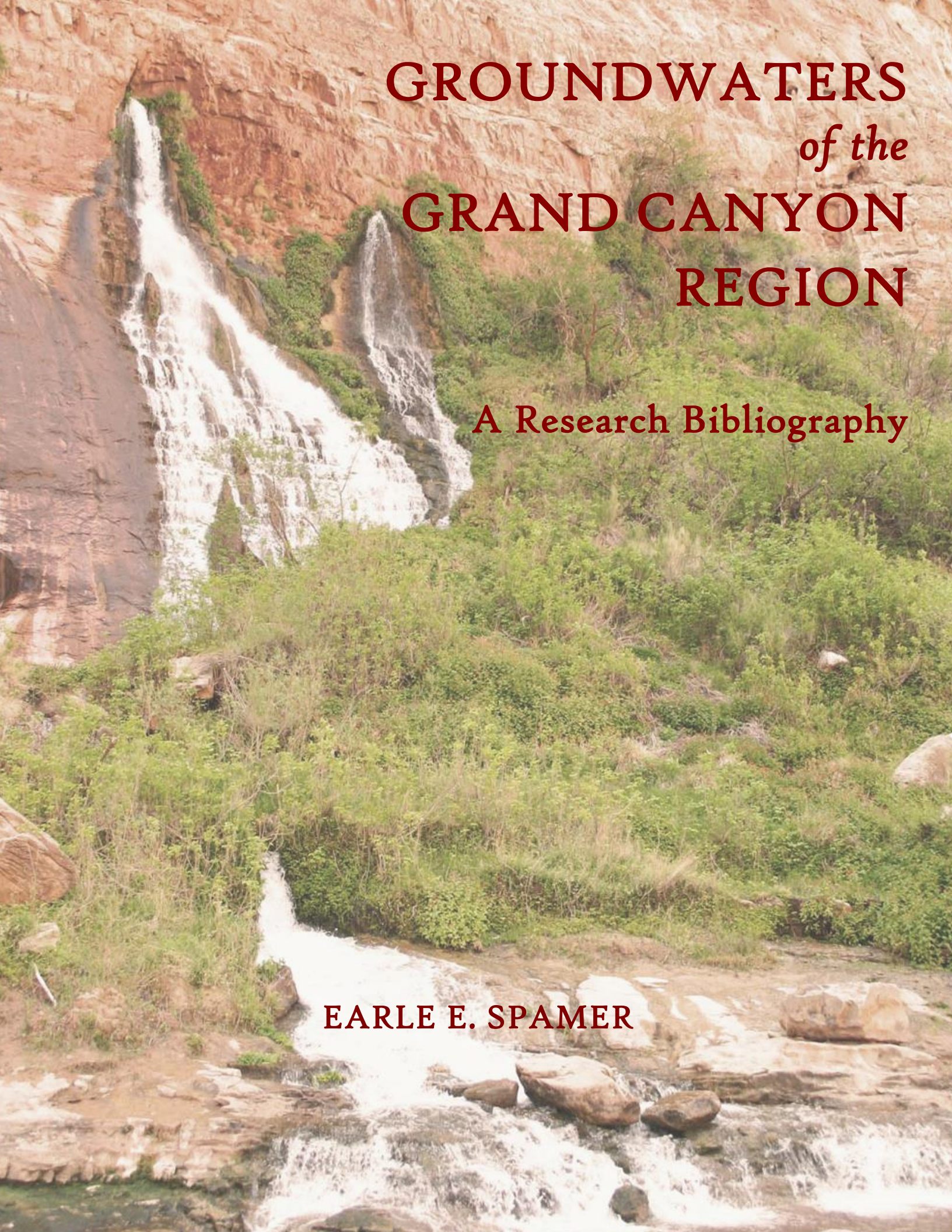

GROUNDWATERS *of the* GRAND CANYON REGION

A Research Bibliography

EARLE E. SPAMER

COVER PHOTO. Vasey's Paradise, Colorado River Mile 31.9 Right, Grand Canyon National Park

(Arizona Game and Fish Department, Jeff Sorenson)

GROUNDWATERS OF THE GRAND CANYON REGION

FRONTISPIECE. Pumpkin Spring, Colorado River Mile 212.9 Left, Grand Canyon National Park

Pumpkin Spring is a highly mineralized carbonate mound-form warm spring (23° C, 73° F), an uncommon occurrence in the Grand Canyon. Geochemical analysis of this groundwater (pH 7.0) reveals high levels of arsenic with zinc, lead, copper, and other contributions. Its gentle overflow has created an orange travertine rind along the bank of the Colorado River. At lower river levels, the rind displays stalactite-like points. (For more information on Grand Canyon's spring types, see the illustrated guide at https://www.nps.gov/grca/learn/nature/spring-types.htm.)

(photo by Nate Loper, via Wikimedia Commons [https://creativecommons.org/licenses/by/2.0] https://commons.wikimedia.org/wiki/File:Pumpkin_Spring_in_the_Grand_Canyon_along_the_Colorado_River_in_Arizona_(52997746290).jpg*; accessed 25 September 2024)*

GROUNDWATERS OF THE GRAND CANYON REGION, ARIZONA

A Research Bibliography of Groundwater Hydrogeology

and the

Record of Environmental Issues, Legislative Oversight, and Native American Cultural Concerns of Groundwater Use

WITH ANNOTATIONS

plus

A Bibliography of Grand Canyon Springs Ecology

———————

1880–2024

EARLE E. SPAMER

RAVEN'S PERCH MEDIA • 2024

GROUNDWATERS OF THE GRAND CANYON REGION, ARIZONA

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GROUNDWATERS
OF THE GRAND CANYON REGION

A Research Bibliography

CONTENTS

IN THE PDF DOCUMENT ALL LINES BELOW ARE HYPERLINKS

GEORGE VASEY

(1822–1893)

carte de visite, 1867

Riding down a short distance a beautiful view was presented. The river turned sharply to the east, and seemed inclosed by a wall set with a million brilliant gems. What could it mean!—every one wondered. On coming nearer we found a fountain bursting from the rock high overhead, and the spray in the sunshine formed the gems which bedecked the walls. The rocks below the fountain were covered with mosses and ferns and many beautiful flowering plants. We named it "Vasey's Paradise," in honor of the botanist who traveled with us the previous year.

— *John Wesley Powell*

"The Cañons of the Colorado."

Scribner's Monthly, Vol. 9, no. 4 (February 1875), p. 406

INTRODUCTION

In recent years there has been increased attention to the groundwaters of the Grand Canyon and the surrounding region. Hydrogeological investigators have made significant inroads toward understanding how the complex system of "plumbing" works in this area, a subject that was, frankly, relatively basic just a generation ago. There are growing concerns about the effect of human activities, especially through breccia-pipe uranium mining, on the channeling of groundwaters to the rare springs of the Grand Canyon and on the chemical and health qualities of the water. The impacts are on humans and the wildlife that depend upon those springs. One source in particular, Roaring Springs, which comes from the Kaibab Plateau karst systems, provides 100 percent of the waters used by millions of visitors and residents yearly on the South and North Rims both. Yet even more concerning is how human-caused changes may affect the sources that are important to Native Americans who have lived here for millenia. These waters shape the livelihoods of these people and, more notably, affects their time-honored cultural and spiritual relationships with the very lands that contribute these waters.

Concerns over the deterioration of water flows and their contamination, and the cultural impacts this has on Native American peoples, have been addressed to agencies at federal and state levels, which administer the laws and policies established for the utilization of lands in and about the Grand Canyon and the protection of natural resources there. On several occasions, federal-level protections have been sought for the greater Grand Canyon ecosystem. Only in 2023 was a broad measure of protection implemented by a Presidential declaration through the Antiquities Act of 1906, when Joe Biden, in the shadow of culturally significant *Wii'i Gdwiisa*—Havasupai, clench-fist mountain; Red Butte in modern geography—signed the proclamation that created the nearly one-million-acre Baaj Nwaavjo I'tah Kukveni–Ancestral Footprints of the Grand Canyon National Monument. Bounding in three parcels the federally-administered lands of the Grand Canyon and vicinity, the monument was created to protect *Baaj nwaavjo* (Havasupai, "where Indigenous peoples roam"), and *i'tah kukveni* (Hopi, "our ancestral footprints"), reflecting the

significance of the Grand Canyon area not just to one, but to many Tribal Nations. (Eleven Indigenous Tribes are traditionally associated with the Grand Canyon.[1])

Still, the creation of the national monument, which protects sacred places for cultural and spiritual practices, does not absolutely protect the ecological, scientific, historic, scenic, and cultural values of the greater Grand Canyon landscape. Existing livestock-grazing, hunting, and fishing uses are continued, but, egregiously, existing uranium-mining sites may continue to be used. While such mines and claims are on both sides of the Grand Canyon, the most socially and politically prominent of these in recent years is near Red Butte—the Pinyon Plain Mine, charily renamed by its corporate owners from its geographically attractive name, Canyon Mine, in light of disapproval of environmental and Indigenous groups. It is this mine that has greatest concerns for disrupting the groundwater connections to South Rim springs, including the most precious of them that feed Havasu Creek, the literal lifeblood of the Havasupai people. The hauling of uranium ore through the Navajo Nation, which occurred soon after the reopening of the mine in 2024, is also a paramount concern to the Diné, who have suffered for years the health effects of decades of uranium mining on their lands. Thus indirectly, the same operations that can impact the Grand Canyon's groundwaters go abroad far beyond the canyon.

All this is a reminder that the Grand Canyon is more than the chasm. It is the lands 'round about, and the people there. Its human history embraces five centuries of Western incursions, since 1540, which is nothing compared to Indigenous Peoples' presence from time immemorial; yet the springs were there when they arrived.

This research bibliography is more than a list of publications. Its content—and more directly the content of the cited publications—displays the breadth of interest and activities in the ecology of Grand Canyon's springs, the hydrogeology of the karst groundwaters that are their sources. There are as well the concerns that the physical effects of the mining operation inside the plateau can alter the coursework of groundwaters and the ecologies of spring areas. When the spring waters are well used by people, the level of concern escalates. Concerns and reactions also appear among administrative, legal, and legislative agential bodies. In fact, interest in the Grand Canyon's groundwaters goes back at least to 1880, when it seems that the warm springs below Lava Falls of the Colorado River were already recognized, although in those days the reasons for interest were both scientific and commercial (therapeutic, supposedly).[2]

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[1] Refer to Earle E. Spamer, *Bibliography of Native Americans Traditionally Associated with the Grand Canyon*, 2nd edition (Raven's Perch Media, 2023) (3rd ed. projected for early 2025).

[2] William Pepper, "Report of Committee on Sanitaria and on Mineral Springs," *Transactions of the American Medical Association*, Vol. 31 (1880) (see under "Unanalyzed" springs, p. 557: "Lava Springs in Grand Cañon of Colorado, Arizona", with no data). Another early reference appeared in A. C. Peale, Lists and analyses of the mineral springs

The bibliography is divided into three sections: *Part 1* comprises publications that relate to the physical aspects of groundwaters in the plateaus that bound the Grand Canyon and of springflows at various heads. This includes a few publications that pertain to studies of ancient groundwater systems of the Grand Canyon; specifically, the study and dating of speleothems that may contribute toward understanding the geological incision rates of parts of the Grand Canyon. *Part 2* contains publications that address human aspects of the groundwaters; specifically, matters relating to oversight by administrative entities and legislations, issues pertaining to the localized environments of springheads, and matters of concern to the cultural and spiritual activities of Native American peoples. *Part 3* is a bibliography of springs ecology for sites in the Grand Canyon and vicinity.

The record contained in these citations traces changes in research themes over time and the introduction of novel topics of scientific curiosity and cultural significance alike. At this time at least, the greatest concerns in the Grand Canyon region relate to understanding the hydrological systems within the plateaus, and to concerns of anthropogenically produced contamination of these waters.

Omitted are publications that pertain to the legacies of mine wastes, unless they specifically relate to groundwater contamination in this region. Likewise, the geochemistry of the region's geological features known as breccia pipes (which were created by groundwater systems of ancient geological time, long before the systems of modern groundwaters) is not a subject addressed in this bibliography. Those of the pipes that are heavily mineralized are the source of abundant metal ores like copper, nickel, zinc, and uranium, but only the publications that address disturbance through the mining of ores, with concomitant effects on the groundwaters, are listed in Part 2.

For publications that relate to broader ecological and environmental matters, which otherwise are about the environments of the Grand Canyon region, consult Part 19 of the comprehensive bibliographical series, THE GRAND CANON, Volume 1/Part A (Raven's Perch Media, new edition projected for early 2025) and separate, specialized bibliography available through Raven's Perch. It is from this series that the citations in this groundwaters bibliography have been extracted *(see next page)*. And regarding the breccia pipes just mentioned, see numerous citations throughout Part 21 of that volume.

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of the United States (a preliminary study), *U.S. Geological Survey Bulletin 32* (1886), p. 196; listing "Lava springs, in Grand Cañon of the Colorado River" with a temperature of 89° F (with no further data) and taking note of "Bitter Spring, south of Lee's Ferry, on Colorado River", with no data. (The latter is apparently Bitter Spring of the Bitter Springs AZ 7.5-minute topographic quadrangle, sited near the head of Salt Water Wash near the base of the Echo Cliffs and not along the river.)

KEY TO ITEM NUMBER PREFIXES

Parts of THE GRAND CANON From Which Citations Have Been Copied For the Groundwaters Research Bibliography

Only those parts that have contributed to this special bibliography are listed.
See https://ravensperch.org for information about the full bibliography.

GENERAL AND PARTICULAR-INTEREST SUBJECTS (GRAND CANYON AND LOWER COLORADO RIVER REGIONS)

2 General Publications — Historical, Geographical, Social, Cultural, Biographical, Popular, and Commonplace Works

HUMAN AFFAIRS

14 Sociology, Recreation, Education, Economics, and Related Subjects in the Grand Canyon–Lake Mead Region

15 Health And Safety in the Grand Canyon–Lake Mead Region

17 Native Americans in the Grand Canyon Region

ENVIRONMENTAL AND BIOLOGICAL SCIENCES

18 Physical Environment of the Grand Canyon Region

19 Biology and Ecology of the Grand Canyon Region

21 Geology of the Grand Canyon Region

GROUNDWATERS OF THE GRAND CANYON REGION

PART 1

Groundwater Hydrogeology

Anonymous

1897 21.5630 A windy well. *In:* Here and There [SECTION]. *The Christian Work*, 62 (January 21): 115.

Air currents from earth cracks in Arizona; specifically one encountered in the drilling of a well by Mr. Coufman "at his place". "It is supposed that there is an underground opening between the Grand Canyon of the Colorado, which cleaves the earth to a depth of more than a mile, and the Sycamore Canyon, some eighty miles to the south of it, of the same proportions, but much shorter." Credited to *Popular Science Monthly* [*sic*; *i.e.*, *Popular Science News* (see Harvey, 1896)]. Fanciful . . . but published.

1951 21.6739 Ground water resources and their conservation. Ground water provinces of the United States (continued); provinces P, Q, and R; P—Southern Rocky Mountain Province; Q—Montana-Arizona Plateau Province; R—Northern Rocky Mountain Province. *The Johnson National Drillers Journal*, 23(5) (September/October): 1-5.

1978 21.7855 A karbonát-és szulfátkőzetek földrajzi elterjedése az Amerikai Egyesült Államokban. Distribution of karst areas in relation to carbonate and sulphate rocks in the United States. *Karszt és Barlang* (Magyar Karszt- és Barlangkutató Társulat, Budapest), 1978(1/2): 56-57. ("W. E. Davies nyomán"; "After W. E. Davies".) [In Hungarian, with bilingual item title.]

Map of the United States; areas delineated and specifically labeled include "Kaibab-fennsik (Eszak-Arizona). Helyenként felszabdalt plató vízszintes fekvésű karbonmészkőből. Sekély dolinák, kevés kisebb méretű barlang." (*transl.* 'Kaibab Mountains (Northern Arizona). In some places, a plateau of horizontal Carboniferous limestone. Shallow sinkholes, few smaller caves.') (ENTIRE NOTE)

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See "Grand Canyon bottled"—"Grand Canyon Spring Water" from a 3,000-ft well at Valle.

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South Rim between Horseshoe Mesa and Horn Creek.

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"Dans le Colorado , le carbonifère , puissant d'environ 1.400 mètres, est presque exclusivement calcaire et gréseux et donnerait lieu à des émissions d'eau abondantes, si la pluie tombait elle même plus copieusement sur la région; à la base , on trouve le calcaire rouge dit du «Red Wall», au milieu le grès rougeâtre d'Aubrey, enfin au sommet le calcaire d'Aubrey. [. . .]

"d) Permien. Dans la région des Apalaches , il est seulement représenté par sa base , soit un conglomérat recouvert par une puissante assise de marnes rouges qui le rend imperméable . Comme on l'a vu , il devient calcaire et parfois gréseux plus à l'Ouest, vers le Nebraska; toutefois dans la région du grand Canon du Colorado , il est représenté par des couches argileuses et gypsifères , rouges ou brunes , qui sont naturellement tout à fait imperméables."

[*transl.* 'On the Colorado, the Carboniferous, about 1,400 meters high, is almost exclusively calcareous and sandstone and would give rise to abundant water emissions, if the rain itself fell more copiously on the region; at the base, we find the red limestone called the "Red Wall", in the middle the reddish sandstone of Aubrey, finally at the top the limestone of Aubrey. [. . .]

'd) Permian. In the Appalachian region, it is only represented by its base, that is, a conglomerate covered by a significant layer of red marl which makes it

impermeable. As we have seen, it becomes calcareous and sometimes sandstone further West, towards Nebraska; however in the region of the Grand Canon of the Colorado, it is represented by clayey and gypsiferous layers, red or brown, which are naturally quite impermeable.']

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Blue Springs on the Little Colorado River. [Refer also to Haydock (2020, ITEM NO. 2.31770).]

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PART 2

Environmental Issues, Legislative Oversight, and Native American Cultural Concerns

Anonymous

1916 2.15980 Melted snow supplies water to arid district. *Engineering News*, 76(10) (September 7): 435.
Proposed water pipelines from San Francisco Peaks to Flagstaff, Williams, and El Tovar at Grand Canyon. See also editorial, p. 467.

1916 2.15981 Ingenious water-supply. *In:* Editorials. *Engineering News*, 76(10) (September 7): 467.
Regarding proposed water pipelines from San Francisco Peaks to Flagstaff, Williams, and El Tovar at Grand Canyon; see item, p. 435.

1924 15.1182 Water supply at Grand Canyon. *Santa Fe Magazine*, 18(2) (January): 30.
Describes the acquisition and daily transport by rail of "100,000 gallons of fresh spring water" from "Jack Smith and Flagstaff springs".

1931 2.27970 [Water pipeline and reservoir.] *Building and Engineering News* (San Francisco), 35(39) (September 26): 21.
"Grand Canyon, Arizona.—Allen Brothers, 1625 S Alameda St., Los Angeles, awarded contract to construct pipe line and reservoir at Grand Canyon, Ariz., for the Santa Fe Railway. The contract includes furnishing and installing approximately 12,000 ft. of 6-in. steel and cast iron pipe from the rim of the canyon to Indian Gardens Springs, and the construction of a 70,000-gallon concrete reservoir and foundations for two pumps." (ENTIRE ITEM)

1966 2.12993 [Passing note of Tom Miller's work as project officer manager with Halvorson Construction Co. on Trans-Canyon Pipeline Project.] *In:* Class Corral [SECTION]. *Alcalde* (University of Texas Alumni Magazine), 55(3) (November): 29.
Transcanyon pipeline.

1970 13.4552 Bright Angel Operation "Fly-Down" for helicopters. *Grist* (U.S. National Park Service, National Conference on State Parks, and National Recreation and Park Association), 14(2) (March/April): 9.
Use of helicopters to fly in bridge segments and pipe to replace bridges and a water pipeline along Bright Angel Creek that were destroyed in the 1966 flood. Three photos and brief description of logistics.

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Features Grand Canyon water supply.

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Desulfovibrio anaerobic bacteria proposed as groundwater additive for Orphan Mine drainage, to discourage drinking.

2012 18.2632 Csökken a Grand Canyoni uránbányászat [*transl.* 'Uranium mining in the Grand Canyon is declining']. *In:* Kishírek a Nagyvilágból ['Wide World News'] [SECTION]. *Atomerőmű* (Paksi Atomerőmű Zártkórűen Működő Részvénytársaság, Paks, Hungary), 35(2) (February): 17. [In Hungarian.]
Regarding the federal withdrawal of lands near Grand Canyon from new mining for 20 years. In noting Senator John McCain's reaction, notes *(in translation here)*, "The senator also believes that mining does not affect the quality of drinking water and has fallen victim to an emotional PR campaign that exploits the public's love for the Grand Canyon."

2012 2.19076 Explorers Over-the-Hills Hikers. *Meadview Monitor*, (November/December): 5.
Includes note of Hualapai water pipeline from Peach Springs to Grand Canyon West.

2013 18.1497 Protect the grandest watershed of all! *Canyon Echo* (Sierra Club, Grand Canyon Chapter), (Winter): 9.
Proposed Grand Canyon Watershed National Monument.

2014 18.1659 Achieving permanent protection of the Grand Canyon watershed. *BlackHawk Watch* (Northern Arizona Audubon Society), 43(4) (March/April): 1.
Proposed Grand Canyon Watershed National Monument.

2014 13.3414 Let's protect the Grand Canyon watershed. *Environment Arizona*, 8(3) (Fall): [1-2].

2015 2.23684 Presenting the 2015 Pathfinder Award recipients: Michael P. Anderson, Elling Halvorson, Alan Mulally. *Aloft* (Museum of Flight, Seattle, Washington), 37(4) (July/August): 16-17.
Halvorson award (p. 17) notes Grand Canyon work, including the transcanyon water pipeline.

2023 13.5363 Baaj Nwaavjo I'tah Kukveni Ancestral Footprints of the Grand Canyon National Monument; a historic event: August 8, 2023. *Boatman's Quarterly Review*, 36(3) (Fall): 11-13.

Pictorial of Joe Biden's designation of the new national monument at the Red Butte Airfield.

2023 17.3589 Tribal leaders join President Biden for the designation of the Baaj Nwaavjo I'tah Kukveni Ancestral Footprints of the Grand Canyon National Monument. *In:* Bulletin Board [SECTION]. *Community Update* (Navajo Nation, Division of Community Development, Window Rock, Arizona), (August): [7].
Baaj Nwaavjo I'tah Kukveni—Ancestral Footprints of the Grand Canyon National Monument.

2023 13.5406 Indigenous Peoples Caucus celebrates new Northern Arizona national monument *The GRIN* (Gila River Indian News, Sacaton, Arizona), 26(16) (August 18): 5. ("Submission; Arizona House Democrats".)
Baaj Nwaavjo I'tah Kukveni—Ancestral Footprints of the Grand Canyon National Monument.

2023 13.5407 New national monument protects tribal lands and waters. *America's Wilderness* (The Wilderness Society), 25(2) (Fall): 7.
Baaj Nwaavjo I'tah Kukveni—Ancestral Footprints of the Grand Canyon National Monument.

2024 13.5408 Groups, scientists urge Arizona governor to close uranium mine in newly designated Baaj Nwaavjo I'tah Kukveni–Ancestral Footprints of the Grand Canyon National Monument. *Canyon Echo* (Sierra Club, Grand Canyon Chapter), (Spring): 4.
See also related cartoon, "Beyond the Slab", by Greg Pentkowski, p. 7.

Aiken, Bruce

2013 15.706 The transcanyon pipeline: A short history. *Canyon Views* (Grand Canyon Association), 20(3) (Summer): 6-7.

Allison, M. Lee, AND Spencer, Jon E.

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Regarding a scientific integrity incident at the U.S. Geological Survey Geochemistry Laboratory (see U.S. Department of the Interior, Office of Inspector General, 2016, ITEM NO. 18.2141). This *Open-File Report* involves research in the Grand Canyon area; specifically in relation to environmental impacts of uranium mining.

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See Grand Canyon noted under "History", p. 2.

Amesbury, Steven S.; Burnett, Jonathan; Chen, Hui; Guertin, D. Phillip; Johns, Renee; Krecek, Tasha; Spouse, Terry; Summerset, James C.; Uhlman, Kristine; AND Westfall, Erin

2010 18.1377 *NEMO watershed-based plan : Colorado-Grand Canyon watershed.* Tucson: University of Arizona, Water Resources Research Center; Arizona Department of Environmental Quality, Water Quality Division; and University of Arizona Cooperative Extension Service, SEPARATELY PAGINATED SECTIONS AND APPENDICES [256 pp. total].
Non-point Education for Municipal Officials.

Arizona Chamber Foundation, AND Prosper Foundation

NO DATE 13.3576 *Policy brief : the proposed Grand Canyon Watershed National Monument: A monumental mistake?* Phoenix: Arizona Chamber Foundation, and Prosper Foundation, 13 pp. [2015.]

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2010 15.569 *Blue ribbon panel on water sustainability : final report : November 30, 2010.* Arizona Department of Environmental Quality, Arizona Corporation Commission, and Arizona Department of Water Resources, 139 pp.
See p. 5: Sewage treatment and water recycling at Grand Canyon since 1926.

Arizona Department of Environmental Quality, Division of Water, Surface Water Section, Monitoring Unit

2007 18.1223 A water quality investigation of seventeen Grand Canyon tributaries: July 2004-May 2005. (Lin Lawson, ed.; Lee Johnson, Jason Jones, Doug McCarty, Kyle Palmer, Steven Pawlowski, Sam Rector, Patti Spindler, Roland Williams, contributors.) *Arizona Department of Environmental Quality, Open File Report 07-04*, 88 pp.
Paria River, Nankoweap Creek, Clear Creek, Bright Angel Creek, Monument Creek, Hermit Creek, Crystal Creek, Shinumo Creek, Royal Arch Creek, Tapeats Creek, Deer Creek, Kanab Creek, Matkatamiba Creek, Havasu Creek, Spring Canyon Creek, Three Springs Creek, Diamond Creek.

Arizona State Legislature

2023 13.5403 *Resolution; opposing the designation of the proposed "Baaj Nwaavjo I'tah Kukveni Grand Canyon National Monument" and demanding the federal government obtain the consent of Congress, Arizona State Legislature, and local communities before designating any additional national monuments, parks, wildlife reguges, conservation areas, areas of critical environmental concern, wild and scenic rivers, wilderness, wilderness characteristics areas, or other federal special use areas in Arizona or otherwise withdrawing and reserving federal mineral, water, land or other natural resource rights in Arizona.* Phoenix: Arizona State Legislature, 15 pp.
Adopted August 7, 2023; with 16 signatures.

Austin, George T., AND Bradley, W. Glen

1969 19.5194 Additional responses of the poor-will to low temperatures. *The Auk*, 86 (October): 717-725.
Laboratory experimentation with "An active female Poor-will caught at Pakoon Springs Ranch, Mohave County, Arizona on 5 April 1968".

Babbitt, Jim [Babbitt, James E.]

2014 18.1708 A grander canyon? Campaigning for Grand Canyon Watershed National Monument. *Colorado Plateau Advocate*, (Fall): 22-23.

Bahr, Sandy

2015 18.1747 Support is growing for Grand Canyon Watershed National Monument proposal. *BlackHawk Watch* (Northern Arizona Audubon Society), 44(4) (March/April): 5.

Bair, Russell T.; Schenk, Edward R.; Tobin, Benjamin W.; AND Childres, Hampton

2016 19.5160 Potential impacts on native and invasive fish habitat in Bright Angel Creek (AZ) with the redesign of Grand Canyon water intake infrastructure [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 48(7): Paper 94-8, doi:10.1130/abs/2016AM-282429.
Regarding the replacement of the Transcanyon Pipeline and consideration of moving intake facility from Roaring Springs to near the mouth of Bright Angel Creek.

Balenquah, Lyle

2023 17.3579 Connected by earth. For the members of the 13 tribes who form the Grand Canyon Tribal Coalition, Baaj Nwaavjo I'tah Kukveni—Ancestral Footprints of the Grand Canyon National Monument is recognized as a landscape that contains markers of Indigenous culture and history. We believe we have lived upon these lands since time immemorial, and our connections to them are rooted in the lifeways of our ancestors. *Colorado Plateau Advocate*, (Fall/Winter): 24-27.

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Center for Biological Diversity

2015 19.4834 *Before the Secretary of the Interior: Emergency petition to list the Arizona wetsalts tiger beetle (*Cicindela haemorrhagica arizonae*) and the MacDougal's yellowtops (*Flaveria macdougalii*) as Endangered or Threatened under the Endangered Species Act.* [No place]: Center for Biological Diversity, [4], 20 pp.

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NO DATE 18.1660 *Conserving the Grand Canyon watershed : a proposal for national monument designation.* [No place]: Center for Biological Diversity, Grand Canyon Wildlands Council, and Sierra Club, v, 15 pp. [May 2012.]

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Davenport, George L., Jr.

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2023 13.5362 Baaj Nwaavjo I'tah Kukveni—Ancestral Footprints of the Grand Canyon National Monument. Native peoples are the Canyon's original stewards and we must continue to stand with them to protect this natural wonder from future threats. *Boatman's Quarterly Review*, 36(3) (Fall): 7-11.
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Gitlin, Alicyn

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Goetz, Mattea

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Brief report, with photos, of a group hike up Red Butte accompanied by hydrogeologist Laura Crossey, geologist Karl Karlstrom, and members of the Havasupai Tribe. Commemorating the Baaj Nwaavjo I'tah Kukveni–Ancestral Footprints of the Grand Canyon National Monument and perspectives on the Pinyon Plain Mine.

Gosar (Mr.) [Gosar, Paul]

2023 13.5432 Amendment no. 92 offered by Mr. Gosar. *Congressional Record—House*, (November 20: H5325.

Remarks "in support of my amendment 92, to prohibit the Biden administration from implementing, administering, or enforcing the recent Grand Canyon National Monument designation and corresponding mineral withdraw for almost a million acres." Baaj Nwaavjo I'tah Kukveni—Ancestral Footprints of the Grand Canyon National Monument.

Gosar (Mr.); Crane (Mr.); Biggs (Mr.); AND Newhouse (Mr.) [Gosar, Paul; Crane, Eli; Biggs, Andrew S.; AND Newhouse, Daniel]

2023 13.5402 A bill; To nullify Presidential Proclamation 10606, establishing Baaj Nwaavjo I'tah Kukveni Grand Canyon National Monument and withdrawing certain land in Arizona from mineral entry, and for other purposes. *U.S. 118th Congress, 1st Session, H. R. 5635*, 2 pp.

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Grand Canyon Trust

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NO DATE 13.5463 *Uranium mining near the Grand Canyon. How does the Grand Canyon national monument impact mining?* [No place]: Grand Canyon Trust, 1 p. [2023.] [Fact sheet.]
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Grand Canyon Wildlands Council; Sierra Club; AND Center for Biological Diversity

NO DATE 18.1661 *Conserving the Grand Canyon watershed : a working draft proposal for national monument designation.* [No place]: Grand Canyon Wildlands Council, Sierra Club, and Center for Biological Diversity, iii, 7 pp. [June 2012.]

Green, Christopher T.; Andraski, Brian; Walton-Day, Katherine E.; Bern, Carleton; Naftz, David L.; Fuller, Christopher; AND Duniway, Michael

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Green, Christopher T.; Conaway, C. H.; Perkins, K. S.; Andraski, Brian J.; Walton-Day, Katherine E.; AND Bern, Carleton R.

2022 21.8485 Variations in hydrology and vertical transport of metals in the unsaturated zone across the mine life cycle at breccia-pipe uranium mines, Arizona, USA [ABSTRACT]. *In: 16th Biennial Conference of Science and Management for the Colorado Plateau and*

Southwest Region, September 12-15, 2022, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona, pp. 72-73.
Study sites at the EZ2 (no production), Arizona 1 (recent production), Pinenut (reclamation), and Kanab North (post-reclamation) claims.

Grijalva (Mr.), AND Gallego (Mr.) [Grijalva, Raúl M., AND Gallego, Ruben]

2023 13.5401 A bill; To designate the Baaj Nwaavjo I'tah Kukveni Grand Canyon National Monument in the State of Arizona, and for other purposes. *U.S. 118th Congress, 1st Session, H. R. 4580*, 23 pp.

Grijalva (Mr.) [Grijalva, Raúl M.]**; *et al.***

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2013 13.4131 A bill; To withdraw the Tusayan Ranger District and Federal land managed by the Bureau of Land Management in the vicinity of Kanab Creek and in House Rock Valley from location, entry, and patent under the mining laws, and for other purposes. *U.S. 113th Congress, 1st Session, House of Representatives, H. R. 1350*, 2 pp. (Grand Canyon Watersheds Protection Act of 2013.)

2019 13.4529 A bill; To protect, for current and future generations, the watershed, ecosystem, and cultural heritage of the Grand Canyon region in the State of Arizona, and for other purposes. *U.S. 116th Congress, 1st Session, House of Representatives, H. R. 1373*, 2 pp., map. (Grand Canon Centennial Protection Act.)

Haaland, Deb

2024 13.5476 *Baaj Nwaavjo I'tah Kukveni–Ancestral Footprints of the Grand Canyon Natinal Monument Advisory Committee : charter.* [Washington, D.C.]: U.S. Bureau of Land Management and U.S. Forest Service, 3 pp.
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Uranium mining.

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Uranium mining.

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1953 21.1350 The Navajo Country, Arizona-Utah-New Mexico. *In: Physical and economic foundation of natural resources, Volume 4, Subsurface facilities of water management and patterns of supply-type area studies.* U.S. Congress, House Interior and Insular Affairs Committee, pp. 105-129.

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National Topographic Map Series. For Grand Canyon 1° × 2° NTMS area see Koller (1980).

Heilweil, Victor M., AND Freethey, Geoffrey W.

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Henry, Brianna L.; Croteau, Marie-Noele; Walters, David M.; Miller, Janet L.; Cain, Daniel J.; AND Fuller, Christopher C.

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Hinck, Jo Ellen

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Hinck, Jo Ellen, AND Cleveland, Danielle

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Hinck, Jo Ellen, AND Linder, Greg

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Hinck, Jo Ellen; Brumbaugh, William G.; Cleveland, Danielle; AND Linder, Greg

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2017 19.5859 Environmental DNA methods for inference of species presence and abundance [ABSTRACT]. *In: 14th Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region, September 11-14, 2017, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona.* [No imprint], p. 139.
Grand Canyon watershed.

Rihs, John

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Rosholt, J. N.; Emslie, Steve; AND Stevens, Larry [Stevens, Lawrence E.]

1987 21.2802 Paleoclimatic and paleohydrologic significance of uranium-series ages of anhydrite and gypsum in caves, Grand Canyon National Park, Arizona [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 19(5): 330.

Sabol, Thomas A.

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2011 13.2853 Public Land order no. 7773; Emergency withdrawal of public and national forest system lands, Coconino and Mohave Counties; AZ. *Federal Register*, 76(124) (June 28): 37826.
Withdrawal for six months of 1,010,776 acres from location and entry under 1872 Mining Law, "to protect the Grand Canyon Watershed from adverse effects of locatable hardrock mineral exploration and mining".

2012 13.2937 Public Land Order No. 7787; Withdrawal of public and National Forest System lands in the Grand Canyon watershed; Arizona. *Federal Register*, 77(11) (January 18): 2563-2566.

Schaar, Melissa A.

2011 18.1362 Occurrence and mobility of uranium and other elements in the Grand Canyon springs [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 43(4): 60.

Schenk, Edward R.

2017 21.7292 Hydrology projects related to the Grand Canyon TransCanyon Pipeline [ABSTRACT]. *In: Annual Symposium of the Arizona Hydrological Society, Flagstaff, Arizona, High Country Conference Center, September 6-9, 2017*.

Schenk, Edward R.; Tobin, Benjamin W.; Thornton, Richard; Stillman, Jennifer; Childres, Hampton; AND Valle, Cynthia M.

2016 21.7049 An overview of surface water studies of desert spring fed streams related to the large-scale replacement of the Transcanyon Pipeline in Grand Canyon National Park [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 48(7): Paper 96-3, doi:10.1130/abs/2016AM-281719.

Regarding the replacement of the Transcanyon Pipeline and consideration of moving intake facility from Roaring Springs to near the mouth of Bright Angel Creek.

Schmidt, Curtis J.

1975 15.810 Current municipal wastewater reuse practices. *In:* Lindstedt, K. Daniel, and Bennett, Edwin R. (eds.), *Research Needs for the Potable Reuse of Municipal Wastewater : proceedings of a workshop sponsored by the: U.S. Environmental Protection Agency, American Water Works Association, Water Pollution Control Federation, in cooperation with the University of Colorado, March 17-20, 1975, Boulder, Colorado.* Cincinnati, Ohio: U.S. Environmental Protection Agency, Office of Research and Development, Municipal Environmental Research Laboratory, pp. 15-28. (Volume: EPA-600/9-75-007.)

See p. 24, the section, "Domestic Reuse", which notes the domestic reuse operation at Grand Canyon National Park.

Schmidt, Curtis J., AND Clements, Ernest V., III

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Grand Canyon, see pp. 36, 92, 98-101, 125, 138; and "Appendix A. Field Investigation Reports, Grand Canyon Village, Arizona", pp. 169-174.

Schmidt, Curtis J., AND Ross, D. E.

1975 15.657 *Cost-effectiveness analysis of muncipal wastewater reuse.* Washington, D.C.: U.S. Environmental Protection Agency, Water Planning Division, 166 pp. + appendices [233 pp. total]. (Water Quality Management Guidance , WPD-4-76-01.)

Includes Grand Canyon.

Schmidt, Curtis J.; Kugelman, Irwin; AND Clements, Ernest V., III

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Grand Canyon, see pp. 2239-2240.

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2023 14.1798 Agency information collection activities; science communication strategies related to mining activities. *Federal Register*, 88(115) (June 15): 39271-39272.

U.S. Geological Survey request for comment pertaining to data collection regarding "potential effects of uranium exploration and mining activities in the Grand Canyon watershed on people, wildlife, and water resources. * * * documenting the efficacy of existing mining-related science communication efforts to partners and advance USGS knowledge and use of communication methods to deliver actionable science to non-science audiences in the future."

2023 21.8468 Agency information collection activities; science communication strategies related to mining activities. *Federal Register*, 88(206) (October 26): 73615-73616.

Request for comment. "*Abstract:* The USGS has a history of conducting research on uranium-bearing breccia pipe deposits to address data gaps related to the potential effects of uranium exploration and mining activities in the Grand Canyon watershed, its people, wildlife, and water resources. The USGS also recognizes a need to constantly update methods for communicating science to partners and non-scientists. The project proposed herein seeks to identify a path toward efficiently providing data and results to decision makers, stakeholders, partners, and the public to maximize the utility of science products. This research will advance USGS capability by documenting the efficacy of existing mining-related science communication efforts to partners and will advance USGS knowledge and use of communication methods to deliver actionable science to non-science audiences in the future. Information will be collected via semi-structured interviews conducted in person with members of the general public in the Grand Canyon watershed."

Shale, Les; Christensen, Eastman; AND Moberley, G. T.

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Society of Petroleum Engineers; International Association of Drilling Contractors.

Shannon, Joseph P.; Vasquez, K.; AND Taylor, C. O'Rourke

1989 18.625 Water chemistry of the Colorado River and it's [*sic*] tributaries from Lees Ferry to Diamond Creek. *In: Colorado River Investigations VIII : July/August, 1989* (supervised by Stanley S. Beus, Lawrence E. Stevens, and Frank B. Lojko). Flagstaff, Arizona: Northern Arizona University, *for* U.S. National Park Service, Grand Canyon National Park, pp. 92-103.

Shearer, Pete

2022 15.1252 Tusayan Sanitary District. *In: Field trip guide—Pinion Plain Mine* [sic, Pinyon Plain Mine]*, Lost Orphan Mine, Tusayan water treatment plant, Grand Canyon water reclamation facility, Coconino County, Arizona : Coconino Plateau Watershed Partership annual field trip, September 30, 2022 : sponsored by: WestLand Engineering and Environmental Services.* [No place]: Coconino Plateau Water Advisory Council and Watershed Partnership, pp. 24-30.

Sierra Club

NO DATE 13.3434 *Grand Canyon Watershed.* San Francisco and Washington, D.C.: Sierra Club, [2] pp. [2015.]

Fact sheet about the proposed Grand Canyon Watershed National Monument.

Sierra Club, Grand Canyon Protection Campaign

2015 13.3490 Support broadens for the Grand Canyon Watershed National Monument. *Boatman's Quarterly Review*, 28(3) (Fall): 12.

Excerpt from July 28, 2015, press release.

Simkins, Larry

1987 15.1315 Water—up, down, and over the edge. *In:* Grand Canyon—Managing over the edge [FEATURE]. *Courier* (U.S. National Park Service, Washington, D.C.), 32(10) (October): 8-9.
Trans-canyon water pipeline.

Sinclair, David A.

2017 21.7309 Geomorphology and floral diversity at Grand Canyon ecoregion springs [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 49(6), Session 300, doi:10.1130/abs/2017AM-303679.

2018 21.8242 *Springs geomorphology influences on physical and vegetation ecosystem characteristics, Grand Canyon ecoregion, USA.* Master's thesis, Northern Arizona University, 113 pp.

SLR International Corporation

2023 21.8482 *Technical report on the pre-feasibility study on the Pinyon Plain project, Coconino County, Arizona, USA : Energy Fuels Inc.* Lakewood, Colorado: SLR International Corporation, *for* Energy Fuels, Inc., Lakewood, Colorado, SEPARATELY PAGINATED SECTIONS [173 pp. total]. (SLR Project No. 138.02544.00006. Effective Date: December 31, 2022. Signature Date: Febraury 23, 2023. Qualified Persons: Mark Mathisen, R. Dennis Bergen, Jeffrey Woods, Lee (Pat) Gochnour, Grant Malensek.)
Pinyon Plain Mine (formerly Canyon Mine).

Smith, Colgan B.

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Smith, George E. P. [Smith, Geoge Edson Philip]

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Sommerfeld, Milton R.; Crayton, Wayne M.; AND Crane, Nancy L.

1976 18.643 *Survey of bacteria, phytoplankton and trace chemistry of the lower Colorado River and tributaries in the Grand Canyon National Park.* Tempe, Arizona: Arizona State University, *Colorado River Research Program, Technical Report 12* (Grand Canyon National Park, Colorado River Research Series, Contribution 40), 136 pp. (National Technical Information Service PB 267731/AS.)

Sorensen, Jeff A.; Kubly, Dennis M.; AND Mallett, W. Michael

1998 18.1802 *Solar Pathfinder data from springs, seeps, and streamside habitats in Grand Canyon and northern Arizona : (Supplemental report to NGTR 122 and 125: Kanab ambersnail investigations) : June 1998.* [Phoenix]: [Arizona Game and Fish Department], 10 pp.

Springer, Abraham E. [Springer, Abe]

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2019 21.7772 The Coconino and Redwall-Muav aquifers of the Grand Canyon region and their importance for people and ecosystems [ABSTRACT]. *In:* Karlstrom, Karl E., Crossey, Laura J., Semken, Steven, Stoeberl, Todd, and Calhoun, Jeanne (convenors), *Grand Canyon Geology and Geoscience Education Public Symposium, April 18-20, 2019 : in honor of Grand Canyon National Park's 2019 centennial celebration, Earth Day 2019, and the 150th anniversary of John Wesley Powell's 1869 pioneering Colorado River expedition.* [No imprint], pp. 26-27.

Springer, Abraham E., AND Mueller, Julie M.

2019 18.2374 Known and unknown values of springs ecosystem services for two national forests in a semi-arid region [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 51(5): Paper No. 267-2 (https://gsa.confex.com/gsa/2019AM/meetingapp.cgi/Paper/335209).

Land management and ecology in Kaibab National Forest and Coconino National Forest.

Springer, Abraham E., AND Stevens, Lawrence E.

2008 21.4801 Importance of springs and springs [*sic*] ecosystems to species and habitats of the Colorado River [ABSTRACT]. *In: Colorado River Basin Science and Resource Management Symposium 2008. Coming together: Coordination of science and restoration activities for the Colorado River ecosystem : abstracts : November 18-20, 2008, Doubletree Resort Hotel, Scottsdale, Arizona.* [No imprint], p. 65.

Steevens, Jeffery A.; Keith, G. K.; AND Bern, Carleton R.

2022 15.1300 Potential use of zero valent iron to reduce toxicity in uranium mine detention pond water [ABSTRACT]. *In: 16th Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region, September 12-15, 2022, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona*, pp. 176-177.

Pertaining to an unspecified breccia pipe mining site in the Grand Canyon region.

Stevens, Bonnie

2018 21.7620 How long can ancient water quench the thirst of millions? Understanding the business of water flowing from the cavernous Grand Canyon aquifer. *Flagstaff Business News* (Flagstaff, Arizona), 5(11) (May): 1, 35.

Stevens, Lawrence E. [Stevens, Larry]

2007 18.1243 *A compilation and evaluation of historic water temperature and related water quality data from the Colorado River, Grand Canyon, with particular emphasis on river miles 55 to 65: Final report.* Flagstaff, Arizona: Stevens Ecological Consulting, LLC, *for* U.S. Geological Survey, Grand Canyon Monitoring and Research Center, Flagstaff, 26 pp. + [Appendix A] "Microsoft Access database of Colorado River and tributaries water temperature and associated water chemistry (provided in electronic form only)".

Stevens, Lawrence E.; Ledbetter, Jeri; Hardwick, Gloria; Joyce, Molly A.; Misztal, Louise; AND Campbell, Carianne

2016 21.7014 (EDS.) *Arizona springs restoration handbook : Sky Island Alliance and the Springs Stewardship Institute.* [Flagstaff and Tucson, Arizona]: Museum of Northern Arizona, Springs Stewardship Institute; Desert Landscape Conservation Cooperative; and Sky Island Alliance, 125 pp. [Cover title: *Arizona Springs*.]
Grand Canyon noted throughout.

Stevens, Lawrence E.; Springer, Abraham E.; AND Schenk, Edward R.

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Stevens Ecological Consulting, LLC

2005 18.1484 *An ecological assessment of water resources, Kane and Two Mile Ranches, eastern Arizona Strip: 30 September 2005 draft final report.* Flagstaff, Arizona: Stevens Ecological Consulting, LLC, *prepared for* Grand Canyon Wildlands Council, Inc., Flagstaff, Arizona, *for submission to* Grand Canyon Trust, Flagstaff, Arizona, 68 pp.
Kane Ranch, Two Mile Ranch.

Stewart, B. D.

1989 18.2272 Determination of ^{226}Ra and uranium in fish samples from waters of the Grand Canyon (Arizona, USA) by alpha spectroscopy without electrodeposition. *Journal of Radioanalytical and Nuclear Chemistry*, 137(3): 213-218.

Stewart, B. D.; McKlveen, J. W.; AND Glinski, R. L.

1988 18.2271 Determination of uranium and radium concentrations in the waters of the Grand Canyon by alpha spectrometry. *Journal of Radioanalytical and Nuclear Chemistry*, 123(1) (July): 121-132.
Colorado River and tributaries.

Stronghold Engineering, Inc.

2023 15.1308 Transcanyon waterline; Grand Canyon National Park, Arizona; cost $208 million; duration March 2023-ongoing; type civil. *Stronghold Engineering, Inc.* [newsletter] (Perris, California), (3rd Quarter): 1.
The firm was awarded the contract for waterline project construction March 14, 2023.

Symons, George E.

1967 15.679 Water reuse—what do we mean? *In:* Proceedings of the 22nd Industrial Waste Conference, May 2, 3, and 4, 1967. *Purdue University, Engineering Bulletin*, 52(3): 1059-1065. (Volume: Engineering Extension Series, 129.)
See p. 1062: "In this country since about 1924, the effluent of an activated sludge municipal wastewater plant effluent has been used for lawn sprinkling in Grand Canyon National Park." (ENTIRE NOTE)

1968 15.680 Water reuse: What do we mean? *Water and Wastes Engineering*, 5(6): 40-43.

Taylor, Howard E.; Spence, John R.; Antweiler, Ronald C.; Berghoff, Kevin; Plowman, Terry I.; Peart, Dale B.; AND Roth, David A.

2004 21.4143 Water quality and quantity of selected springs and seeps along the Colorado River corridor, Utah and Arizona: Arches National Park, Canyonlands National Park, Glen Canyon National Recreation Area, and Grand Canyon National Park, 1997-98. *U.S. Geological Survey, Open-File Report 2003-496*, 34 pp.

Thomas, David; Sharrow, David; Wynn, Kriby; Brown, Julianne; Beer, Margaret; AND Thomas, Helen

2009 18.1478 *Water quality vital signs monitoring protocol for park units in the northern Colorado Plateau network.* U.S. National Park Service, Inventory and Monitoring Program, Version 1.01, SEPARATELY PAGINATED SECTIONS [1,040 pp. total].
Includes Pipe Spring National Monument.

Tillman, Fred D.; Beisner, Kimberly R.; Anderson, Jessica R.; AND Unema, Joel A.

2022 21.8428 An assessment of uranium in groundwater in the Grand Canyon region. *In: Field trip guide—Pinion Plain Mine* [sic, Pinyon Plain Mine]*, Lost Orphan Mine, Tusayan water treatment plant, Grand Canyon water reclamation facility, Coconino County, Arizona : Coconino Plateau Watershed Partership annual field trip, September 30, 2022 : sponsored by: WestLand Engineering and Environmental Services.* [No place]: Coconino Plateau Water Advisory Council and Watershed Partnership, pp. 15-20.
Pinyon Plain Mine formerly Canyon Mine.

2024 21.8490 Grand Canyon, uranium mines, and groundwater; investigating the connection. *Boatman's Quarterly Review*, 37(1) (Spring): 10-12.

Tillotson, M. R. [Tillotson, Miner R.]

1929 15.143 A water supply for the North Rim of the Grand Canyon. *Arizona State Board of Health, Bulletin*, 50: 35-37.

Tilousi, Carletta

2023 13.5410 Grand Canyon Tribal Coalition celebrates Baaj Nwaavjo I'tah Kukveni–Ancestral Footprints of the Grand Canyon National Monument designation. *Hopi Tutuveni* (Kykotsmovi, Arizona), 31(16) (August 16): 2.

Tilousi, Carletta, AND Hinck, Jo Ellen

2022 21.8486 The Havasupai perspective of uranium mining in Grand Canyon Watershed: a conceptual risk model [ABSTRACT]. *In: 16th Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region, September 12-15, 2022, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona*, p. 185.

2024 21.8477 Expanded conceptual risk framework for uranium mining in Grand Canyon watershed—inclusion of the Havasupai Tribe perspective. *U.S. Geological Survey, Open-File Report 2023-1092* (Version 1.1, February 2024), 25 pp.

2024 21.8492 Conceptual risk framework—Havasupai perspective. *U.S. Geological Survey, General Information Product 240*, 1 p. [Labels in Havasupai and English.]
"Modified from Tilousi and Hinck, 2023"; *i.e.* Tilousi and Hinck (2024, ITEM NO. 21.8477).

2024 21.8481 Contaminant exposure framework—Havasupai perspective. *U.S. Geological Survey, General Information Product 239*, 1 p.
"Modified from Tilousi and Hinck, 2023"; *i.e.* Tilousi and Hinck (2024, ITEM NO. 21.8477).

2024 21.8493 Havasuw Baj Gwawg Gnavg. *U.S. Geological Survey, General Information Product 241*, 1 p. [In Havasupai.]
"Modified from Tilousi and Hinck, 2023"; *i.e.* Tilousi and Hinck (2024, ITEM NO. 21.8477). Abstract from USGS website indicates, "This General Information Product was designed to show the contaminant exposure framework from the Havasupai perspective in the Havasupai language." Translation of "Contaminant exposure framework—Havasupai perspective" (ITEM NO. 21.8481).

Tobin, Benjamin W.; Springer, Abraham E.; Kreamer, David K.; AND Schenk, Edward

2018 18.2592 The distribution, flow, and quality of Grand Canyon springs, Arizona (USA). *Hydrogeology Journal*, 26(3) (May): 721-732 + Supplementary Material online at https://link.springer.com/article/10.1007/s10040-017-1688-8. [With abstracts also in French, Spanish, Chinese, and Portuguese.]
Supplementary Material Table S1 provides data for ion chemistry of springs (previously unpublished): Lower Milkweed Canyon, Milkweed Spring, Big Spring, Boucher East Spring, Burro Spring, Clear Creek, Diamond Creek Spring, Grapevine East Spring, Grapevine Main Spring, Havasu Spring, Hawaii Spring, Hermit Spring, Hindu Canyon Spring, Indian Garden Spring, JT Spring, Lonetree Spring, Meriwhitica Spring, Mines Spring, Monument Spring, Peach Springs, Pipe Creek, Pumphouse Spring, Red Canyon Spring, Ribbon Creek, Roaring Springs, Salt Creek Spring, Tapeats Creek, Thunder River, Vaseys Paradise, Artesian Spring at River Mile 183, Bridge Canyon Spring, Granite Spring Canyon Spring, Travertine Canyon Spring, Warm Springs at Lava Falls, Ridenour Mine Spring, Caly Tank Canyon Spring, Fern Spring, Horse Flat Canyon Spring.

Uhlman, Kristine

2008 15.684 Arsenic in Arizona ground water; source and transport characteristics. *University of Arizona, Arizona Cooperative Extension, AZ1453*, 4 pp.

Uhlman, Kristine; Rock, Channah; AND Artiola, Janick

2009 15.683 Arizona drinking water well contaminants. *University of Arizona, Arizona Cooperative Extension, AZ1503*, 4 pp.

U.S. Bureau of Land Management

NO DATE 15.686 Nixon Spring drinking water source redevelopment. [No place]: *U.S. Department of the Interior Recovery Investments*, 1 p.
Variant 1: "Construction is estimated to begin by March, 2010 and end August, 2010", Scott Sticha, contact; photo, aerial view at site.

NO DATE 15.687 Nixon Spring drinking water source redevelopment. [No place]: *U.S. Department of the Interior Recovery Investments*, 1 p.
Variant 2: "Construction is estimated to begin by June, 2010 and end in mid October, 2010", Linda Johnson, contact; photo, view of spring area.

U.S. Circuit Court, Northern District of New York

1905 15.568 *United States Circuit Court, Northern District of New York. In equity, No. 7025. Cameron Septic Tank Company, Complainants, vs. Village of Saratoga Springs and the Sewer, Water and Street Commission of Saratoga Springs, Defendants. Pleadings and proofs.* U.S. Circuit Court, Northern District of New York, 909 pp.
See statement of Hubert D. Wyllie, witness on behalf of the complainant, p. 3 and following; specifically, p. 29, reference *in passing* to Grand Canyon, Arizona, as one location of sewage disposal plants constructed by his company, Cameron Septic Tank Company.
Notice in volume: "Owing to an error on the part of the printer, the first 59 pages and 294 folios of this record contain the printed copy of the complainant's prima facie case. To avoid, therefore, the trouble and expense of entirely repaging and renumbering the folios, the case is left in its present form, the court's attention being respectfully called to the error."

U.S. Department of Agriculture, Natural Resources Conservation Service; AND University of Arizona, Water Resources Research Center

2010 18.1423 *Havasu Canyon watershed : Rapid Watershed Assessment Report June, 2010.* [No place]: U.S. Department of Agriculture, Natural Resources Conservation Service; and University of Arizona, Water Resources Research Center, SEPARATELY PAGINATED SECTIONS [67 pp. total].
Principal Investigators: Dino DeSimone, Keith Larson, Kristine Uhlman, Terry Sprouse, Phil Guertin. Prepared in cooperation with Coconino Natural Resource Conservation District, Arizona Department of Agriculture, Arizona Department of Environmental Quality, Arizona Department of Water Resources, Arizona Game and Fish Department, Arizona State Land Department, U.S. Forest Service, and U.S. Bureau of Land Management.

U.S. Department of the Interior, Office of Inspector General

2016 18.2141 Scientific integrity incident at USGS Energy Geochemistry laboratory. *U.S. Department of the Interior, Office of Inspector General, Report 2016-EAU-010*, 15 pp.

Regarding a scientific integrity incident at the U.S. Geological Survey Geochemistry Laboratory, Lakewood, Colorado. Among products affected is noted, *in passing* (p. 5) "assessment of uranium in the environment in and around Grand Canyon National Park in Arizona for possible groundwater restoration". See also Allison and Spencer (2016, ITEM NO. 18.2140).

U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Radiation Protection Division

2008 15.978 *Technical report on technologically enhanced naturally occurring radioactive materials from uranium mining. Volume 1: Mining and reclamation background.* Washington, D.C.: U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Radiation Protection Division, SEPARATELY PAGINATED SECTIONS [225 pp. total].

"Previously published on-line and printed as Vol. 1 of EPA 402-R-05-007, January 2006; Updated June 2007 and printed April 2008 as EPA 402-R-08-005".

Orphan Mine, Grand Canyon, see in Section 3 ("Volume and Characteristics of Uranium Mine Wastes", subsection "Potential for Water Contamination, pp. 3-15 to 3-20), and in Appendix III ("Overview of Uranium Mines and *In Situ* Leach Operations Case Studies"), pp. AIII-1 to AIII-2.

U.S. House of Representatives, Committee on Natural Resources, Subcommittee on National Parks, Forests and Public Lands

2009 13.2777 *H. R. 644, Grand Canyon Watersheds Protection Act of 2009 : legislative hearing before the Subcommittee on National Parks, Forests and Public Lands of the Committee on Natural Resources, U.S. House of Representatives, One Hundred Eleventh Congress, First Session : Tuesday, July 21, 2009 : Serial No. 111-27.* Washington, D.C.: U.S. Government Printing Office, 67 pp.

Title from p. 1: *Legislative hearing on H.R. 644, to withdraw the Tusayan Ranger District and Federal land managed by the Bureau of Land Management in the vicinity of Kanab Creek and in House Rock Valley from location, entry, and patent under the mining laws. (Grand Canyon Watersheds Protection Act of 2009).*

U.S. House of Representatives, Natural Resources Committee Democrats

2023 17.3565 *Baaj Nwaavjo I'tah Kukveni Grand Canyon National Monument designation effort.* U.S. House of Representatives, Natural Resources Committee Democrats, 1 p.

"On April 11, 2023, tribal leaders of the Grand Canyon Tribal Coalition, joined by Ranking Member Raúl M. Grijalva (D-Ariz.) and Senator Krysten Sinema (I-Ariz.), launched an effort to call on President Joe Biden to use his authorities under the Antiquities Act of 1906 to designate the Baaj Nwaavjo I'tah Kukveni Grand Canyon National Monument." Map accessed at https://democrats-naturalresources.house.gov/imo/media/doc/Proposed%20Baaj%20Nwaavjo%20I'tah%20Kukveni%20Grand%20Canyon%20NM%20Map_20230410.pdf.]

U.S. National Park Service

NO DATE 15.439 *North Rim Development Concept Plan, Grand Canyon National Park, draft* . [AND] *Draft Environmental Assessment, proposed Development Concept Plan, North Rim, Grand Canyon National Park, Arizona.* [AND] *Environmental Assessment, water system improvement, Grand Canyon National Park, Arizona, North Rim.* U.S. National Park Service, 1 volume. [1976.]

1925 15.1231 Tentative agreement covering the construction and operation of sewage-treatment plant, and use and diversion of effluent recovered therefrom, at the Grand Canyon National Park, Grand Canyon, Ariz. *In: National Forests and the Public Domain : hearings before a subcommittee of the Committee on Public Lands and Surveys, United States Senate, Sixty-ninth Congress, First Session, pursuant to S. Res. 347 : June 18, 1925 : Part 5.* Washington, D.C.: U.S. Government Printing Office, pp. 1526-1527.

S. Res 347, to investigate all matters relating to national forests and the public domain and their administration.

Part 5, subcommittee meeting "at the schoolhouse in Grand Canyon National Park, Ariz[.], Senator Ralph H. Cameron, presiding."

This item is a document introduced into the record, following on the testimony of the superintendent of Grand Canyon National Park (see J. R. Eakin, 1925, ITEM NO. 13.5196). The agreement is on the authority of an act of Congress, March 3, 1925. Of special note: "On account of the excessive high cost of fresh water at the canyon and the absence of any supply which can be developed to materially lessen this cost it is necessary to treat the sewage so that the effluent may be used again for boiler feed, cooling water for Diesel engines, irrigation, and restricted toilet purposes."

U.S. National Park Service, Denver Service Center

1977 15.886 *Environmental Assessment : water system improvement, North Rim, Grand Canyon National Park.* U.S. National Park Service, Denver Service Center, 40 pp.

1980 15.155 *Environmental Assessment : Phantom Ranch sewage treatment facilities, Grand Canyon National Park, Arizona*. Denver: U.S. National Park Service, 22 pp.

1984 15.593 *Environmental Assessment, replace water distribution system, village area, Grand Canyon National Park.* U.S. National Park Service, Denver Service Center, 67 pp.

1985 15.594 *Environmental Assessment : modify wastewater treatment plant, South Rim : Grand Canyon National Park, Arizona.* U.S. National Park Service, Denver Service Center, 30 pp.

U.S. National Park Service, Grand Canyon National Park

NO DATE 15.251 *Safe drinking water.* U.S. National Park Service, Grand Canyon National Park, information sheet. [2002?]

NO DATE 13.4119 *Transcanyon water distribution pipeline, Grand Canyon National Park : Environmental Assessment.* U.S. National Park Service, Grand Canyon National Park, SEPARATELY PAGINATED SECTIONS [92 pp. total]. [2018.]

For public comment. Transcanyon pipeline.

NO DATE 15.1330 *1926 water reclamation plant.* U.S. National Park Service, Grand Canyon National Park, 2 pp. [*Ca.* 2023.]

Illustrated fact sheet.

1963 15.156 *Rehabilitation of water systems and supplementary water supply for North and South Rim developments, Grand Canyon National Park, Arizona*. U.S. National Park Service, Grand Canyon National Park, 8 pp. + appendices.

2000 15.559 *Improvements for Desert View wastewater treatment system : Draft Environmental Assessment : Grand Canyon National Park, Desert View.* U.S. National Park Service, Grand Canyon National Park, 32 + 3 pp.

2001 21.3798 *Native waters.* U.S. National Park Service, Grand Canyon National Park, 4 pp. [Fact sheet.]
Groundwater hydrology and biological communities at springs.

2006 15.473 *Safe drinking water.* U.S. National Park Service, Grand Canyon National Park, 1 p. ("1106".)

2017 13.3850 *Trans-Canyon Water Distribution Pipeline : Environmental Assessment.* U.S. National Park Service, Grand Canyon National Park, 8 pp.
Request for public input in developing an Environmental Assessment for the replacement of the Trans-Canyon Water Distribution Pipeline. Includes one-leaf pre-addressed comment sheet for mailing to Grand Canyon.

2019 13.4516 *Finding of No Significant Impact : transcanyon water distribution pipeline.* U.S. National Park Service, Grand Canyon National Park, 46 pp.

2023 15.1299 *North Rim water system improvements : pre-NEPA : civic engagement, June-July 2023.* U.S. National Park Service, Grand Canyon National Park, 3 pp.
Newsletter. Regarding the proposed replacement of the North Rim to Roaring Springs water pipeline. NEPA: National Environmental Policy Act.

U.S. National Park Service, Historic American Engineering Record (HAER)

2015 16.1202 *HAER AZ-95. Transcanyon water line (trans-canyon water pipeline), Grand Canyon National Park, beginning 5 miles below North Kaibab Trail and .14 miles east of Roaring Springs and extending to Indian Garden and Indian Garden pumphouses, Grand Canyon vicinity, Coconino County, Arizona.* Denver, Colorado: U.S. National Park Service, Intermountain Regional Office, Historic American Engineering Record, 34 pp.
"Historian: James Wright Steely, Historian and Architectural Historian, SWCA Environmental Consultants, Denver, Colorado. The HAER team completed documentation in summer 2015."

U.S. National Park Service, Water Resources Division

1996 18.2216 *Baseline water quality data inventory and analysis : Grand Canyon National Park.* Fort Collins, Colorado: U.S. National Park Service, Water Resources Division, *for* U.S. National Park Service, Washington, D.C., SEPARATELY PAGINATED SECTIONS [827 pp. total]. (Water Resources Division and Servicewide Inventory and Monitoring Program.) (*U.S. National Park Service, Water Resources Division, Technical Report NPS/NRWRD/NRTR-96/84.*)

1999 18.2217 *Baseline water quality data inventory and analysis : Pipe Spring National Monument.* Fort Collins, Colorado: U.S. National Park Service, Water Resources Division, *for* U.S. National Park Service, Washington, D.C., SEPARATELY PAGINATED SECTIONS [240 pp. total]. (Water Resources Division and Servicewide Inventory and Monitoring

Program.) (*U.S. National Park Service, Water Resources Division, Technical Report NPS/NRWRD/NRTR-99/220.*)

U.S. Public Health Service, Indian Health Service

2004 15.953 *The Sanitation Facilities Construction Program of the Indian Health Service : Public Law 86-121 : Annual Report for 2004.* Rockville, Maryland: U.S. Department of Health and Human Services, Indian Health Service, Office of Environmental Health and Engineering, Division of Sanitation Facilities Construction, 39 pp.

See p. 12, "Supai Village Water System Improvements, Havasupai Indian Reservation, Arizona".

Unmacht, Jim

2023 13.5451 Review from the Ridge [COLUMN]. *Arizona Sportsmen for Wildlife Conservation : annual report and accomplishments : 2023*. New River, Arizona: Arizona Sportsment for Wildlife Conservation, p. [2] [pagination includes wraps].

Regarding the "President's Proclamation last summer with the Grand Canyon" (refers to the Baaj Nwaavjo I'tah Kukveni–Ancestral Footprints of the Grand Canyon National Monument, not mentioned by name): "We did not advocate for such a designation, however we were afforded an opportunity by Senator Sinema and Representative Grijalva to work with their staffs to join the Arizona Game and Fish Commission and Department in outline what was needed to make the inevitable monument palatable for wildlife, conservation, the Commission/Department's authority, as well as hunting and angling."

Wachholtz, Jordan; Paulson, Gregg; AND Kreamer, David K.

2018 21.7633 Mining in the Grand Canyon watershed and the implications on the quality of water sources [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 50(6): doi:10.1130/abs/2018AM-323830.

Wasser, Miriam

2018 21.8523 Will Trump dump on Grand Canyon? Experts say risk of uranium mining not worth reward. *Phoenix New Times* (Phoenix), (January 11):.

The Wilderness Society

2017 18.2061 *Too wild to drill.* Washington, D.C.: The Wilderness Society, 36 pp. [White paper on drilling and mining threats to environment of public lands. See "Greater Grand Canyon Watershed, Arizona", pp. 8-9.]

Wood, Alexander J.; Springer, Abraham E.; AND Tobin, Benjamin W.

2020 18.2423 Geochemical variability in karst-siliciclastic aquifer spring discharge, Kaibab Plateau, Grand Canyon. *Environmental and Engineering Geoscience*, 26(3) (August): 367-381.

"This study focuses on the hydrogeological variability within the shallow karst-siliciclastic Coconino (C) aquifer on the Kaibab Plateau, north of Grand Canyon National Park."

Woolley, Travis

2023 13.5433 Baaj Nwaavjo I'tah Kukveni—proposed national monument to protect the Grand Canyon. *In:* Region 2 Director's Report. *Arizona Wildlife News*, 68 (Summer): 17-18.

GROUNDWATERS OF THE GRAND CANYON REGION

PART 3

Springs Ecology of the Grand Canyon Region

This bibliography cites publications that specifically pertain to the ecology of springs in the Grand Canyon region. Publications pertaining strictly to geochemical investigations of groundwaters and environmental impact studies are listed in Part 2 herein.

Other publications are not cited, particularly those that relate to biological or systematic studies of certain taxonomic groups or species, except those that report from specific spring sites; for example, Vasey's Paradise, "Indian Garden" (renamed Havasupai Gardens in 2023), or Thunder River.

More general publications about Grand Canyon ecology are likely to include some material about springs in the canyon and nearby—for example: publications that pertain to the feral burro problems may contain observations made at spring sites disturbed by these introduced animals; or publications about range conditions on the Arizona Strip may include its infrequent spring sites. These publications are not generally cited herein because they are not focused on springs ecology.

Part 19 of THE GRAND CANON Volume 1/Part A contains all biologically and ecologically relevant publications. Raven's Perch Media also has available several taxonomically focused bibliographies accessible online at https://ravensperch.org/special-biological-bibliographies/ — non-avian terrestrial vertebrates (including bats), ornithology, ichthyology, entomology (insects, arachnids, and other arthropods), invertebrates (except insects and other arthropods), botany, and protists and other microorganisms. Also available is a bibliography and annotated checklist of living organisms first taxonomically named from the Grand Canyon and vicinity.

Organismal identifications in these citations are contemporary and may have been reidentified or taxonomically reassigned or synonymized since the time of publication.

Anonymous

2010 19.3996 Grand Canyon Spring, and springs in the wildlands. *Wild and Brief* (Grand Canyon Wildlands Council), 1(1) (May 7): [1].
Includes "Pakoon Springs Restoration".

Bailard, Jennifer L., AND Moret, Geoffrey J. M.

2017 19.6690 *Mojave Desert Network selected large springs : Tassi Spring benthic macroinvertebrate and springsnail data 2012 to 2016.* Fort Collins, Colorado: U.S. National Park Service, Natural Resource Stewardship and Science, 13 pp. (*U.S. National Park Service, Natural Resource Data Series, NPS/MOJN/NRDS—2017/1119*.)
Grand Canyon-Parashant National Monument.

Brian, Nancy J.

2000 19.1981 (COMPILER) Checklist of non-vascular plants of Grand Canyon National Park, Arizona; kingdoms Monera, Protista, Fungi, and Plantae (phylum Bryophyta). *Notulae Naturae* (Academy of Natural Sciences of Philadelphia), (474), 20 pp.
NOTE: This paper includes records of diatoms (Bacillariophyceae) from previously uncollected localities, including spring sites in the Colorado River corridor, and some new taxonomic records for Grand Canyon diatoms, that were determined from material collected by Earle Spamer.

Brulliard, Nicolas

2017 19.6766 Desert gator; the life and times of Clem of Grand Canyon-Parashant. *National Parks*, 91(3) (Summer): 58-59.
Regarding the feral alligator set loose in the 1970s at Pakoon Springs, a ten-acre habitat now in Grand Canyon-Parashant National Monument; recaptured in 2005 and now living in a sanctuary in Scottsdale, Arizona.

Burke, Kelly J.; Harcksen, Kathleen A.; Stevens, Lawrence E.; Andress, Robert J.; AND Johnson, R. J.

2015 19.4794 Collaborative rehabilitation of Pakoon Springs in Grand Canyon-Parashant National Monument, Arizona [ABSTRACT]. *In:* Riper, Charles van, III, Drost, Charles A., and Selleck, S. Shane (compilers), A quarter century of research on the Colorado Plateau—A compilation of the Colorado Plateau Biennial Conference Proceedings for 1993-2015. *U.S. Geological Survey, Open-File Report 2015-1115*, p. 174.
Abstract in advance of paper in press *in* Huenneke, Laura F., Riper, Charles van, III, and Hays-Gilpin, Kelley A. (eds.), *Proceedings of the Eleventh Biennial Conference of Research on the Colorado Plateau*.

2015 19.5115 Collaborative rehabilitation of Pakoon Springs in Grand Canyon-Parashant National Monument, Arizona. *In:* Huenneke, Laura F., Riper, Charles van, III, and Hays-Gilpin, Kelley A. (eds.), *The Colorado Plateau VI : science and management at the landscape scale.* Tucson: University of Arizona Press. (11th Biennial Conference of Research on the Colorado Plateau.)

Cain, D. L.; Croteau, M.-N.; Fuller, C. C.; Barasch, D.; Beisner, K.; AND Schenk, E.

2017 19.5836 Uranium exposure in spring outflows within Grand Canyon National Park [ABSTRACT]. *In: 14th Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region, September 11-14, 2017, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona.* [No imprint], p. 28.
Data based on studies of insect taxa.

Cantonati, Marco; Fensham, Roderick J.; Stevens, Lawrence E.; Getecke, Reinhard; Glazier, Douglas S.; Goldscheider, Nico; Knight, Robert L.; Richardson, John S.; Springer, Abraham E.; AND Tockner, Klement

2020 19.6882 Urgent plea for global protection of springs. *Conservation Biology*, 35(1): 378-382.
See illustrations: Fig. 1c, "Thunder River Springs (Grand Canyon National Park, U.S.A.), a karstic cave gushet spring (photo by J. H. Holway)"; Fig. 1f, "Flaveria mcdougallii, occurs at only a few alkaline springs in central Grand Canyon (U.S.A.) (photo by LS)".

Carothers, Steven W., AND Aitchison, Stewart W.

1971 19.5780 *Blue Springs (mi. 13, Little Colorado River) as a barrier to distribution of speckled dace Rhinichthys osculus Girard (CYPRINIDAE) : preliminary report (1971) and request for additional support (1972).* [Flagstaff, Arizona]: Museum of Northern Arizona, *for* Grand Canyon Natural History Association, 10 pp. [Title thus.]

Cartwright, Jennifer M.; Dwire, Kathleen A.; Freed, Zach; Hammer, Samantha J.; McLaughlin, Balir; Misztal, Louise W.; Schenk, Edward R.; Spence, John R.; Springer, Abraham E.; AND Stevens, Lawrence E.

2020 19.6451 Oases of the future? Springs as potential hydrologic refugia in drying climates. *Frontiers in Ecology and the Environment*, 18(5): 245-253 + Supporting Information online, http://onlinelibrary.wiley.com/doi/10.1002/fee.2191/suppinfo (19 pp.).
Although this item is broadly pertinent to the area covered by this bibliography, there is no specific reference to this area other than a photo of "hanging gardens", without location information, but which shows the Royal Arches along the Colorado River in Marble Canyon (figure 1b, p. 246).

Croteau, M.-N.; Cain, D. J.; Campbell, K. M.; AND Fuller, C. C.

2019 19.6276 Uranium bioaccumulation in aquatic invertebrates: A comparative study in spring outflows in the Grand Canyon National Park [ABSTRACT]. *In: 15th Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region : theme: "Science and Solutions for Conserving the Southwest's Land, Water, Biodiversity and Cultures" : September 9-12, 2019, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona*, pp. 29-30.

Croteau, M.-N.; Fuller, C. C.; AND Cain, D. L.

2015 19.4847 Bioavailability of uranium to aquatic invertebrates: how modeling can help to understand U bioaccumulation [ABSTRACT]. *In: 13th Biennial Conference of Science and Management on the Colorado Plateau and Southwest Region, October 5-8, 2015,*

Northern Arizona University, High Country Conference Center : oral and poster abstracts, p. 21.
Grand Canyon springs and streams.

Darrow, Robert A.

1948 19.5217 Notes on the Arizona flora. *Leaflets of Western Botany*, 5(6) (May): 93-100.
See *Shepherdia argentea* (Pursh) Nutt., from "Two Mile Spring, House Rock Valley" (p. 97).

Dohm, Paul W.; Weber, Jake R.; Gianniny, Gary L.; AND Tobin, Benjamin W.

2017 19.5839 Matrix porosity and desert seep communities in the R-aquifer; insights from the sequence stratigraphy and diagenesis of the Redwall Limestone, Grand Canyon, Arizona [ABSTRACT]. *In: 14th Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region, September 11-14, 2017, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona.* [No imprint], pp. 47-48.

Drost, Charles A.

2005 19.2589 Biology of stream caves in Grand Canyon National Park [ABSTRACT]. *In: Eighth Biennial Conference of Research on the Colorado Plateau, du Bois Center, Northern Arizona University, 7-10 November 2005 : program and abstracts of presented papers and posters (version 2.0)*, p. 41.

Drost, Charles A., AND Blinn, Dean W.

1995 19.2878 *Invertebrate survey of Roaring Springs Cave, Grand Canyon National Park, September 1994.* [Flagstaff, Arizona: Northern Arizona University], *for* U.S. National Park Service, Denver Service Center, 13 pp. (Work Order 1443PX200094183.)

1997 19.572 Invertebrate community of Roaring Springs Cave, Grand Canyon National Park, Arizona. *Southwestern Naturalist*, 42(4): 497-500.

Engelhardt, George P.

1917 19.3317 Grand Canyon notes. *Copeia*, (39) (January 24): 5-7.
Notes from a trip into Grand Canyon on Bright Angel Trail, principally at Indian Garden; on lizards, frogs and tadpoles.

Gladson, Dick

2004 19.2443 Spring reveg work at Indian Garden. *Footprints*, (8) (January/February): 3.
Revegetation project.

Grand Canyon Trust, Staff

1997 19.663 Seeps in the Grand Canyon; hope springs eternal. *Colorado Plateau Advocate*, (Fall): 3.

Grand Canyon Wildlands Council

2001 19.2351 *An inventory, assessment, and development of recovery priorities for Arizona Strip springs, seeps and natural ponds: A synthesis of information.* Flagstaff, Arizona: Grand Canyon Wildlands Council, Inc., *for* Arizona Water Protection Fund, Phoenix, 49 pp. (AWPF grant no. 99-074WPF: Task 2.)

2002 19.3858 *Arizona Strip springs, seeps and natural ponds: Inventory, assessment, and development of recovery priorities : final project report.* Flagstaff, Arizona: Grand Canyon Wildlands Council, Inc., *for* Arizona Department of Water Resources, Arizona Water Protection Fund, Phoenix, 47 pp. (AWPF grant no. 99-074WPF.)

2010 19.3862 *Pakoon Springs rehabilitation : final report.* Flagstaff, Arizona: Grand Canyon Wildlands Council, Inc., *for* U.S. Bureau of Land Management, Grand Canyon-Parashant National Monument, St. George, Utah, and Arizona Department of Water Resources, Arizona Water Protection Fund, Phoenix, 84 pp. + maps and rehabilitation plans (11 × 17-inch format) + 910 field rehabilitation photos on DVD. ("Task #9, AWPF grant contract #06-137WPF and including Task #4 and Task #8 final monitoring reports".)

Henry, Brianna L.; Croteau, Marie-Noele; Walters, David M.; AND Cain, Daniel J.

2017 19.5844 Bioaccumulation dynamics and transfer of uranium across metamorphosis in the mayfly *Neocloeon triangulifer* [ABSTRACT]. *In: 14th Biennial Conference of Science and Management for the Colorado Plateau and Southwest Region, September 11-14, 2017, High Country Conference Center, Northern Arizona University, Flagstaff, Arizona.* [No imprint], p. 71.

Studies of material gathered along the Colorado River (locations not identified), as a model for understanding uranium mining impacts in the Grand Canyon region.

Henry, Brianna L.; Croteau, Marie-Noele; Walters, David M.; Miller, Janet L.; Cain, Daniel J.; AND Fuller, Christopher C.

2020 19.6560 Uranium bioaccumulation dynamics in the mayfly *Neocloeon triangulifer* and application to site-specific prediction. *Environmental Science and Technology*, 54(18): 11313-11321 + Supplemental Information online (https://pubs.acs.org/doi/10.1021/asc.est.0c03372), 7 pp.

". . . mayfly U concentrations were predicted using the water chemistry and U measured in periphyton from springs in Grand Canyon . . ." (from the abstract).

Hershler, Robert; Liu, Hsiu-Ping; AND Stevens, Lawrence E.

2016 19.5617 A new springsnail (Hydrobiidae: *Pyrgulopsis*) from the lower Colorado River basin, northwestern Arizona. *Western North American Naturalist*, 76(1): 72-81.

Pyrgulopsis hualapaiensis, new species; types from Upper Peach Springs, Hualapai Indian Reservation, Mohave County, Arizona.

Kobor, Jeremiah S., AND Springer, Abraham E.

2003 19.2482 Predicting riparian vegetation response to groundwater withdrawals: An interdisciplinary modeling approach to a regional spring system, Grand Canyon, AZ [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 35(6): 374.

Kobor, Jeremiah S.; Springer, Abraham E.; Scott, M. L.; AND Shafroth, P.

2004 19.4555 Hydrologic and ecologic responses to diminished spring discharge; surface-water/groundwater and vegetation modeling, Grand Canyon, Arizona [ABSTRACT]. *Eos* (American Geophysical Union, Transactions), 85(47, Fall Meeting Supplement), Abstract H33D-0497.

Kubly, Dennis M.; Sorensen, Jeff A.; AND Henderson, Norman R.

1998 19.2045 *Contingency plan for relocating Niobrara ambersnails from –9 Mile Spring, Glen Canyon, in the event of an emergency, high discharge flood from Glen Canyon Dam : an evaluation of potential scenarios and options prepared for the interagency Kanab Ambersnail Working Group.* [No imprint], 7 pp.

2001 19.5982 Contingency plan for relocating Niobrara ambersnails from –9 Mile Spring, Glen Canyon, in the event of an emergency, high discharge flood from Glen Canyon Dam : an evaluation of potential scenarios and options prepared for the interagency Kanab Ambersnail Working Group. *In:* Sorensen, Jeff A., and Nelson, Clay B., *Final progress report for 2000: Status of translocated Kanab ambersnail populations in Grand Canyon, Arizona : status of the Phoenix Zoo ambersnail refugium : status of the Niobrara ambersnail population at Minus 9 Mile Spring, Glen Canyon, Arizona.* Phoenix: Arizona Game and Fish Department, Nongame and Endangered Wildlife Program.

Reprinting of Kubly *et al.* (1998, ITEM NO. 19.2045).

Ledbetter, Jeri D.; Stevens, Lawrence E.; Hendrie, Marguerite; AND Leonard, Ariel

2016 19.4997 Ecological inventory and assessment of springs ecosystems in Kaibab National Forest, northern Arizona. *In:* Ralston, Barbara E. (ed.), Proceedings of the 12th Biennial Conference of Research on the Colorado River Plateau. *U.S. Geological Survey, Scientific Investigations Report 2015-5180*, pp. 25-40.

Ledbetter, Jeri D.; Stevens, Lawrence E.; Leonard, Ariel; AND Hendrie, Marguerite

2013 19.5436 Springs ecosystems of Kaibab National Forest [ABSTRACT]. *In: 12th Biennial Conference of Science and Management on the Colorado Plateau, September 16-19, 2013, Northern Arizona University, Flagstaff, Arizona : program and abstracts of presented papers and posters.* [Flagstaff, Arizona: Northern Arizona University], p. 84.

Williams and North Kaibab Ranger Districts.

McCulley, Bryan

1985 21.2114 *Marble Canyon spring sampling investigation.* Columbus, Ohio: Battelle Memorial Institute, Office of Nuclear Waste Isolation, technical report BMI/ONWI-514, 62 pp

Contract report, under contract no. DE-AC02-83CH10140 with U.S. Department of Energy. [Geochemistry.]

Meretsky, Vicky J.

2008 19.2951 Mechanisms of change in seep/spring plant communities on the southern Colorado Plateau. *In:* Stevens, Lawrence E., and Meretsky, Vicky J. (eds.), *Aridland springs in North America : ecology and conservation.* Tucson: University of Arizona Press.

Meretsky, Vicky J., AND Stevens, Lawrence E.

1997 19.6920 Changes in paradise: spatio-temporal vegetation dynamics at Vaseys Paradise, Grand Canyon, Arizona [ABSTRACT]. *In:* Ecological Society of America, 1997 Annual Meeting jointly with The Nature Conservancy, 10-14 August 1997, Albuquerque, New Mexico; "Changing Ecosystems: Natural and Human Influences"; Abstracts. *Ecological Society of America Bulletin*, 78(4) (October, Supplement): 146.

Meretsky, Vicky J., AND Wegner, David L.

1999 19.2231 *Kanab ambersnail at Vaseys Paradise, Grand Canyon National Park, 1998 monitoring and research : year-end final report.* [No imprint], 9 pp. [Submitted to SWCA, Inc.]

2000 19.3909 *Kanab ambersnail at Vasey's Paradise, Grand Canyon National Park, 1998-99 monitoring and research : final report.* Flagstaff, Arizona: SWCA, Inc., *for* Grand Canyon Monitoring and Research Center, Flagstaff, Arizona, [4], 21, [27] pp.

Meretsky, Vicky J.; Miller, M. P.; Nelson, C. B.; Sorenson, J. A.; AND Stevens, L. E.

1999 19.1141 Conservation of an endangered succineid land snail. *First Symposium of the Freshwater Mollusk Conservation Society, March 17-19, 1999, Chattanooga, TN : program guide and abstracts*, pp. 53-54.

Nuyttens, Kaleigh; Springer, Abe E.; AND Stevens, Lawrence E.

2022 19.6741 Springs of Grand Canyon's South Rim: Ecological inventories, assessments, and updated hydrologic trends [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 54(2): abstract 4-8, https://doi.org/10.1130/abs/2022CD-374179.

Osife, Maiya Laree

2013 19.6536 Pakoon Springs: The rehabilitation continues. *Southern Paiute-Parashant Bulletin* (U.S. Bureau of Land Management and U.S. National Park Service, Grand Canyon-Parashant National Monument), 1 (July): 6-7.

NOTE: As noticed on p. 1, Osife is the author of the entirety of this inaugural issue.

Pelz, Jen

2024 19.6872 The missing waterfall. *Colorado Plateau Advocate*, (Spring/Summer): 26-29.

Drought conditions affect springs and spring communities in Grand Canyon.

Rice, Steven E.

2013 18.1525 Springs and seeps: The life source of Grand Canyon. *Canyon Views* (Grand Canyon Association), 20(3) (Summer): 3-4.

Scott, Joan

2003 19.2445 Another day in paradise; researchers take on a heavenly mission to save a tiny mollusk. (Photographs by Bob Miles.) *Wildlife Views* (Arizona Game and Fish Department), 46(2) (March/April): 1, 6-10.
Kanab ambersnail at Vasey's Paradise, Marble Canyon, Grand Canyon National Park.

Shelley, Rowland M., AND Stevens, Lawrence E.

2003 19.5129 Discovery of the milliped *Tylobolus utahensis* Chamberlin in Arizona (Spirobolida: Spirobolidae). *Western North American Naturalist*, 63(4): 541-542.
One male and one female specimen collected by Stevens on April 3, 2001, at Upper Deer Creek spring, Grand Canyon. Not illustrated.

Simmons, Virginia McConnell

1976 19.6711 Vasey's Paradise lost? The Inner Gorge of the Grand Canyon is much richer in flora than is generally recognized. *National Parks and Conservation Magazine*, 50(10) (October): 11-14.

Sinclair, B. J.

2006 19.2960 A new species of *Wiedemannia* Zetterstedt from Grand Canyon National Park, with notes on additional Nearctic species (Diptera: Empididae). *Entomological Society of Ontario, Journal*, 137: 25-30.
Wiedemannia digna, new species; type locality Vasey's Paradise.

Sinclair, David A.

2017 19.5613 Geomorphology and floral diversity at Grand Canyon ecoregion springs [ABSTRACT]. *Geological Society of America, Abstracts with Programs*, 49(6), Session 300, doi:10.1130/abs/2017AM-303679.

2018 19.6587 *Springs geomorphology influences on physical and vegetation ecosystem characteristics, Grand Canyon ecoregion, USA.* Master's thesis, Northern Arizona University, 113 pp.

Snow, Tim K.; Castner, Shawn V.; AND Noel, Debra C.

1994 19.4220 Bat survey of Roaring Springs Cave (Coconino County, Arizona). *Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 58*, 7 pp.

Sommerfeld, Milton R.; Crayton, Wayne M.; AND Crane, Nancy L.

1976 18.643 *Survey of bacteria, phytoplankton and trace chemistry of the lower Colorado River and tributaries in the Grand Canyon National Park.* Tempe, Arizona: Arizona State University, *Colorado River Research Program, Technical Report 12* (Grand Canyon National Park, Colorado River Research Series, Contribution 40), 136 pp. (National Technical Information Service PB 267731/AS.)

Sorensen, Jeffrey Alan [Sorensen, Jeff A.]

NO DATE 19.1994 *Kanab ambersnail (Succineidae:* Oxyloma haydeni kanabensis *Pilsbry, 1948).* [Arizona Game and Fish Department, Nongame and Endangered Wildlife Program], [6] pp. [2000.] [Fact sheet.]

2001 19.2066 *Kanab ambersnails in Grand Canyon, Arizona: Sampling error, habitat relationships, and population assessment.* Master's thesis, Arizona State University, 49 pp.

2005 19.3235 Kanab ambersnail 2005 progress report: Status of translocated populations and initial results from the November 2004 habitat mitigation experiment. *Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 243*, 15 pp.

2009 19.3236 Kanab ambernsail habitat mitigation for the 2008 high flow experiment. *Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 257*, 7 pp.

Sorensen, Jeff A., AND Kubly, Dennis M.

1997 19.1519 Investigations of the endangered Kanab ambersnail: monitoring, genetic studies, and habitat evaluation in Grand Canyon and northern Arizona. *Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 122*, 102 pp.

1997 19.2238 *Studies on the endangered Kanab ambersnail in Grand Canyon, Arizona* [ABSTRACT]. Presentation at the annual conference of the Arizona/New Mexico chapters of the American Fisheries Society and the Wildlife Society, Gallup, New Mexico, February 8, 1997, 1 p.

1998 19.2232 Monitoring and habitat surveys of the endangered Kanab ambersnail in Grand Canyon and northern Arizona. *Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 125*, 31 pp.

Sorensen, Jeff A.; Kubly, Dennis M.; AND Winstead, Richard A.

1998 19.2239 *A snail tale: Grand Canyon floods prompt recovery efforts for an endangered mollusk* [ABSTRACT]. Presentation to Guides Training Seminar, Fredonia, Arizona, March 28, 1998, 1 p.
Kanab ambersnail.

Sorensen, Jeff A.; Nelson, Clay B.; AND Bolen, Darren K.

2003 19.2449 Kanab ambersnail 2003 progress report: Analysis of habitat data, status of translocated populations, and additional habitat surveys. *Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 220*, 54 pp.

Spamer, Earle E.

1995 19.1521 Strange bedfellows; W.W. Bass and the Endangered Species Act. *Nature Notes* (Grand Canyon National Park), 11(3) (Fall): 10-11.
Regarding the Kanab ambersnail, *Oxyloma haydeni kanabensis*, at Vasey's Paradise.

1996 19.1522 Academy helps save habitat of endangered snail. *Explore* (Academy of Natural Sciences of Philadelphia), 2(1) (February/March): 3.
Regarding the Kanab ambersnail, *Oxyloma haydeni kanabensis*, at Vasey's Paradise.

2000 19.1996 Mollusks run through it. *High Country News*, 32(17) (September 11): 13. [Letter in response to article, "The snail that stands like a dam", by Guy Webster, 32(14) (July 31): 5 (ITEM NO. 19.2011).] [Editor's title for letter.]
Regarding the Kanab ambersnail, *Oxyloma haydeni kanabensis*, at Vasey's Paradise.

Spamer, Earle E., AND Bogan, Arthur E.

1991 19.4809 *Mollusks of the Colorado River corridor, Grand Canyon, Arizona : including an overview of mollusks of the Grand Canyon region.* Philadelphia: Academy of Natural Sciences of Philadelphia, Department of Malacology, *for* [U.S. Bureau of Reclamation], Glen Canyon Environmental Studies [Flagstaff, Arizona], 40 pp. [December 1991.]
This report was cited by Spamer and Bogan (1993, ITEM NO. 19.1524) as "in press" *in* D. W. Blinn, L. E. Stevens, and J. P. Shannon, "The effects of Glen Canyon Dam on the aquatic food base in the Colorado River corridor in Grand Canyon, Arizona", U.S. National Park Service report, NPS cooperative agreement no. CA-8009-8-002. However, that report by Blinn *et al.* was not produced as such, and thus this GCES report was not included.
NOTE: Spamer and Bogan (1993 , ITEM NO. 19.1524) published revised and updated data to those presented in this GCES report, but this 1991 report does include comparative and supporting data that are not available elsewhere. This report is accessible on the Grand Canyon Monitoring and Research Center website.
Survey sites include spring areas of Vasey's Paradise and Thunder River.

1993 19.1524 Mollusca of the Grand Canyon and vicinity, Arizona: New and revised data on diversity and distributions, with notes on Pleistocene-Holocene mollusks of the Grand Canyon. *Academy of Natural Sciences of Philadelphia, Proceedings*, 144: 21-68. [Published April 7.]
Survey sites include spring areas of Vasey's Paradise and Thunder River.

1993 19.1525 New records of Mollusca for Grand Canyon National Park and Arizona. *Southwestern Naturalist*, 38(3) (September): 293-298.
NOTE: The authors had intended that this paper appear before the one published in the *Proceedings of the Academy of Natural Sciences of Philadelphia* (Spamer and Bogan, 1993, ITEM NO. 19.1524); however, due to publisher's delays in *Southwestern Naturalist* the *Proceedings* paper appeared first, in April.\
Survey sites include spring areas of Vasey's Paradise and Thunder River.

2002 19.2223 Contrasting objectives in environmental mediation, reconnaissance biology, and endangered species protection—a case study in the Kanab ambersnail, *Oxyloma haydeni kanabensis* Pilsbry 1948 (Gastropoda: Stylommatophora: Succineidae). *Walkerana*, 9 [for 1997-1998] (22): 177-215. [Publication of volume delayed.]
Regarding the Kanab ambersnail at Vasey's Paradise.

Spence, John R.

1993 19.3914 *A preliminary survey of hanging gardens and related vegetation along the Colorado River, Grand Canyon National Park.* Page, Arizona: Glen Canyon National Recreation Area, Resource Management Division, 13 [15] pp.
Between Vasey's Paradise and Lava Falls.

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The RAVEN'S PERCH MEDIA colophon is derived from original artwork by **Balduin Möllhausen**. It recalls this bird's habit of gathering and caching objects. It is a fine detail from the lithograph delineated by J. J. Young that is "General Report Plate VII" in Joseph C. Ives' *Report Upon the Colorado River of the West, Explored in 1857 and 1858* (Washington, 1861), which depicts a wintry camp just south of the Grand Canyon. The scene was sketched and described by Möllhausen on April 10, 1858, while he was perched in a nearby tree. He noted (in translation here), "a couple of ravens [*paar Raben*] croaked morosely on the bare branches of a dried-up fir tree as they waited impatiently for our departure, so that they could scout around the abandoned camp site for fat morsels." (Möllhausen, *Reisen in die Felsengebirge Nord-Amerikas bis zum Hoch-Plateau von Neu-Mexico, unternommen als Mitglied der im Auftrage der Regierung der Vereinigten Staaten ausgesandten Colorado-Expedition*. Hermann Costenoble, Leipzig, 1861, Vol. 2, p. 83.) Möllhausen's original watercolor painting is now in the Amon Carter Museum of American Art (Fort Worth, Texas; https://www.cartermuseum.org/collection/character-high-table-lands-1988146).

Raven's Perch Media was created in 2018, but Möllhausen's remarks on this very scene were not discovered until the translation was made for *Möllhausen's Grand Canyon*, another Raven's Perch Media production (2022).

BACK COVER PHOTOS

Mining activities at Grand Canyon historically encroached on the very areas frequented by visitors and residents. Investigations continue into their effects on groundwaters of the region.

(TOP) The Orphan Mine headframe, which was present during 1959–2009, is shown positioned on the old Orphan copper-mining claim (1906) that was found in a breccia pipe that breaches the canyon wall immediately west of Grand Canyon village. After high-grade uranium ore was discovered there in 1951, a full-fledged operation mined the site for several years, trucking ore out of the park to far-away mills. The mine is today a part of the national park and is closed off, being a U.S. Environmental Protection Agency Superfund Site (ID AZN000908478). Warnings are issued regarding the use of springs in the canyon near this site, which have unhealthy uranium concentrations.

(BOTTOM) One of the adits of the Last Chance copper mine on Horseshoe Mesa below Grandview Point. While small springs occur in the area, including the Miner's Spring adjacent to the mine site, the small-scale mining operation, packing very rich copper ore out of the canyon by mule in the late 19th and early 20th centuries, was not significant enough to seriously affect them.

(photos U.S.National Park Service)