



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 *River Ecosystem Science*, which includes the Grand Canyon Monitoring and Research Center (GCMRC)). Both branches conduct research on the biology, ecology, and natural 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



Endangered Pima pineapple cactus in south-central Arizona. For information on SBSC cactus research: https://www.usgs.gov/centers/sbsc/science/endangered-cacti-arizona?qt-science_center_objects=0#qt-science_center_objects.

(Photo credit: Chris Jarchow, 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. We also provide links to our website and highlight some of our recent science.

National Geographic: How to tell a turtle from a tortoise

Jeff Lovich* was quoted in an online National Geographic piece titled, **How to tell a turtle from a tortoise**. Additionally, an award-winning book that Jeff co-authored titled, **Turtles of the United States and Canada**, was mentioned in the article and a link was provided to the book. Here is the link to the National Geographic piece: <https://news.nationalgeographic.com/2017/12/shell-game--how-to-tell-a-turtle-from-a-tortoise/>. Here is the link to the book mentioned in the article: <https://jhupbooks.press.jhu.edu/content/turtles-united-states-and-canada>.



Agave, a potential biofuel in the Southwest.
(Photo Credit: Sasha Reed, USGS)

High Country News: It's not only trees — wildfires imperil water too

High Country News published an article titled, **It's not only trees — wildfires imperil water too**. The piece is about the effects of wildfires on erosion and water quality in the West. Joel Sankey* was quoted in the piece and it can be found here: <http://www.hcn.org/issues/49.21/water-its-not-only-trees-wildfires-imperil-water-too>. Joel recently published a paper on this topic, and the paper can be found here: <http://onlinelibrary.wiley.com/doi/10.1002/2017GL073979/full>.

Documentary about Glen Canyon and Lake Powell

On December 2, Helen Fairley* was interviewed by a group of independent filmmakers for a documentary on the social and cultural significance of Glen Canyon and Lake Powell reservoir, the implications of lowering reservoir levels for life in the West, and the cultural and natural features that may be exposed in the future if the reservoir level continues to drop. Helen provided information about archaeological studies that were conducted prior to the completion of Glen Canyon Dam and what they revealed about the prehistoric and historic inhabitants of the area. She also briefly summarized some of the current studies being conducted by the SBSC's Grand Canyon Monitoring and Research Center to understand effects of Glen Canyon Dam on the downstream terrestrial environment. For more information, contact Helen Fairley, hfairley@usgs.gov.



View of Glen Canyon. (Photo Credit: Emily Palmquist, USGS)

Public, Partner, and Youth Outreach Activities

Meeting with the Environmental Protection Agency about climate, fire, erosion, and sediment

Joel Sankey* gave a presentation to the U.S. Environmental Protection Agency's Water Reuse, Water Scarcity, and Drought Grants Progress Review Meeting. Joel presented his research about the potential effects of climate, wildfire, and erosion on sediment in western watersheds. Here is a link to the paper the presentation is based on: <http://onlinelibrary.wiley.com/doi/10.1002/2017GL073979/full>.

Collaborative project to monitor sediment in Chippewa River

David Dean* and Daniel Buscombe (Northern Arizona University) gave a presentation to the Minnesota Water Science Center and Wisconsin Water Science Center about comprehensive sediment transport monitoring of sand-bedded rivers. David and Daniel are starting a project in collaboration with the Minnesota and Wisconsin Water Science Centers for the U.S. Army Corps of Engineers (USACE) to comprehensively monitor sediment transport on the Chippewa River in Wisconsin. Shipping channels within the Mississippi River regularly fill with Chippewa River sediment, and this project will help the USACE plan dredging operations within the Mississippi River

Department of Energy, vegetation community, evapotranspiration, and groundwater

Pamela Nagler* and Chris Jarchow* met with a Department of Energy contractor about how to move forward with project that will use drones to assess vegetation community, evapotranspiration by vegetation, and impacts on groundwater resources in the Shiprock, New Mexico and Moab, Utah areas.



Riparian vegetation along the banks of the San Pedro River. (Photo Credit: Pamela Nagler, USGS)

National Park Service's Expanded Non-native Aquatic Species Management Plan

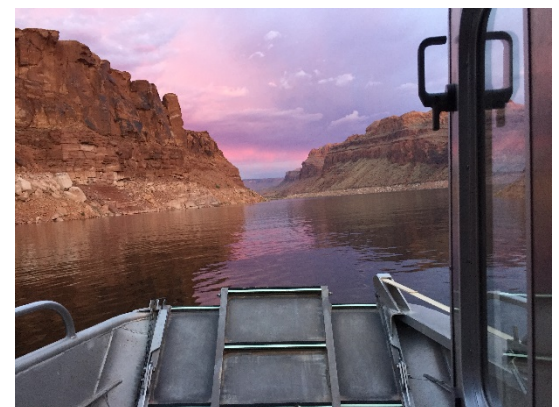
The National Park Service had public open house meetings in Page, Flagstaff, and Phoenix Arizona to discuss the Expanded Non-native Aquatic Species Management Plan. Scott VanderKooi*, chief of SBSC's Grand Canyon Monitoring and Research Center (GCMRC), addressed questions relevant to GCMRC science at the Page and Flagstaff meetings. David Ward*, GCMRC fish biologist, addressed relevant questions in Phoenix.

Grand Canyon Monitoring and Research Center Fish Cooperators Meeting

SBSC's Grand Canyon Monitoring and Research Center (GCMRC) held their annual Fish Cooperators Meeting for the Glen Canyon Dam Adaptive Management Program on December 7-8. GCMRC personnel interacted with Arizona Game and Fish Department, Fish and Wildlife Service, National Park Service, and private consulting firms to share information related to all the fish studies that have occurred during the previous year and coordinate all of next year's research.

Water-Quality Partnership Program

Mike Moran* and Bridget Deemer* of the Grand Canyon Monitoring and Research Center met with Mark Anderson of the Glen Canyon National Recreation Area on December 13, 2017 to discuss potential ideas for funding under the U.S. Geological Survey (USGS)-National Park Service (NPS) Water-Quality Partnership Program. The National Water-Quality Partnership Program empowers USGS scientists and NPS resource managers to work in partnership to support a broad range of policy and management needs related to high-priority water-quality issues in national parks. Various ideas for scientific studies with regard to Lake Powell water quality were discussed.



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

Standards and guidelines for monitoring forest restoration

John Bradford* participated in a workshop for a technical cooperative program called SilvaCarbon on December 5-7 in Washington, D.C. The workshop focused on international consultation on developing standards and guidelines for monitoring of forest restoration.



Lone standing ponderosa pine more than two decades after a forest fire in northern Arizona.
(Photo Credit: John Bradford, USGS)

Southwest Seed Partnership

Molly McCormick* went to the Southwest Seed Partnership as part of their steering committee. Other members of the committee include personnel from U.S Forest Service, Region 3; Fish & Wildlife Service; Bureau of Land Management; and National Park Service.

Colorado River Water Users Association

Scott VanderKooi*, chief of SBSC's Grand Canyon Monitoring and Research Center, Ted Kennedy*, Charles Yackulic*, and Paul Grams* attended the annual meeting of the Colorado River Water Users Association (CRWUA). Scott assisted with outreach and Ted, Charles, and Paul gave presentations at the conference. CRWUA brings people together to exchange ideas and perspectives on the use and management of the Colorado River.

Soil survey and ecological site development on federal lands

Mike Duniway* represented the USGS at the Federal Land Advisory Group (FLAG) meeting in Portland Oregon on December 12 -13. FLAG is a working group of federal agencies that help guide soil survey and ecological site development on federal lands. Natural Resources Conservation Service (NRCS) Soil Survey leadership as well as soil leads from Bureau of Land Management, National Park Service, U.S. Forest Service, and Bureau of Indian Affairs were in attendance. Mike was invited to give a presentation on USGS structure and capacities as they relate to soil survey inventory and associated ecological site development, and opportunities for USGS-NRCS collaboration with completing soils inventories and ecological sites on all federal lands by 2026.



Soil profile in an arid rangeland.
(Photo Credit: Mike Duniway, USGS)

SCIENCE

Published Papers, Reports, Data Releases, etc.

Ferrenberg, S., Faist, A.M., Howell, A.*, and Reed, S.C.*, 2017, **Biocrusts enhance soil fertility and *Bromus tectorum* growth, and interact with warming to influence germination**: Plant and Soil, <https://link.springer.com/article/10.1007/s11104-017-3525-1>.

Lamichhane, B.R., Subedi, N., Pokheral, C.P., Dhakal, M., Acharya, K.P., Pradhan, N.M.B., Smith, J.L.D., Malla, S., Thakuri, B.S., and Yackulic, C.B.*, 2017, **Using interview and biological sign surveys to infer seasonal use of forested and agricultural portions of a human-dominated landscape by Asian elephants in Nepal**: Ethology Ecology & Evolution, <http://www.tandfonline.com/doi/full/10.1080/03949370.2017.1405847>.

Massatti, R.*, Doherty, K.D., and Wood, T.E., 2017, **Resolving neutral and deterministic contributions to genomic structure in *Syntrichia ruralis* (Bryophyta, Pottiaceae) informs propagule sourcing for dryland restoration**: Conservation Genetics, <https://link.springer.com/article/10.1007/s10592-017-1026-7>.

Tucker, C.L.*, McHugh, T.A.*, Howell, A.*, Gill, R., Weber, B., Belnap, J.*, Grote, E.*, Reed, S.C.*, 2017, **The concurrent use of novel soil surface microclimate measurements to evaluate CO₂ pulses in biocrusted interspaces in a cool desert ecosystem**: Biogeochemistry, v. 135, p. 239-249, <https://link.springer.com/article/10.1007/s10533-017-0372-3>.

Walters, D.M., Ford, M.A.*, and Zuellig, R.E., 2017, **A digital reference collection for aquatic macroinvertebrates of North America**: Freshwater Science, v. 36, no. 4, p. 693-697, <https://doi.org/10.1086/694539>.

Presentations, Posters, Lectures, Workshops, and Panels

Dean, D.J.*, Diehl, R.M., and Topping, D.J.*, 2017, **Biogeomorphic feedbacks in the southwestern USA: exploring the mechanisms of geomorphic change and the effectiveness of mitigation measures** [presentation]: American Geophysical Union meeting.

Grams, P.E.*, Buscombe, D.*, Topping, D.J.*, and Mueller, E.R., 2017, **Identification of discontinuous sand pulses on the bed of the Colorado River in Grand Canyon** [poster]: American Geophysical Union meeting.

Kasprak, A.*, Bransky, N., Caster, J.*, Sankey, J.B.*, and Sankey, T., 2017, **The effect of topographic survey technique and resolution on the interpretation of geomorphic change in river valleys** [poster]: American Geophysical Union meeting.

Kennedy, K.*, 2017, **Little bugs, big data, and Colorado River adaptive management** [presentation]: Colorado River Water Users Association annual meeting.

McCormick, M.B.*, 2017, **RAMPS: Restoration Assessment and Monitoring Program for the Southwest** [presentation]: Mojave Native Plant Program Meeting.

Munson, S.M.*, Bunting, E.L.*, Belnap, J.*, and R.H., and Webb, R.H., 2017, **Plant responses, climate pivot points, and trade-offs in water-limited ecosystems** [presentation]: American Geophysical Union meeting.

Platt, A.S., Buscombe, D., Porter, R.C., and Grams, P.*, 2017, **Estimating sediment thickness from riverbed to bedrock within the Colorado River in the Grand Canyon** [poster]: American Geophysical Union meeting.

Reed, S.C.*, Ferrenberg, F., Tucker, C.*, Rutherford, A., Wertin, T., McHugh, T., Morrissey, E., Kuske, C., and Belnap, J.*, 2017, **Dryland responses to global change suggest the potential for rapid non-linear responses to come changes, but strong resistance to others** [presentation]: American Geophysical Union meeting.

Sankey, J.B.*, Kasprak, A.*, Caster, J.*, and East, A.E., 2017, **Inferring the effects of sediment supply changes on sediment connectivity from river-valley morphodynamics** [poster]: American Geophysical Union meeting.

Tucker, T.*, Reed, S.C.*, Howell, A.*, Gill, R., and Belnap, J.*, 2017, **Seasonal reversal of temperature-moisture response of net carbon exchange of biocrusted soils in a cool desert ecosystem** [presentation]: American Geophysical Union meeting.

Yackulic, C.B.*, Deemer, B.*, Dibble, K.*, Yard, M.*, and Kennedy T.*, 2017, **Do we focus too much on flows?** [presentation]: Colorado River Water Users Association annual meeting.

OTHER NOTABLES

Advanced modeling training

Kathryn Thomas* received advanced training on State and Transition Simulation (ST SIM) modeling of landscape vegetation dynamics at Fort Collins, Colorado. The training was attended by USGS, U.S. Forest Service, and Nature Conservancy researchers, as well as graduate students, who are applying ST SIM to model vegetation dynamics, fire behavior, and carbon sequestration among other landscape management and planning issues.

Dryland restoration workshop

Molly McCormick*, representing the Restoration Assessment & Monitoring Program for the Southwest (RAMPS), along with National Park Service-Southwest Exotic Plant Management Team and University of Arizona Cooperative Extension hosted a dryland restoration workshop at the recent Society for Ecological Restoration, Southwest Chapter annual conference. Information on RAMPS can be found here: <https://usgs.gov/sbsc/ramps>.



Experimental restoration plots in a dryland environment.
(Photo Credit: Moly McCormick, USGS)

New member of the Society for Ecological Restoration, Southwest Chapter Board

Molly McCormick* was voted in as the newest member of the Society for Ecological Restoration, Southwest Chapter board.

American Geophysical Union meeting


1) Pamela Nagler* attended the American Geophysical Union meeting and chaired a session titled, **Evapotranspiration: Advances in in situ measurements and remote sensing based modeling approaches**. Additionally, Pamela served as a judge for student presentation for the Outstanding Student Paper Awards and participated in the Hydrological Processes Editorial Board meeting.

2) Sasha Reed* co-chaired several sessions at the recent American Geophysical Union meeting. Specifically, she co-chaired the **Terrestrial ecosystems in a time of change: thresholds, tipping points, and critical transitions**; **Science at the frontier: using multi-method research to create new knowledge and assess tools across spatial and temporal scales**; and **Integrated understanding of climate, carbon, nutrient cycles, human activities, and their interactions in terrestrial ecosystems sessions**.

For more information about the Southwest Biological Science Center:

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

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