

## 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.

### 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](mailto:twojtowicz@usgs.gov)).

### IMAGE OF THE MONTH



Female mule deer (*Odocoileus hemionus*) in an aspen grove  
(photo credit: Charles van Riper III, USGS)

## OUTREACH

### Media, Broadcasts, and Films

Jayne Belnap was filmed by [National Geographic](#) in Antarctica discussing the impacts of trampling in the cold desert ecosystem of the Dry Valleys of Antarctica. The film crew was part of the January 2016 expedition and she participated in a follow-up interview in Washington, D.C. on July 24.

Ted Kennedy was the guest on the [BioScience Talks](#) podcast and he discussed the results of his recent BioScience paper on the influence of Glen Canyon Dam operations on the aquatic foodweb. The podcast can be found at: <http://bioscienceaibs.libsyn.com/hydroelectric-dams-kill-insects-wreak-havoc-with-food-webs>. The citation for the paper discussed on the podcast is: [Kennedy, T.A.](#), [Muehlbauer, J.D.](#), [Yackulic, C.B.](#), Lytle, D.A., Miller, S.W., [Dibble, K.L.](#), [Kortenhoeven, E.W.](#), [Metcalf, A.N.](#), and Baxter, C.V., 2016, **Flow management for hydropower extirpates aquatic insects, undermining river food webs**: BioScience, doi: 10.1093/biosci/biw059.

Paul Grams and Ted Kennedy were quoted in a July 25th [High Country News](#) article about the effects of the Glen Canyon Dam. Specifically, Grams and Kennedy commented on sandbars and the food base for fish in the Grand Canyon. The title of the article is, "New measures could reduce Glen Canyon Dam's impact on the Grand Canyon – a bit", and can be found here: <https://www.hcn.org/issues/48.12/new-measures-could-reduce-glen-canyon-dams-impact-on-the-grand-canyon-a-bit>.

### Public and Partner Outreach Activities

Research geologists [Alan Kasprak](#) and [Joel Sankey](#) from the USGS Grand Canyon Monitoring and Research Center (GCMRC) participated in Grand Canyon Youth's Partners in Science river trip June 23rd to July 1, 2016. Alan and Joel teamed up with 15 high school students from several western states and 7 river guides from the [Grand Canyon Youth](#) program to conduct structure-from-motion topographic surveys of river sandbars and windblown sand dunes during the 9-day raft trip through Grand Canyon. The data that were acquired will inform an ongoing GCMRC study that aims to quantify sediment transfer, or connectivity, between the Colorado River channel and the broader valley bottom within the Grand Canyon.

Brent Sigafus and Fish and Wildlife Service personnel spoke to a troop of [Boy Scouts](#) about wildlife-related jobs on July 15-17. The Boy Scouts learn about wildland firefighting, tracking frogs using radio telemetry, identifying amphibians, and conservation efforts for federally threatened and endangered species, and assisted with other conservation/research efforts.

Scott VanderKooi, Chief of the USGS Grand Canyon Monitoring and Research Center (GCMRC), and Carol "Fritz" Fritzinger, logistics coordinator for GCMRC, participated in a collaborative Partners in Science river trip with [Grand Canyon Youth](#) from July 21 - July 26th. Also on this trip, was [Secretary of Interior, Sally Jewell](#), who met the 15 high school youth from several different states at the top of Bright Angel Trail where she hiked in with them and rafted the Colorado River for 5 days. The Secretary participated in all activities required for a successful river trip such as: helping with camp, cooking, participating in science talks, presentations and data collection, hiking, and interacting with youth one-on-one. The science focus of the trip was fisheries and interactions between the aquatic and terrestrial ecosystems in Grand Canyon. Data were collected on native and nonnative fish, aquatic and terrestrial

insects, reptiles, and rodents. Information collected during this trip will help GCMRC scientists better understand fish population dynamics and how energy moves between aquatic and terrestrial environments in Grand Canyon.

Lucas Bair, a natural resource economist at the Grand Canyon Monitoring and Research Center, talked to three classes of middle school students at Killip Elementary in Flagstaff, Arizona about hydropower. Each class was learning about hydro, wind, and solar power generation so they could propose a hypothetical power system for their school.

## SCIENCE

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

Bradford, J.B., 2016, **Climate change impacts on sagebrush ecosystems: an ecohydrological perspective** [presentation]: 2016 International Rangeland Congress Workshop.

Bradford, J.B., 2016, **Climate Change, Ecohydrology, and Sagebrush Ecosystems** [presentation]: Meeting with BLM staff in Washington D.C.

Buscombe, D., and Grams, P.E., 2016, **Stochasticity of riverbed backscattering, with implications for acoustical classification of non-cohesive sediment using multibeam sonar** [presentation]: River Flow 2016: The 8<sup>th</sup> International Conference on Fluvial Hydraulics, Applications of Hydroacoustics to River Morphodynamics (special session).

Caster, J., Kasprak, A., and Sankey, J.B., 2016, **But what does it mean? Geomorphic process attribution in DEMs-of-Difference derived from repeat lidar** [abstract]: U.S. Geological Survey 2016 Lidar Science Workshop. (link to site: <https://sites.google.com/a/usgs.gov/usgs-lidar-science-collaboration/home/usgs-2016-lidar-science-workshop?pli=1>).

Dibble, K., Yackulic, C., and Kennedy, T., 2016, **Drought increases trout recruitment at the expense of adult size in tailwaters downriver of dams in western North America** [symposium]: American Fisheries Society Meeting.

Drost, C.A., Lovich, J.E. and Puffer, S.R., 2016, **Removal of non-native slider turtles from Montezuma Well** [poster]: Research through Partnerships Symposium. This symposium commemorated the 100th anniversary of the National Park Service in Flagstaff, Arizona. The poster was presented by Dorothy Firecloud of the National Park Service, the Superintendent of [Montezuma Castle National Monument](#).

Drost, C.A., Lovich, J.E. and Puffer, S.R., 2016, **Removal of non-native slider turtles from Montezuma Well, Arizona, USA** [poster]: Planet at the Crossroads: International Union for the Conservation of Nature, World Conservation Congress. Link to the meeting: <http://www.iucnworldconservationcongress.org/>.

Duniway, M., 2016, **New concepts and tools for managing Colorado Plateau landscapes: soils, ecological potential, and ecological dynamics** [presentation]: [Grand Staircase Escalante National Monument](#) 20<sup>th</sup> anniversary celebration.

Munson, S. and Thoma, D., 2016, contributed to an NPS information brief (<https://irma.nps.gov/DataStore/DownloadFile/552758>) focused on helping resource managers make short-

term forecasts of vegetation condition in parks. The brief was featured on page 5 of the August NPS Climate Change Response Program Newsletter:  
<https://www.nps.gov/subjects/climatechange/upload/2016-08-16-FINAL-Q2-CCRP-Newsletter.pdf>.

Sasha Reed traveled to Los Alamos National Laboratory (LANL) on July 18 to give an invited talk on dryland biogeochemistry and to discuss a future collaboration with LANL scientist Nate McDowell about how climate manipulation treatments may be indirectly affecting pinon pine and juniper function via effects on the nitrogen cycle. For more information about this work, please contact Sasha ([screed@usgs.gov](mailto:screed@usgs.gov)).

Robin Reibold, Sarah Fisher, Erika Geiger, Mike Duniway, Jayne Belnap, and Sasha Reed traveled to Bandelier National Monument (BNM) on August 18<sup>th</sup> to work on a Natural Resource Preservation Program (NRPP) project with Northern Arizona University collaborators Matt Bowker and Kristina Young, NPS collaborator Kay Beeley, and USGS collaborator Craig Allen. This research aims to explore the composition and function of biological soil crust communities in BNM and the role biocrust remediation could play in reducing the massive soil erosion that threatens BNM's national treasures. Please contact Sasha Reed ([screed@usgs.gov](mailto:screed@usgs.gov)) for more information.

Sankey, J.B., and Sankey, T.T., 2016, **Lidar remote sensing of vegetation structure and biomass for ecology and geomorphology research and monitoring** [abstract]: U.S. Geological Survey 2016 Lidar Science Workshop. (link to site: <https://sites.google.com/a/usgs.gov/usgs-lidar-science-collaboration/home/usgs-2016-lidar-science-workshop?pli=1>).

Taniguchi, M., Lovich, J., Mine, K., Ueno, S., and Kamazaki, N., 2016, **Unusual population attributes of invasive red-eared slider turtles (*Trachemys scripta elegans*) in Japan: do they have a performance advantage?**: Turtle Survival Alliance Symposium (New Orleans, August 1-4).

Charles van Riper III was a panelist on the "Working with Government Agencies" workshop at the North American Ornithological Conference (August 16-20). This panel had representatives from USGS, the FCC, BOEM, APHIS, NPS, Environment Canada, the MD Department of Natural Resources, and the FL Fish and Wildlife Commission.

Ward, D., 2016, **Consequences of an altered hydrologic regime for the Colorado River fishes in Grand Canyon** [symposium]: American Fisheries Society Meeting.

Ward, D., and Yard, M., 2016, **What's in the hump?** [poster]: American Fisheries Society Meeting.

### Published Papers and Reports

Bastille-Rousseau, G., Yackilic, C.B., Frair, J.L., Cabrera, F., and Blake, S., 2016, **Allometric and temporal scaling of movement characteristics in Galapagos tortoises**: Journal of Animal Ecology, v. 85, no. 5, p. 1171-1181, <http://onlinelibrary.wiley.com/doi/10.1111/1365-2656.12561/abstract>.

Butterfield, B.J., and Munson, S.M., 2016. **Temperature is better than precipitation as a predictor of plant community assembly across a dryland region**: Journal of Vegetation Science, DOI: 10.1111/jvs.12440. Early View Online at: <http://onlinelibrary.wiley.com/doi/10.1111/jvs.12440/full>.

Darrah, A.J., Greeney, H.F., and van Riper III, C., 2016, **Importance of the 2014 Colorado Delta pulse flow for migratory songbirds: insights from foraging behaviour**: Ecological

Engineering, doi: 10.1016/j.ecoleng.2016.06.001,  
<http://www.sciencedirect.com/science/article/pii/S0925857416303184>.

Dodrill, M.J., and Yackulic, C.B., 2016, **Nonlinear relationships can lead to bias in biomass calculations and drift-foraging models when using summaries of invertebrate drift data**: Environmental Biology of Fishes, p. 1-12, doi:10.1007/s10641-016-0507-8, early online link: <http://link.springer.com/article/10.1007/s10641-016-0507-8>.

Ernst, C.H., Laemmerzahl, A.F., and Lovich, J.E., 2016, **A morphological review of subspecies of the Asian box turtle, *Cuora amboinensis* (Testudines, Geomydidae)**: Proceedings of the Biological Society of Washington, v. 129, p. 144-156, doi: 10.2988/0006-324X-129.Q2.144.

Hatten, J.R., Giermakowski, J.T., Holmes, J.A., Nowak, E.M., Johnson, M.J., Ironside, K.E., van Riper III, C., Peters, M., Truettner, C., and Cole, K.L., 2016, **Identifying bird and reptile vulnerabilities to climate change in the southwestern United States**: Open-File Report 2016-1085, 76 p., <http://dx.doi.org/10.3133/ofr20161085>.

Hultine, K.R., Grady, K.C., Wood, T.E., Shuster, S.M., Stella, J.C., and Whitham, T.G., 2016, **Climate change perils for dioecious plant species**: Nature Plants, doi: 10.1038/NPLANTS.2016.109, <http://www.nature.com/articles/nplants2016109>.

Melis, T.S., Pine, W.E., Korman, J., Yard, M.D., Jain, S., and Pulwarty, R.S., 2016, **Using large-scale flow experiments to rehabilitate Colorado River ecosystem function in Grand Canyon: basis for an adaptive climate-resilient strategy**, in Miller, K.A., Hamlet, A.F., Kenney, D.S., and Redmond, K.T., eds., Water policy and planning in a variable and changing climate: United States, CRC Press, P. 315-346.

Nauman, T., and Duniway, M., 2016, **The automated reference toolset (ART): a soil-geomorphic ecological potential matching algorithm**: Soil Science Society of America Journal. doi: 10.2136/sssaj2016.05.0151. Early link to paper: <https://dl.sciencesocieties.org/publications/sssaj/first-look>.

Sankey, T.T., Sankey, J.B., Horne, R., and Bedford, A., 2016, **Remote sensing of tamarisk biomass, insect herbivory, and defoliation: novel methods in the Grand Canyon Region, Arizona**: Photogrammetric Engineering and Remote Sensing, v. 82, no. 8, p. 645-652, doi: 10.14358/PERS.82.8.645, <https://pubs.er.usgs.gov/publication/70175160>.

Wertin, T., Belnap, J., and Reed, S., 2016, **Experimental warming in a dryland community reduced plant photosynthesis and soil CO<sub>2</sub> efflux although the relationship between the fluxes remained unchanged**: Functional Ecology, DOI: 10.1111/1365-2435.12708. Early online link: <http://onlinelibrary.wiley.com/doi/10.1111/1365-2435.12708/full>.

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## New Grants

Ted Melis is a Co-PI of a recently funded NSF grant titled, “**CNH-RCN: Amazon Dams Network: advancing integrative research and adaptive management of social-ecological systems transformed by hydroelectric dams**”. This award will facilitate the sharing of knowledge, insights, and information about the effects of dams in Brazil, Bolivia, and Peru.

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## New Projects and Experiments

Dan Buscombe, Paul Grams, Erich Mueller, and Alan Kasprak conducted a week-long experiment in July to simulate eddy sandbars in Grand Canyon to investigate equilibrium eddy sandbar forms and to measure 3-dimensional flow structures. The experiment was conducted at St. Anthony Falls Laboratory at the University of Minnesota in Minneapolis where they used their own scaled analog eddy-fan complex.

David Topping, David Dean, and Daniel Buscombe were in Big Bend National Park at the end of July making *in situ* measurements of suspended clay particle size distributions in the Rio Grande. Physical samples, acoustical measurements using 3 frequencies, holographic imaging, and laser-diffraction measurements were used to determine whether biological flocculation is present in the clay in transport.

## OTHER NOTABLES

A paper published in FEMS Microbiology Ecology, with Jayne Belnap as a co-author, was among the most cited papers for that journal in 2015 according to a representative from FEMS Microbiology Ecology. The paper is: Steven, B., Gallegos-Graves, L.V., Belnap, J., Kuske, C.R., 2013, **Dryland soil microbial communities display spatial biogeographical patterns associated with soil depth and soil parent material**: FEMS Microbiology Ecology, v. 86, p. 101-113, doi: 10.1111/1574-6941.12143.

Collaborative research conducted by Seth Munson (SBSC), Kathryn Irvine (NOROCK), Erin Bunting (SBSC) and the National Park Service at Capitol Reef National Park was featured on the July cover of Applied Vegetation Science: <http://onlinelibrary.wiley.com/doi/10.1111/avsc.2016.19.issue-3/issuetoc>. The research focuses on understanding how grazing and water balance influence the condition of semi-arid grasslands. The citation for this research is: Thoma, D.P., Munson, S.M., Irvine, K.M., Witwicki, D.L., and Bunting, E.L., 2016, **Semi-arid vegetation response to antecedent climate and water balance windows**: Applied Vegetation Science, v. 19, p. 413-429. <http://onlinelibrary.wiley.com/doi/10.1111/avsc.12232/abstract>. This research was supported by the National Climate Change and Wildlife Science Center and the Status and Trends Program.

Kathryn Thomas (SBSC), Travis Marsico (Arkansas State University), Daniel Herms (Ohio State University), and Patrick Tobin (University of Washington) are part of the Powell Center for Analysis and Synthesis working group entitled, **Predicting the next high-impact insect invasion: elucidating traits and factors determining the risk of introduced herbivorous insects on North American native plants**. The working group’s goal is to examine the contribution of five types of drivers toward invasion impact and contribute to testing the relative importance of the defense-free

space and enemy release hypotheses in different systems. The working group convened in Fort Collins, CO from July 25-29.

An external review of the GCMRC fisheries program was conducted from August 2-5. Five university researchers with expertise in fish biology, ecology, and population dynamics were invited to participate in a review of the [Glen Canyon Dam Adaptive Management Program's fisheries program](#) that is led by GCMRC. The review included presentations by GCMRC and cooperating scientists on their work to understand the biology and ecology of the endangered humpback chub, nonnative rainbow trout and other Colorado River fish species of interest to resource managers and stakeholders. Panelists and scientists also participated in a field trip to Lees Ferry, Arizona which included travel by boat to view Glen Canyon Dam, visits to several sites along the Colorado River downstream of the dam, and a campout along the river. A report from the review panel is expected in fall 2016

Jayne Belnap was in Kuala Lumpur, [Malaysia](#) for a conference on science in Antarctica August 21-26. She presented a paper on the impacts of trampling on soil surfaces and another paper on wind erosion of sediments in the Dry Valleys.

The [Adaptive Management Work Group](#) met in Flagstaff, Arizona August 24-25. Presentations were given by Scott VanderKooi, Chief of the Grand Canyon Monitoring and Research Center (GCMRC); Paul Grams, David Topping, and Erich Mueller, GCMRC hydrologists; Jeff Muehlbauer, GCMRC research ecologist; and Joel Sankey, SBSC research geologist about the recent scientific and budget updates.