Giving published geoscience a working future

Lessons from DS926: a reusable, scientist-guided path from legacy reports to web maps and subsurface services

Lester J. Williams | October 23, 2026

A report may be finished, but its scientific usefulness does not have to end with publication. The DS926 project shows how a geologist-controlled inventory and repeatable Python workflows can make an established regional framework easier to find, examine, maintain, and build upon.

A regional framework, and a practical question

State Geological Surveys and other public science agencies hold decades of valuable mapping. Much of that work remains in reports, plate maps, borehole records, and digital files created for an earlier generation of GIS. A new investigation often begins by rediscovering these sources and reconstructing how they fit together. That effort consumes time before the scientific questions can even be addressed.

The Floridan aquifer system provided a practical place to work through this problem. USGS Professional Paper 1807 presents a revised regional hydrogeologic framework across Florida and parts of Georgia, Alabama, and South Carolina. Data Series 926 supplies digital surfaces and thicknesses for selected hydrogeologic units, and Data Series 760 provides supporting borehole geophysical logs. Together, they offer a substantial scientific foundation, but moving that foundation into a coherent web experience requires more than uploading files. [1-3]

As a coauthor of these source publications and a hydrogeologist and hydrologist with a long career at the USGS, I approached the work with two responsibilities: preserve the meaning of the published interpretation, and make its evidence and limitations easier for the next scientist to examine. Logic Cloud Geo is the independent consulting setting in which I am developing and applying that approach.

The master spreadsheet became the control point

The first essential product was a master reference workbook. It linked source datasets to publication figures and plates and recorded their scientific roles, naming conventions, units, vertical references, and processing decisions. Rather than treating every layer as an isolated file, the inventory made relationships explicit: which points support which surface, which contours belong with which map, and where a unit or interpretation applies.

This was a working agreement between scientific judgment and code. A geologist reviewed the relationships and exceptions; Python scripts used the approved inventory and associated configuration to organize ingestion, build products, and check results. As questions arose, the workbook and documented decisions were refined. Automation followed those decisions rather than silently supplying its own geological interpretation.

For another agency, the exact workbook columns and scripts would change. The transferable idea is a maintainable inventory that staff can understand, review, and use to control repeatable processing. It should preserve the agency's terminology and source identifiers while making aliases, crosswalks, and exceptions visible.

From source data to PUB, WEBREADY, and ArcGIS Online

The workflow separated data preparation from cartographic assembly and web publication. Source data were retained, working datasets were standardized where necessary, and Python scripts assembled a PUB map in ArcGIS Pro. That map served as the publication-oriented reference for checking layer membership, scientific content, and the visual relationships established in PP1807.

A WEBREADY map was then prepared for online use. It carried forward the intended interpretation while adapting display scales, symbols, labels, layer order, default visibility, and pop-up content for an interactive map. Publishing and finalization steps used scripts and explicit settings to make repeated work more consistent, with human review at each stage.

Stage	What it controls	Scientific review
Source and inventory	Publication links, source files, units, datums, identifiers, and exceptions	Confirm what each dataset represents and where it applies.
PUB map	Publication-oriented layer assembly, symbols, contours, and labels	Compare the map with the source plate and its explanation.
WEBREADY map	Web display scales, layer visibility, pop-ups, and readable symbols	Check that interactive presentation preserves scientific meaning.
AGOL map	Published item references, bookmarks, links, and browser behavior	Test the actual public experience, including supporting evidence.
Optional services	Raster sampling, unit relationships, outputs, and documented qualifiers	Review derived results and their limits before release.

The result can be explored in the LCG collection of 25 Floridan aquifer system web maps. The collection is a working example of the approach: a reader can move from a regional overview to individual framework maps and then back to the underlying publications. [4]

Preserve the source, then add useful context

Fidelity does not require a browser map to behave like a scanned plate. It requires that the source interpretation, authorship, units, map relationships, and limitations remain traceable. Interactive additions should help a reader understand the published work, with any enrichment or derived product distinguished from the original source.

Plate 1 illustrates the benefit. Key wells and cross-section lines retain their place in the framework, while matched wells provide access to DS760 geophysical-log files. A reader can investigate supporting borehole information without first locating a separate database and reconstructing the well match. Other maps bring control points, contours, unit extents, and explanatory information into a common viewing environment.

These additions improve access to evidence; they do not turn a regional interpretation into a site-specific observation or automatically resolve uncertain correlations. A useful digital framework makes those distinctions easier to see. [4-5]

Lessons that matter for the next framework

The most valuable lessons were about maintaining scientific control as the number of products grew. Similar-looking layers could have different purposes. A thickness grid was not interchangeable with an elevation surface. A unit name could vary between reports, and a no-data area could mean that an interpretation did not apply there. Those distinctions had to be recorded before processing could be trusted.

- Make units, horizontal and vertical references, geographic applicability, and no-data meaning explicit before combining datasets.
- Retain original source data and distinguish normalization, cartographic changes, and derived scientific products.
- Check maps in the environment where people will use them. A correct ArcGIS Pro pop-up does not guarantee that HTML links will render as intended in a browser.
- Keep web refinements in the maintained configuration. A later publishing or finalization run can otherwise restore an older symbol size or overwrite a manually improved pop-up.
- Use small, targeted updates when only one published property needs to change, and verify that unrelated content remains intact.
- Document exceptions and review outputs with a geologist or hydrologist who understands the source report. Code can check consistency; interpretation still requires scientific responsibility.

Repeatable assembly and checks can reduce repeated manual setup and make corrections easier to propagate. The DS926 work demonstrates that mechanism, but no measured percentage of time or cost savings is claimed here. The effort required for a new report depends on the condition of its sources and the scientific work needed to resolve gaps.

The reusable part is the process

DS926 is a case study, not a requirement that another agency adopt Floridan unit names or duplicate its data structure. The same sequence can begin with a groundwater framework, a bedrock or surficial geologic map series, mineral-resource mapping, or another set of subsurface interpretations. Each project needs its own scientific relationships, review criteria, and publication choices.

When GIS files exist, the initial work is to assess their completeness, schema, spatial references, and relationship to the report. When a report has only scanned maps, tables, or cross sections, a separate recovery phase may be needed: locating originals, georeferencing, digitizing, transcribing, and documenting uncertainty. Those tasks require review and cannot be treated as a fully automatic conversion. Some sources may be suitable only for contextual display until additional evidence is available.

A useful first engagement is a bounded pilot: select one report or a few related maps, assess the sources, agree on the intended use, and produce a reviewed example. The resulting inventory, scripts, documentation, and staff walkthrough can establish a process the agency can operate and extend to its next report. Scope and handoff should fit the agency's own tools, staffing, and maintenance capacity.

From discoverable maps to reusable scientific services

Web maps are one useful outcome. Where source data and scientific relationships support it, a framework can also supply raster downloads, point and batch queries, reproducible notebooks, or other computing services. The DS926 subsurface service illustrates this next step by returning estimated framework elevations and depths with geographic applicability and explanatory qualifiers. Its separate methods paper describes the calculations and limitations. [6]

These services need their own review. Interpolation, vertical-reference conversion, surface stacking, and missing-data handling introduce decisions beyond cartographic publication. A service should disclose those decisions and retain enough provenance for another scientist to understand the result. Publishing a web map does not, by itself, make its layers analysis ready.

The larger opportunity extends across political boundaries. Aquifers and geologic units do not end at a state line. Discoverable maps with source citations, documented nomenclature, and reusable data can help neighboring agencies find related work, compare interpretations, and identify gaps. They provide a basis for collaboration without requiring every interpretation to be merged into one supposedly seamless model.

Over time, that access can support groundwater investigations, water-resource planning, mineral and other economic-resource assessments, and the next generation of subsurface mapping. The benefit comes from making existing scientific investment easier to examine and reuse, while keeping responsibility for new conclusions with the scientists making them.

Sources and working examples

1. Williams, L.J., and Kuniansky, E.L., 2016. Revised hydrogeologic framework of the Floridan aquifer system in Florida and parts of Georgia, Alabama, and South Carolina (ver. 1.1). USGS Professional Paper 1807.

2. Williams, L.J., and Dixon, J.F., 2015. Digital surfaces and thicknesses of selected hydrogeologic units of the Floridan aquifer system. USGS Data Series 926.

3. Williams, L.J., Raines, J.E., and Lanning, A.E., 2016. Geophysical log database for the Floridan aquifer system and southeastern Coastal Plain aquifer system (ver. 1.1). USGS Data Series 760.

4. Logic Cloud Geo. Floridan aquifer system publication series: 25 interactive ArcGIS Online maps.

5. Plate 1: Key Wells and Cross Sections. Interactive web map with matched DS760 log links.

6. Williams, L.J., 2026. Floridan aquifer system subsurface elevation retrieval: Technical - how it works. Logic Cloud Geo.

What report would you like to put back to work?

I would welcome a conversation with State Geological Surveys, USGS scientists, and other public agencies about a report or series of reports that could benefit from this approach. My role is to contribute the hydrogeologic experience, GIS work, and Python development needed to establish a practical process with your staff - one that you can understand, maintain, and extend using your own data.

Send me a publication link, a short description of the available GIS or scanned material, and the questions you want the resulting maps or services to help answer. After an initial review, I can propose a scope and estimate the time and consulting fees for a pilot, a larger ingestion effort, and any optional services or staff handoff.

Contact me personally at lesterw@logiccloudgeo.com. The aim is to help useful science remain useful, and to give your next subsurface investigation a better place to begin.