



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).

IMAGE OF THE MONTH



Heterogeneous landscape of southern Utah in 2014 with shrubland in the foreground.
(Photo credit: John Bradford, USGS)

UPCOMING CONFERENCE

The Biennial Conference of Science & Management on the Colorado Plateau & Southwest Region

Location: Flagstaff, AZ

Dates: September 11-14, 2017

Homepage of conference: <https://nau.edu/merriam-powell/biennial-conference/>

Online registration: <https://nau.edu/Merriam-Powell/Biennial-Conference/Registration/>



Colorado River downstream view of Marble Canyon from Nankoweap. (Photo Credit: Scott VanderKooi, 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, and sediment loads in watersheds

A USGS news release was published about the results of a paper that investigated the potential consequences of climate, wildfire and erosion on the sediment loads of watersheds in the western United States.

The lead author, Joel Sankey*, and Erich Mueller* are SBSC researchers. The other co-authors are Jason Kreitler (USGS, Western Geographic Science Center), Todd Hawbaker (USGS, Geoscience and



An *Amanita muscaria* mushroom (poisonous) coming through ponderosa pine litter. (Photo Credit: Todd Wojtowicz, USGS)

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). The press release is titled, Increases in wildfire-caused erosion could impact water supply and quality in the West, and can be found here: <https://www.usgs.gov/news/increases-wildfire-caused-erosion-could-impact-water-supply-and-quality-west-2>

Long-term restoration trends in the Southwest

A USGS news release was published about a paper that analyzed treatments on Bureau of Land Management lands from 1940-2010. The lead author, Stella Copeland*, is associated with the SBSC and Northern Arizona University. The other co-authors are Seth Munson* and John Bradford* from the SBSC, David Pilliod and Justin Welty from USGS, Forest and Rangeland Ecosystem Science Center, and Brad Butterfield from Northern Arizona University. The news release is titled, Wildfire and invasive species drives increasing size and cost of public land restoration efforts, and can be found here: <https://www.usgs.gov/news/wildfire-and-invasive-species-drives-increasing-size-and-cost-public-land-restoration-efforts>



SBSC researchers preparing experimental restoration plots. (Photo Credit: Seth Munson, USGS)

Dust from the Salton Sea

Seth Munson* was interviewed by a reporter from the Desert Sun newspaper to comment on a new University of California, Riverside study that examined dust generated from the shrinking Salton Sea in southern California and associated health implications. The story is titled “Studying dust around the Salton Sea, scientists find initial answers” and appears at: <http://www.desertsun.com/story/salton-sea/2017/08/04/dust-health-salton-sea-scientists/537566001>.

SBSC and Northern Arizona University working together to restore lands in southwest

NAU News, an online news source for Northern Arizona University, published an article that referenced the Restoration Assessment & Monitoring Program for the Southwest (RAMPS). RAMPS is a collaborative program between the SBSC, other USGS Science Centers, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, NAU, and other universities that aims to strengthen restoration strategies and outcomes executed by Department of Interior land management agencies. The article can be found here: <http://news.nau.edu/butterfield/#.WZ2yhyiGOUI>. More information on RAMPS can be found here: <https://usgs.gov/sbsc/ramps>.



Experimental restoration plots developed by RAMPS researchers. (Photo Credit: Molly McCormick, USGS)

Public, Partner, and Youth Outreach Activities

Chiricahua leopard frogs in Buenos Aires National Wildlife Refuge

A new informational sign about the federally threatened Chiricahua leopard frogs was recently installed on the Buenos Aires National Wildlife Refuge in southern Arizona. The development of the sign was a cooperative effort between the USGS, University of Georgia, and the U.S. Fish and Wildlife Service. SBSC's Brent Sigafus* has been studying Chiricahua leopard frogs on the Buenos Aires National Wildlife Refuge:

https://www.usgs.gov/centers/sbsc/science/modeling-colonization-a-population-chiricahua-leopard-frogs?qt-science_center_objects=0#qt-science_center_objects.



Chiricahua leopard frog.
(Photo Credit: Brent Sigafus)

Plant materials for restoration projects

On August 28, Molly McCormick* spoke with the Fish and Wildlife Service, Region 2 Ecological Services Seed Team on the topic of plant materials for restoration. The group included people from Arizona, New Mexico, Oklahoma, and Texas. The team is investigating plant materials research and applications to their Threatened and Endangered and Partners programs in order to better understand benefits and risks to sourcing various plant materials. Molly provided them with an overview and guidance on some of the topics USGS and university collaborators are working on in regards to plant materials technology and research.

SCIENCE

Presentations, Posters, Lectures, Workshops, and Panels

Bradford, J.B.*, Schlaepfer, D.S., Palmquist, K.A., and Lauenroth, W.K., 2017, **Climate change impacts on soil temperature and moisture regimes in western North America** [presentation]: Ecological Society of America Annual Meeting.

Butterfield, B.J., and Munson, S.M.*, 2017, **Temperature, not precipitation, is the dominant assembly filter in dryland plant communities** [presentation]: Ecological Society of America Annual Meeting.

Dibble, K.L.*, Yackulic, C.B.*, and Kennedy, T.A.*, 2017, **Drought facilitates longitudinal recovery of thermal regimes in regulated rivers but may remove barriers to warm-water fish invasion** [presentation]: American Fisheries Society Annual Meeting.

Dzul, M.C. *, Yackulic, C.B. *, and Korman, J., 2017, **Combining continuous remote detections with traditional sampling to estimate the migratory flux of fish** [presentation]: Ecological Society of America Annual Meeting.

Ennen, J.R., Agha, M., Lovich, J.E. *, Drost, C. *, Puffer, M. *, and Rosen, P.C., 2017, **Habitat-associated morphology divergence physically constrains reproductive output in a mud turtle** [presentation]: Turtle Survival Alliance Symposium.

Ferrenberg, S. *, Tucker, C. *, Reibold, R. *, Howell, A. *, and Reed, S.C. *, 2017, **Biocrust influences on soil fertility vary among community states and are negatively impacted by warming** [poster]: Ecological Society of America Annual Meeting.

Itter, M.S., Bradford, J.B. *, Finley, A.O., D'Amato, A.W., and Foster, J.R., 2017, **Assimilation of tree-ring and repeat census data to model interactions between climate and past forest dynamics** [presentation]: Ecological Society of America Annual Meeting.

- Lovich, J.E. *, Fisher, R., Puffer, S.R. *, Cummings, K., Greely, S., and Ford, M., 2017, **The southwestern pond turtle (*Actinemys pallida*) in the Mojave River of California: past, present and future** [presentation]: Turtle Survival Alliance Symposium.
- McIntyre, C.L. *, Archer, J., and Belnap, J. *, 2017, **Grass germination and establishment on biocrusts - the role of awns and seed placement** [presentation]: Ecological Society of America Annual Meeting.
- Mech, A.M., Marsico, T.D., Thomas, K.A. *, Herms, D.A., and Tobin, P.C., 2017, **Predicting the impact of non-native specialist insects feeding on North American host plants** [presentation]: Ecological Society of America Annual Meeting.
- Munson, S.M. *, Bunting, E.L. *, and Bradford, J.B. *, 2017, **Plant production responses to seasonal water balance diverge among deserts and plant communities in the southwestern U.S.** [poster]: Ecological Society of America Annual Meeting.
- Nagler, P. L. *, Waugh, W.J., Glenn, E.P., Nguyen, U., Jarchow, C.J., and Vogel, J., 2017, **Methods for measuring effects of changes in tamarisk evapotranspiration on groundwater at southwestern uranium mill tailings sites** [presentation]: Ecological Society of America Annual Meeting.
- Nauman, T.W. *, Duniway, M.C. *, Villarreal, M.L., and Poitras, T.B., 2017, **Disturbance Automated Reference Toolset (DART): assessing patterns in ecological recovery from energy development on the Colorado Plateau** [presentation]: Ecological Society of America Annual Meeting.
- Palmquist, K.A., Jordan, S., Bradford, J.B. *, Schlaepfer, D.R., and Lauenroth, W.K., 2017, **Resource quantity and resource heterogeneity shape species richness and beta-diversity patterns in big sagebrush plant communities** [presentation]: Ecological Society of America Annual Meeting.
- Petrie, M.D., Duniway, M.C. *, Peters, D.P.C., and Brungard, C.W., 2017, **Coupling of climate, hydrology and vegetation productivity in dry to wet growing seasons is influenced by fine-scale soil and vegetation heterogeneity in the northern Chihuahuan Desert** [presentation]: Ecological Society of America Annual Meeting.
- Puffer, S.R. *, Lovich, J.E. *, Agha, M., Ennen, J.R., Meyer-Wilkins, K., Tennant, L. *, Smith, A., and Vamstad, M.S., 2017, **Reproductive ecology of desert tortoises (*Gopherus agassizii*) in the Sonoran Desert region of Joshua Tree National Park** [presentation]: Turtle Survival Alliance Symposium.
- Reed, S.C. *, Belnap, J. *, Barger, N., Schwabadissen, S., and Lohse, S., 2017, **Community dynamics at centimeter scales: nitrogen fixation controls in dryland biological soil crusts** [presentation]: Ecological Society of America Annual Meeting.
- Schlaepfer, D.R., Bradford, J.B. *, Palmquist, K.A., and Lauenroth, W.K., 2017, **Geoengineering impacts on ecological droughts in global drylands** [presentation]: Ecological Society of America Annual Meeting.
- Thomas, K.A. *, and Jarchow, C.J. *, 2017, **Indicators of plant biodiversity in the Southwest: future stressors to ecological services?** [presentation]: Ecological Society of America Annual Meeting.
- Waugh, W.J., Glenn, E.P., Moore, D., Nagler, P.L. *, Bush, R., and Kautsky, M., 2017, **Growing desert phreatophytes to control flow of contaminated groundwater at a uranium mill site** [presentation]: Ecological Society of America Annual Meeting.

Ward, D.L. *, and Dibble, K.L. *, 2017, **Eradication of invasive aquatic species using liquid ammonia** [presentation]: American Fisheries Society Annual Meeting.

Yackulic, C.B. *, 2017, **Joint modeling of invading and resident population dynamics to inform endangered species management** [presentation]: Ecological Society of America Annual Meeting.

Published Papers, Reports, Data Releases, etc.

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>.

Durning, L.E. *, Sankey, J.B. *, Chain, G.R. *, and Sankey, T.T., 2017, **Riparian vegetation classification of the Colorado River Corridor, Grand Canyon, Arizona, 2013**—Data: U.S. Geological Survey data release, <https://doi.org/10.5066/F7K64GJF>.

Durning, L.E. *, Sankey, J.B. *, Chain, G.R. *, and Sankey, T.T., 2017, **Water classification of the Colorado River Corridor, Grand Canyon, Arizona, 2013**—Data: U.S. Geological Survey data release, <https://doi.org/10.5066/F7PZ5799>.

East, A.E., Sankey, J.B. *, Fairley, H.C. *, Caster, J.J. *, and Kasprak, A. *, 2017, **Modern landscape processes affecting archaeological sites along the Colorado River corridor downstream of Glen Canyon Dam, Glen Canyon National Recreation Area, Arizona**: U.S. Geological Survey Scientific Investigations Report 2017–5082, 22 p., <https://doi.org/10.3133/sir20175082>.

Ennen, J.R., Matamoros, W.A., Agha, M., Lovich, J.E. *, Sweat, S.C., and Hoagstrom, C.W., 2017, **Hierarchical, quantitative biogeographic provinces for all North American turtles and their contribution to the biogeography of turtles and the continent**: Herpetological Monographs v. 31, no. 1, p. 114-140, <https://doi.org/10.1655/HERPMONOGRAPHS-D-16-00013>.

Moore-O’Leary, K.A., Hernandez, R.R., Johnston, D.S., Abella, S.R., Tanner, K.E., Swanson, A.C., Kreitler, J., and Lovich, J.E. *, 2017, **Sustainability of utility-scale solar energy—critical ecological concepts**: Frontiers in Ecology and the Environment, <http://onlinelibrary.wiley.com/doi/10.1002/fee.1517/abstract>.

Nagler, P.L. *, Nguyen, U., Bateman, H.L., Jarchow, C.J. *, Glenn, E.P., Waugh, W.J., and van Riper III, C. *, 2017, **Northern tamarisk beetle (*Diorhabda carinulata*) and tamarisk (*Tamarix* spp.) interactions in the Colorado River basin**: Restoration Ecology, <http://onlinelibrary.wiley.com/doi/10.1111/rec.12575/full>.

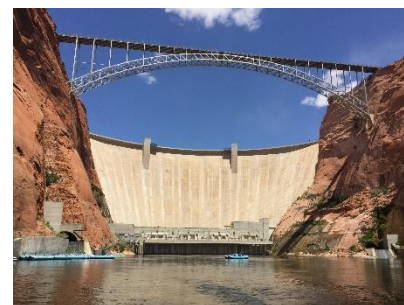
Sankey, J.B. *, Kreitler, J., Hawbaker, T.J., McVay, J.L., Miller, M.E., Mueller, E.R. *, Vaillant, N.M., Lowe, S.E., and Sankey, T.T., 2017, **Climate, wildfire, and erosion ensemble foretells more sediment in western USA watersheds**: Geophysical Research Letters, <http://onlinelibrary.wiley.com/doi/10.1002/2017GL073979/full>.

OTHER NOTABLES

Grand Canyon Monitoring and Research Center presentations

Scott VanderKooi*, Chief of SBCS's Grand Canyon Monitoring and Research Center (GCMRC), presented an overview of GCMRC's program and science provided in support of the Glen Canyon Dam Adaptive Management Program to the Federal Inland Hydropower Working Group on July 31, 2017.

VanderKooi's presentation was one four given by USGS scientists to the group on USGS research being used to inform hydropower development and operations. Other presentations were given by Rachel Reagan and Noah Adams of the Western Fisheries Research Center and Chauncey Anderson of the Oregon Water Science Center. Mona Khalil with the Ecosystems Mission Area provided introductory remarks.



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

Special session on phosphorus cycling at Ecological Society of America

At this year's Ecological Society of America meeting, Sasha Reed* and Oak Ridge National Lab scientist Rich Norby hosted an organized oral session titled "Phosphorus cycling in terrestrial ecosystems: Interactions among plant, microbial, and biogeochemical diversity", which focused on an emerging understanding of the phosphorus cycle across a range of scales. There will be a meeting report about the session in *New Phytologist*. For more information contact Sasha at screed@usgs.gov.

Meeting between ranchers, recreationalists, the general public, and officials

On Saturday, August 19, Seth Munson* and Molly McCormick* attended the annual Diablo Trust Campout Under the Stars event, held on State Trust Lands south of Flagstaff. They performed a bit of work on the ranch (like removing weeds), then enjoyed a potluck BBQ with 63 agency officials from federal, state, and local governments, ranchers, recreationalists, and community members.



Attendees at Diablo Trust campout removing weeds. (Photo Credit: Molly McCormick, USGS)

For more information about the Southwest Biological Science Center:

twojtowicz@usgs.gov

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

