L., and Glenn, E.P., 2016, **How did the delta respond? An analysis of greenup and evapotranspiration (ET) of the Colorado River Delta following the Minute 319 pulse flows to Mexico** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/126763.*

Kasprak, A., Buscombe, D., Caster, J., Grams, P.E., and Sankey, J.B., 2016, **The individual and additive effects of vegetation encroachment and hydrological alteration on sediment connectivity in Grand Canyon** [presentation]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/160229*.

Mayes, M.A., Reed, S., Najjar, R., Romero-Lankao, P., and Birdsey, R., ,2016, **State of the carbon cycle of North America: overarching findings** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/190511.*

Miller, M., Mann, R., and Duniway, M., 2016, **Grassland restoration** [presentation]: Canyon County Science and Management Symposium.

Nagler, P.L., Nguyen, U., Bateman, H.L., Jarchow, C., van Riper III, C., Waugh, W., and Glenn, E., 2016, **Potential for water savings by defoliation of saltcedar (*Tamrix* spp.) by saltcedar beetles (*Diorhabda carinulata*) in the Upper Colorado River Basin** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/142885*.

Pett-Ridge, J., McFarlane, K.J., Heckman, K.A., Reed, S., Green, E.A., Nico, P.S., Tfaily, M.M., Wood, T.E., and Plante, A.F., 2016, **Digging a litter deeper: microbial communities, molecular composition and soil organic matter turnover along tropical forest soil depth profiles** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/189074*.

Poitras, T.B., Villarreal, M.L., Waller, E.K., Duniway, M.C., and Nauman, T.W., 2016, **Identifying optimal remotely-sensed variables for ecosystem monitoring in the Colorado Plateau** [poster]: American Geophysical Union meeting.

Reed, S., Cavaleri, M.A., Alonso-Rodriguez, A. M., Kimball, B.A., and Wood, T.E., 2016, **Tropical rain forest biogeochemistry in warmer world: initial results from a novel warming experiment in Puerto Rico tropical forest** [presentation]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/1414401.*

Reed, S.C., Ferrenberg, S., Tucker, C., Rutherford, W.A., Wertin, T.M., McHugh, T.A., Morrissey, E., Kuske, C., Mueller, R., and Belnap, J., 2016, **Abiotic and biotic controls over biogeochemical cycles in drylands: insights from climate change and nitrogen deposition experiments on the Colorado Plateau** [presentation]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/118681.*

Rossi, R., Buscombe, D., Grams, P.E., Schmidt, J.C., and Wheaton, J.M., 2016, **From hype to an operational tool: efforts to establish a long-term monitoring protocol of alluvial sandbars using 'structure-from-motion' photogrammetry** [poster]: American Geophysical Union meeting. Link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/174475.*

Sankey, J., 2016, **Watershed resiliency to climate change and future fire in the western USA** [presentation]: 3rd Southwest Fire Ecology Conference. Online like to abstract: *http://swfireconference.org/wp-content/uploads/2013/03/SW16-Abstracts-and-bios-v2.pdf.*

Sankey, J.B., Kasprak, A., and Caster, J., 2016, **Geomorphic process from topographic form: automating the interpretation of repeat survey data to understand sediment connectivity for source-bordering aeolian dunefields in river valleys** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/151471.*

Sankey, T., Sankey, J.B., Horne, R., Bedford, R., and Cagney, L., 2016, **Remote sensing of tamarisk biomass, insect herbivory, and defoliation: novel lidar and multispectral methods in the Grand Canyon region, Arizona** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/142481.*

Shrestha, G., Cavallaro, N., Najjar, R., Romero-Lankao, P., Mayes, M.A., Reed, S.C., Birdsey, R., and Zhu, Z., 2016, **Discussions, concluding remarks, State of the Carbon Cycle Report (SOCCR-2) town hall discussions** [panel discussion]: American Geophysical Union meeting.

Walker, J., Brown, J.F., Sankey, J.B., Wallace, C., and Weltzin, J.F., 2016, **Pheology of succession: tracking the recovery of dryland forests after wildfire events** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/141520*.

Wang, G., Li, J.J., Ravi, S., Sankey, J.B., Duke, D., Gonzales, H.B., and van Pelt, S., 2016, **Post-fire soil nutrient redistribution in northern Chihuahuan Desert** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/123366*.

Waugh, W., Nagler, P.L., Vogel, J., Glenn, G., Uguyn, U., and Jarchow, C.J., 2016, **Methods for measuring effects of changes in tamarisk evapotranspiration on groundwater at southwestern uranium mill tailings sites** [poster]: American Geophysical Union meeting. Online link to abstract: *https://agu.confex.com/agu/fm16/meetingapp.cgi/Paper/142812.*

Published Papers, Reports, and Data Releases

Bastille-Rousseau, G., Gibbs, J.P., Yackulic, C.B., Frair, J.L., Cabrera, F., Rousseau, L.-P., Wikelski, M., Kümmeth, F., and Blake, S., 2016, **Animal movement in the absence of predation--environmental drivers of movement strategies in a partial migration system**: Oikos, online, doi:10.1111/oik.03928. Online link: *http://onlinelibrary.wiley.com/doi/10.1111/oik.03928/full.*

Bestelmeyer, B.T., Williamson, J.C., Talbot, C.J., Cates, G.W., Duniway, M.C., and Brown, J.R., 2016, **Improving the effectiveness of ecological site descriptions: general state-and-transition models and the Ecosystem Dynamics Interpretive Tool (EDIT):** Rangelands, v. 38, p. 329-335. Online link: *http://www.sciencedirect.com/science/article/pii/S0190052816300700.*

Bunting, E.L., Munson, S.M., and Villarreal, M.L., 2016, **Climate legacy and lag effects on dryland plant communities in the southwestern US**: Ecological Indicators, v. 74, p. 216-229. Online link: *http://www.sciencedirect.com/science/article/pii/S1470160X16306215*.

Duniway, M.C., Nauman, T.W., Johanson, J.K., Green, S., Miller, M.E., Williamson, J.C., and Bestelmeyer, B.T., 2016, **Generalizing ecological site concepts of the Colorado Plateau for landscape-level applications**: Rangelands, v. 38, p,. 342-349. Online link: *http://www.sciencedirect.com/science/article/pii/S0190052816300827*.

Durning, L.E., Sankey, J.B., Davis, P.A., and Sankey, T.T., 2016, **Four-band image mosaic of the Colorado River corridor downstream of Glen Canyon Dam in Arizona, derived from the May 2013 airborne image acquisition**: U.S. Geological Survey Data Series 1027, *https://doi.org/10.3133/ds1027*.

Howell, P.E., Hossack, B.R., Muths, E., Sigafus, B.H., and Chandler, R.B., 2016, **Survival estimates for reintroduced populations of the Chiricahua leopard frog (*Lithobates chiricahuensis*)**: Copeia, v. 104, p. 824-830. Online link: *http://www.bioone.org/doi/abs/10.1643/CE-16-406*.

Pennington, V.E., Schlaepfer, D.R., Beck, J.L., Bradford, J.B., Palmquist, K.A., and Lauenroth, W.K., 2016, **Sagebrush, greater sage-grouse, and the occurrence and importance of forbs**: Western North American Naturalist, vol. 76, no. 3, p. 298-312. Online link: *http://www.bioone.org/doi/full/10.3398/064.076.0307*.

Yackulic, C.B., 2016, **Competitive exclusion over broad spatial extents is a slow process: evidence and implications for species distribution modeling**: Ecography, no. 39, p. 001-009, doi:10.1111/ecog.02836. Online link: *http://onlinelibrary.wiley.com/doi/10.1111/ecog.02836/full*.

OTHER NOTABLES

SBSC Director David Lytle and John Bradford participated in the steering committee meeting of the Southern Rockies Landscape Conservation Cooperative in Bernalillo, New Mexico, from November 30 - December 1.

On November 7, the Department of the Interior initiated a 96 hour, high-volume water release from Glen Canyon Dam. This high flow experiment, the fourth since 2012, was conducted as part of an experimental strategy to improve the resources of the Colorado River through Grand Canyon National Park, including sandbars and camping beaches, marsh and riverside vegetation, and aquatic habitats such as backwaters. Studies conducted in conjunction with previous controlled floods have allowed scientists to better understand the physical and ecological processes of the post-dam Colorado River. Scientists David Topping, Nick Voichick, Tom Sabol, Ron Griffiths, and Paul Grams with SBSC's Grand Canyon and Monitoring Research Center (GCMRC) collected data on resource responses during the high flow experiment.

Scott VanderKooi, Chief of the Grand Canyon Monitoring and Research Center (GCMRC), gave an invited presentation on GCMRC activities at the 275th meeting of the Upper Colorado River Commission on December 14 in Las Vegas, NV. His talk focused on the November 2016 High Flow Experiments released from Glen Canyon Dam on the Colorado River and the responses of key biological and physical resources downstream in Glen and Grand Canyons. For more information, contact: Scott VanderKooi, Flagstaff, AZ 928-556-7376.

Scott VanderKooi, Chief of the Grand Canyon Monitoring and Research Center, was an invited attendee at the signing ceremony for the Record of Decision for the Long Term Experiment and Management Plan Environmental Impact Statement on Glen Canyon Dam operations for the next 20 years. Secretary of Interior Sally Jewell signed the Record of Decision on December 15 at an event held during the annual meeting of the Colorado River Water Users Association in Las Vegas, NV (*https://www.doi.gov/video/this-week-interior-december-16-2016*). For more information, contact: Scott VanderKooi, Flagstaff, AZ 928-556-7376.

Jayne Belnap left for Antarctica at the end of December to work with scientists from New Zealand in assessing the effects of tourism on the fragile Dry Valleys of Antarctica. The Dry Valleys have been mostly off-limits to all but researchers; however, there is growing interest from tourists to visit them. In some parts of the Dry Valleys, extremely fragile ventifacts (rocks shaped by wind) and soils, while other parts of the Dry Valleys may be more resistant and resilient to human visitation. The project is to map the vulnerability of areas to visitation to determine which, if any, areas can be opened to tourists, and to provide guidelines for use of these areas by researchers.