

Sharing and Discovering Map Symbols with SymbolStore.org

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Abstract. Maps are often used to support each phase of emergency management activities, including disaster planning, response activities, and long-term recovery efforts. While there are many symbol standards for emergency management, interoperable map designs remain elusive for this domain. Informal symbol conventions are frequently applied by emergency management mapmakers in place of more formal standards. And until now there have been few flexible mechanisms for discovering, sharing, and previewing these symbol sets among mapmakers. Here we highlight the Symbol Store, a web-based interactive tool intended to help mapmakers discover, share, and preview point symbols. The Symbol Store allows users to browse for symbols by keywords, category tags, and contributors. It also allows users to preview symbols on realistic maps prior to download. Moving forward, we are focused on further fostering the development of refined symbol sets through the addition of new features to the Symbol Store.

Keywords: Symbology, Map Design, Standardization

1. Introduction

One of the most critical cartographic challenges is to determine the means for representing geographic features. This task is often supported through the careful selection of ready-made symbols provided in mapping and graphic design software, or through the drafting of new symbols. Developing best practices for symbol designs and their standardization has been a topic of Cartographic research for several decades now (Rado and Dudar 1971; Robinson 1973; Morrison and Forrest 1995). While there has been much progress on how to design symbols, current mechanisms for discovering and sharing symbols tend to rely on symbol distribution through GIS

software and informal sharing through set-specific websites and personal exchanges (Robinson et al. 2011). While a great deal of effort has gone into developing new symbol standards in recent years to support map interoperability in defense, crisis management, and humanitarian mapping domains (Dymon 2003; DOD 2008; Kostelnick et al. 2008), much less progress has been made toward ensuring that symbols can be easily discovered and shared. Here we present our progress toward developing a web-based platform for sharing and refining map symbols that we call the Symbol Store. This work is driven by results from a multi-year investigation of symbol interoperability at the U.S. Department of Homeland Security (DHS). Our prior work focused first on the use of existing standards (Robinson et al. 2011) such as the ANSI 415 symbol set (ANSI 2006), and the development of a new more flexible platform for supporting the creation of new symbol standards (Robinson et al. 2012).

A primary goal for the Symbol Store is to help users who want to search for and quickly retrieve point symbols using keywords, category names, and other metadata. Supporting this core functionality enables the Symbol Store to enhance interoperability in emergency management contexts where authorities work together to create maps to support situational awareness and emergency response actions (Cutter 2003). Emergency management mapping also frequently involves planning activities and long-term recovery efforts which also stand to benefit from improved symbol sharing mechanisms.

While our initial work with the Symbol Store has focused on developing basic methods to support web-based symbol sharing, our current efforts are aimed at integrating an iterative process for standardizing domain specific symbol sets. The following sections outline our progress toward supporting both areas of concern.

2. Sharing Symbols

To support cartographers who wish to easily discover new symbols and share the symbols they have already collected, we developed a web-based platform for sharing symbols called the Symbol Store *Figure 1*. Based on the results of our prior work to study the use of symbol standards by DHS mapmakers and to design a new process to developing new and more flexible symbol standards, we developed four core goals to shape the Symbol Store application:

2.1. Search for and retrieve symbols

A fundamental aim for the Symbol Store is to support easy and efficient keyword searches for symbols that are used cartographers from government agencies as well as the private sector. Our intention is to support rapid retrieval for symbols using basic keyword search techniques. Current methods for finding symbols in GIS software often rely only on the formal names assigned to symbols, rather than their keyword description.

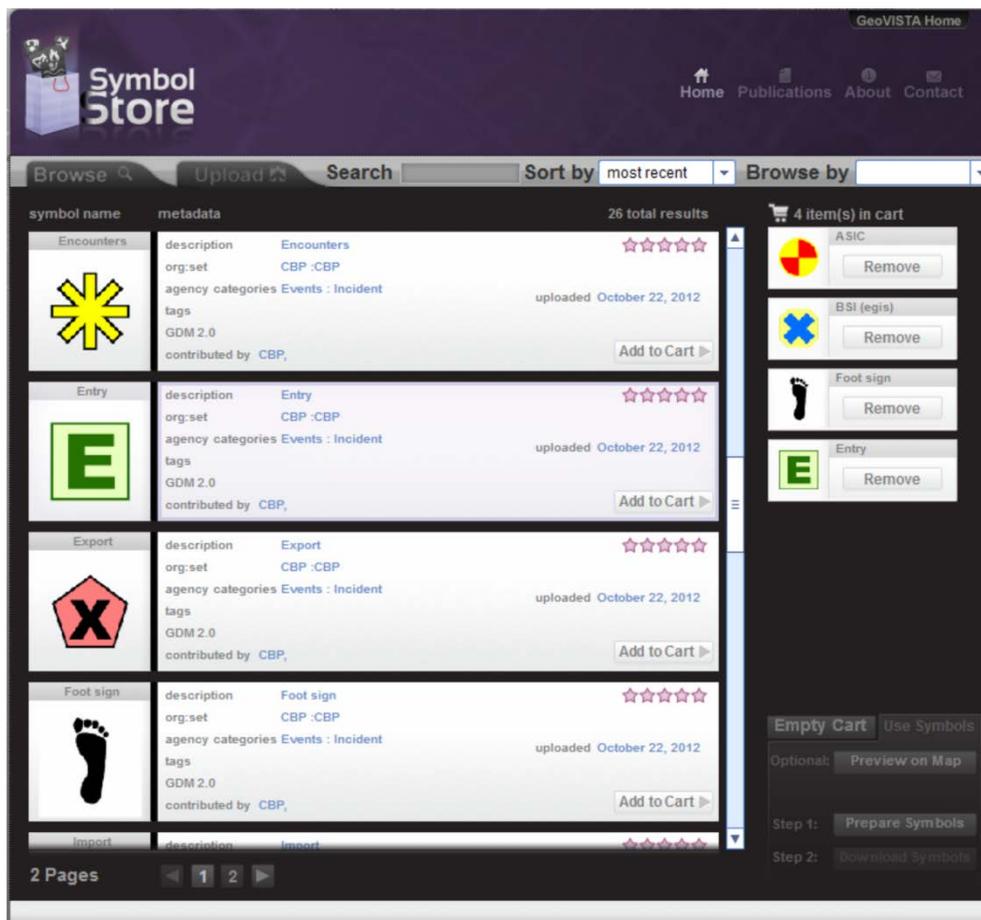


Figure 1. The primary Symbol Store interface for browsing and selecting symbols.

2.2. Preview symbols on realistic maps

Once a user has selected a set of symbols using the Symbol Store search interface, they can preview these symbols using the map preview tools shown here in *Figure 2*. These map preview tools provide a range of controls designed to allow users to change the map scale, feature density, labeling, coloring, and other common map design aspects in order to preview

the suitability of their symbols prior to downloading them. They can also switch between multiple realistic basemaps to see how symbols work (or do not work) in common cartographic design situations.

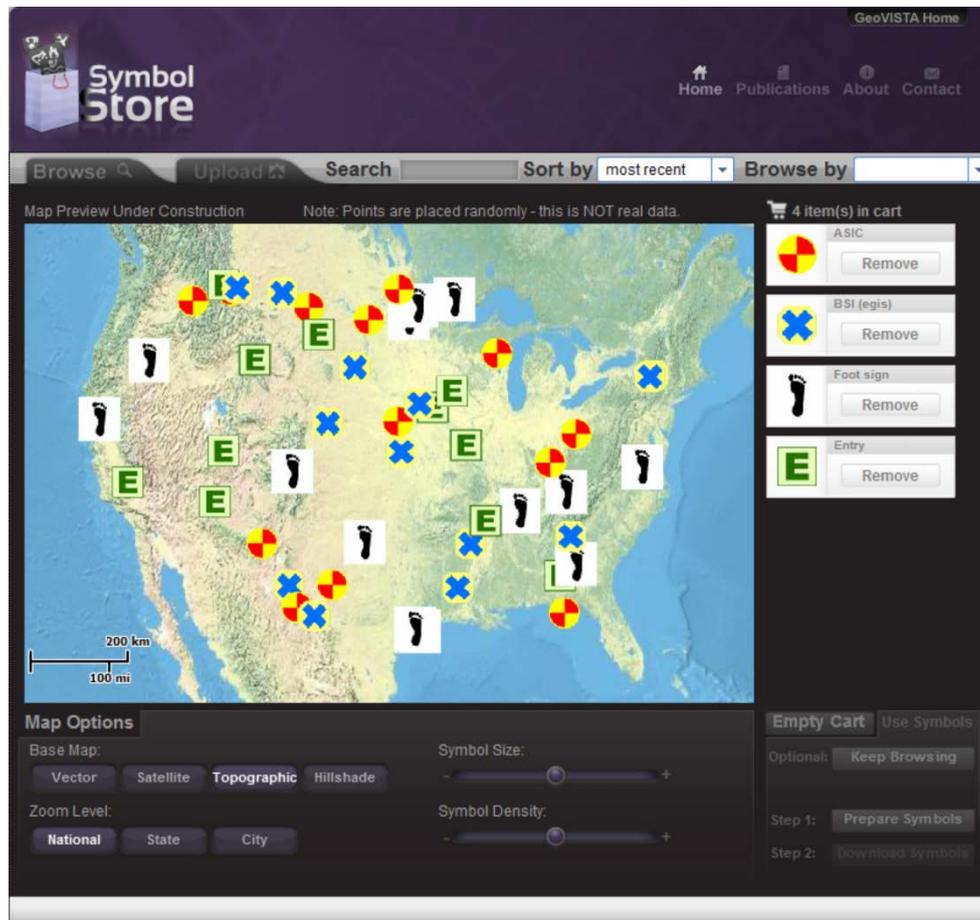


Figure 2. The Symbol Store interactive map preview interface for testing symbols.

2.3. Browse for symbols

In addition to basic search tools to find symbols using keywords, Symbol Store users can browse for symbols by time (show the most recent uploads, for example), contributor (show all symbols designed by a particular agency, for example), and symbol categories (show every symbol that is tagged as part of the category called *infrastructure*, for example). This browsing capability supports iterative and flexible symbol discovery, and it is particularly well-suited for cases in which keyword searches are not possible (e.g. you don't know the exact name for the symbol you want) or efficient (e.g. you know you need several symbols that correspond to infrastructure).

These browsing features also allow popularity measures such as subjective ratings to become one of the means by which new symbols can be discovered and shared. We anticipate this capability to be bolstered over time as increasing numbers of users provide ratings for symbols housed in the Symbol Store.

2.4. Share symbols

Users can contribute symbols to Symbol Store by uploading an Esri *.style file and associated fonts through the Symbol Store interface. Alternatively, they can choose to upload a collection of .PNG or .SVG graphic symbols if they are not commonly using Esri .style files. After uploading symbols, users can tag individual symbols or groups of symbols to assign keywords, category names, and other important metadata information (see Section 3 for details).

The Symbol Store (currently accessible at SymbolStore.org) holds over 2400 symbols collected from major U.S. government symbol sets as well as public domain symbol sets designed by independent cartographers. To help users select symbols, an interactive map preview allows users to test a set of symbols on realistic maps as shown in *Figure 2*. Once the user has found and previewed a set of useful symbols, they can be downloaded for immediate use in a range of common formats. The selected symbols are bundled together in a zip file which includes PNG images in three common resolutions, an Esri .style file for use in ArcGIS, and SVG vector graphics that can be used in graphic design software.

3. Refining Symbols

Our most recent additions to the Symbol Store are features that allow communities of mapmakers to iteratively refine and enhance their symbol collections. These new features build on prior work to develop an asynchronous, round-based approach for refining and formalizing domain specific symbol sets (Robinson et al. 2012). In that research, we developed and tested this standardization approach. To test this method we created a web-based platform called the e-Symbology Portal, based on a customized Drupal content management system. Subsequent to our initial testing of the e-Symbology Portal and our accompanying symbol standardization process, we saw the need for closer integration between the Symbol Store and the e-Symbology Portal in order to more efficiently and effectively support communities of mapmakers who want to share and refine their symbols.

The Symbol Store now directly engages with the e-Symbology Portal so that users engaged in our iterative process for refining map symbol standards

can select sets of symbols to review, enhance and refine their associated metadata, and identify new symbol design needs. Users can review symbols through a dedicated interface that supports metadata creation (for newly uploaded symbols) and refinement (for existing symbols in Symbol Store). *Figure 3* shows an example of how our new tools can assist users in the tasks associated with iteratively refining symbol sets through modifying their metadata.



Figure 3. The Symbol Store interface for refining symbol metadata.

4. Conclusion

Looking ahead, we envision multiple new opportunities for extensions to our work to develop new means for sharing and refining map symbols. We have recently completed an initial user study with mapmakers who engage in flood mitigation mapping to rate the overall utility and usability of the Symbol Store. Our preliminary results indicate that the tool is highly rated in terms of both key aspects of performance, but that there remain a wide range of small interface improvements and new functions that we must implement in order to maximize user satisfaction and overall utility.

As a next step, we plan to evaluate the Symbol Store and e-Symbology Portal integrated process and symbol refining tools with mapmakers. Our aim for this evaluation is to enhance existing functions designed to support symbol refinement and to identify new means to support collaboration and interoperability around symbology. We envision the use of this integrated process to be limited to a relatively small group of the overall user popula-

tion for the Symbol Store, but this group is nonetheless very important as the Symbol Store will only thrive if we are able to design good mechanisms for supporting iterative refinement of symbol sets by mapmakers.

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