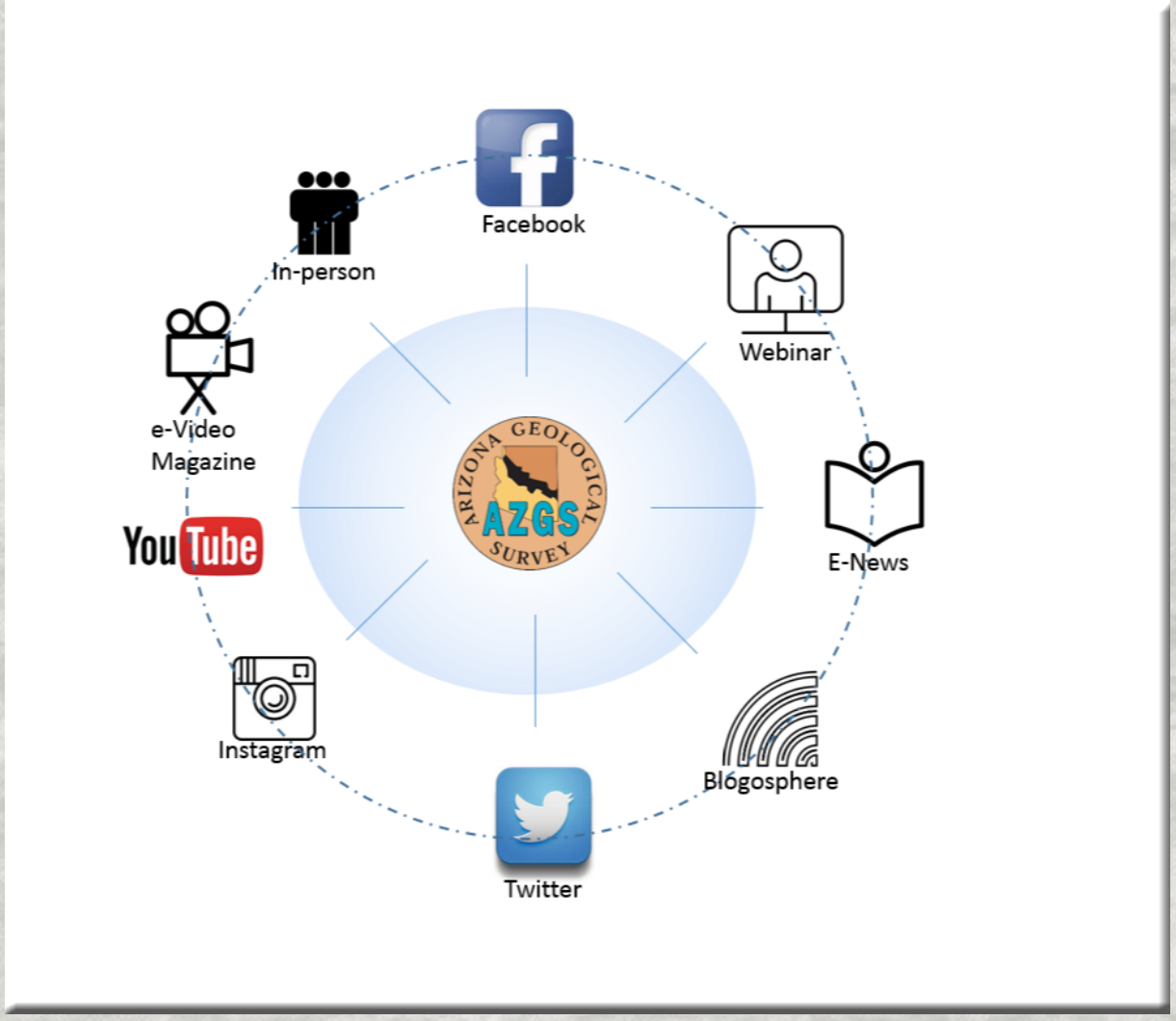
Reaching Beyond the Choir: Using an integrated social media-web platform to share the research products of a state science agency

F.M. Conway



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February 2020

UA SCIENCE
ARIZONA GEOLOGICAL SURVEY

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Arizona Geological Survey
University of Arizona

P.A. Pearthree, Arizona State Geologist and Director

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ARIZONA GEOLOGICAL SURVEY

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AZGS social media posts reached about 8,700 people a day in 2019!

Introduction

Those in the public, private, and government sector increasingly rely on information and news from social media outlets and websites. AZGS stakeholders are no exception. About 60% of US adults rely on the internet as their primary source of information for science-based inquiries (Brossard, D. and Scheufele, D.A., 2013). A Pew Research Center report shows that Youtube and Facebook are accessed by 73% and 69%, respectively, of all adult US internet users (Perrin and Anderson, 2019). Instagram (37%), LinkedIn (27%) and Twitter (22%) follow in their wake.

In light of this increase in internet use, science institutions and societies have a responsibility to establish robust social media and web resources to deliver their research and products to those beyond their core stakeholders. In the case of the AZGS, Arizona State statute, AZ Rev Stat 27-152, tasks AZGS to: *provide geologic information to enhance public understanding of the state's geologic character, geologic hazards and limitations, and mineral resources; and to inform, advise and assist the Arizona public in matters concerning the geological processes, Earth materials, landscapes, and the development and use of mineral resources.*

Social media platforms provide inexpensive and powerful avenues for disseminating geoscience materials. According to Rowlands and others (2011), researchers increasingly use social media tools to: 1) communicate their work; 2) develop and sustain networks and collaborators; and 3) to learn what others are doing. The Traveling Geologist integrated social platform is a pioneering effort to inspire budding scientists and fostering science communication (Spencer and others, 2017).

For state geological surveys, social media outlets provide an unequaled, and cost-effective, opportunity to showcase and deliver their products and services to stakeholders, policy-makers, and the public.

An original AZGS Facebook post, which frequently reaches thousands of viewers, requires four-to eight-minutes to build; a post on the House Mtn. shield volcano on 4 Jan 2020 reached nearly 14,000 viewers. Twitter, LinkedIn, and Instagram posts require one- to two-minutes to prepare because the content is typically immediately at hand. Conversely, original Arizona Geology blog posts can take one- to three-hours to draft. In aggregate, a week of social media posts requires roughly 90-minutes, with an additional one- to three-hours to draft an original blog post. Over an average 7-day stretch, AZGS Facebook and Twitter posts reach approximately 60,000 people, or about 660 individuals per work-minute.

Designing and populating attractive and content-rich websites is order of magnitudes more costly to develop. They do, however, provide a stable, easily accessed platform for delivering basic geoscience information addressing popular geologic themes: geologic hazard assessment and monitoring, energy resources, and the nature of mineral resources and the state of mining and resource recovery.

Science Communication Philosophy

Position AZGS as a statewide and regional leader implementing innovative geoscience communication model to disseminate geologic products and services

Communicating AZGS objectives, goals, projects and accomplishments is of mission-critical importance for the Survey. The Survey leadership team, with input from select stakeholders (e.g., Arizona Land Subsidence Group, STATEMAP Advisory Committee, Arizona Geological Society, and others) develops messaging and social media products congruent with the overarching objectives and mission laid out by state statute.

Over the past decade, we expanded our communications and social media footprint to inform and engage our stakeholders, decision-makers, and the broader public regarding the role of AZGS geoproducts in building a stronger, more resilient Arizona. We employed 'content marketing' tactics create relevant and valuable content to attract and engage a broader audience, with the objective of informing and empowering stakeholders.

<u>AZGS Target Audiences</u>**.** The AZGS Community, i.e., foundational stakeholders, includes our long-time stakeholders in state (e.g., ADOT, ADWR) and federal government (e.g., USGS) that rely on AZGS' products and services (Figure 1). This community is engaged and is aware of the value and high quality of our services and products.

The AZGS Network comprises groups and scientific societies that share AZGS' values (e.g., transparency, unbiased scientific research, and impact of geologic processes and hazards on society) and interests, and includes: Arizona Geological Society, Arizona Hydrological Society, American Institute of Professional Geologists, AEG, SME, Arizona's mining and mineral communities, environmental consulting & geotechnical community, Arizona Rock Products

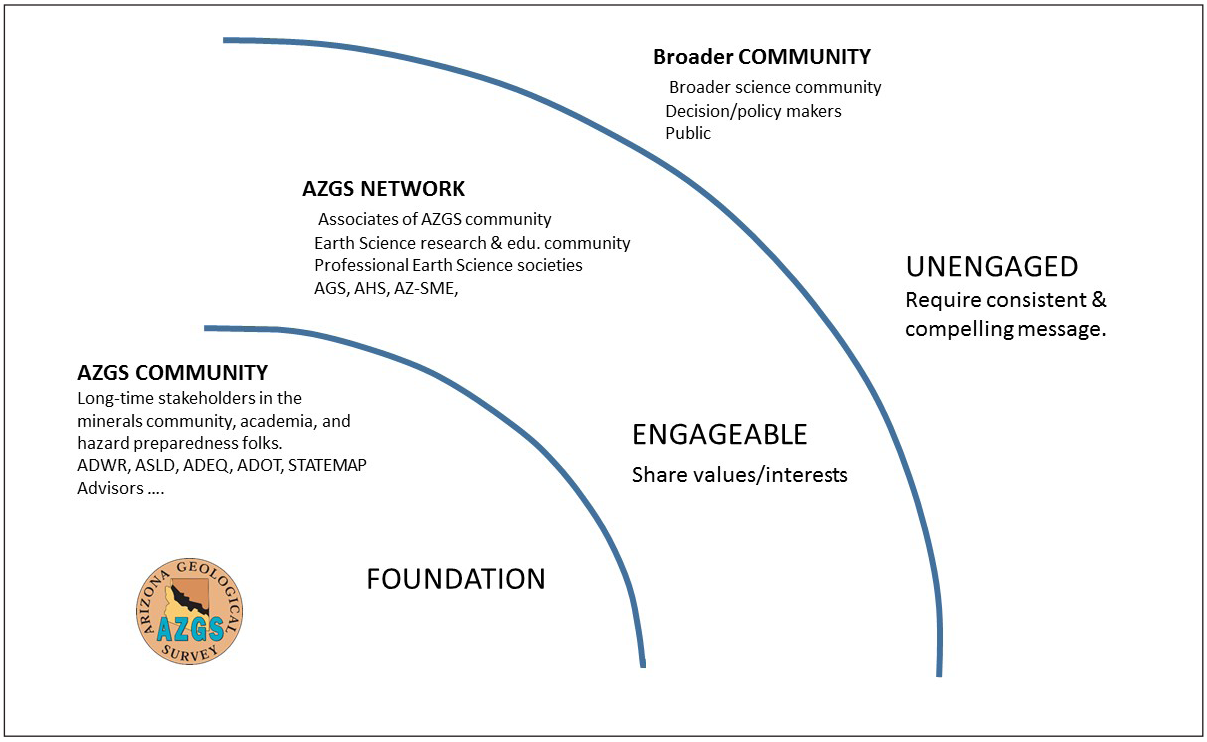


Figure 1. Three principal audiences for AZGS social media posts and websites.

Association, Arizona Mining Association, Lowell Institute for Mineral Resources, and Earth and space science programs at the University of Arizona, Arizona State University, and Northern Arizona University (Figure 1). We engage the AZGS Network via quasi-regular e-mails forwarded by institutional gatekeepers (e.g., the Secretary of the Arizona Geological Society).

The broader community comprises decision- and policy-makers, and the public. This audience requires constant and compelling messaging in order to engage them, and, ideally, to move them to the Network. Reaching this audience will always prove difficult because their interests run towards the ephemeral and idiosyncratic, e.g., home buyers seeking information on earth fissures or problem soils when selecting new quarters. The needs of this audience may be best served by providing general geologic information served at AZGS's portal page.

Communications Strategy. A chief strategic goal is to engage and inform AZGS stakeholders on developments in projects, products, important milestones, funding, and other AZGS-related matters that impact our stakeholders and the public. AZGS social media outlets, websites, and tri-annual newsletter serve as the primary vehicles for sharing geologic information and new developments.

AZGS outreach efforts should support and complement our communication strategy, while promoting growth and sustainability of the Survey's mission through effective and engaging communication. By way of example, publishing a blog post on '*Hypothetical earthquake scenarios: a planning tool for civil authorities'* marries our emphasis on geohazard assessment with tools designed for the planning community to mitigate impacts of ground shaking.

Objectives. We have three principal objectives. First, showcase the AZGS theme 'Geosciences at work for Arizona' as we grow and strive for sustainability. Thereby, reminding our immediate stakeholders – see the Foundation and Network groups in Figure 1 - of the values, strengths, and contribution of AZGS to understanding and managing Arizona's mineral resources and geologic hazards.

Second, conduct broad outreach to the Earth systems science community – academia, government, geoinfomatics, industry and business – and the American public whose lives and livelihoods are impacted by our collective and applied knowledge of Earth system sciences.

Third, identify and embrace one or more simple messages to infuse into outreach and marketing AZGS projects. Messaging should be congruent with AZGS values. As AZGS grows and expands, the nature of the messaging should be fine-tuned to parallel progress and growth. Example*: AZGS Geoscience at work for Arizona (*Lizzuo and others, 2019*); AZGS– using geoinfomatics to power geoscience research.*

Communication Tactics. To highlight AZGS geologic products, we employ tactics emphasizing the value of those products to the geosciences community, AZGS stakeholder(s) communities, and Arizona policy-makers. We use social media outlets to reach the broader community while promoting prudent natural resources (minerals) use and natural hazard awareness for a stronger more resilient Arizona.

Some examples of tactics commonly employed: showcase fresh content from azgs.arizona.edu via social media; outreach using 'Ask a Geologist'; deploy geotourism content; networking with other geoscience agencies and societies; engage in presentations, conferences, and workshops. Table 2 details the daily, monthly, and quarterly responsibilities of the AZGS communications team.

Table 1. Responsibilities of the AZGS communications team.

i. Daily social media output – Facebook, Twitter (& LinkedIn);

ii. Draft and distribute quarterly newsletters & annual report;

iii. Canvass AZGS staff for information to share with our stakeholders;

iv. Maintain and grow AZGS distribution network – expanding the AZGS horizon;

v. Develop storylines for science media at the local, state, and national level;

vi. Survey the AZGS leadership and staff on honing and improving the Survey's messaging;

vii. Monitor and evaluate activity at AZGS online venues to drive new content development.

Communication Channels & Outlets**.** With the social media and websites now in play (Figure 2) the essential elements of an efficacious communication program are in place. We need to redouble efforts to integrate output to support and reinforce AZGS messaging across social media platforms. By way of example, the social media feeds should serve the same content, albeit, packaged for different audiences, thus delivering palatable messaging and content.

Common themes and topics. Geoscience themes dominate our social media posts. A bare bone listing of topics would include: AZGS publications, geohazard events (e.g., earthquakes in AZ and environs), environmental geology, earth fissures, sinkholes, landslides, volcanoes and volcanic products, mining news, minerals, natural resources, energy, geologic structures (folds, faults, mylonitic structures etc.), wildfires, collaborations, geoarchaeology, rock-art,

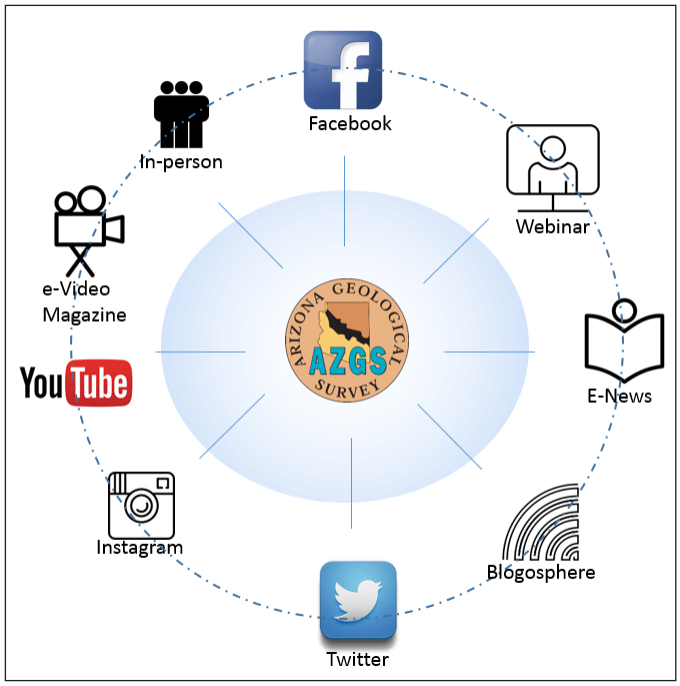


Figure 2. Digital and analog outlets for the Arizona Geological Survey.

online field trip guides, hydrology, and USGS Arizona-centric publications and fact sheets (e.g., Gungle and Paretti, 2018), among other things.

Part I: Social Media Outlets

Social media refers to a conversational, distributed mode of content generation, dissemination, and communication among communities (Zeng and others, 2010).

The AZGS maintains accounts on Facebook, Twitter, Youtube, LinkedIn (Table 3). (An AZGS Flickr account is inactive.) The primary social media outlets are Facebook, Twitter and Youtube. In 2019, AZGS Facebook followers increased by 11%, Twitter by 12%, and Youtube by 13%. AZGS's LinkedIn account, established in 2011-2012, was dormant until Nov. 2019. In Nov. 2019, at the urging of individuals from the University of Arizona's Communications, I opened an AZGS Instagram account (account status: 40 posts and 64 followers as of 19 Dec 2019).

Return on Investment. An ambitious social media program provides an inexpensive tool, fractional

pennies on the dollar, versus conventional promotional campaigns, while reaching and exponentially expanding the AZGS Network and Broader audiences. AZGS' profile on social media is large in comparison to the time/resource investment. An original Facebook post requires ~ 4 to 8 minutes. Reposting from one of our many science partners (e.g., USGS, AGI, AGU, Phenology Network, ADEQ) requires half that time. Tweets require only a minute or two to prepare. As the number of followers increases, AZGS' Facebook reach (~5,800 reach/day) and Twitter impressions (~2,900 impressions/day) will grow.

Comparison with other State Geological Surveys. The AZGS is not alone in establishing a presence on social media. Some surveys, e.g., the Washington Geological Survey, bundle their social media presence with their state's Dept. of Natural Resources. While bundling can result in a greater number of followers, geoscience messaging is diluted by sharing the platform with state wildlife and other natural resource agencies.

Figure 3a compares the number of social media followers of 17 state geologic surveys. AZGS leads all surveys with nearly 29,000 followers collectively on Facebook, Twitter, and Youtube. The Utah Geological Survey has more than 6,000 LinkedIn followers; in comparison, the AZGS has ~ 1,470 followers. The Utah, Wisconsin, Arkansas, and Kansas Geological Surveys all have robust social media programs. Figure 3b shows how AZGS social media footprint compares with national geologic surveys and geoscience societies. Of these, the U.S. Geological Survey footprint on social media platforms is exponentially greater than that of the others.

FACEBOOK *AZ.Geological.Survey*

Facebook is our top performing social media platform (Table 2). We post to it daily, including weekends and holidays. The SP Crater post (Figure 4) represents an example of a highly performing post: ~7,700 views, 650 engaged (i.e., clicked on the image or text), 98 people liked the post, and 18 people shared it with their facebook friends or networks. The highest performing post of the past several years involved the M5.3 Duncan, AZ, earthquake and reached ~100,000 people. Our Facebook followers are predominantly from North America, but we do have a small worldwide following (Table A-2). Appendix I (Figure A-1) presents illustrations demonstrating growth in followers in 2019; representative monthly reach; and, AZGS Facebook demographics.

TWITTER *azgeology*

As with Facebook, we post original material daily and retweet posts from others that are congruent with AZGS values and would be of interest to our 7,400 followers (Table 2). To accommodate Twitter character constraints, posts are terser than Facebook posts. All posts are accompanied by an image and frequently by a URL directing viewers to supplemental information. Figure A-2 presents a snapshot of Twitter activity for July 2019. Over a recent 91-day period, AZGS Twitter posts made an average 3,183 impressions per day, for a total of 289.7 impressions (Figure A-3).

In contrast to Facebook, 53% and 47% of AZGS Twitter followers are male and female, respectively. Thirty-seven percent of followers completed college and 19% completed graduate school. By inference, the highest level of education for the remaining 46% would be secondary or elementary school.

YOUTUBE *azgsweb*

The AZGSWeb YouTube channel hosts 109 original videos. Video categories include: Arizona Mining Review (69 videos); Video Abstracts (4 videos), Earthquakes (16 videos) Geology Play list (15 videos), Fissures (26 videos), Liked Videos (7), Project Videos (2), Featured Videos (66); some videos occur in more than one category. Figure A-4 presents the Youtube dashboard analytics for AZGSWeb for most of 2019.

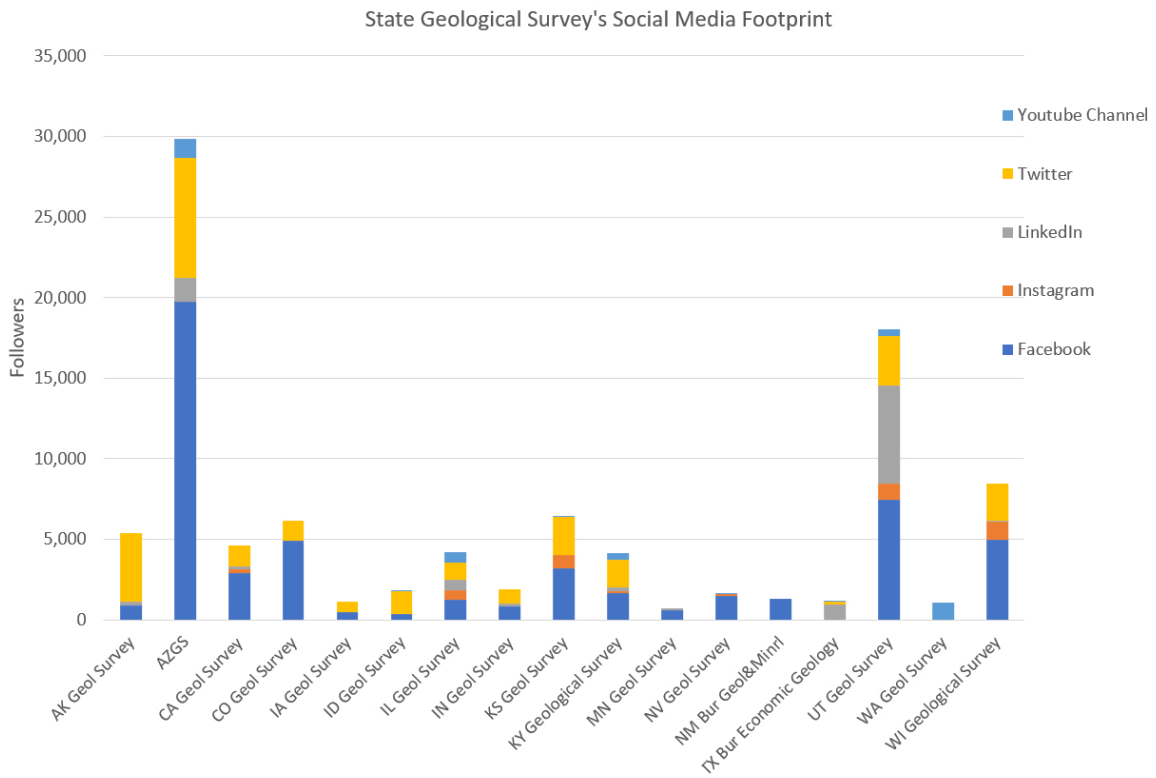
AZGS LinkedIn *Arizona Geological Survey – University of Arizona*

First established in 2013, the AZGS LinkedIn account was dormant until November 2019, when I

Table 2. AZGS social media outlets: # followers, frequency of posts, and performance.

Outlet	# Followers	Post Frequency	Viewer Activity
Facebook	19,809	1-2 times/day	~ 5,800/day reach
*Instagram	64	1-3 times/week	
*LinkedIn	1,470	1-3 times/week	
Twitter	7,414	2-5 times/daily including retweets	~ 2,926/day impressions
YouTube	1,220	Episodic	~38,700 views (~1,200 viewing hours) in 2019

*Postings first initiated in Nov. 2019.



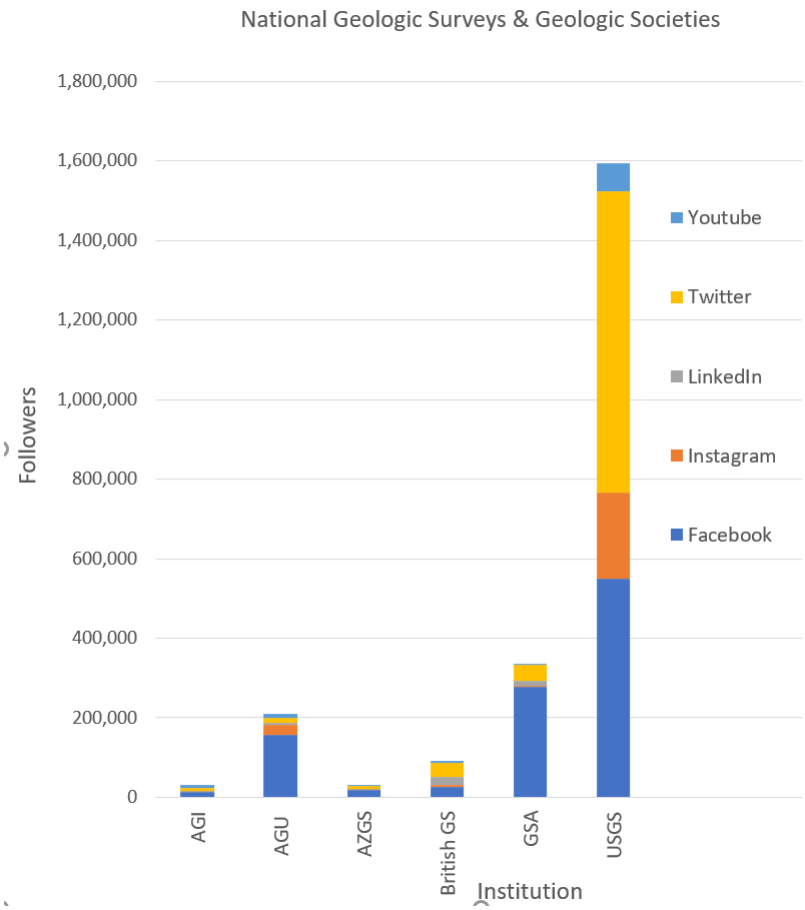


Figure 3a and b. a) The social media footprint of 17 state geological surveys; data drawn from social media outlets of each survey. b) Social Media footprint of national geologic surveys and geoscience societies.

recognized that we had about 1,400 followers. At that point, I began posting 1 to 3 times weekly to evaluate viewer interest and to monitor growth. As of 30 Dec. we had 1,470 followers (Table 2).

LinkedIn posts are tailored for a professional, career-oriented audience and thus focus on AZGS achievements and developments in geologic resource exploitation and geohazards (Figure A-5).

AZGS Instagram *azgeology*

The AZGS presence on Instagram was established in Nov. 2019. Instagram came highly recommended by UA Communications staff for reaching younger viewers. Instagram is best-suited for compelling images coupled with short, non-technical captions (Figure A-6).

Part II. AZGS Web Environments & Blog.

We operate five (5) web environments (Table 3), excluding peripheral sites, e.g., USGIN, NGDS, and the now defunct Arizona Experience. The AZGS portal (azgs.arizona.edu) is the highest performing site with nearly 94,000 users in the past year (Table 3).

Figure 4. SP lava flow post of 6 Dec. 2019. Photo by Ted Grussing.

The Arizona Geology Blog is the next highest performing web environment. The online AZGS Document Repository probably performs as well or better than the blog, but it is not configured to report Google Analytics.

Viewers of AZGS websites prefer desktop computers (55% AZGS Portal to 67% Hazard Viewer). Mobile users of the individual websites sites range from 26% to 38%. Tablet users make-up only 7% to 8% of users.

AZGS Portal azgs.arizona.edu

This is the online face of the Survey and shares basic geologic information on the setting, mineral resources, and geohazards of Arizona. This page is tailored for a non-technical public audience. It includes six principal themes: Minerals & Mining, Publications, Center for Natural Hazards, Outreach & Geoheritage, Energy, AZGS Services, and About.

The most popular pages, and sub-pages, are Minerals & Mining, Center for Natural Hazards, and Publications.

Our former state portal environment, azgs.az.gov, continues to draw viewers (~6,000 in 2019), because it hosts the 40-year archive of Fieldnotes (Arizona Bureau of Geology) and Arizona Geology Newsletters.

As reported by Google Analytics, access to azgs.arizona.edu is dominated by Chrome (54%) and Safari (27%). Firefox and IE user make up just 5% each. Fifty-four percent of users are male, 46% female (Figure 5). The gender balance is an improvement over Facebook demographics (61% men). As with our Facebook account, users skew young with 61% between the age of 18 and 34 (Figure 5). Eighty-nine percent of users are from the U.S. (Figure A-7).

NOTE: Google Analytics aggregates demographics for AZGS websites.

AZGS Mine Data minedata.azgs.arizona.edu

The AZGS public mining archive comprises ~ 21,000 mining reports, maps, and photographs that were originally curated by the Arizona Dept. of Mines and Mineral Resources. From 2011 to 2016, the AZGS dedicated funds to scan and broadcast these otherwise unpublished documents. Those in the Arizona mining community perceive these resources as some of AZGS' most valuable assets (Lizzuto and others, 2019). In 2019, more than 6,800 users from across the world accessed archive materials (Figure A-7).

AZGS Document Repository repository.azgs.az.gov

The online AZGS Document Repository was launched in the summer of 2010. It was not configured to collect and report Google Analytics data. Nonetheless, the repository is a high performing document delivery system. Select publications reach audiences ranging from 1,000s to tens of thousands of individuals (Table 7).

The Document Repository is now mirrored, document-for-document, at the University of Arizona Library AZGS Document Repository (https://repository.arizona.edu/handle/10150/628301). This assures survival of the repository reports and maps.

Table 3. Performance of AZGS web environments from 1 Jan 2019 to 19 Dec 2019.

Website	Users	Sessions	PageViews	PageV/Users
AZGS Portal	93,902	114,415	226,182	2.4
AZ Geology Blog	12,316	15,433	23,333	1.9
Mine Data	6,779	11,721	79,474	11.7
Azgs.az.gov	5,987	7,043	10,712	1.8
Hazard Viewer	4,984	7,170	8,810	1.8
AZGS Doc. Repository	NA	NA	NA	

Table 4. Performance of five of the ~1,400 documents available at the AZGS Document Repository.

i. Geologic Map of Petrified Forest National Park, Arizona, viewed 30,600 times since release in 2012;

ii. Geologic map of the Phoenix Mountains, Central Arizona, viewed 44,000 times since online release ca. 2012.

iii. Metallic Mineral Districts and Production in Arizona, viewed 8,300 times since online release ca. 2015;

iv. A Guide to the Geology of Organ Pipe Cactus National Monument and the Pinacate Biosphere Reserve, viewed 3,600 times since release ca. 2016;

v. Investigations of the Possible Underground Extent of La Posta Quemada Sinkhole, Colossal Cave Mountain Park, Pima County, Arizona, viewed 1,300 times since release in May 2018.

Arizona Geology Blog blog.azgs.arizona.edu

Former AZGS Director and State Geologist Lee Allison launched the Arizona Geology blog ca. 2007. He published ~4,400 posts, sometimes averaging 2.2 posts/day/year. Following Lee's death in Aug. 2016, we continued to publish the blog. In 2018, the blog moved to blog.azgs.arizona.edu/. It continues to perform well (Table 3).

By way of promoting blog posts, we distribute short e-mails touting posts to gatekeepers of Earth science societies listserves: e.g., Arizona Geological Society, American Institute of Professional Geologist (Arizona branch), Association of American State Geologists, Arizona Hydrological Society, Assn. of Environmental and Engineering Geologists (Arizona branch), Society of Mining, Metallurgy and Mineral Exploration (Phoenix and Tucson), Arizona Rock Products Assn..

For an example of a recent blog posting, see: Enhancing AZGS' Digital Geologic Maps with GIS Data Formats ~ https://blog.azgs.arizona.edu/index.php/blog/2019-12/enhancing-azgs-digital-geologic-maps-gis-data-formats. Most people accessing the blog are from the U.S., but there is a small worldwide following (Figure A-7).

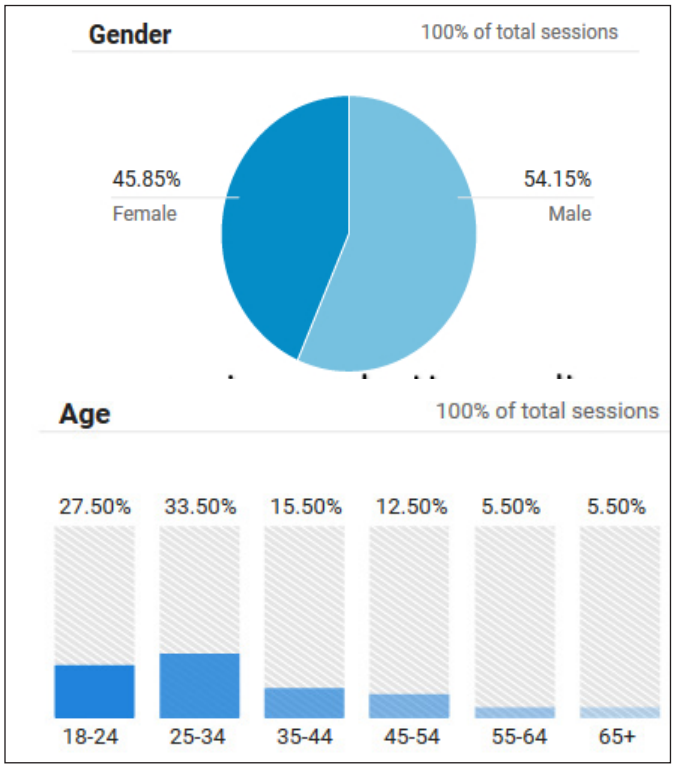


Figure 5. Google Analytics demographics - gender and age for AZGS' principal website, azgs.arizona.edu. The 18-24 and 25-34 age groups comprise 61% of all users.

Concluding Statement

The majority of US adults use the internet to gather news and science information. In response to this trend, AZGS has deployed a cogent communications program comprising social media platforms and websites to inform our stakeholders - geoscientists, geotechnicians and hydrologists, academicians, educators, local-county-tribal-state and federal

government staff, decision-makers, and the public - of the value, products, and services that we provide.

Social media offers efficacious and inexpensive platforms for communicating with thousands of individuals daily; in aggregate, we spend three- to four-hours per week on social media and in publishing a weekly blog post. Our social media footprint is substantially larger than that of other state geological surveys and rivals that of the American Geosciences Institute and to a lesser extent that of the British Geological Survey.

Growing AZGS Digital Footprint. There are a number of actions to grow and enhance AZGS performance on social media platforms and at our websites. The following is a brief list of action items to follow up in 2020.

Facebook / Twitter: Improve the quality of posts by emphasizing plain language and by sharing more posts from geological surveys and societies in the southwestern U.S.

Instagram: Increase number of posts weekly. Call on AZGS staff to provide images, or provide staff with individual access so that they can upload images on their own.

LinkedIn: Confer with others who have greater experience on LinkedIn to shape a comprehensive strategy for engaging LinkedIn followers.

YouTube: AZGSWeb channel is badly in need of curating with an eye towards re-cataloging the videos to help viewers find the appropriate video. The Video Abstracts series has the potential to reach non-technical stakeholders with brief, plain language summaries of AZGS research.

Arizona Geology Blog: Strive for continuity in posting, i.e. 3- to 4-posts monthly. Enlist guest bloggers to broaden our topics and grow readership. (We have reached out to potential guest bloggers in the past with mixed success. Lots of initial enthusiasm followed by long lag times and promises to contribute at another time.)

AZGS.Arizona.edu – Continue to add content and include a dynamic theme, e.g., landslide mapping along I-17 corridor, to illustrate the scope and nature of AZGS research.

Repository.azgs.az.gov – The AZGS geoinfomatics and programming team are redesigning the interface and structure of the repository. The result should be a substantial improvement in appearance and accessibility.

Minedata.azgs.arizona.edu – The site needs a new interface badly. The site search tools work well, with the exception of the geographic search. Google Maps has discontinued support of this feature and users are warned that the search is unavailable.

AZGS.az.gov – Our former state portal page. Features still residing there, e.g., Fieldnotes and Arizona Geology newsletters, should be migrated to either AZGS.Arizona.edu or a second independent host. AZGS.az.gov should be shuttered and moved offline.

References

Brossard, D. and Scheufele, D.A., 2013, Science, New Media and the Public. Science, V. 339, www.sciencemag.org

Greenwood, S., Perrin. A., Duggan, M., Social Media Update, 2016, Pew Research Center, https://www.pewresearch.org/internet/2016/11/11/social-media-update-2016/

Gungle, B.W. and Paretti, N.V., 2018, Assessment of environmental flows in the middle Verde River watershed, Arizona. US Geological Fact Sheet 2018-2062 (https://pubs.er.usgs.gov/publication/fs20183062)

Lizzuo, C., Bartels, A., Brands, C.C. and Yashi, A., 2019, Arizona Geological Survey Economic Impact Report. Arizona Geological Survey Contributed Report OFR-19-A, 21 p., 3 appendices

Perrin, A. and Anderson M., 2019, Share of U.S. adults using social media, including Facebook, is mostly unchanged since 2018. Pew Research Center, https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/.

Rowlands, I., Nicholas, D., Russell, B., Canty, N., and Watkinson, A., 2011, Social media use in the research workflow. Learned Publishing, v. 24, p. 183-195. https://onlinelibrary.wiley.com/doi/epdf/10.1087/20110306

Spencer, C.J., Gunderson, K.L., Hoiland, C.W. and Schleiffarth, 2017, Earth-Science Outreach Using an Integrated Social Media Platform. Geological Society of America: GSA Today, https://www.doi.org/10.1130/GSATG333GW.1

Zeng, D., Chen, H., Jusch, R. Li, S.-H., 2010, Social Media Analytics and Intelligence. IEEE Intelligent Systems, v. 25 #6, 4 p. https://ieeexplore.ieee.org/abstract/document/567858

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Appendix I: Tables & Figures Showcasing AZGS Social Media & Website Activity

This appendix comprises images and tables drawn directly from AZGS social media outlets: Facebook, Twitter, Instagram, LinkedIn, Youtube, and AZGS websites and blog.

Table A-I: An abridged list of 275 science agencies, Arizona state agencies, academic departments, societies, and media outlets that follow at least one AZGS social media account.

Table A-2: Facebook followers by country, city, and language. Limited to the top 10 in each group.

Figure A-1 a, b, c: Facebook parameters for calendar year 2019.

Figure A-2. Twitter dashboard for July 2019.

Figure A-3. AZGS Twitter activity for a 91-day period ending on 20 Dec. 2019.

Figure A-4. Youtube AZGSWeb Channel dashboard with 2019 analytics.

Figure A-5. Representative post at our AZGS - University of Arizona LinkedIn page.

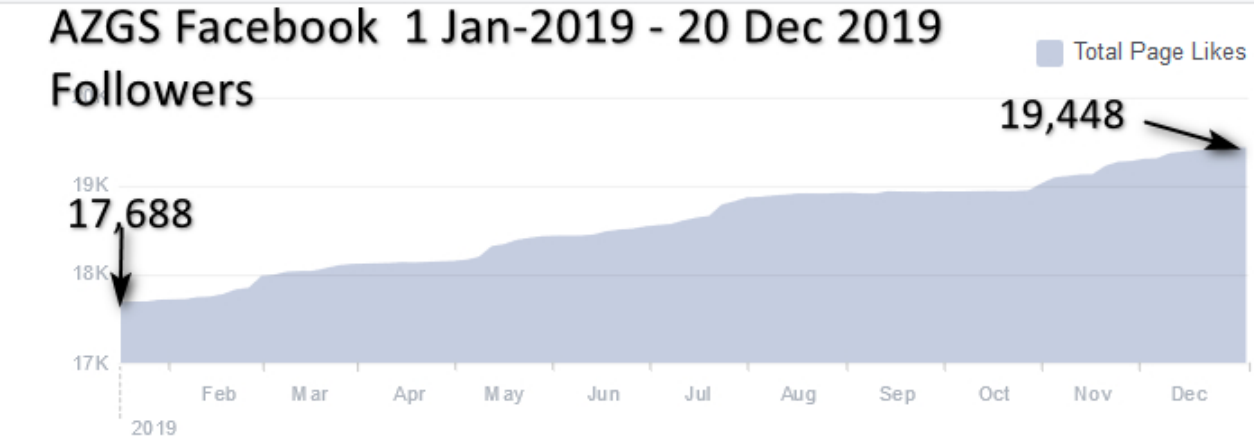
Figure A-6. A represntative post from AZGS Instagram account.

Figure A-7. Worldwide distribution of select AZGS websites for calendar year 2019: azgs.arizona.edu portal page; AZGS Mine Data; and the Arizona Geology blog.

Table A-1. An abridged list of 275 government agencies, academic institutions, and Earth Science societies that follow at least one AZGS social media account.

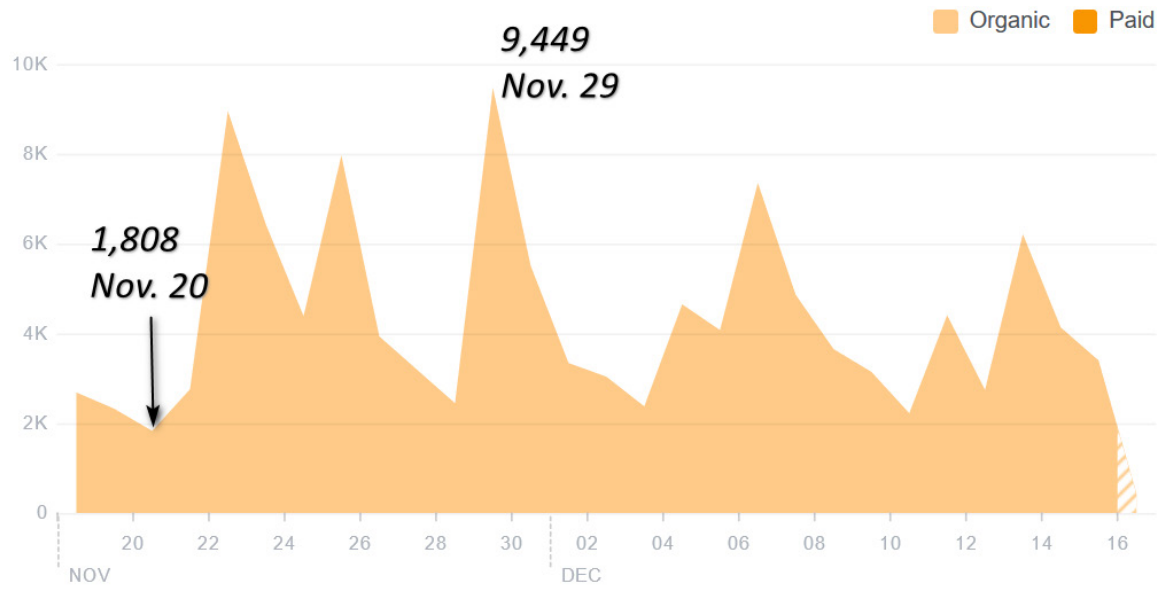
4th Oil, Gas & Petrochemistry Conf.
AAPG CairoUniversity
AAPG Energy Policy
ABWC Arizona
ACS Earth Space Chem
ADEQ
AEG - New York-Philadelphia Chapter
AEG-MSU
Africa Geo Tours
AGI Critical Issues
AGI Education
AGU's EOS
Alabama Geological Survey
American Exploration - trade assn.
American Geophysical Union
American Geosciences Institute
American Society of Dam Safety
America's Wildlife
AMWUA
Appalachian State Geo&Env Sci
Arizona Ag. And Resource Economics
Arizona Capitol Museum
Arizona Daily Star
Arizona Daily Sun
Arizona Dept of Water Resources
Arizona Emergency Services Assn.
Arizona Forward
Arizona Highways
Arizona Humanities
Arizona Mining Association
Arizona Museum of Natural History
Arizona Project Wet
Arizona Remote Sensing Center
Arizona Science Desk
Arizona SRP
Arizona State Parks
Arizona Wildlife Federation
Assn for Women Geoscientists - New Zealand
ASU Future
ASU Meteorites
ASU_CEMHS
Axial 3D Seismic Expedition
AZ DEMA
AZ EIN
AZ Women's History Alliance
AZAEP - AZ Environmental Professionals
AZCentral Education
AZDEQ
AZPM News
Basin and Range Watch
Bearded Lady Project
BLM Arizona
BLM Careers
British Geological Survey in Scotland
British Geological Survey Landslides
British Sedimentological Research Group
British Sedimentological Research Group
Cal Poly Geology
California Dept. of Conservation
California Land Surveyors Association
Canadian Geotechnical Journal
Canadian Jounal of Earth Science
CAZCA
Centre for Resources and Earth Energy Systems Durham U
Climas
Coconino County Emergency Management
Colorado School of Mines
Community Watershed Alliance
Concord University Geology
CRWUA
CSIR - National Geophysical Research Inst.
Data Discovery Studio
DataONE
Deep Carbon Observatory
Durham Earth Science
Earthworks
Earth & Space Open House - SESEASU
Earth and Environmental Sciences - UIC
Earth Science & Climatic Change
Earth Science for Society-Canada
Earth Science Picture of the Day
EcoWatch - news site
EERI
Energy News Now
eNewsAZ
Environment and Social Responsibility Society of Canada
Environmental Reporting British Columbia
EnviroSolve
ESIPfed
ESRI - J. Kerski
European Geoparks
EWU Geology
Flood Control District of Maricopa County
Flyover Country
Foro Espanol de los Geoparques Mundiales de UNESCO
Fossil Portal
Friends of the Tonto Natl Forest
Friends of the Verde River
GEM - Global EQ Model
Geologia y Volcanes
Geologos del Mundo
Geology at UWE Bristo
Geology is the Way
Geomorphology Rules
GeoNewsfeed
Geoparc Jbel Bani
GeoPrac.net
Geoscience Daily
Geoscience EnvAgency
Geosciences ParisSud
Geoscientist Magazine
Geothermal Resources Council
Geothermie Conseil
Gila National Forest
GIS Congress
GIS Day
GIS Services - City of Tucson
Grand Canyon Conservancy
Grand Canyon Trust
GSA Energy Geology
GSA Environmental and Eng. Geology Division
GSA Hydrogeology Division
GSA Sedimentary Geology Division
Hawaii Groundwater and Geothermal Resources Center
Hydrology-Journal
Idaho Geological Survey
IEEE Earthzine
iGlobes
IISD Water
Illinois State Geological Survey
Imperial Earth Science & Engineering
Institute of Geologists of Ireland
Instituto Geologicl Minero
International Assn. for Geoethics
International Association of Geomorphologists
International Seismological Center
Interplanetary ASU
Iowa Geological Survey
IRIS
IRIS Earthquake Science
Israel Geological Society
Journal of China Geol. Survey & Academy of Geol. Sciences
KJZZ
Journal of Geophysical Research
KQED Science
Kuwait Geological Society
Landslide Reporter
Macquarie Univ Dept of Earth & Planetary Sciences
Magma Geopark
MalawiGeoSociety
Maricopa County Emergency Mgmt
Mass. Geological Survey
MEC Education
Mexico Mining Center
Mining Hall of Fame
Monash Univ. Earth, Atmosphere & Environment
Musee de Mineralogie
Museum of Northern Arizona
NASA
NASA's OSIRIS-Rex
NASEM Earth
National Assn. of Abandoned Mine Land Programs
National Mining Association
National Weather Service Tucson
Nature Reviews Earth & Environment
NCAR Earth Observing Lab
NESTA-US
NMMNHS Paleontology
NOAA
North American Helium
Okalahoma Geological Society
Oxford School of Archaeology
Paleoseismicity
PavementGeology
Pima County Office of Emergency Management
Planet - remote sensing lab
Plants Map
Pleistocene Park
Prescott National Forest
PrescottAZ History
Princeton University Geosciences
Prospectors & Developers Assn. of Canada
Public Understanding of Science Journal
PubSciX
Pusat Survei Geologi
Raspberry Shake -Citizen Science EQ
RealTime Earthquakes
Renewable Energy World News
Restoration Consortium USU
RHUL Earth Sciences
Rockd
Rockstone Research
Santa Cruz County Flood Control District
Saudi GIS Symposium
SaveTheColoradoDelta
SciBlogHub
SciReach
SciStarter - Citizen Science
SEG Publications
SEG Wiki
SEPM
ShakeOut
Simona - Project Simona
Sky Island Alliance
Social Media followers
Society for Geology Applied to Mineral Deposits
Somali Geological Association
Sonoran Institute
South Wales Geological Society
Southern Arizona Assn for Women Geoscientists
Southern California Earthquake Center
Southwest CASC
Southwestern Research Station - AMNH
Stonehammer Geopark
Sustainability @ ASU
SW Fire Consortium
Temblor - hazards site
Texas State University System
The American Geographical Society
The Disaster Channel
The Student Jounal of Natural Sciences
Tucson CERT
Tucson Water
U Mass Geosciences
UAA Geosciences Dept
Uarizona Ag & Life Sciences
Uarizona CAPLA
Uarizona Environmental Science
Uarizona Geosciences
Uarizona Research
UASNRE
UAZGlobal
UAZScience
UNAM Hydrogeology Group
UNAM Museo de Geofisica
UNESCO Global Geoparks
UNESCO Land Subsidence
Union Square Research Group
Univ. of Alabama Geological Sciences
Univ. of Alberta SEG Student Chapter
Univ. of Chile Dept de Geologica
Univ. of Nebraska School of Natural Resources
Univ. of South Wales Geology
Univ. of Sydney School of Geosciences
Univ. of Wisconsin Geology Museum
University of Arizona
University of Nevada Press
University of Utah Seismograph Stations
US Fish and Wildlife
US Fish and Wildlife
US Geological Survey
USGS Arizona
USGS Kentucky
USGS Land Cover
USGS Minerals
USGS Pubs Warehouse
USGS Seismic
USGS Volcanoes
USGSCoopUnits
Utah Seismic Safety Commission
Virgina DGMR
Virginia Div of Mineral Mining
Volcanica Magazine
WaterForColorado
Water-Use It Wisely
Water Well Journal
Western Kentucky Univ. Geology
Wiley Earth and Space Science
Wisconsin Geol. & Natural History Survey
Women in STEM Student Council
Women of Geology
WRB 2015 Soil Classification System
WRRC
WSSPC
Wyoming Geological Survey
Yavapai County Flood Control District

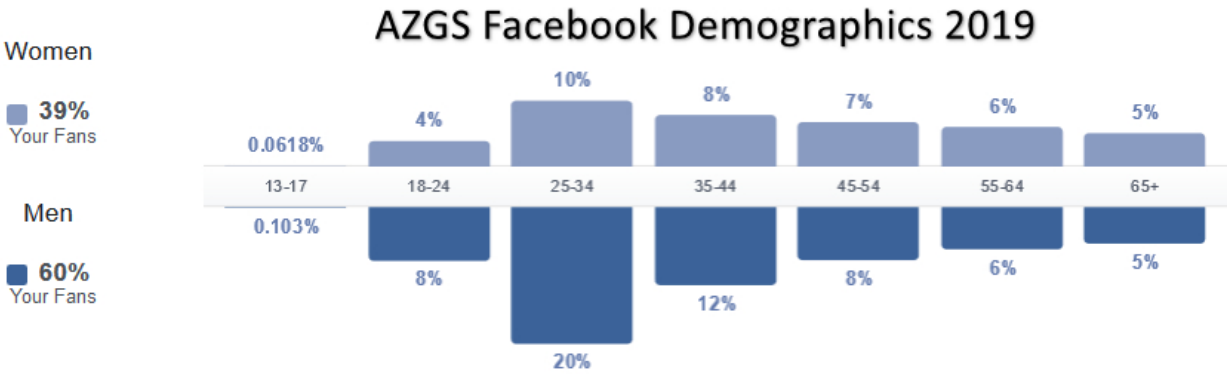
Total Page Likes as of Today: 19,448



Post Reach AZGS on Facebook - 16 Nov to 19 Dec 2019

The number of people who saw any of your posts at least once. This metric is estimated.





Previous Page

Figure A-1 a, b, c. Analytics for AZGS Facebook account. a) Increase in Facebook followers from 1 Jan to 20 Dec. 2019. b) Facebook activity, i.e., 'Post Reach' from 16 Nov. to 19 Dec. 2019. c) AZGS Facebook demographics, gender and age, for 2019. The gender split and age envelopes displayed here are characteristic of our decade on Facebook. According to Facebook 'People Reached", not all of whom are followers, is more balanced - 55% male to 44% female.

Table A-2. AZGS Facebook followers: top 10 countries, cities, and languages. Courtesy of Facebook analytics.

Top Ten Countries

Country	Your Followers
United States of America	9,324
India	982
Mexico	713
Pakistan	479
Brazil	460
Egypt	419
Italy	419
Peru	356
Canada	300
Myanmar	288

Top Ten Cities

City	Your Followers
Phoenix, AZ	830
Tucson, AZ	659
Flagstaff, AZ	339
Mexico City, Mexico	193
Lima, Peru	162
Mesa, AZ	146
Prescott, AZ	137
Cairo, Egypt	123
Kolkata, India	114
Yangon, Myanmar	114

Top Ten Languages

Language	Your Followers
English (US)	11,995
English (UK)	1,747
Spanish	1,718
Arabic	658
French (France)	542
Portuguese (Brazil)	442
Spanish (Spain)	424
Italian	418
Turkish	273
Indonesian	178

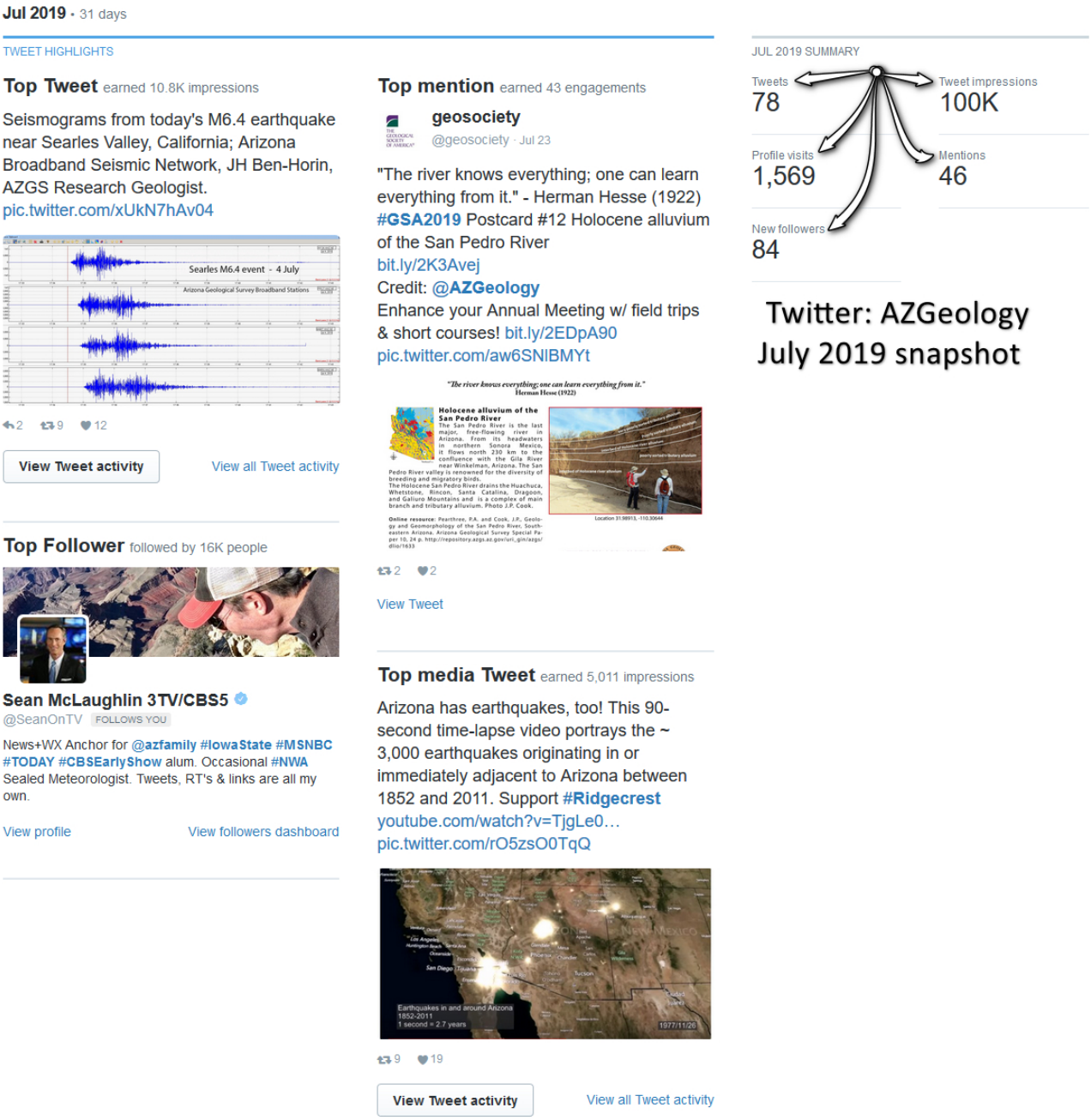


Figure A-2. A snapshot of AZGS Twitter activity (78 tweets, 100,000 impressions, and 84 new followers) for July 2019. Several tweets are included to illustrate what a typical post looks like. Data courtesy of Twitter Analytics.

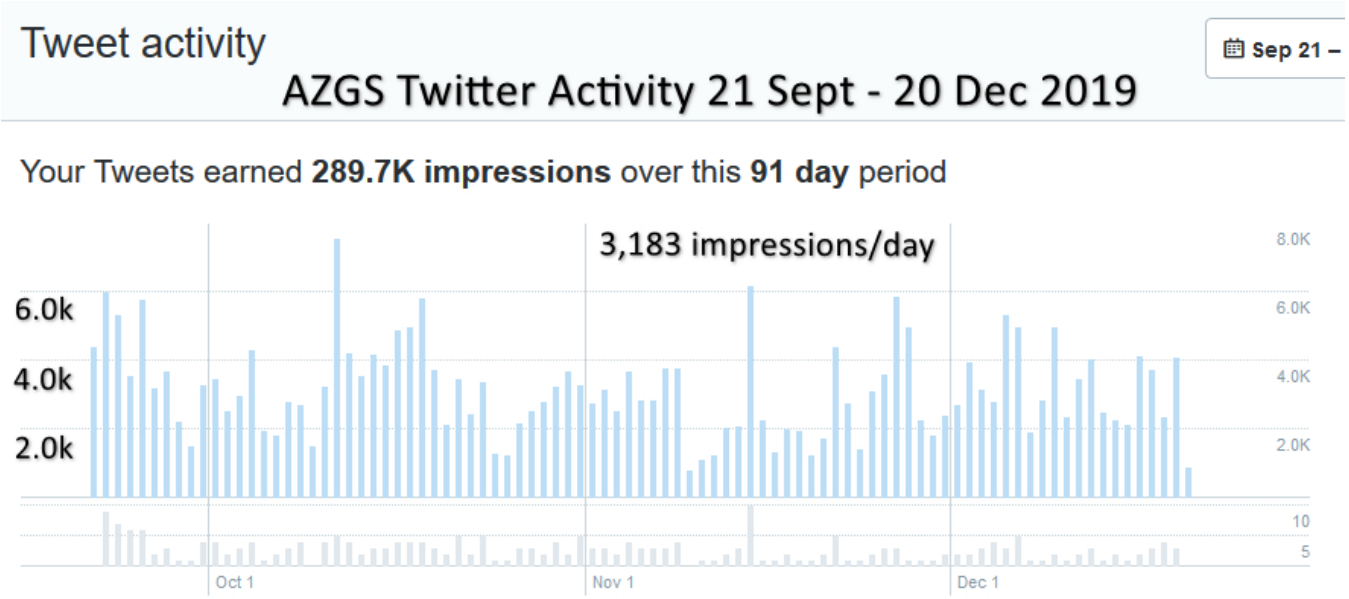


Figure A-3. Twitter activity (i.e., impressions) at *azgeology* for the 91-day period from Sept. to Dec. 2019. On average we garnered nearly 3,200 impressions per day, for an aggregate total approaching 290,000 impressions. Data courtesy of Twitter Analytics.

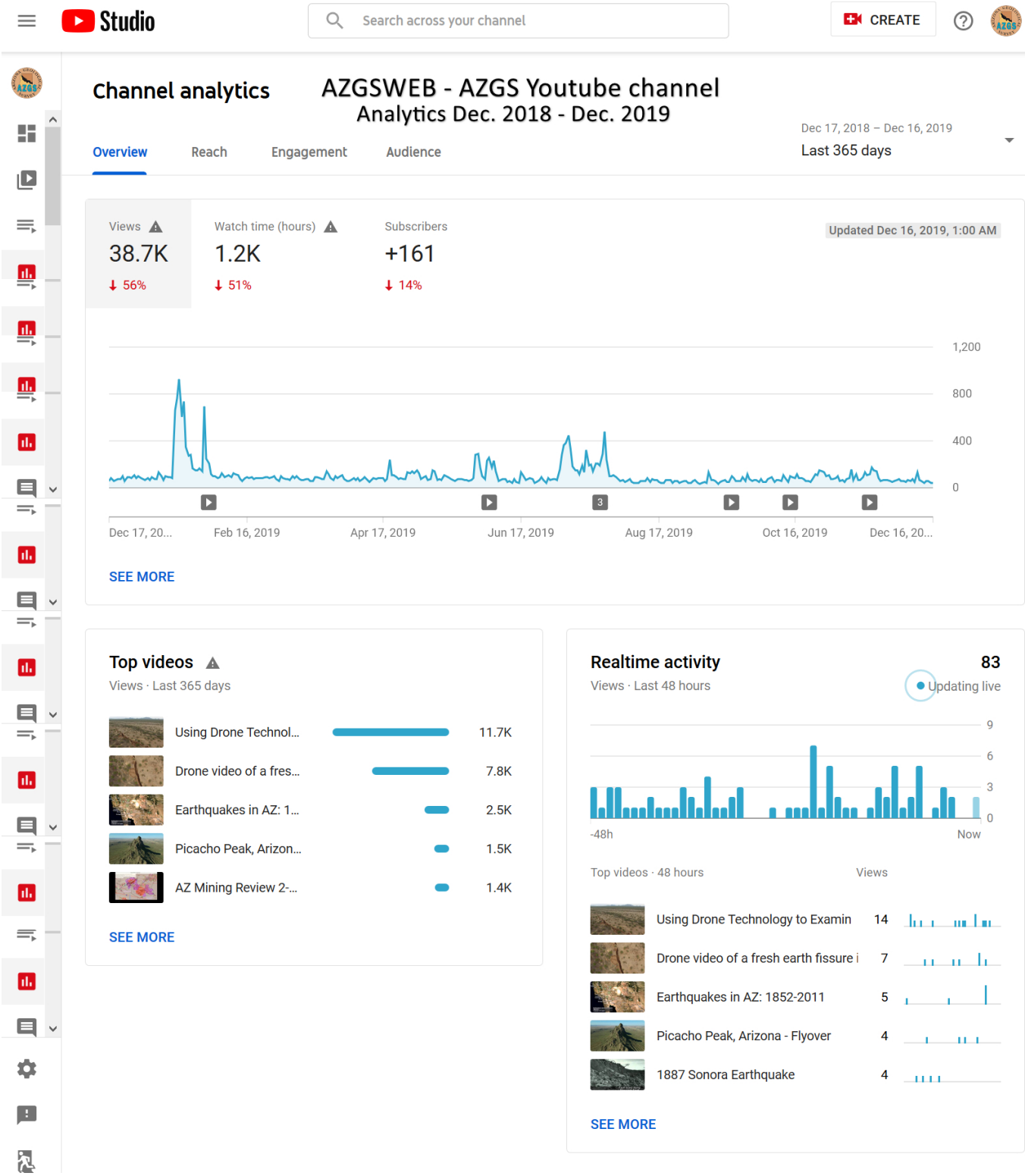


Figure A-4. Overview of AZGS' YouTube channel analytics from Dec. 2018 to Dec. 2019. Of the 38,700 views, ~ 65% (25,116) and ~12% (4,707) originate in the U.S. and Germany, respectively. Views originating in Canada total almost 1% (356). Remaining views are subdivided co-equally between Europe, Asia, Africa, and Australia.

Figure A-5. Representative LinkedIn post promoting the recent Arizona Mining Review interview of Greg Hahn, Arizona Silver.

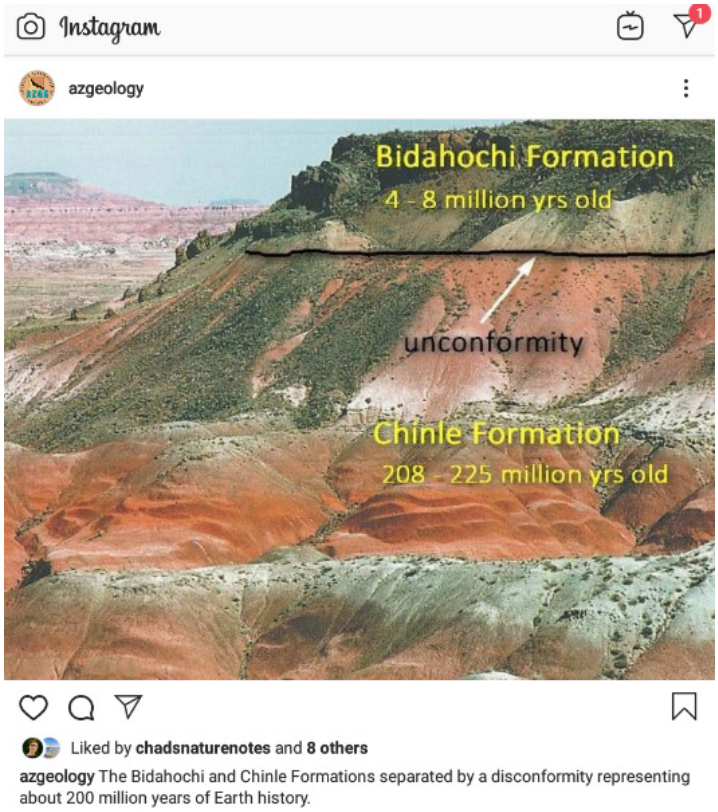
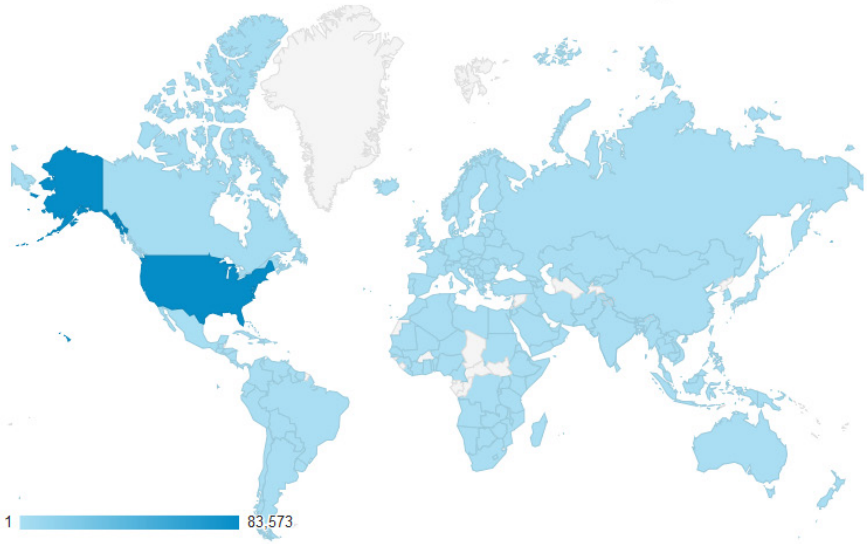


Figure A-6. Representative Instagram postings from November 2019.

Following page

Figure A-7. Worldwide distribution of AZGS websites for 2019.

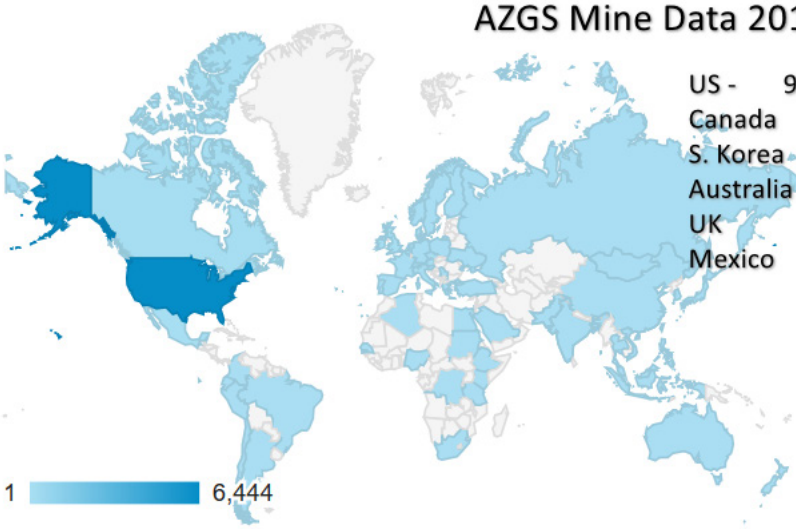
azgs.arizona.edu - User audience by country



Top 5 Countries

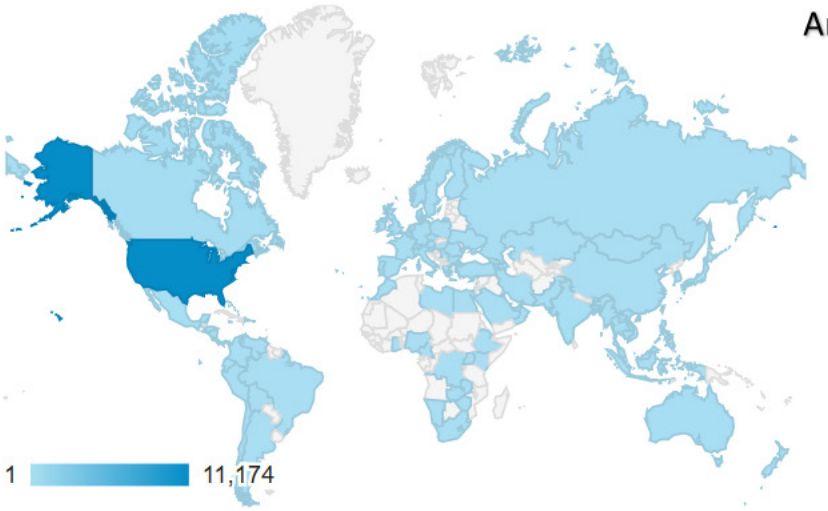
US - 88.8%
Canada - 1.6%
UK - 1.0%
India - 0.74%
Philippines - 0.7%

AZGS Mine Data 2019



US - 93%
Canada 1.7%
S. Korea 1.4%
Australia 0.72%
UK 0.5
Mexico 0.4

Arizona Geology Blog



US 90%
Canada 2.3%
UK 1.0%
Australia 0.8%
India 0.5%
Mexico 0.4%