AGI's Critical Issues Program – Pioneering a new approach to sharing societally-relevant science with state and local decision makers

Leila Gonzales, Senior Researcher
Cassaundra Rose, Program Mgr.
Ben Mandler, AGI/ Schlumberger Fellow
Maeve Boland, Dir. Geoscience Policy
American Geosciences Institute
Critical Issues Program

The American Geosciences Institute's Critical Issues program (www.americangeosciences.org/critical-issues) provides accessible, decision-relevant information on issues at the intersection of the geosciences and society. The program aims to support connections and communication between the geoscience community and decision makers. Although the program caters to decision makers at all levels, it particularly focuses on state and local decision makers because these stakeholders are commonly underserved by geoscience policy efforts.

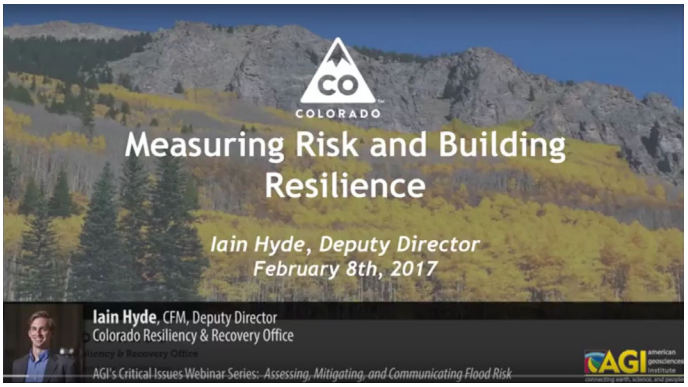
The program convenes meetings, such as the AGI Critical Issues Forum, but its main interface is a web-based platform of resources that bring the expertise of the geoscience community to decision makers by offering a curated selection of information products from sources that include state geological surveys, federal and state agencies, and AGI's member societies.

The Critical Issues program offers the following freely accessible information services:

Research Database
- Over 4,000 publications primarily from state geological surveys and the U.S. Geological Survey.
- 71% of publications are from state geological surveys

Webinars
- Free webinars on a variety of topics that bring geoscientists and decision makers together to discuss potential solutions to challenges at the interface of geoscience and society.

Maps & Visualizations
- 144 interactive maps and visualizations covering all 50 states and the District of Columbia.
- 40% of the maps are from state geological surveys.



Case studies
- A new product that is coming online in Spring 2017.
- Specific applications of geoscience to societal problems.

Factsheets (*see example on p 4-5*)
- A new product that is coming online in Spring 2017.
- Provide more in-depth information on the big issues.

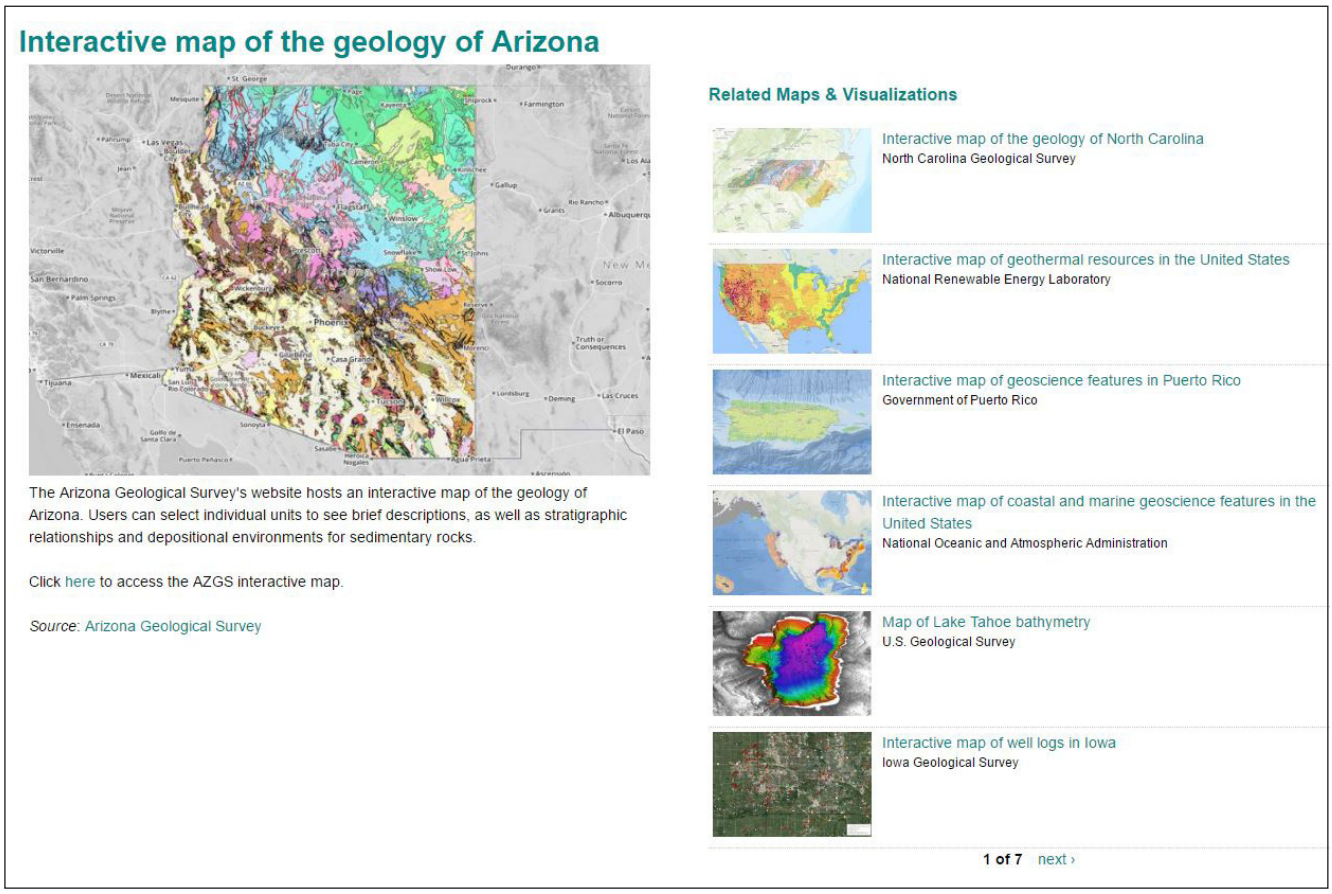
Frequently Asked Questions
- 105 questions on topics including: climate, energy, hazards, mineral resources, and water.
- FAQs are a collection of original content written by Critical Issues program staff and content from external sources (primarily from federal agencies).

Given the focus of the Critical Issues program on state and local level decision makers, state level information is particularly valuable to these target audiences. As such, state geological surveys produce many of the information products disseminated through the Critical Issues website.

Because we are interested in reaching decision makers at all levels, our network of contacts extends beyond state and local decision makers to include federal agency staff, industry representatives, college and university faculty, researchers and students, and K-12 educators. Our primary methods for outreach include social media posts through our Twitter account, targeted emails that provide information about our products and events that we host, periodic surveys, and in-person meetings - including face-to-face discussions with state and local decision makers and our attendance at conferences and other meetings.

Most visitors to our Critical Issues website begin their journey to us by using a search engine to find what they are looking for, and then find links to our website in their list of search results.

State survey publications in our research database and maps in our maps & visualization collection account for the majority of state geological survey content on our website. State geological survey staff have also presented at several of our webinars. The Critical Issues website drives a lot of traffic directly to state geological survey websites: 80% of clicks on links from our research database and 37% of clicks from our maps &



visualizations collection take visitors to state geological survey websites. In 2016, there were a total of 7,972 click-throughs from the Critical Issues website to state geological survey websites.

State geological surveys have a vast amount of information products and expertise that are sought by state and local decision makers across the U.S. The Critical Issues program wants to continue to increase awareness of state geological survey products, and the following are some ways that state geological surveys can promote their information resources through the Critical Issues website:

1. Notify the Critical Issues program staff about interactive maps and visualizations.
2. Provide indexing copies of publications for the Research Database and the links to where people can download the publication from the state geological survey's website.
3. Provide content for Critical Issues FAQs, case studies, or factsheets.
4. Participate in a webinar - either by speaking at the webinar, or co-sponsoring or co-organizing one.

5. Notify Critical Issues program staff about upcoming events, news, reports, etc. so we can write about them in our news briefs or blog posts, and also get the word out about them via our Twitter feed.
6. Link to the Critical Issues Research Database and/or Critical Issues program website from your state geological survey's website.

About the Critical Issues Research Database

The Critical Issues Research Database is a curated collection that currently includes just over 4,000 publications from state and federal agencies and AGI's member societies. Over two-thirds of the publications are from state geological surveys. We load new publications to the database on a monthly basis, and maintain all the links in the database on a weekly basis. In order to provide for full-text searching, we retain an index copy (a PDF) of each publication.

The research database provides users with the ability to do a full-text search of the publications, meaning that the information entered into the search form is matched against the text in actual publication as well as against the publication's metadata. Website visitors are not able to download the publications from our database. The only content they see from the publication is a snippet of text that shows them the relevance of that publication to their search query.

When a user clicks on a publication record, they are able to see the metadata for that publication. We provide them with the link to the publication where it exists on the source organization's website, and we also provide them with a link to the source organization and the primary program that has produced the publication; for state geological surveys, this usually takes users to the Publications page.

Looking ahead to 2017 and beyond

We are launching two new types of information products this year: case studies and factsheets - see the following for an example factsheet. These information products are primarily aimed at providing information to state and local decision makers (i.e., emergency planners, water managers, city planners, governors, mayors, legislators and regulators, etc.), but also have a potential wider audience that includes educators and the general public. These information products are relatively short (typically 500-600 words) so that decision makers can quickly assess how useful each case study is for their particular needs.

Case studies provide examples of successful geoscience-informed approaches to local and regional issues affecting people in many parts of the country. Case studies provide a general overview, and focus on actions, tools, lessons learned, established best practices, and if available, information regarding more detailed references and resources.

Factsheets provide accessible and concise summaries of important geoscience topics. Factsheets are broad in scope while also highlighting specific issues of particular significance.

We are expanding the scope of the Research Database's content to include a wider variety of publications, such as maps, technical publications, etc., as well as older publications. We are also upgrading the Research Database's infrastructure to a more robust repository system. We have approached all of the state geological surveys to request their permission and help with increasing the number of publications in the Research Database from state geological surveys. To date, we have received approval from 36 state geological surveys, are in discussions with four, have not reached an agreement with one, and are waiting on a response to our request from eight.

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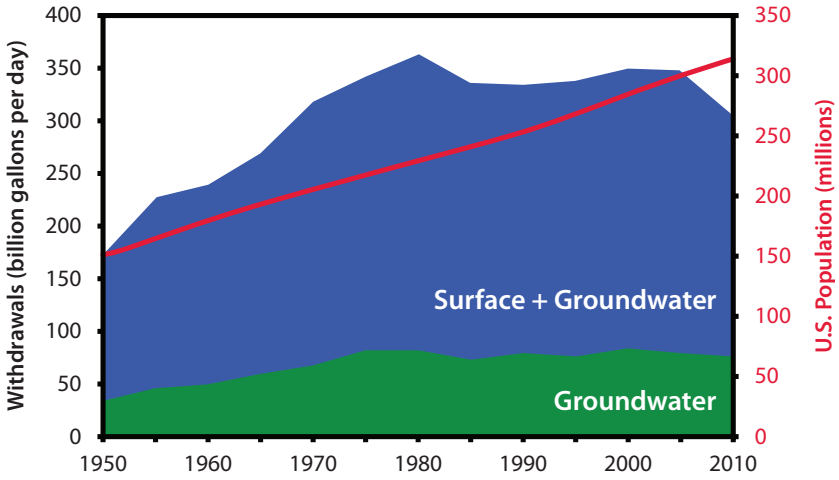
Factsheet

Groundwater use in the United States

A renewable and abundant source of water with its own sustainability challenges

Fresh water from underground

Groundwater is any water found underground in the cracks and pores in soil, sand, or rock. Groundwater provides 25% of the fresh water used in the United States[1]. It is particularly important for irrigation and domestic uses in arid or remote areas, where surface water may be in short supply or far away. Groundwater is replenished when rainfall soaks into the ground, but it can take hundreds to thousands of years to replace what we extract. In arid areas, high demand for groundwater and slow replenishment provide challenges for sustainable groundwater management.



Fresh groundwater and total fresh water withdrawals in the United States over time. For most of the 20th century, water use increased to support a larger population. Much of the recent decrease in both groundwater and overall water use is due to more efficient or reduced irrigation practices in arid areas[2].

Data source: U.S. Geological Survey[1]

Key concepts, defined:

Aquifer: a rock formation that contains and can transmit water
Fresh water: water with low salt concentrations (typically less than 500 parts per million)
Withdrawal: water taken from ground or surface water sources for human use. Also called "water use"
Consumption: the portion of water withdrawn that is not returned to water sources after use

Just the numbers (2010)[1]

Annual fresh groundwater withdrawals
- 27.7 trillion gallons

Number of water wells in the United States
- 15.9 million

Major uses of fresh groundwater
- Irrigation: 65%
- Public supply: 21%
- Domestic self-supply: 5%

States most dependent on groundwater (% of total fresh water withdrawals)
- Kansas: 80%
- Arkansas: 69%
- Mississippi: 68%
- Florida: 64%
- Hawaii: 63%

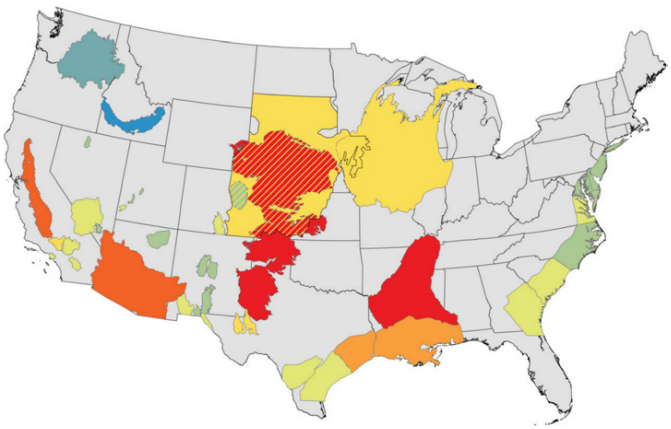
Largest groundwater users (% of all groundwater withdrawals)
- California: 16%
- Arkansas: 10%
- Texas: 10%
- Nebraska: 6%
- Idaho: 5%

96% of groundwater withdrawn is fresh; 4% is salty

98% of all self-supplied domestic water withdrawals come from groundwater wells

Groundwater sustainability

Some groundwater is used and then released to surface water bodies, such as rivers or lakes, but it is almost never pumped back into the ground. Instead, groundwater is replenished almost entirely by rainfall. In the United States, roughly one quarter of all rainfall becomes groundwater[3]. Groundwater makes up roughly 90% of the total available fresh water in the United States[1], but it is not evenly distributed or needed. In some areas, particularly in the more arid West, groundwater use outpaces groundwater recharge[4].



Total groundwater depletions (in cubic km) for major aquifers in the contiguous United States between 1900 and 2008[5]. Red 150-400; dark orange 50-150; light orange 25-50; dark yellow 10-25; light yellow 3-10; green 0-3; blues indicate net recharge.
Image Credit: U.S. Geological Survey[5]

The Ogallala Aquifer

The Ogallala Aquifer is the largest aquifer in the United States. It is part of the High Plains Aquifer system, which underlies parts of eight states from Texas to South Dakota. 90% of the water extracted from the Ogallala Aquifer is used for irrigation[3], supplying the water for roughly one-third of all irrigated agriculture in the country[3].

Since the 1930s, massive water withdrawals have rapidly depleted the southern and central portions of the aquifer. In parts of Texas and Kansas, water levels have dropped by over 150 feet[5]. The U.S. Geological Survey monitors the Ogallala Aquifer through its High Plains Water-Level Monitoring Study[6], reporting changes in water level and storage to Congress every two years. State geological surveys and other state agencies also monitor the aquifer.

Withdrawal vs. consumption

Water withdrawals only tell part of the story. Many water uses involve the borrowing of water - for thermoelectric power generation, domestic and commerical use, mining, and industry - most of which is returned to water bodies after it has been used[7]. Water *consumption* refers to the water that is withdrawn for human use but not returned. Irrigation accounts for around 80% of fresh water consumption[7]: most is lost to evaporation and the incorporation of water into crops. Although groundwater provides 25% of the fresh water used in the United States, it provides 43% of the fresh water used for irrigation[1]. As a result, groundwater accounts for around 40% of U.S. fresh water consumption.

More Resources

USGS Water: https://www2.usgs.gov/water/

USGS High Plains Water-Level Monitoring Study: http://ne.water.usgs.gov/ogw/hpwlms/

National Ground Water Association: http://www.ngwa.org/

2016 AGI Critical Issues Forum - Addressing Changes in Regional Groundwater Resources: Lessons from the High Plains Aquifer: http://www.americangeosciences.org/policy/ci-forum-2016

References

[1] Estimated Use of Water in the United States in 2010 - U.S. Geological Survey: http://pubs.usgs.gov/circ/1405/

[2] Western Irrigated Agriculture - U.S. Department of Agriculture: http://www.ers.usda.gov/data-products/western-irrigated-agriculture.aspx

[3] Groundwater Facts - National Ground Water Association: http://www.ngwa.org/fundamentals/use/pages/groundwater-facts.aspx

[4] Ground-Water Availability in the United States - U.S. Geological Survey: http://pubs.usgs.gov/circ/1323/

[5] Groundwater Depletion in the United States (1900-2008) - U.S. Geological Survey: http://pubs.usgs.gov/sir/2013/5079/

[6] High Plains Water-Level Monitoring Study - U.S. Geological Survey: http://ne.water.usgs.gov/ogw/hpwlms/

[7] Estimated Use of Water in the United States in 1995 - U.S. Geological Survey: http://pubs.usgs.gov/circ/1998/1200/report.pdf