Statewide Spatial Data Clearinghouses: an Oregon Case Study

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Abstract

Collaborative planning to streamline as well as to provide citizens with easier access to geospatial data has a long history in Oregon. A milestone in this process was the launch of the Oregon Spatial Data Library (OSDL) (http://spatialdata.oregonexplorer.info) in November 2009. The OSDL provides a method for sharing public domain geospatial data at no cost to the user and is part of Oregon's participation in the National Spatial Data Infrastructure (NSDI). This article reviews the nationwide setting for development of the NSDI and subsequent development of state geospatial clearinghouses. The paper first reviews these clearinghouses with a specific focus on five user-centric characteristics: keyword search options; availability of training or documentation; ease of access to metadata; presence of locally unique data; and calls for data or metadata contributions. These characteristics address the perspective of users who are neither GIS experts nor familiar with the clearinghouses. Information literacy concepts and the literature review informed the selection of the characteristics used in the review. The OSDL is reviewed in the same manner with the intention of commenting on steps which might be taken to make it more effective in the future.

Note:
The Oregon Spatial Data Library is a joint effort between the Department of Administrative Services Geospatial Enterprise Office and Oregon State University.

Introduction

A brief visit to the website Data.gov (2012) will demonstrate that many states are attempting to provide their citizens with easier access to public data. In Oregon, collaborative planning to streamline access to data has a long history particularly as it relates to geospatial data. A milestone in this process was the launch of the Oregon Spatial Data Library (OSDL) (http://spatialdata.oregonexplorer.info) in November 2009. It provides a method for sharing public domain geospatial data at no cost to the user. Earlier collaborations between Oregon State University Libraries (OSUL), the Institute for Natural Resources (INR) and state agencies resulted in a collection of themed portals, the Oregon Explorer™ (Salwasser & Avery 2010). As a result, OSUL and the INR had the means and structure in place to design and host this public interface for Oregon's Geospatial Clearinghouse (OGC). The OSDL is also part of Oregon's participation in the National Spatial Data Infrastructure (NSDI).

National Spatial Data Infrastructure

A succinct history of federal interests in geographic information related to the formation of the National Spatial Data Infrastructure (NSDI) was provided by Shuler as he addressed the future role of librarians in a more geospatial literate environment (2003). Seven years earlier, Executive Order (E.O.) 12906, "Coordinating geographic data acquisition and access: the national spatial data infrastructure," had defined the NSDI as "the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data" (1994). The NSDI would be aided by a National Geospatial Data Clearinghouse which was a "distributed network of geospatial data producers, managers, and users linked electronically."
E.O. 12906 section 3 called for the development and implementation of:

- National Geospatial Data Clearinghouse;
- A Standardized documentation of data;
- Public access to geospatial data;
- Executive agency utilization of the clearinghouse; and
- Funding by the Department of the Interior.

As a framework for addressing these tasks, E.O. 12906 outlined spatial data "themes" which had shared relevance for many layers of government (federal/tribal, state, county, and municipal). Specifically, the focal themes of transportation, hydrology, and political boundaries were identified. Collection and aggregating of "framework data" (data within these thematic areas) was characterized as fragmented. More often than not, there was duplication of effort across agencies and jurisdictions for lack of information, lack of means and/or lack of incentive to make data freely available for sharing.

In 1990 a revision to Office of Management and Budget (OMB) Circular No. A–16 established the Federal Geographic Data Committee (FGDC) headed by Secretary of the Department of the Interior (2002). Section 2e of E.O. 12906 defined the collaborative coordination role for the FGDC:

> "The FGDC shall seek to involve State, local, and tribal governments in the development and implementation of the initiatives contained in this order…utilize the expertise of academia, the private sector, professional societies, and others as necessary to aid in the development and implementation of the objectives of this order."

So charged, the FGDC took the lead in establishing metadata standards and guidelines for sharing information about spatial data, publishing the *Framework: Introduction and guide* (FGDC 1997). The formation of data clearinghouses soon followed at institutions like Cornell (Herold et al. 1999).

In Oregon, a strategic plan for geospatial data was adopted for the state in 1996. The plan was rewritten in 2001 in response to Oregon Executive Order 00-02 and "improved" by the Oregon Geographic Information Council in 2009 (OGIC 2010).

In these plans, framework layers/themes for Oregon follow those identified by the FGDC and include geodetic control, cadastral, orthoimagery, elevation, hydrography, administrative units, and transportation. Of these, three are complete (OGIC 2010). Other base themes of significance are bioscience, geoscience, preparedness, climate, utilities, structures/addresses and places, and land use/land cover of which only climate is complete. State and federal agencies collaborate to develop and provide stewardship of these datasets (Data.Oregon.Gov 2011). As these framework data layers are developed they are made available for harvesting by the NSDI Clearinghouse Catalog.

Literature Review

The NSDI began a top down program hoping to achieve more efficient spatial data creation and sharing at multiple, more local, levels. Surveys available in the literature point to the complexity of articulating measures of and barriers to "success." The National Framework Survey (Tulloch 2000; Tulloch & Robinson 2000) noted that a critical concern was whether or not data, collected locally, could be available nationally. Looking at a county subset of the Framework Survey responses, Tulloch and Fuld (2001) found many counties were not collecting framework data at all, and of those that were, the activity (production, revision, distribution) on framework data themes varied. Further, they noted that while respondents may be active in creating and to a lesser extent, sharing framework data, they were far less active in creating metadata to describe their data. This has implications for making that data accessible for harvesting at the state or national level.

A study of data sharing and coordination in local governments hints at best practices for fostering "geographic information relationships" at the municipal level (Harvey & Tulloch 2004; Harvey & Tulloch 2006). Primary among these is the need for better education. In a later article the same authors describe the need to "loosen up" those data themes of higher value to local and regional entities. They offer the examples of parcels and zoning which are difficult to develop from the top down, yet sharing policies "often prevent these from being stitched together." Additionally, the value of and barriers to data sharing between and within local governments is discussed. Sharing data at the local level is best understood in a wider social context the authors conclude, noting that there is a need to know more about how geographic information is "practically interwoven in mandated and legislative activities" (Tulloch & Harvey 2007, p. 57).

More recently the question of why there has not been more sharing of data at a regional level (across jurisdictions) invited others to call for further study of the "bottom up" building of the NSDI including "innovations in institutionalizing and sustaining (spatial) information infrastructures" (Nedovic-Budic et al. 2009, p. 16).

Efforts to create access to spatial data through clearinghouses as part of spatial data infrastructures (SDI) are varied. To help address this, several authors have assessed the progress of clearinghouse and SDI development. One such study compares national infrastructures to one another (Crompvoets et al. 2004) and concludes, among other things, that more user-friendly interfaces are needed. A survey evaluating local government efforts in Australia (McDougall et al. 2009) included questions about access to spatial data and inter-organizational collaboration.

State Initiatives

Recognizing this need to support sharing of data at least at the state level, by 2005 the FGDC offered competitive Cooperative Agreement Program (CAP) grants to states willing to articulate their own strategic plans for the development and sharing of framework data. In collaboration with the National States Geographic Information Council (NSGIC), the FGDC formed the *Fifty States Initiative Action Team* (2009).

The 2009 State Summary (NSGIC) on geospatial coordination listed 41 web addresses for state clearinghouse nodes. The NSGIC provides a geographic information system (GIS) inventory service, "Ramona," (http://gisinventory.net) which harvests metadata containing links to standards-compliant data or data services for subsequent harvesting by the NSDI Clearinghouse Catalog. In the 2009 survey only 33 of the states reported their sites could be harvested by the Geospatial One-Stop (now geo.data.gov).

Oregon Spatial Data Library in context

Until the launch of the Oregon Spatial Data Library in late 2009, Oregon GIS data were available through a static list on the Oregon.gov website. This list, which is still available, is not searchable, nor does it provide the ability to dynamically navigate the data. The OSDL provides a more user-friendly interface for both discovering and accessing spatial data than the static list. Also, it supports the overarching goal of de-duplicating datasets and efforts between data producers. Although the improvements to access and efficiency are important, the authors felt it would be beneficial to consider other states' clearinghouses and place the OSDL in a broader context, using the most recent NSGIC survey (2009). This comparison attempts to address areas in which OSDL is excelling as well as make recommendations for improvement.

A list of the 50 states' clearinghouses was developed using the NSGIC Survey links to state clearinghouses and a Google search to fill in the gaps (Appendix A). Only 44 state clearinghouses were available during the time of the review. Several sites were under construction, down for maintenance, or simply not functional. One required user registration which the authors opted not to pursue.

Other than the NSGIC State Surveys which focus on infrastructure and support, no previous evaluation of the state clearinghouses was found in the literature. While recognizing that comparisons among clearinghouses could take many forms -- including robust technical review -- this evaluation sought only to address the perspective of users who were neither GIS experts nor familiar with the clearinghouses. With this in mind, the authors reviewed the websites for the presence of five user-centered characteristics (Table 1) which reflect key information literacy concepts or were influenced by the literature described previously. The first three features emphasize the ability of a user to effectively discover information, understand it, and then subsequently evaluate and incorporate it into one's work. These were:

- Keyword search options
- Availability of training or help documents specific to the site
- Ease of access to metadata

Next, two characteristics were selected in an effort to address community and collaboration, which are important underpinnings of clearinghouse history and development.

- Presence of locally unique data
- Calls for data (or metadata) contributions from the broader state GIS community

Each clearinghouse was visited between December 2011 and January 2012 for the purpose of looking for search tools, training documents, metadata previews, local interest data, and requests for community participation through data sharing.

Table 1: Presence of five user-centric characteristics of geospatial clearinghouses

# With keyword search	# With custom help available	# With viewable metadata	# Touting local data	# Soliciting contributions
23	17	38	13	14

The ability to effectively discover the information made available is an important feature of the clearinghouse user interface. To determine if data could be found by users such as students and other non-GIS professionals, the presence of keyword searching was noted. In some cases, keyword searching was available, but did not appear to be working at the time of the review. Aside from keyword searching, many clearinghouses offered filtering by theme and some offered location searches.

Varied technology exists to support individual state clearinghouses. Depending on the technology and level of user, different types of guidance may be needed. Many clearinghouses offer links to standard technical help documentation. Fewer states offer customized help that address which data are included, the organization of the data, terminology, and other more basic guidance that would benefit a novice user. The Wyoming Geolibrary (based on ArcGIS Server Geoportal Extension 9.3.1.) provides an example of customized help documentation that combines technological as well as contextual guidance. The Wyoming clearinghouse documentation includes an overview of the site, search options, screenshots, and descriptions of each theme and data type (Wyoming Geographic Information Science Center 2010).

The availability of good metadata helps users determine whether the data will meet their needs. Metadata provides the origin and currency of the data and can help identify possible leads for further investigation. Information such as projection, date, authorship, description of coverage, and allowed uses among other things are typically included. However, in the clearinghouses examined, methods for accessing this critical information were not always straightforward. Several clearinghouses did not allow users to determine the qualities or usefulness of data by previewing the metadata in advance of downloading data.

One of the objectives of the OSDL, and of the clearinghouse concept generally, is to support the development of the NSDI from the ground up, contributing to a larger effort that is evidenced by the Fifty States Initiative. State level oversight for the clearinghouses allows the freedom to expand on the framework data layers with other important data. In this evaluation, the authors noted clearinghouses which clearly highlighted local-interest data on their homepage or news feed. Examples of data that elucidated this characteristic ranged from a shapefile showing current “Walk-In Hunting Access” locations in Kansas (http://www.kansasgis.org/), to North Carolina’s Hurricane Irene imagery (http://data.nconemap.com/geoportal/catalog/main/home.page).

Another way to generate a sense of community among GIS data users is to facilitate data sharing from within a broader group of interested parties. In addition to state agencies, municipal governments, university affiliates, and others generate data. Several clearinghouses actively encourage contributions to their sites. Although the process by which data or metadata could be added was not reviewed, the authors felt that an invitation to contribute data acknowledged the importance of this larger GIS community. The Maryland Mapping Resource Guide (MMRG) is one such clearinghouse: "MMRG offers a suite of tools that help data owners document what they are willing to share and how..." (Maryland GIS).

In reviewing the OSDL through the same lens used to evaluate the other clearinghouses, three of the five selected characteristics are present (Table 2). The two characteristics lacking are customized help and solicitation of data. A custom help document could be developed that includes the robust technological information that currently exists under the "Help" menu, as well as new information such as basic navigation, discovery, and download information.

Table 2: Presence of five user-centric characteristics in the OSDL

Is a keyword search available?	Is custom help available?	Are metadata viewable?	Is local data touted?	Are contributions solicited?
Y	N	Y	Y	N

Incorporation of additional, user-contributed data is something that has been under discussion for some time as a potential OSDL service. In actuality, few users have volunteered data, but the process is not formalized or available to the general public at this time due to limitations of the technology and staff available. Also, vetting data is no small task. Other clearinghouses may have similar informal conduits for accepting volunteered data, but this evaluation only sought to address whether the clearinghouse appeared to actively seek data from new sources.

Conclusion

The *Oregon Strategic Plan for Geographic Information Management* (OGIC 2010) estimates that 85% of data has a geographic component. From this, it is evident that geospatial data is becoming an essential need for many stakeholders. Oregon has begun to address this need by creating a portal for hosting and distributing data, but has also made significant inroads in the discovery and accessibility of such data.

In light of the informal evaluation and issues in data-sharing at a national level, there are several paths that future development of the OSDL might take to increase collaboration at the state, county, and municipal levels. OSDL provides a strong foundation for sharing reliable spatial data about Oregon.

One benefit of the partnerships that exist currently to support OSDL is that Oregon State University is already an integral partner through its library. OSDL is highly dependent on the continued collaborations between its state and university partners for the technological and planning support. OSDL may also become a source for OSU-generated data which have broader appeal.

OSDL has the potential to become a tool for other data sharing purposes as well. Access to landscape-level information for Oregon, Washington, Arizona and New Mexico through the OSDL will be added in 2012. Use of the OSDL in conjunction with other Oregon Explorer portals and tools, for regional collaboration and disaster preparedness: wildfire as well as "the big one" earthquake/tsunami, floods, has been suggested (McSpaden 2009).

Additionally, the Oregon Department of Transportation (ODOT) has partnered with the OSDL to enhance and upgrade the underlying software architecture with the goal of creating a framework dependent data extraction tab that will allow users to select from pre-defined areas of interest and select data in various formats. Although this work will initially be limited to authorized ODOT users, the development work will apply to ongoing improvements in the OSDL site as a whole.

In the future, availability of better software will benefit both data providers and users. Geoplatform.gov has the potential to be this new software and is being evaluated by the State of Oregon. No matter what the new system, the OSDL will continue to expand with more data – likely actively solicited -- and an improved portal that provides users a streamlined, searchable interface for finding relevant local, federal, university, tribal, and other data.

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Appendix A: Geospatial Clearinghouses by State (current as of April 2012)

State	URLs used in evaluation (Dec 2011- Jan 2012)	Notes
Alabama	http://portal.gsa.state.al.us/	"Offline" at time of review
Alaska	http://www.asgdc.state.ak.us/	
Arkansas	http://www.geostor.arkansas.gov	
Arizona	http://agic.az.gov/portal/main.do	Under development at time of review; online in April 2012
California	http://atlas.ca.gov/	
Colorado	http://coloradogis.nsm.du.edu	Under development at time of review
Connecticut	http://www.ct.gov/gis	GIS Council website only with external links to map & data sources
Delaware	https://dataexchange.gis.delaware.gov/	
Florida	http://www.fgdl.org/	
Georgia	http://data.georgiaspatial.org	Must register to search
Hawai'i	http://hawaii.gov/dbedt/gis/	
Idaho	http://www.insideidaho.org	
Illinois	http://www.isgs.uiuc.edu/nsdihome/	
Indiana	http://indianamap.org & http://www.indiana.edu/~gisdata/	
Iowa	http://www.iowagis.org	Site not functional at time of review.
Kansas	http://www.kansasgis.org	
Kentucky	http://kygeonet.ky.gov/	
Louisiana	http://doa.louisiana.gov/lgisc/	
Maine	http://megis.maine.gov	
Maryland	http://www.marylandgis.net	
Massachusetts	http://www.mass.gov/mgis/massgis.htm	
Michigan	http://www.mcgi.state.mi.us/mgdl	
Minnesota	http://www.lmic.state.mn.us/chouse/index.html	
Mississippi	http://www.gis.ms.gov/portal	
Missouri	http://msdis.missouri.edu/	
Montana	http://gisportal.mt.gov/Portal/	
Nebraska	http://www.dnr.ne.gov/databank/geospatial.html	
Nevada	http://keck.library.unr.edu/	
New Hampshire	http://www.granit.sr.unh.edu/	
New Jersey	https://njgin.state.nj.us/NJ_NJGINExplorer/index.jsp	
New Mexico	http://rgis.unm.edu/	
New York	http://www.nysgis.state.ny.us/	
North Carolina	http://www.nconemap.net/	
North Dakota	http://www.nd.gov/gis/	
Ohio	http://ogrip.oit.ohio.gov/ServicesData/OhioMetadataServer/tabid/88/Default.aspx	

Oklahoma	http://geo.ou.edu/DataFrame.htm	
Oregon	http://spatialdata.oregonexplorer.info/	
Pennsylvania	http://www.pasda.psu.edu	
Rhode Island	http://www.edc.uri.edu/rigis	
South Carolina	http://gis.sc.gov/data.html	
South Dakota	http://arcgis.sd.gov/server/sdGIS/	
Tennessee	http://tnmap.tn.gov/portal	
Texas	http://www.tnris.org/	
Utah	http://agrc.utah.gov/sgid	
Vermont	http://www.vcgi.org/	
Virginia	http://gisdata.virginia.gov/Portal/	
Washington	http://metadata.gis.washington.edu/	
West Virginia	http://wvgis.wvu.edu	
Wisconsin	http://sco.wisc.edu/wisclinc/index.php	
Wyoming	http://wygl.wygisc.org/wygeolib/	