

# Montana Base Map

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The timely and efficient development of geospatial information has always been one of the more demanding information technology (IT) infrastructure needs for the State of Montana and a motivating factor behind the creation of the 2006 GIS Common Operating Picture (COP) Report. Many states are undertaking this challenge by centering authority and responsibility in a single, state-level organization. However, many of these same states also encourage and support federated geospatial communities where the key to success is the ability to deliver the correct information, to the proper location, at the right time. The roadmap outlined in this paper is a vision of that trend as it applies to the State of Montana.

## **Background**

### **The Changing GIS “Paradigm”**

The GIS paradigm is rapidly changing from a system of isolated pockets of technologies and users to a more integrated approach. The increasing potential for data to be contributed by and shared among entities at all levels – local, state, tribal, private and federal – in a system where the community itself encourages better sources of information, is both encouraging and daunting.

The concept of a Statewide, ‘federated’ system where a series of independent entities form a cohesive data sharing system whose connectivity to each other enables all participants to create and use information, is more in demand now than it has ever been. For the federation to be successful one thing is clear, a primary factor is the ability to locate data anywhere within the federation network and deliver that geospatial information to the consumer in a timely fashion. What consumers seek are reliable, authoritative geospatial information and services upon which to make decisions and conduct analysis. Interestingly enough, championing that demand is not just the GIS community but also organizational decision makers.

### **Common Operating Picture (COP)**

Given the criticality of location-based data, and the changing GIS technological landscape, the COP clearly envisioned the development of a centrally managed, accessible Montana base map and geospatial services within a federated community. That is, a central position of authority (GIO) - the person responsible for providing:

1. Leadership
2. Guidance
3. Advocating for funding
4. Developing and enforcing standards
5. Setting policy
6. Oversight of the GIS coordination activities
7. Being the final arbitrator for all GIS roles/responsibilities

## **Vision**

Given this background, the question becomes “Where are we now, where are we going and how do we get there?”

### **Montana Base Map**

The federal government, in cooperation with state, regional, local and private sector interests has identified seven geospatial base map or “framework data layers” for the nation. These layers represent the primary geographical themes. The seven Federal-level layers include:

- Cadastral (or land parcels)
- Elevation
- Geodetic Control (precise location)
- Government Units (e.g., city or county)
- Hydrography (surface water)
- Orthoimagery (e.g., aerial photographs)
- Transportation

In addition, the Montana Land Information Advisory Council (Council) and the State’s Geographic Information Officer (GIO) have approved six supplementary base map layers specifically for Montana:

- Geology
- Hydrologic Units (sub-watersheds and drainages)
- Land Cover (Vegetation)
- Soils (Inventory and Classification)
- Wetlands
- Critical Infrastructure and Structures

Together, these 13 layers constitute the Montana Spatial Data Infrastructure (MSDI). These base layers are in various states of development and their completion, dissemination and ongoing maintenance is a top priority for the entire GIS community.

### **The Path**

The vision from the GIS community has always been to mainstream geospatial information and tools into appropriate public and private organizations. This means leveraging the excellent work already accomplished by the State, Federal Government, tribes, local governments and the private sector. That is, enhancing the quality, quantity and acceptance of GIS information across and within entity boundaries, and providing more timely and accurate geospatial information to the public and public decision-makers. Further, policy-level support for long-term financial stability of the infrastructure depends on the success of this vision.

It is clear that the GIO is accountable within State government for moving that vision forward and consequently, is the State’s central GIS authority. It is also obvious that to be effective there needs to be a balance between centralized and decentralized activities; neither extreme will produce the desired results. Therefore, the GIO must base decisions

concerning the role of centralized and decentralized activities on sound management principles and best practice behavior.

For example, the critical nature of MSDI theme stewardship assignments means that any entity accepting the obligation must incorporate these duties as an essential part of their everyday business processes or the base layer itself will suffer. This standard is very high. It does not mean they just “use” or “disseminate” the data; the steward must be the primary creator or statewide coordinator of the data collection and maintenance processes, and take major responsibility for the development of theme related web-based services as one of their principal (mission critical) business functions.

Some base layers have 'intrinsic' (natural) custodians (e.g., soils with NRCS); organizations that totally integrate the development, maintenance and access of these themes as part of their ordinary, mission critical business processes.

Most base map layers do not. For example, Critical Infrastructure and Structures (CIS) data has no intrinsic custodian. There are many CIS data “users”, but no single organization whose mission it is to create, maintain and ensure access to a statewide CIS database. This paper describes these themes as having ‘non-intrinsic’ custodianship.

The only entity having the development, maintenance, enhancement and coordination responsibilities for all 13 layers (intrinsic and non-intrinsic custodianship) MSDI base map layers as part of their institutionalized mission is the office of the GIO. Therefore, it is necessary that the GIO, with advice from the Council, is the person who must ultimately decide on any delegation of stewardship responsibility.

### **Base Map Service Center**

If we are to realize the vision, the Montana Base Map must provide the foundation for anyone seeking to leverage spatial information about Montana. To that end, there must be a focal point for the State; a place where the ultimate responsibility and authority resides; a single hub - a Base Map Service Center (Center) within the Department of Administration/information Technology Services Division (DOA/ITSD) with the GIO as its head. The GIO and the Center must virtually become one entity, working for the well-organized, professional management and oversight for all base map data.

However, the “center” is not simply a physical location, but a virtual coalition of data creators, data storage facilities, clearinghouses and information consumers. That is, the Center does not exercise physical control over all data. The concept of a federation allows data to be stored and/or retrieved from many appropriate locations; the role of the GIO and the Center is to ensure this is accomplished in the most efficient and effective manner possible, and that access is afforded to the broadest audience possible.

Stated another way, in order for digital geographic information to be useful to the widest audience possible and to prevent duplication of effort, data layers must be easily located, provided common formats, and be readily and reliably available when and where they are needed. Access can and should be flexible and make use of the latest technologies (e.g.,

web services) where appropriate, but as necessary still provide more traditional access methodologies to the raw data. Key to this is allowing access from many different starting places, the ability to identify where the most authoritative data is located, and a mechanism to report how to obtain the information in a timely manner.

It is also clear that some base map layers will have many “information contributors” who participate in the federation not just as consumers, but also as providers of "sub-theme" data directly to the appropriate steward, for example the contribution of one boundary layer to the Government Units theme. Another example would be local governments contributing county cadastral data to the statewide database. However, in many cases, entities producing and maintaining quality "sub-theme" data do not have the mandate or the resources required to store and disseminate that information across the entire federation.

That is why one should not confuse this stewardship role with that of the clearinghouse or data-warehouse. While the COP clearly advocates data creation, maintenance and access services “reside” with intrinsic custodians, it also promotes the idea that the primary clearinghouse functions of data discovery resides with the MSL, that the principal data-warehousing (i.e., data storage) role is located in the DOA/ITSD, and the task of delivering these through web-based services or traditional methods is entrusted to federated service hubs. Further, it is clear that ensuring all this happens effectively falls to the GIO/Center.

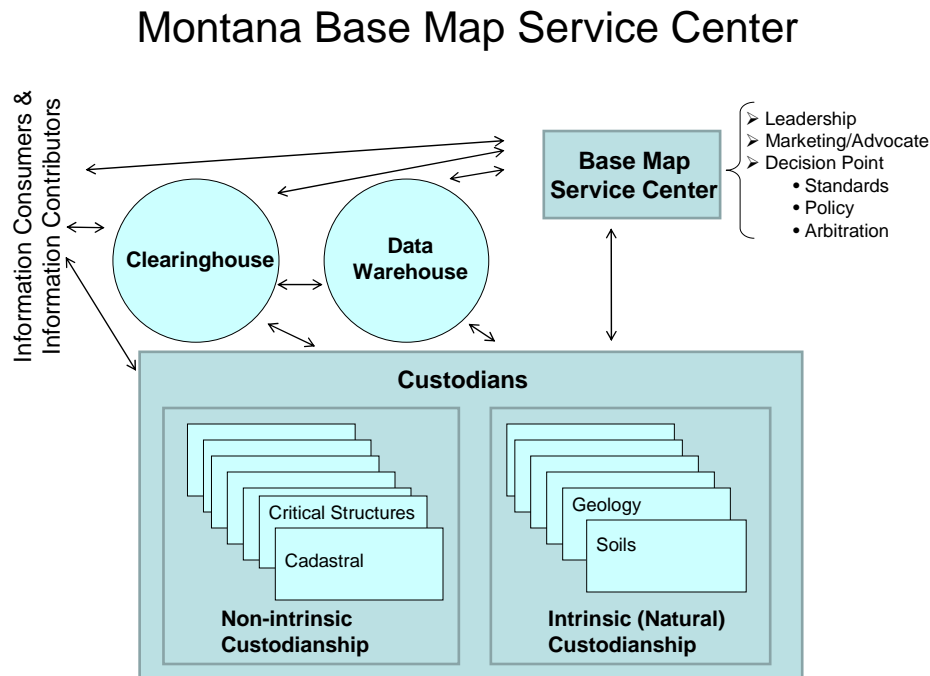
Another responsibility of the Center is to promote continuing cooperative efforts at the agency, local government, tribal, federal, public and private sector levels. Although all the partner agencies and organizations are primarily responsible for developing and implementing GIS technology for their in-house use, Montana needs to be even more successful in implementing technology transfer and resource sharing. Interagency partnerships have and will continue to facilitate the development of GIS within many organizations, including providing access to technology that would otherwise be beyond the reach of many entities and affording cooperating organizations the basis for long-term staff and infrastructure sharing. Presently, a federation of these organizations are contributing to infrastructure costs sharing (e.g., Orthoimagery flyovers), the use of a common data warehouse and clearinghouse, and participation in a shared expertise pool of GIS specialists, programmers, and other IT staff (e.g., the Montana Association of Geographic Information Professionals - MAGIP), but much more needs to be accomplished.

Finally, another role of the Center is as a primary promoter of geospatial data and tools within and across public organizations. It is a common perception among GIS professionals that the policy makers who allocate resources do not always understand the value of geospatial information and analysis. Historically, the GIS community has done a poor job of communicating the “business value” of geospatial tools; instead concentrating on the value of the data. If the use of these tools is to become widespread, bridging the real or perceived “chasm” that exists between GIS technical leaders and policymakers is crucial. The best way to accomplish this goal is by “speaking” the

language of business, and by approaching these discussions from the top down rather than simply from the bottom up. Rest assured, this is a combination of top-down and bottom-up marketing. However, the GIS community must bring public decision-makers into the deliberations to ensure long-term success. The focal point for accomplishing this at the state-level is the GIO and the Center.

Designating one geospatial focal point within State government begins to define and clarify GIS roles and responsibilities. It provides a decision-point where issues can be aired and resolved. It affords the State with a single contact point where individuals and organizations wanting information about GIS can go. The Center is the central point in the development of the State's long-term geospatial direction and the primary statewide advocate for that vision. Consistent with the Montana Information Technology Act (MITA) and the State's IT Plan, creating a Center will reduce costs and increase information viability by focusing technical expertise and reducing data development duplication, while continually enhancing the quality and quantity of digital geographic information and related web-based services. Additionally, it facilitates the proliferation of GIS technologies to appropriate government business processes by providing a central marketing arm for advocating the value of geospatial tools to the public decision-making process. Finally, the Center is the State group that can best advocate with public decision-makers for adequate, statewide geospatial funding.

The following is a graphical representation of the Center concept:



Thus, the Center is the organization headed by the GIO and, with the advice of the Council, has primary accountability for all Montana Base Map layers. Additionally, it is the institution responsible for coordination of geospatial activities among State agencies

and between those agencies and local governments, tribes, and the Federal Government, and for advancing the value of geospatial data and tools to the public decision making process. It is the place where long-term vision is set and conflicts are resolved.

### **Summary**

In contrast with its relatively obscure beginning and limited focus, Geographic Information System technologies are now experiencing rapid changes. These technological developments are in turn spurring exponential growth in the demand for GIS applications. This situation presents a unique set of challenges and opportunities to administrators, managers, technical specialists and the customers they serve.

As GIS technology and the relative importance of the services it delivers to organizations have advanced, there has been a shift in the creation, management and dissemination of GIS data and services from stand-alone, one-off efforts to a multi-partner, federated GIS model. Although Montana has been at the forefront of GIS technological developments in the past, maintaining this status and collectively adapting to the changing paradigm will require continuing innovative work. The identification of the MSL clearinghouse, DOA/ITSD warehouse, and the creation of the BMSC are all essential building block in the evolution of a value-added, federated GIS model that meets the business needs of the public and of the partners.

The responsibility/accountability to manage this transition for State government and to cooperate with all the other entities within the GIS community lies with the GIO and the institutionalization of a Montana Base Map Service Center.