



**MONTANA SPATIAL DATA INFRASTRUCTURE  
FRAMEWORK THEME REVIEW**

**2009**

**PREPARED BY  
THE MONTANA ASSOCIATION OF GEOGRAPHIC INFORMATION PROFESSIONALS**

**FOR  
THE MONTANA LAND INFORMATION ADVISORY COUNCIL**



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## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME REVIEW PROCEDURES

### PROCESS

The goal of this review is to gather complete information on all MSDI themes working from readily available information. In many cases the requested information already exists in annual theme reports, but not presented in the form requested in this questionnaire. Well-constructed responses to questions are preferred over highly-technical explanations. Responses to the questionnaire will help, in part, to inform and guide policy makers on the status of MSDI themes. Please consider the Montana Land Information Advisory Council (MLIAC) to be your audience when constructing responses.

In cooperation with MLIAC and MAGIP, a team of your peers has been assembled to work with each Theme Steward individually in completing this task and compiling results. A Theme Steward will (1) complete the questionnaire, (2) email a copy of the completed questionnaire to the assigned review team member, and (3) schedule a time when the review team member can go over the questionnaire results via phone or in person. The purpose of the one-on-one consultation with a team member is to ensure that the team member assigned to your theme fully understands what you have presented in text. They may have follow up questions. There may be responses that are not clear.

Through this process the team might identify cross theme issues that need to be summarized and presented to MLIAC in June 2009. This is intended to be a constructive process and not onerous. Your time as well as ours is valuable, and we are attempting to use this process as an efficient means to compile a status on each theme and provide some leadership on where MLIAC might focus its efforts in the coming fiscal year(s).

### TIMETABLE

- Theme Stewards to complete responses to questionnaires and/or schedule consultations by April 25, 2009.
- Complete all responses to questionnaire and follow up phone consultations with Theme Stewards by May 15, 2009.
- Team will compile final report to be presented to MLIAC at their June 5, 2009 quarterly meeting

### THEME ASSIGNMENTS

- **Doug Burreson** (*Missoula County*): Addressing, Cadastral, Transportation
- **Lance Clampitt** (*USGS*): Critical Infrastructure, Hydrography, Land Use/Land Cover
- **Chris Stump** (*Montana DEQ*): Elevation, Hydrologic Units, Orthoimagery
- **Kris Larson** (*CDM*): Geology, Soils, Wetlands
- **Mike Sweet** (*University of Montana*): Geodetic Control, Government Units, Geographic Names

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME REVIEW QUESTIONNAIRE

1) **Theme Name:**

Provide the official theme name\title as you understand it to be.

2) **Theme Definition:**

Provide a brief layman's description of the theme. An example for the transportation theme might be "all public ground transportation routes in Montana".

3) **Theme Description:**

Provide a technical description that describes the full technical scope of the theme. Please limit the description to one well-constructed paragraph. An example for the transportation theme might be "The Transportation theme is multi-modal and integrates roads, railways, and trails from multi-jurisdictional data providers. Each is managed as a separate sub-theme, but spatially integrated to support multi-modal applications. Roads are all local, state, and federal road systems." [Etcetera]

4) **Sub-theme Descriptions:**

If a theme is comprised of multiple related features list them here in an ordered list. An example for the government units theme might say "Government Units is currently comprised of county boundaries, school districts, rural fire districts, and legislative district boundaries." If another organization is collaborating on maintenance of a specific boundary then identify that organization. For example, "The Office of Public Instruction assists in the maintenance of school district boundaries." If features have been identified, but without an obvious provider then simply state the general case. For example "Over 60 additional administrative unit boundaries have been identified, but with no present support for creation and maintenance."

5) **Primary Data Users and Stakeholders:**

While an all-inclusive list would be impossible to construct, it is helpful to identify those organizations that regularly rely on this theme for their work or identify where a working relationship for use has been established.

6) **Theme Completeness:**

In a few sentences describe what you would consider to be a reasonable, achievable target product for this theme relative to the theme definition. For example, "Statewide representation of all waterways at 1:24,000 scale that meets USGS National Mapping Standards." How close are you to achieving this target?

7) **Theme Stewardship Status:**

In a few sentences describe stewardship for development, maintenance, access, and distribution of this theme. If you rely on other entities\agencies to carry out these responsibilities for this theme then please identify those. For example, "The Montana Portal at the Montana State Library distributes metadata, and supports search and discovery for this theme".

8) **Theme dependencies:**

If this theme is dependent on other framework themes to become complete or to be properly maintained, then please identify these themes, otherwise indicate "none".

**9) Standards and Best Practices:**

List any published standards or documented best practices this theme subscribes to. If this theme is based on a standard briefly describe how the standard is adhered to.

**10) Data model, schema, or documents:**

List any published or formal description of the data represented by this theme that are available to data users or data providers.

**11) Data Stewards:**

Some themes require the assistance or engagement of others for specific roles. Typical roles might be data provider, data integrator, data distributor, metadata clearinghouse. Please identify other collaborators that have a significant role in development, maintenance, or distribution of data related to this theme. For example, “This theme integrates road centerlines maintained by multiple counties. Metadata is distributed through the Montana State Library Portal. Data access and data access services for this theme are provided by the Montana Department of Administration.

**12) Montana GIO:**

What can Montana’s GIO do to support this particular theme or for framework themes in general? What do you need the GIO to do for you? Is there a specific role or responsibility for the GIO that needs to be met? Are there other policy organizations that should be engaged in advancing this theme?

**13) Professional Community:**

What would you offer the role and responsibility of Montana’s Association of Geographic Information Professionals to be for this theme or for framework themes in general? Are there other professional organizations that should be engaged on this particular theme?

**14) Your Request to GIO or Council:**

Are there any factors pertinent to the advancement or sustainability of this theme toward completeness that would be useful for the GIO and the Land Information Advisory Council to know? These factors can be of any nature such as institutional, financial, or technical.

**15) Do you have any additional comments?**

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: CADASTRAL

### 1) **Theme Name:**

Montana Cadastral Framework

### 2) **Theme Definition:**

Cadastral data are the geographic extent of the past, current, and future rights and interests in real property. Rights and interests are the benefits or enjoyment in real property that can be conveyed, transferred, or otherwise allocated to another for economic remuneration. (Federal Geographic Data Committee, Cadastral Subcommittee, 1996) Most Cadastral Databases are a subset of that very broad definition. Many laymen simply describe a cadastral framework as parcels but unfortunately this is a vast simplification of the theme. A multi-purpose cadastral may contain deeded lots, lots aggregated into taxable property, easements, zoning, school districts, and many more features. All convey rights and interests to real property.

### 3) **Theme Description:**

The Montana Cadastral Framework provides a digital representation of the written legal description of taxable parcels and non-taxable parcels, or land ownership, as defined in the Montana Department of Revenue's (DOR) Computer Assisted Mass Appraisal database (CAMA) The non-taxable parcels may include public lands (federal, state, local governments, etc.), tribal lands in USA or tribal trust, and other exempt property such as church owned property. The Montana Cadastral Framework provides land ownership information when the parcel data is linked with the Department of Revenue's (DOR) Computer Assisted Mass Appraisal data (CAMA). All taxable parcels have DOR property appraisal data while exempt property is simply listed as tax exempt. Most tax exempt property could be associated with other databases, for example state trust lands with the state trust land database or federal parcels with the BLM's LR2000 however that has not occurred yet. The boundaries of aliquot parcels are built on the Bureau of Land Management's Geographic Coordinate Database (GCDB) and the non-aliquot parcels (parcels based on bearings and distances) are created through the use of coordinate geometry (COGO), original digitization of paper and Mylar maps or deeds. The boundaries of a tax parcel do not constitute a legal survey; inaccuracies exist with both the mapped data and the CAMA data. If a person is seeking the definitive legal description of real property, they should consult the recorded deed at the local county courthouse. Given the broad FGDC Cadastral Subcommittee definition, cadastral databases can contain other data beyond tax parcels. The Montana Cadastral Framework does contain additional features (feature classes) described under question 4.

The Cadastral Framework Theme relies on a federated approach with a goal of creating and maintaining a standardized, statewide, tax parcel layer built upon the Bureau of Land Management's Geographic Coordinate Database (GCDB). This includes integrating parcel data from a group of multiple-jurisdictional agencies on a monthly basis. Specifically, the Cadastral Framework obtains data from 8 counties and the Montana Department of Revenue. In addition, many other themes (land stewardship (originally from the MT Heritage Program), conservation easements, school boundaries, etc.) with coincident geometry are now built, maintained and integrated with the Cadastral Theme. For anybody to truly understand the nature of cadastral data they would need to read: 1. Need for a Multipurpose Cadastre, National Academy Press, 1980 2. National Land Parcel Data: A Vision for the Future, National Academy Press, 2007

### 4) **Sub-theme Descriptions:**

The Cadastral Framework Theme, specifically the ESRI parcel data model presently used by the

BMSC at this time, is not comprised of any related features other than those described in question 3. Nevertheless, there are several sub-themes that are directly related to the Cadastral and GCDB. Given the definition of cadastral data, literally all of the following could be said to be part of a multi-purpose cadastre but for simplification of the Montana situation we offer the following list as examples although it is far from complete:

Cadastral related subthemes:

- Conservation easements
- Heritage "stewardship" (really in a broad sense aggregated land ownership)
- State trust lands
- Water rights
- Easements (road and otherwise)

GCDB related subthemes:

- State boundary
- County boundaries
- School Districts
- Voting Districts
- Conservation Districts
- Rural Fire Districts
- Any boundary theme that is completely or partially vertically integrated with tax parcels or the Public Land Survey System (PLSS)

**5) Primary Data Users and Stakeholders:**

Primary users of the Cadastral Framework Theme include both the public and private sector. The public sector includes many different state agencies and local governments. For instance, the Montana Department of Natural Resources uses the Cadastral Framework on a daily basis in their water rights adjudication process. And, the Department of Revenue uses the data for agricultural assessment of rural lands. The Department of Transportation uses it for easement acquisition. Plus, many local governments use the Cadastral Framework for urban planning and development. Basically, any state or local government agency that needs land information is using the Cadastral Framework Theme. As for the private sector, this group includes realtors, appraisers, the oil and gas industry, banks, insurance agencies, school teachers, hunters, home buyers or anyone else needing land ownership information. Stakeholders include the 8 counties and the Department of Revenue that provide parcel data and the Bureau of Land Management.

**6) Theme Completeness:**

As of April 2009, the Cadastral Framework Theme, as described in question 3, was basically complete for all 56 Montana counties; nonetheless, there are a few exceptions. The exceptions include: federal lands in Flathead County (Forest Service lands and Glacier National Park), Yellowstone National Park and a partial township in Jefferson County. The Cadastral Framework is also a dynamic theme: the data is always in a state of change. For example, the DOR and the 8 counties generally supply updates of parcels and CAMA on a monthly basis. This data is then integrated into the statewide model. In addition to the monthly changes, the Cadastral Framework and the BLM have a GCDB enhancement program to increase the accuracy of the GCDB and parcels in selected areas. Depending on funding, these enhancements are generally scheduled to take place once or twice a year. With enhancements in GCDB, the sub-themes also have to be adjusted to the updated Cadastral Framework Theme.

**7) Theme Stewardship Status:**

From a tax parcel perspective, we consider the theme, as it is today, to be completely developed and in maintenance. The maintenance is provided by individual counties and DOR, and integrated by Base Map Service Center (BMSC). It is also distributed by the BMSC:

<http://giscoordination.mt.gov/data.asp#Cadastral>. BMSC provides education and outreach, especially to counties maintaining data and moving it to geodatabases or conducting GCDB enhancement projects. Outreach through user meetings or training opportunities could be improved. BMSC maintains a web page that is regularly updated on status and activities of the theme - <http://giscoordination.mt.gov/cadastral/msdi.asp>. The Montana Portal at the Montana State Library distributes metadata and supports search and discovery for this theme. As stewards of this theme the BMSC would rate stewardship of this theme as an A. In terms of a true multi-purpose cadastre there are other cadastral data that if available statewide could be integrated into a state cadastre. For an example of what Ravalli County believes to be a multi-purpose cadastre read their 2010 Montana Land Information Act grant application at: [http://itsd.mt.gov/content/policy/councils/mliac/MLIA\\_GRANTS/2010/RAVALLI\\_COUNTY\\_2010\\_MLIA\\_Grant](http://itsd.mt.gov/content/policy/councils/mliac/MLIA_GRANTS/2010/RAVALLI_COUNTY_2010_MLIA_Grant)

#### 8) **Theme dependencies:**

The Cadastral Framework relies upon timely updates in CAMA from the Department of Revenue as a link to tax parcel attributes. The theme is dependent on the collection of geodetic control on Public Land Survey System corners for accuracy enhancements to GCDB that result in cadastral adjustments. In some cases, in areas we call "red-lined areas" that deviate from GCDB control we rely partially on aerial imagery such as National Agricultural Imagery Program (NAIP), or preferably higher resolution imagery, to adjust parcels. Indirectly, better addresses contained in county databases could be linked through parcel geocode, and transferred back up to the DOR CAMA. Roads, hydrography (water features) and hypsography (elevation) may sometimes be used to create or verify a parcel boundary when no other sources exist.

#### 9) **Standards and Best Practices:**

The Cadastral Framework Theme follows the Cadastral Publications Standards of the Federal Geographic Data Committee (FGDC). The Chief of the BMSC is a member of the FGDC Cadastral Subcommittee and monitors any changes to the standard. If changes to the standard resulted in major deviations from the existing database schema the BMSC Cadastral Database Analyst would evaluate the risks and benefits of making the changes. Presently, in all cases local government data can be integrated and adapted to meet the standard.

FGDC: <http://www.nationalcad.org/showdoclist.asp?doctype=1&navsrc=Standards>

#### 10) **Data model, schema, or documents:**

Information on the Cadastral Framework Theme can be found on the Montana Base Map Service Center website or the Montana Cadastral Mapping website.

Montana Base Map Service Center: <http://giscoordination.mt.gov/cadastral/msdi.asp>

Montana Cadastral Mapping Application: <http://www.gis.mt.gov>

The database was originally constructed on the Arc Parcel data model - <http://support.esri.com/index.cfm?fa=downloads.dataModels.filteredGateway&dmid=11>. This model contains a lot of extraneous features for an integrated state framework (although perhaps not for a county data source). The BMSC is in the process of refining the original data model to make it better reflect the data actually contained in the database.

#### 11) **Data Stewards:**

The Cadastral Framework Theme relies on many different partners to achieve its goal of providing a statewide parcel layer. For example, the Department of Revenue and 8 Counties provide parcel data to the Cadastral Data Steward on a monthly basis, and the Bureau of Land Management has worked closely with the Montana Base Map Service Center in developing a GCDB Enhancement project to increase the accuracy of the CGDB and parcels throughout the state. Some of the other partners

include the National Heritage Program (sub-themes: Stewardship and Conservation Easement data) and the Montana State Library Portal (distribution of metadata).

**12) Montana GIO:**

The Cadastral Framework Theme's greatest need is a source of stable funding. This is where the GIO should put his efforts. The GIO, along with the Montana Land Information Advisory Council, needs to be extremely aggressive in acquiring the funds from the state legislature or other sources. Without a stable source of money, applications and dependencies (such as those who rely on the cadastral web application) are built on a "house of cards" that could be removed at any time. Additionally, it's very difficult to plan and execute advancements for the Cadastral Framework.

**13) Professional Community:**

The professional community can still provide valuable feedback on the direction the theme moves in. We recognize that we need to do a better job involving them through more theme meetings and a continually updated website. The professional community can also sponsor training opportunities that foster professional development for those using or creating cadastral or cadastral related data. We would also recommend that to have a basic understanding of cadastral data, the professional community minimally needs to read the executive summaries of the two National Academy publications referenced in question 3.

**14) Your Request to GIO or Council:**

The GIO and the Council should also actively advocate for a permanent PLSS monument restoration and coordinate improvement program. The GIO and the Council should recognize not only the dependencies that the cadastral framework has on other themes (see answer to question 8), but the dependencies that other data have on cadastral (see answer to question 4). The Council needs to understand that advocacy for this and other MSDI themes require research and work. As noted in question 3, to have a basic understanding of cadastral data, minimally the executive summaries of the two National Academy publications need to be read. As stewards of the Cadastral Framework we would recommend that the GIO and the Council advise the Governor and his staff of the benefits and needs of the Cadastral Framework.

**15) Do you have any additional comments?**

No

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: ELEVATION

### 1) **Theme Name:**

Hypsography / Elevation

### 2) **Theme Definition:**

A measurement or mapping of land elevations

### 3) **Theme Description:**

Hypsography or elevation data refers to a representation of spatially referenced vertical positions above or below a datum surface. This type of geospatial data may be represented by elevation values separated by a consistent grid spacing in the form of the United States Geological Survey's (USGS) Digital Elevation Models (DEMs) or as contour lines following the earth's surface.

### 4) **Sub-theme Descriptions:**

- 1) Digital Elevation Models – USGS (federal – provider / maintainer), Montana Department of Environmental Quality (MTDEQ)
- 2) Digital Terrain Models – National Geospatial-Intelligence Agency (NGA, federal – provider / maintainer)
- 3) Hypsography / Contours – USGS
- 4) Tagged Vector Contour data

### 5) **Primary Data Users and Stakeholders:**

Shaded Relief elevation data for visualization purposes is one of the most widely used geospatial data themes in the world. Elevation data is also used to model water flow, mass movement of material (avalanches and landslides), line of sight analysis, flight simulation rectification of aerial photography, gravity measurements, and terrain analysis. Numerous federal science, land and wildlife management agencies including the USGS, U.S. Fish and Wildlife Service (USFWS), U.S. Bureau of Land Management (BLM), U.S. Environmental Protection Agency (EPA) and U.S. Department of Agriculture (USD) use elevation data for three-dimensional visualization and for analysis. Various state agencies including MTDEQ, Montana Department of Natural Resources (MTDNRC), Montana State Library (MSL), Montana Department of Administration (DOA), Montana Fish Wildlife and Parks (MTFWP) also use this data for both visualization and analysis. USGS remains the largest federal stakeholder. The MTDEQ is the state agency with the most interest and investment in this theme.

### 6) **Theme Completeness:**

Statewide representation at the 10-meter posting resolution based on USGS National Mapping Standards and an institutional process to produce the data and including an event or change in landscape indicator for maintenance. Long term goals include developing a geographic (arc-second) seamless elevation data base from which multiple resolutions of data can be derived.

### 7) **Theme Stewardship Status:**

- 1) Digital Elevation Models at the 30-meter posting are complete for Montana
- 2) Digital Elevation Models at the 10-meter posting are at 70% completion

Both resolutions meet USGS National Mapping Standards. An institutional process for production has been established at the federal level through the USGS. No producer or maintainer has been established at a state level.

**8) Theme dependencies:**

None (hypsography / contours may be dependent on DEMs)

**9) Standards and Best Practices:**

- 1) Standards for Digital Elevation Models  
(<http://rmmcweb.cr.usgs.gov/nmpstds/acrodocs/dem/1DEM0897.PDF>)
- 2) USGS National Mapping Program Technical Instructions 1998, Spatial Data Transfer Standard
- 3) Geographic Information Framework Data Content Standard, Part 3 Elevation, FGDC-STD-014.3-2008

These standards are used and strictly adhere to by the USGS in the production of DEMs

**10) Data model, schema, or documents:**

The basic binary format or schema used in the production of digital elevation data is the USGS DEM data model. The format, record population and general model is explained in the Standards for Digital Elevation Models

(<http://rmmcweb.cr.usgs.gov/nmpstds/acrodocs/dem/PDEM0198.PDF>), USGS National Mapping Program Technical Instructions 1998, Part 2 Specifications, Standards for DEMs.

**11) Data Stewards:**

As the producer of the USGS DEM the USGS is the default federal steward for this theme. Other federal and local users/producers are stakeholders and may at some future point take on a larger role as a sub-steward for elevation data in Montana. The USGS Seamless Data Web Site as well as the Montana State Library Portal serve as discovery sites for elevation data / metadata and link to distribution points both at the federal and state level. Locally, the MTDEQ has showed interest in providing a state wide, raw 10-meter float format elevation model to be used for modeling applications. The Elevation Theme Working Group is pursuing options for this data under DEQ, the BMSC or other state umbrella.

**12) Montana GIO:**

The Montana GIO is the conduit from the stewardship group to the state executive leadership. The main focus of the GIO regarding stewardship should be the introduction of the data theme to the executive level. In this capacity the GIO works with the steward to present the business processes that are directly or in-directly supported by the theme. The GIO also acts as the architect to integrate this theme and the stewardship program into the agency business process and general funding model.

**13) Professional Community:**

MAGIP should support stewardship by recognizing framework data themes and the stewardship concept. MAGIP can facilitate stewardship through sponsorship of working group meetings and framework technical sessions.

**14) Your Request to GIO or Council:**

I believe the institutionalization of stewardship is the key to the financial health and general success of all framework layers. Once a theme is accepted as a necessary part of doing business the technical and financial issues will be much easier to solve. In pursuing this avenue we also need to realize that some themes are not part of any state or local business process and may not warrant the acceptance of or further pursuit of a formal stewardship process.

**15) Do you have any additional comments?**

None

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: GEODETIC CONTROL

1) **Theme Name:**

Geodetic Control

2) **Theme Definition:**

Geodetic control consists of monumented points and coordinate positions, referenced to the National Spatial Reference System (NSRS), which serve as the spatial reference framework for the alignment of almost all spatial data and for other mapping purposes.

3) **Theme Description:**

Geodetic control is the most fundamental data set of the Montana Spatial Data Infrastructure. Geodetic control supports every other framework layer by providing the spatial reference for data set alignment within a spatial reference frame. Geodetic Control supports accurate horizontal and vertical placement of all other layers, particularly Cadastral (by improving horizontal locations), Hypsography (by providing accurate elevations from Height Modernization), Land Cover, Orthoimagery, Soils and Wetlands from a combined campaign to acquire data remotely Sensed data collected with accurate positions and elevations provided by Height Modernization.

4) **Sub-theme Descriptions:**

Geodetic Control is a set of monumented control points (also commonly referred to as “stations”) whose coordinates are established by geodetic surveying methods that identify the points’ locations within the National Spatial Reference System. Geodetic Control may consist of Horizontal and/or Vertical Coordinate information. Horizontal Coordinates describe the position of the control point on the surface of the earth the coordinate may be expressed in terms of Latitude & Longitude, Northing & Easting, or other spatial reference systems, units, and datums. Vertical Coordinates are the elevations or (orthometric) heights that have been accurately determined, and can be used to derive elevations for other surveys. Elevations are referred, by definition, to the geoid.

5) **Primary Data Users and Stakeholders:**

Stakeholders and GIS users rely on this framework layer directly and indirectly. The only real distinction we can make is that Stakeholders are more likely to collect and contribute data and therefore it is in their best business interest to actively promote this theme. While some GIS users directly use the data to geo-register new datasets, for example aerial photography, or to re-align existing datasets, such as boundary data, others will simply reap the benefits of more accurate data without realizing what is happening in the background.

Stakeholders:

- Professional Land Surveyors
- Local Cities and Counties
- State of Montana – Several State Agencies are known to acquire and possess existing project specific Geodetic Control. The primary agencies possessing such data are Department of Transportation, Department of Natural Resources, and Fish Wildlife & Parks.
- Federal Agencies– The majority of existing Geodetic Control in Montana Public Land Survey corners as well as survey, mapping and construction control is held by several Federal agencies: NGS, USGS, Federal Highway Administration, Bureau of Land Management, Bonneville Power Administration, U.S. Forest Service, Bureau of Reclamation, Corps of Engineers, National Park Service, F.A.A., F.C.C., and E.P.A.

- Industry – Private sources of existing control would include utility companies such as Northwestern Energy & PPL-Montana; communications providers as well as privately held control created by Montana Surveyors.

**6) Theme Completeness:**

Content contributions will be on-going, based on revised content densities related to project driven requirements. Real progress depends on having an on-line Montana Control Point Database (MCPD) for a single collection portal. The State of Montana continues to work on the development of a functional database. The project has suffered some setbacks but is back on track, under contract with GCS Research, with the database expected to come online mid-summer of 2009. Data may then be entered into the system by surveyors and the public may access the control point data. For information regarding the functional specifications of that project please visit the link at [http://test.gis.mt.gov/cadastral/SOW\\_MCPD\\_final.doc](http://test.gis.mt.gov/cadastral/SOW_MCPD_final.doc). If MCPD and other important theme related tasks were managed by a Geodetic Reference Center with recognized accountability for the theme, the theme would be much closer to be considering in a permanent and ongoing maintenance phase. Because Geodetic Control on Public Lands Survey System corners support adjustments of the Geographic Coordinate Database (GCDB), ongoing efforts to improve the spatial accuracy of cadastral and boundary data that are based on the GCDB will generate additional geodetic control as well.

**7) Theme Stewardship Status:**

The Base Map Service Center (BMSC) and Theme Lead Rj Zimmer (DJ&A P.C.) continue to work with a fairly active working group to move this theme forward. The Geodetic Control Working Group developed a control point database and offers a spreadsheet for collecting control point information. The spreadsheet and database work together to standardize a Montana control point data exchange file format and also provides a data content standard. As of this writing, GCS Research of Missoula Montana is under contract with the Montana Department of Information Technology and Service's Base Map Service Center, to develop a web-based application for displaying, accessing, and uploading control points. The application should be available by early winter 2009, and will allow Montana's land surveyors to contribute/store control point information from their projects, and allow the general public to research and download control point records. Upon completion both the database and application will be registered with the GIS portal at the Montana State Library. The Montana Dept. of Transportation acts as lead for Montana Height Modernization.

**8) Theme dependencies:**

The theme is not technically dependent on any other framework layer, but every other framework layer is dependent on Geodetic Control. However Geodetic Control is reliant on other framework themes like orthoimagery, transportation and cadastral/PLSS to display control points in the MCPD application and virtually on any map.

**9) Standards and Best Practices:**

There are a variety of standards related to geodetic control:

- NGS Bluebook - <http://www.ngs.noaa.gov/FGCS/BlueBook/>
- FGDC Data Content Standard - [http://www.fgdc.gov/standards/projects/FGDC-standards-projects/framework-data-standard/GI\\_FrameworkDataStandard\\_Part4\\_GeodeticControl.pdf](http://www.fgdc.gov/standards/projects/FGDC-standards-projects/framework-data-standard/GI_FrameworkDataStandard_Part4_GeodeticControl.pdf)

**10) Data model, schema, or documents:**

Documents and information associated with the theme's working group and its activities will usually

be publishes on the theme's website at: [http://giscoordination.mt.gov/geodetic\\_control/msdi.asp](http://giscoordination.mt.gov/geodetic_control/msdi.asp). The most recent revision of the MCPD and the input spreadsheet for MCPD can be found at: [ftp://ftp.gis.mt.gov/geodetic\\_control/mcpd\\_20090430.zip](ftp://ftp.gis.mt.gov/geodetic_control/mcpd_20090430.zip).

**11) Data Stewards:**

This theme will rely heavily on licensed surveyors who will provide content. The agency presently acts as the integrator of the data.

**12) Montana GIO:**

Although geodetic control is not readily visible in the applications that stimulate interest by policy makers, it is a very important framework theme. We need assistance of the GIO, and the Montana Land Information Advisory Council, to lobby for a host to sponsor a Montana Geodetic Reference Center that would be funded and staffed as a permanent steward for Geodetic Control.

**13) Professional Community:**

There are two professional communities that can assist these efforts. First of all the Montana Association of Land Surveyors needs to become engaged in the stewardship process for Geodetic Control. Secondly, the GIS community, presumably MAGIP, needs to reach out encourage surveyors, local and tribal governments, and state and federal agencies to contribute to populating the geodetic control database.

**14) Your Request to GIO or Council:**

We need assistance of the GIO, and the Montana Land Information Advisory Council, to lobby for a host to sponsor a Montana Geodetic Reference Center that would act as a permanent steward for Geodetic Control. The working group has developed a draft of functional requirements for a reference center and would be pleased to submit that to the GIO and Council.

**15) Do you have any additional comments?**

No

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: GEOLOGY

1) **Theme Name:**

Montana Geology Framework

2) **Theme Definition:**

Geologic data is used for natural resource development, land use planning, & hazard mitigation

3) **Theme Description:**

The Montana Bureau of Mines & Geology seeks to provide the best available data concerning the geologic features of the State of Montana. Development of a statewide geologic layer in digital format began sometime in the early 1990's. Individual 30° x 60° quadrangles were mapped by field geologists and developed with GIS staff. This process took many years to complete and was a preliminary step to developing a statewide geologic map. In 2007 the Bureau released a cartographic product at the 1:500,000 scale for a revised statewide geologic map. More recent efforts have shifted toward developing data for 'special focus' areas. Examples of these areas are Big Sky, the Gallatin Valley, the Bitterroot valley, the Jefferson Valley, & the Billings area.

4) **Sub-theme Descriptions:**

Areas of special focus mapping are seen as requiring a more detailed understanding of the geology of a particular region. This could be due to rapid population growth and associated land development or other reasons. Most often, existing geologic data is used as a starting point for the more detailed examination of these 'special focus' areas. Often the better understanding of the special focus mapping leads to a better refinement of the previously existing data.

5) **Primary Data Users and Stakeholders:**

Geologic data is used by a wide variety of end users. Geologic data from the Bureau is used by mineral & petroleum development companies, engineering & geotechnical firms, land use planners, university staff (professors & students), prospectors, & 'rock hounds'. Interest in rocks is not limited to miners. Our most frequent 'customers' for our data are probably geotechnical, engineering, & exploration companies.

6) **Theme Completeness:**

Efforts are currently underway to further refine the level of geologic mapping in Montana. Quadrangles originally mapped at the 1:250,000 are being re-mapped at the 1:100,000 scale to provide a measure of consistency for the theme. All quadrangles of the State will eventually be refined to the 1:100,000 scale.

Many areas of special focus interest exist in Montana for the geology theme. Completion of these growth and transportation corridor areas is an ongoing priority. When this portion of mapping could ever be 'complete' is a moving target.

7) **Theme Stewardship Status:**

Geologic data sets are maintained by staff within the Bureau. Geologists work with GIS staff to update and maintain data in a continuing manner. As better data become available, existing data sets are updated to reflect these changes. While the Bureau is not dependent upon other agencies to maintain this data, it does work with other agencies as part of this ongoing maintenance. Other universities and USGS staff are the most frequent 'collaborators'.

8) **Theme dependencies:**

None

9) **Standards and Best Practices:**

Published maps (and the data behind them) are produced adhering to national map accuracy standards for the published scale. Often the data generated is of better positional accuracy than the published map scale due to data development processes. The Bureau uses the FGDC Digital Cartographic Standard for Geologic Map Symbolization as part of our production processes.

10) **Data model, schema, or documents:**

The Bureau has no published documents concerning our data sets beyond metadata included with each data set. Users are assumed to have some knowledge of geologic mapping and cartographic representation.

11) **Data Stewards:**

None

12) **Montana GIO:**

I see the role of the GIO as a facilitator for the various themes. A GIO has a unique perspective on ALL themes and the interdependent relationships that exist between the themes.

13) **Professional Community:**

The geology theme is a constantly evolving data set. It is not a theme that is static. I encourage GIS professionals to 'consume' this data with that idea in mind. Although the rocks themselves might not change, what we think of them will definitely change.

14) **Your Request to GIO or Council:**

No requests at this time

15) **Do you have any additional comments?**

No, thanks though

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: GOVERNMENTAL UNITS

### 1) **Theme Name:**

Governmental Units

### 2) **Theme Definition:**

Boundaries The Governmental Unit Theme includes the following types: governmental unit, administrative unit, statistical unit, and other unit<sup>[1]</sup> :

- **Governmental unit:** geographic area with legally defined boundaries established under Federal, Tribal, State, or local law, and with the authority to elect or appoint officials and raise revenues through taxes.
- **Administrative unit:** is a geographic area established by rule or regulation of a legislative, executive, or judicial governmental authority, a non-profit organization, or private industry for the execution of some function.
- **Statistical unit:** is a geographic area defined for the collection, tabulation, and/or publication of demographic, and/or other statistical data.
- **Other unit:** are those geographic areas that are not governmental units, administrative units, or statistical units as defined herein, and are not areas that are defined or described in other framework parts.

<sup>[1]</sup>Definitions of a governmental, administrative, statistical, and other unit taken from: USGS. Federal Geographic Data Committee (FGDC). FGDC-STD-014.0-2008. "Geographic Information Framework Data Content Standard," Part 5: Governmental unit and other geographic are boundaries. 2008.

### 3) **Theme Description:**

The Governmental Units Theme is comprised of many existing/potential layers from multiple multi-jurisdiction data providers: i.e. Federal, State, Local, etc. For Montana, the following are currently identified as existing/potential Governmental Unit Sub-themes or data layers in the framework dataset: state boundary, county boundaries, incorporated places, Federal American Indian Reservations, school districts, and special districts. Sub-themes can be managed separately or cooperatively depending upon the spatial and maintenance relationships. Most school districts rely on the county boundary geography, therefore, school districts and county boundaries could be managed cooperatively. The majority of governmental unit sub-themes will be managed cooperatively and vertically integrated with the Geographic Coordinate Database (GCDB), a part of the Geodetic Control and Cadastral Themes, where appropriate. Governmental Units, as defined in Section 2, can be defined legally and found in the structure of law: Federal, State, or Local. For example, School Districts can be found in Montana Code Annotated Title 20 (Education) Chapter 6 (School Districts). The 61<sup>st</sup> Montana Legislature recently passed legislation on Special Districts LC0370 and this legislation includes the following types of special districts: cemetery districts, museum districts, park districts, fair districts, solid waste districts, local improvement districts, mosquito control districts, multijurisdictional districts, road districts, rodent control districts, and television districts.

### 4) **Sub-theme Descriptions:**

The Base Map Service Center (BMSC) is the Governmental Units Steward. Due to the complexity

and quantity of existing/potential governmental unit themes, a sub-steward approach is taken for managing data. The Governmental Unit Steward or the sub-stewards manage the statewide datasets. These datasets can be created by the stewards and/or received from various data providers. For instance, Lewis & Clark County GIS Department submit their respective school district updates to the Base Map Service Center; Yellowstone County GIS Department submit their respective Tax Increment Financing Districts (TIFDs) updates to the Montana Department of Revenue. The BMSC currently has principal stewardship over the following sub-themes: State, County, Federal, American Indian Reservations, and School Districts. The sub-stewards are identified as follows with their respective sub-themes:

- TIFDs - Department of Revenue (co-stewarded with the BMSC)
- Rural Fire District Boundaries - Department of Natural Resources & Conservation
- Historic District Boundaries - Montana State Historic Preservation Office
- Legislative Districts – Legislative Services
- Municipalities - Department of Transportation
- Other Stewards will be assigned when specific sub-themed are further identified.

#### 5) **Primary Data Users and Stakeholders:**

Governmental Unit Boundaries are used by people/entities at the international, national, regional, and local levels. For example, the boundaries are embedded in many different business processes within the state:

- The Base Map Service Center’s “Montana Cadastral Mapping” interactive cadastral web application uses state, county, & city boundary data layers. (<http://gis.mt.gov>)
- “Montana Means Business” an interactive economic development mapping application sponsored by the Governor’s Office of Economic Development uses state, county, & city boundary data layers. (<http://mmb.mt.gov/mmb/>)
- The Montana Office of Public Instruction (OPI) in conjunction with Montana County School District Superintendents participate in an annual review of school district boundaries with the United State Census Bureau in accordance with United States Title 1 (Improving the Academic Achievement of the Disadvantaged<sup>[2]</sup>).
- The Department of Revenue uses TIFDs in their business processes to report to counties what the value of all parcels in the TIFD are; ensure all parcels in the TIFD have the correct value information entered in CAMA (Computer Aided Mass Appraisal); and use the boundary/boundary legal description in the DOR approval process for TIFD.

<sup>[2]</sup> U. S. Department of Education. [www.ed.gov](http://www.ed.gov). Improving Basic Programs Operated by Local Educational Agencies (Title I, Part A). Types of Projects. “More than 50,000 public schools across the country use Title I funds to provide additional academic support and learning opportunities to help low-achieving children master challenging curricula and meet state standards in core academic subjects. For example, funds support extra instruction in reading and mathematics, as well as special preschool, after-school, and summer programs to extend and reinforce the regular school curriculum.” 5/1/2009.

#### 6) **Theme Completeness:**

Montana State, County, Federal American Indian Reservation, School District, Rural Fire District, Historic District Boundary Lines are complete Government Unit data layers. The Base Map Service Center defines a layer as complete when statewide standardized data exists with a defined maintenance schedule. Tax Increment Financing District and Municipality boundary lines are

complete but not yet ready for public release. Future projects will be announced as BMSC and the Government Units Work Group work together to prioritize data needs. Recently passed legislation, SB 57, may also drive prioritization.

**7) Theme Stewardship Status:**

BMSC is an integrator/coordinator/distributor of complete statewide layers role. Due to the amount of boundary layers that are under Government Units Framework each framework's status will be defined when themes are researched, completed, or assigned a Sub-Steward.

**8) Theme dependencies:**

Cadastral, Elevation, Geodetic Control, Hydrography, Imagery, and Transportation

**9) Standards and Best Practices:**

The Government Units Theme uses the “Adjusting GIS Data to the GCDB Best Practices” (written by DJ&A in conjunction with BMSC, and can be found at the Base Map Service Center’s website: [giscoordination.mt.gov](http://giscoordination.mt.gov)); this best practice promotes coincidence of all Governmental Unit Boundary Layers, Cadastral Themes, and any other Themes using this best practice. The Government Units Framework Coordinator is currently reviewing the FGDC (Federal Geographic Data Committee) Data Content Standard on Governmental unit and other geographic area boundaries and will consider adopting these standards.

**10) Data model, schema, or documents:**

The Government Unit Framework theme does not use a formal all encompassing, integrated Governmental Unit Data Model or schema. Separate data models/schemas are used for each existing theme. Topological rules for boundary themes are created to keep coincidence, when suitable, in that data; for example School Districts uses the “Must Not Overlap” topological rule. All boundaries, where appropriate, will be coincident with the GCDB. Any new boundary layers will be placed logically into corresponding data models/schemas to support thematic or topological relationships.

Schemas exist, for example the “ArcGIS Census Data Model for Using US Census TIGER DB Data,” but are not in use because of various reasons. The aforementioned data model is not in use because it was built strictly for US Census TIGER data, which currently is not topologically coincident with most Montana data themes. Additional discussions need to take place regarding data models & schemas.

**11) Data Stewards:**

The Base Map Service center is responsible for coordination/outreach; data provider, data integrator, data distributor, data clearinghouse for statewide Government Unit data. The BMSC works with data providers, i.e. local governments or other state agencies, throughout the state in developing statewide Government Unit data layers. Government Unit metadata will be hosted at the metadata clearinghouse: Montana GIS Portal.

**12) Montana GIO:**

Specifically for Governmental Units, assistance in creating workflows, policies, and rules, while working with local governments and Department of Revenue, for recently passed 2009 Legislation HB 49 on Special Districts. Furthermore, achieve permanent funding for the Base Map Service Center, the Governmental Unit Steward. According to the Common Operating Plan <sup>[3]</sup>, the role of Montana’s Geographic Information Officer should include the following:

- Leadership

- Guidance
- Advocacy for funding
- Develop and enforce standards
- Set policy
- Oversight for the coordination of GIS activities
- Final arbitrator for all GIS roles/responsibilities

<sup>[3]</sup>The list roles of the Montana Geographic Information Officer were taken directly from the Common Operating Plan. Adopted by the Montana Land Information Advisory Council September 2006.

**13) Professional Community:**

The Montana Association of Geographic Information Professionals (MAGIP) should continue to promote Governmental Unit Best Practices. Workshops were held on “Adjusting GIS Data to the GCDB” Best Practices at the recent Fall Technical Session and Spring Meeting. Additionally, MAGIP should continue to be supportive in education and outreach to members and the professional community. To continue to bring in professionals or host events to help stimulate technological growth, advance ideas, and promote networking in the state of Montana.

**14) Your Request to GIO or Council:**

See response to 12.

**15) Do you have any additional comments?**

None

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: HYDROGRAPHY

### 1) **Theme Name:**

Montana Hydrography Framework Layer This framework layer is more commonly referred to as the National Hydrography Dataset or simply by the acronym “NHD”.

### 2) **Theme Definition:**

All surface water streams and water bodies in Montana.

### 3) **Theme Description:**

The NHD is a comprehensive set of digital spatial data representing the surface water of Montana using common features such as lakes, ponds, streams, rivers, canals, and reservoirs that carry a rich set of embedded attributes including a flow direction network and other linked information and characteristics. These data are designed to be used in general mapping and in the analysis of surface-water systems using geographic information systems (GIS).

### 4) **Sub-theme Descriptions:**

The NHD is composed of two feature datasets that are comprised of multiple feature classes. The first dataset contains surface water features and the second feature dataset is comprised of the hydrologic units. The surface water features are broken out into NHDArea, NHDAreaEventFC, NHDFlowline, NHDLine, NHDLineEventFC, NHDPoint, NHDPointEventFC and NHDWaterbody. Each of these feature classes has multiple feature types, for instance NHDAreas can be dams, inundation areas, streams represented by both banks, and rapids or spillways as a few examples. NHDFlowlines represent the linear features of stream/rivers, pipelines, canal/ditch or artificial paths (the hypothetical centerline of 2 dimensional water features). The hydrologic units dataset contain features that define different classifications of drainage areas commonly lumped together as hydrologic units. These features are classified into regions, subregions, basins, subbasins, watersheds and subwatersheds, from largest to smallest current classification.

### 5) **Primary Data Users and Stakeholders:**

Montana Fish Wildlife and Parks (FWP) fisheries program, Montana Department of Environmental Quality (DEQ) water quality program (TMDL), Montana Department of Natural Resources and Conservation (DNRC) water rights, irrigation coordination, dam safety, flood plain management, and irrigation coordination are potential heavy users currently using the medium resolution NHD or a customized derivative. Montana Natural Heritage Program (NHP) currently uses the data for several tasks including the development of the Montana Wetlands Framework Layer, and the United States Forest Service (USFS) maintain the NHD as an enterprise database. Other users are the many conservation, irrigation, and watershed groups, Montana Trout Unlimited, county and tribal governments within the state, the federal Bureau of Land Management, Environmental Protection Agency, the National Park Service, U.S. Fish Wildlife Service, U.S. Geological Survey and perhaps the hydropower generators within the state of Montana.

### 6) **Theme Completeness:**

The data are 90% or better complete to match the original source data of 24,000 paper maps. The next target is the realignment of the major 2-dimensional rivers that have changed courses in the many years since the source maps were.

### 7) **Theme Stewardship Status:**

The Montana State Library/NRIS is the primary state steward for the Montana Hydrography

Framework Layer. We have worked closely with the USGS to improve the quality of the hydrography linework and network topology based on the USGS 1:24000 topographic map data. Currently we are in the process of finding ways to better integrate the tools available in the NHD into the business processes of public and private groups within the state in order to integrate those groups in as data stewards. From what has been learned to this point we expect that the primary state steward will need to remain actively involved in both the outreach and data editing processes to ensure the successful adoption of the NHD within the state. While we still hope to reach a long term goal of less centralized dataset maintenance (greater reliance upon data stewards for managing data quality), trying to implement a program of this nature too rapidly could undermine our efforts. Many potential users have been hesitant to participate because they are concerned that they will be committing themselves to costly and time consuming maintenance tasks for a product that hasn't yet show proven results in their realm of interest. Currently we depend to a minor extent on other groups to point out areas of concern to edit. We have solicited edits in various formats from other agencies and have been successful in receiving and incorporating edits from USFS and NHP.

**8) Theme dependencies:**

The further incorporation of the National Watershed Boundary Dataset (WBD) is progressing at the national level. There is a cooperative agreement between USGS and NRCS outlining how this shall proceed. MSL/NRIS has had initial discussions with the state NRCS office (responsible for state stewardship of the WBD) about the need to work together to better integrate our efforts from a technical standpoint. The maintenance of the NHD spatial accuracy and densification is dependent on the current 3-5 year NAIP. Continuation of this program or a similar imagery program will continue to be a dependency for the NHD.

**9) Standards and Best Practices:**

The USGS has identified a proper edit procedure through the NHD Maintenance.doc and a standards document through the NHD Data Standards. Both of these documents can be found on line at <http://nhd.usgs.gov/techref.html> and <http://webhosts.cr.usgs.gov/steward/>.

**10) Data model, schema, or documents:**

<http://nhd.usgs.gov/techref.html>

**11) Data Stewards:**

Metadata is distributed through the Montana State Library Portal. Data access and data access services for this theme are provided by the Montana State Library. For the Montana Hydrography Framework Layer to be truly successful we need buy in from state agencies as well as watershed groups, irrigation districts, and conservation districts across the state. To date many groups have resisted adapting their business processes to the High Resolution NHD because of a perception that the cost of such a transition outweighs the benefits. The unfortunate result of this has been the adoption by many groups of internal hydrography datasets built from a number of different source data sets for many different purposes with inconsistent data quality and maintenance programs to support them. We strongly believe that if a coalition of groups interested in hydrography within the state would redirect the energy they are currently putting into the maintenance of their internal datasets toward the NHD, the result would be a far superior hydrography dataset which would require much less effort to maintain. A number of outreach efforts have already been planned including the re-evaluation of users and user needs, targeted user support meetings, and the development of a strong NHD working group. We hope that a renewed emphasis on outreach will lead to the successful development of a team of data stewards.

**12) Montana GIO:**

While not specific to the Montana Hydrography Framework Layer, the GIO needs to provide

guidance that will ultimately lead to the adoption of framework data sets as the standard for state government agencies (and hopefully beyond). To date much time, effort, and money has been spent in the development of MSDI Framework Layers. In almost every case, some state agency has offered some reason that they should be excused from using one or more of these framework layers. If we continue to make exceptions to the adoption of these themes, we will never see them fully supported since it will almost always be in each agencies best interest to continue with their current business model which does not rely upon framework data. If these issues are dealt with early, many options for compromise are still available. The longer we wait to deal with these issues, the more rigid the data sets and data structures become. This will limit the GIO to only heavy handed tactics for bringing agencies into line with a state standard. This would be a very unpleasant situation which could be very damaging to the state GIS community.

**13) Professional Community:**

To date the MAGIP meetings, conferences and technical sessions have offered good opportunities for MSL/NRIS to advertise the availability of NHD and to provide additional outreach in the form of training sessions and workshops targeting both users of NHD and potential data stewards who wish to perform edits to the NHD. We feel that these events are extremely important and hope that MAGIP will continue to offer these opportunities for us to reach out to their members. Anything else that MAGIP can offer that will encourage interested parties to submit areas of concern for updates and contribute local datasets to enhance the quality of the NHD high resolution data will be beneficial.

**14) Your Request to GIO or Council:**

I think that this has been addressed in earlier answers, but it is worth reiterating that anything the council and the GIO can do to encourage Framework buy in would be beneficial. The responsibility for this extends well beyond the council, but their involvement is crucial. Beyond that we appreciate all of the financial and institutional support that both the council and the USGS have provided. While we continue to rely on their financial support we are optimistic that we are moving towards a point where the ongoing maintenance costs are minimized and supported through other more stable funding sources and grant funding will be used primarily for enhancements to the dataset.

**15) Do you have any additional comments?**

Theme name needs to be vetted by council

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: HYDROLOGIC UNITS

1) **Theme Name:**

Hydrologic Units a.k.a. Watershed Boundary Dataset (WBD)

2) **Theme Definition:**

Several nested levels of watershed boundaries with size criteria established by national standards.

3) **Theme Description:**

The WBD is a seamless national database that was developed on a state by state basis. USGS and EPA created the 2-digit hydrologic code system used to create the nested levels. USGS delineated watersheds down to the 8-digit sub-basin level. USDA/NRCS continued with the 10-digit watersheds and 12-digit sub-watersheds developed at 1:24,000 scale.

4) **Sub-theme Descriptions:**

None

5) **Primary Data Users and Stakeholders:**

Primarily used by government agencies as an accounting unit. Also used by local watershed groups to define area of interest or extent of coordination.

6) **Theme Completeness:**

Statewide database of hydrologic units normalized to 1:24,000 USGS topography and the National Hydrologic Dataset (NHD). Topography is complete; work with the NHD is ongoing and will probably be completed this year. There is also an effort to complete this dataset across the Canadian border. There is a national plan to accomplish this and work will begin Spring2009.

7) **Theme Stewardship Status:**

Initial data creation has been completed and dataset is in maintenance status. Process for updates and error correction is managed by USDA/NRCS through state contact. Data is available online at USDA Geospatial Data Gateway at <http://datagateway.nrcs.usda.gov>.

8) **Theme dependencies:**

High-resolution NHD

9) **Standards and Best Practices:**

Federal Guidelines, Requirements, and Procedures for the National Watershed Boundary Dataset (<ftp://ftp-fc.sc.egov.usda.gov/NCGC/products/watershed/hu-standards.pdf>). This standard was closely followed, although there is an issue with naming conventions that is inconsistent with national guidelines.

10) **Data model, schema, or documents:**

<http://www.ncgc.nrcs.usda.gov/products/datasets/watershed/datainfo.html>

11) **Data Stewards:**

This theme is being integrated with the NHD and in the future will be a part of the NHD data model and distributed with it. In addition to the Geospatial Data Gateway, data will be distributed through the Montana State Library Portal.

**12) Montana GIO:**

Nationally, hundreds of millions of dollars have been invested in the creation of this theme, as well as the NHD. It would be very beneficial to settle on this NHD/WBD product as a standard for the state. There are currently several different hydrologic base units in use by different agencies. Settling on one version would help prevent inconsistencies in this area. It is important to bring more players to the table and make this product fit the needs of the Montana GIS community.

**13) Professional Community:**

Same as above. This would be a good time to strategize about the future of these layers.

**14) Your Request to GIO or Council:**

Lance Clampitt is working on bringing parties to the table to help with data integration and standardization. Meeting planned for May 2009.

**15) Do you have any additional comments?**

The Montana State Library (NRIS) has an MOU with USGS on stewardship of the NHD.

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: LAND COVER AND LAND USE

1) **Theme Name:**

Montana Land Cover and Land Use

2) **Theme Definition:**

All natural vegetation, land cover and land use, classified from satellite and aerial imagery, mapped at a scale of 1:100000, and interpreted with supporting ground-level data.

3) **Theme Description:**

The completed land cover theme is a baseline digital map of Montana's natural and human land cover. The baseline map is adapted from the Northwest ReGAP project land cover classification, which used 30m resolution multi-spectral satellite imagery from 2002 through 2005, interpreted and classified into the ecological systems developed by Natureserve (Comer et al. 2003) and land cover classes developed by Anderson et al. (1976). The ReGAP product has been modified to produce a seamless Montana land cover map with a consistent statewide legend. It incorporates several other land cover and land use products (e.g. the National Land Cover Dataset, the National Wetlands Inventory, the National Hydrography Dataset) and a reclassification based on plot-level data to the extent that these improve accuracy and enhance the usability of the theme. The original ReGAP map units have been crosswalked to the Federal Geographic Data Committee (FGDC) National Vegetation Classification system standard, and aggregated as appropriate to allow display at multiple scales.

The theme is available as a raster layer through the Montana State Library Natural Resource Information System (MSL-NRIS) image server, and can be explored via a web interface (e.g. the Montana Natural Heritage Program Tracker). Users can submit proposed corrections and can upload plot data to support refinement and reclassification. The theme is accompanied by interpretive materials describing the individual mapping units. Maintenance includes 1) ongoing correction and refinement, as well as integration of other digital land cover data (e.g. wetlands, transportation); 2) addition of new land cover classification from higher-resolution or newer imagery; and 3) complete revision of the entire basemap every 7-10 years when new regional land cover maps (e.g. ReGAP) become available.

4) **Sub-theme Descriptions:**

None

5) **Primary Data Users and Stakeholders:**

Natural resource managers. The scale of the theme makes it most useful to stakeholders whose responsibilities extend across broad landscapes: FWP, DNRC, MDT, DEQ, USFS, BLM, USFWS, tribal environmental offices, etc. 2. County and local land use planners, consultants, and place-based environmental groups 3. Academic and agency researchers and analysts seeking to understand or predict ecological system modifiers like fire, flooding, land movement, and insect outbreaks 4. Recreationists such as hunters, birdwatchers, hikers, rock and fossil hunters, climbers 5. K-12 educators, college and university faculty.

6) **Theme Completeness:**

Please refer to question 3 above for the description of what the completed theme will look like. We estimate that we will meet these targets with a finished version by the spring of 2010, with a usable draft version of the map and descriptive materials available by summer of 2009.

**7) Theme Stewardship Status:**

The GIS theme is being developed by the Montana Natural History Program (MTNHP) Spatial Analysis Lab in Missoula. Interpretive materials are being developed by the Helena office of the MTNHP. The theme will be made available through the NRIS Raster Service and an ftp download site. Interpretive materials will be part of the Montana Field Guide, available on the web. These interpretive materials will link to an interactive web-enabled map, which can be accessed independently.

Maintenance of the theme includes efforts to correct errors in the original mapping (e.g., rock outcrops are often not classified, mountain mahogany shrublands are overmapped, etc), refinements to specific ecological systems (“burning-in” higher resolution wetland maps, overlaying fire perimeters, using ancillary data to produce finer resolution representation of systems that are important to users (e.g. fire-prone forests in the urban interface, sage-steppe, etc).

**8) Theme dependencies:**

The theme can be completed and maintained without other framework themes, but its accuracy will be greatly improved by incorporation of higher-resolution mapping of wetlands and riparian areas, transportation corridors etc.

**9) Standards and Best Practices:**

There is a FGDC standard for the classification of vegetation, but it does not extend to the production of digital data. To meet the standard, we are crosswalking and aggregating map units to the appropriate National Vegetation Classification (NVC) category. Crosswalking occurs within ecological system descriptions. The main theme uses ecological systems as map units, but we will have alternate, aggregated versions that are easier to display. These versions will use NVC formations and divisions as map units. The FGDC standard for vegetation classification can be found at: <http://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation/index.html>. Additionally, we follow FDGC standards for metadata: <http://www.esri.com/metadata/esriprof80.html>.

**10) Data model, schema, or documents:**

Part of the theme development includes production of a formal description of the mapping units (ecological systems). We anticipate completion of these descriptions by summer of 2009. Ecological systems are a mid-level classification unit, typically ranging in size from 5 to 50,000 acres. Within a given ecological system, there may be multiple vegetation associations, i.e. co-occurring species or groups of species. We list these finer-scale groupings in the ecological system descriptions, and over time, will complete Montana-specific descriptions for these as well. In the meantime, descriptions of associations and alliances with a somewhat more southern Rockies bias can be accessed through Natureserve at: <http://www.natureserve.org/explorer/servlet/NatureServe?init=Ecol>.

**11) Data Stewards:**

This theme is derived from land cover classifications produced by the USGS and its contractors. Ecological systems, the mapping units, were originally conceived of by Natureserve, the international network of Heritage Programs and Conservation Data Centers. Underlying field data has been gathered by, and will continue to be collected, by a range of agency and academic researchers. As part of the theme’s ongoing maintenance, we are building data submission protocols that will support refinement and revision. Use of these protocols and data submission by outside ecologists and botanists will be critical to keeping the theme current. Additionally, we will rely on federal and state agencies for annual updates on fire and insect modifications of land cover.

**12) Montana GIO:**

We have not identified a role for the GIO at this time, beyond the basic support, vision and integration envisioned in his role. We do anticipate that other resource agencies and managers will be our strongest advocates in advancing and improving this theme.

**13) Professional Community:**

MAGIP members will provide valuable technical feedback. We also request feedback from Montana Association of Counties (MACO), Montana Association of Conservation Districts (MACD), and Montana Association of Planners (MAP).

**14) Your Request to GIO or Council:**

Once the theme is complete, the main need will be for an annual funding amount to ensure updating, correction, and integration of changes into web maps and so on. We are pursuing non-MLIAC funding for refinement of mapping or for the addition of features that might make the mapping more valuable to particular agencies.

**15) Do you have any additional comments?**

No

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: MASTER ADDRESS DATABASE

1) **Theme Name:**

Montana Address Database (or Montana Master Address Database)

2) **Theme Definition:**

A multi-jurisdictional database of address locations in Montana

3) **Theme Description:**

The Montana Address Database is integrated with the Montana Transportation Framework due to the historical nature of address data often being address ranges associated with road segments and a similarity in business functions for both themes. Today, address data is often associated with point features and has just as many similarities to point-based structures databases as line-based transportation databases. The Montana Address Database accommodates both these address data types. In its theme review of the Critical Infrastructure/Structures Framework, the Base Map Service Center (BMSC) suggested an overall theme definition review, which if conducted, might clarify some addressing issues as well.

4) **Sub-theme Descriptions:**

None

5) **Primary Data Users and Stakeholders:**

While the address database has yet to be populated, a single address database for Montana would be valuable and used by anyone with address-based data. The data would support everyone from a public user looking to find a single address location, to private and commercial sectors, to a state or local government wishing to spatially enable a legacy database containing address data or for use in application. For example, Lewis & Clark County has developed an application for burn permits that is based on their address data. Other counties have expressed interest in adopting the application for their use but this is difficult due to varying availability and types of address data across counties. In emergency response, something that often crosses jurisdictional lines, lives and property are at risk if first responders don't have quick and easy access to accurate address information about the location of emergency incidents. A single address database for the state would also enable state agencies maintaining their own addresses databases to link to this database. Most users would access address data via web services (i.e. a geocoding web service). In addition to being a user of the Master Address Database, the Montana Department of Revenue is a possible stakeholder/partner due to the amount of address information they currently maintain.

6) **Theme Completeness:**

The target for this theme is a statewide database of all available in-use addresses with a documented maintenance schedule. Work has not yet begun to populate the database but it is estimated that time to initially obtain and load all the available address data from providers would take approximately two years.

7) **Theme Stewardship Status:**

Due to the dynamic nature of addresses, this theme relies on local governments, specifically counties, to aid in the development and maintenance of the address data. In this way, the BMSC takes on the stewardship roles of data integrator, data distributor, coordination and outreach. Past experience indicates that it is highly unlikely that counties will engage in completely standardized addressing practices although the nature of addresses suggests they can be integrated at a state level. The

Montana GIS Portal at the Montana State Library will distribute metadata and support search and discovery for this theme.

**8) Theme dependencies:**

Some address data may be obtained from address data in the Critical Infrastructure and Structures Framework. It could potentially be dependent on the Cadastral Framework which is a source of data for structures. Additionally, some structures-based address data is located using aerial imagery. For those jurisdictions that do not maintain coordinate data, address locations may be approximated from address ranges stored in the Montana Transportation Framework.

**9) Standards and Best Practices:**

The following standards are used:

- Montana Persistent Identifier Best Practice  
<http://www.magip.org/Resources/Documents/TechnicalCommittee/BestPractices/PersistentIdentifier.pdf>

In general, the address data model complies with the following addressing best practices and standards:

- NSGIC Address Working Group Best Practices  
[http://www.nsgic.org/hottopics/addressing\\_coordination\\_issues.cfm](http://www.nsgic.org/hottopics/addressing_coordination_issues.cfm)
- National Emergency Number Association address standards  
<http://www.nena.org/>
- URISA Draft Street Address Data Standard  
<http://www.urisa.org/about/initiatives/addressstandard>

The Montana Address Database does not require data providers to alter their existing databases or business processes, rather the data is converted as necessary and standards are enforced as the BMSC integrates provider data into the database.

**10) Data model, schema, or documents:**

The draft data model is published to the Transportation and Addressing website.

<http://giscoordination.mt.gov/transportation/msdi.asp>

**11) Data Stewards:**

This theme relies on counties to provide and maintain address data. The BMSC will integrate county data into a statewide master address database, distribute data (primarily via web services such as geocoding services) and intends to provide additional stewardship functions of coordination and outreach. The Montana GIS Portal is the primary means of discovering and distributing metadata about the address database.

**12) Montana GIO:**

The GIO can continue to follow up on the federal request for funding the Montana Address Database. Additionally, the GIO can help better define efforts and relationships between the Transportation and Critical Infrastructure and Structures Frameworks and the Montana Address Database so development is coordinated, there is no duplication of efforts and the resulting databases can be seamlessly integrated.

**13) Professional Community:**

MAGIP and the professional community can assist this effort by being actively involved. MAGIP can help educate users in the state and provide outreach to potential users.

**14) Your Request to GIO or Council:**

See 12

**15) Do you have any additional comments?**

No

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: ORTHOIMAGERY

1) **Theme Name:**

Orthoimagery Framework

2) **Theme Definition:**

Images of the Earth's surface acquired from aircraft or satellites. These may be data acquired by some sort of sensor or converted from hardcopy aerial photographs by scanning and may be georeferenced and/or orthorectified.

3) **Theme Description:**

The key components include developing a process for the acquisition and data distribution/delivery of current imagery products and a procedure for archiving of historical state imagery holdings. The goal is to establish the foundation for collecting, accurately maintaining, making commonly available and archiving an expanded set of imagery data and services.

4) **Sub-theme Descriptions:**

Statewide Digital Orthophotography:

- NAIP – Acquired by the National Agricultural Imagery Program, in cooperation with other federal agencies, the State of Montana, and several local governments in Montana. They are color 1-meter images that cover over 99 percent of the state.
- 2006 Color Infrared – Acquired in conjunction with the 2005 NAIP project, with additional photography flown in 2006 to cover areas of the state that the NAIP only acquired in three bands.
- 1990-2003 DOQQs – Created by the U.S. Geological Survey's Digital Orthophoto Quarter Quadrangle project. These are 1-meter black and white images.

Satellite imagery – A web site is available at <http://www.montanaview.org> for Montana agencies to share public-domain images they have acquired. The U.S. Geological Survey has announced that it will soon make all of its Landsat imagery freely available for download. Satellite imagery is available from many private and international sources.

Regional Aerial Photography and Orthophotography – NAIP data covering Montana's agricultural lands at 2-meter resolution is available from the USDA for 2004 and 2006

Archival Imagery – Many public and private entities have extensive collections of historic and recent aerial photos.

5) **Primary Data Users and Stakeholders:**

Used of Orthophotography and other aerial imagery is ubiquitous.

6) **Theme Completeness:**

The establishment of a process for the acquisition and data distribution/delivery of current imagery products, and a procedure for archiving of historical state imagery holdings.

7) **Theme Stewardship Status:**

Department of Administration Base Map Service Center (DoA-BMSC) and the Montana State Library Natural Resource Information System (MSL-NRIS) have entered into a joint partnership

agreement to manage the stewardship of the Orthoimagery framework. A joint grant application that establishes goals for the first year of this partnership has been submitted for the FY10 MLIA grant cycle:

[http://itsd.mt.gov/content/policy/councils/mliac/MLIA\\_GRANTS/2010/NAIP\\_2010\\_Grant](http://itsd.mt.gov/content/policy/councils/mliac/MLIA_GRANTS/2010/NAIP_2010_Grant)

**8) Theme dependencies**

None

**9) Standards and Best Practices:**

- Content Standards for Digital Orthoimagery  
[http://www.fgdc.gov/standards/projects/FGDC-standards-projects/orthoimagery/orth\\_299.pdf](http://www.fgdc.gov/standards/projects/FGDC-standards-projects/orthoimagery/orth_299.pdf)
- USDA APFO NAIP Specifications  
<http://165.221.201.14/NAIP.html>

**10) Data model, schema, or documents:**

- 2005 Color NAIP Metadata - [http://nris.mt.gov/nsdi/nris/naip\\_2005\\_tiles.html](http://nris.mt.gov/nsdi/nris/naip_2005_tiles.html)
- Raster Image Services - [http://nris.mt.gov/nsdi/orthophotos/raster\\_svc.htm](http://nris.mt.gov/nsdi/orthophotos/raster_svc.htm)
- GIS Coordination Orthoimagery web site - <http://giscoordination.mt.gov/ortho/default.asp>

**11) Data Stewards:**

The primary source of funding and data collection is the USDA. A partnership of public and private entities within the state provides additional funding to ensure the completeness of the NAIP product. Other public and private entities have also contributed Orthoimagery data through regional imagery projects.

The most current published listing of NAIP funding contributors can be found on the MLIAC web site:

<http://itsd.mt.gov/policy/councils/mliac/default.mcp>

**12) Montana GIO:**

The GIO needs to build public and private partnerships to provide an ongoing source of non-MLIA funding for the collection of consistent high resolution orthoimagery at a regular interval. Additional recommendations may be forthcoming.

**13) Professional Community:**

Work with the theme stewards and the GIO to determine and prioritize Orthoimagery needs. Active promotion of the theme by the professional community could help ensure ongoing funding is available to support the theme.

**14) Your Request to GIO or Council:**

Education of decision makers as to the value of orthoimagery for decision making.

**15) Do you have any additional comments?**

No

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: SSURGO SOILS

### 1) **Theme Name:**

Montana SSURGO Soils

### 2) **Theme Definition:**

The Montana soils theme is a digital representation of certified soil mapping (Soil Survey Geographic Database or SSURGO) spatial data and their associated tabular attribute data (National Soil Information System or NASIS)

### 3) **Theme Description:**

A soil survey describes the characteristics of the soils in a given area, classifies the soils according to a standard system of classification, plots the boundaries of the soils on a map, and makes predictions about the behavior of soils. The information collected in a soil survey helps in the development of land-use plans and evaluates and predicts the effects of land use on the environment. Soil is defined as “the collection of natural bodies in the earth’s surface, in places modified or even made by man of earthy materials, containing living matter and supporting or capable of supporting plants out-of-doors. Its upper limit is air or shallow water. At its margins it grades to deep water or to barren areas of rock or ice. The lower limit of soil is normally the lower limit of biologic activity, which generally coincides with the common rooting depth of native perennial plants” (Soil Survey Staff, 1975). Structured soil surveys have been conducted by the USDA since 1896. This extensive history has resulted in a very well-developed set of mapping procedures and thoroughly documented protocols for spatial and attribute data preparation and certification <http://soils.usda.gov/technical>. Soil surveys in Montana are conducted by the Natural Resources Conservation Service (NRCS) in cooperation with the National Cooperative Soil Survey (NCSS). The NCSS is a nationwide partnership of federal, regional, state, and local agencies and institutions that work cooperatively to investigate, inventory, document, classify, and interpret soils and disseminate, publish, and promote the use of information about soils. Each soil geographic survey (SSURGO) includes the 1:24,000 scale mapping of soil map unit boundaries, lines, and point features, with a unique identifier for each map unit that is linked to records in the National Soil Information System (NASIS) attribute database for that survey area. The map extent for a SSURGO data set may correspond with county boundaries, parts of multiple counties, or a national forest or national park boundary. In Montana there are 107 soil survey areas. The full suite of soil properties that are used to delineate soil map units and that are included in the attribute databases are described in the official Soil Survey manual: [http://soils.usda.gov/technical/manual/contents/chapter3\\_index.html](http://soils.usda.gov/technical/manual/contents/chapter3_index.html)

### 4) **Sub-theme Descriptions:**

Currently the SSURGO data for Montana does not include sub-themes.

### 5) **Primary Data Users and Stakeholders:**

Soils data is used by all state and federal natural resource agencies, county planners, tribal land managers, local engineers, botanists, ecologists, farmers, ranchers, wildlife biologists, and all types of environmental specialists. The NRCS has cooperative agreements and working relationships with the United States Forest Service (USFS), the U.S. Bureau of Land Management (BLM), the Fort Belknap, Rocky Boys, Crow, Fort Peck, and Northern Cheyenne tribes, the Montana Department of Environmental Quality (DEQ), Montana Department of Natural Resources, Montana Natural Heritage Program(MNHP), Montana State Library Natural Resource Information System (MSL-NRIS), local Conservation Districts, and numerous local watershed planning groups.

**6) Theme Completeness:**

Field mapping has been completed for 101 of the 107 soil survey areas in Montana. Eighty surveys have been certified, published and are available to the public. Twenty-five surveys have completed mapping and are in the process of being certified and published. Five survey areas include public wilderness lands and are not scheduled for SSURGO level mapping. Since 2008 the attribute databases for 35 surveys have been updated. According to the current schedule all soil surveys in Montana will be completed by 2010 and will then go into maintenance mode.

**7) Theme Stewardship Status:**

Once certified and published a soil survey goes into maintenance mode which can include the development of additional standardized interpretations based on the soil attribute data. The certification of adjacent survey areas may result in changes to polygons due to edge-matching, in which case both spatial and tabular data will be updated. All soils data for Montana is available via the NRCS Web Soil Survey (WSS) site at: <http://websoilsurvey.nrcs.usda.gov>. The NRCS in Montana also sponsors a partnership with the NRIS program for the distribution of Montana soils data at: <http://www.nris.mt.gov/nrcs/soils>.

**8) Theme dependencies:**

The soils theme is primarily dependent on digital orthoimagery and elevation data (10- and 30-meter digital elevation models or DEMs). At the national level, the NRCS coordinates with APFO to ensure that funding for the NAIP imagery is available and contributes to the USGS for the development of the digital elevation datasets. The current availability of digital imagery and elevation data in Montana is largely due to a long history of NRCS support for the development of these themes. More recently the statewide acquisition of NAIP has benefited from partnership with the State, and other federal agencies have contributed to the continued development of the 10-meter DEMs.

**9) Standards and Best Practices:**

The Montana SSURGO data adheres to the Soil Geographic Data Standard endorsed by the Federal Geographic Data Committee (FGDC) in 1997 (FGDC-STD-006) which can be found at: <http://www.fgdc.gov/standards/projects/FGDC-standards-projects/soils/soil997.PDF>.

These standards are strictly applied and required for the certification of Montana SSURGO data.

**10) Data model, schema, or documents:**

The documentation of the SSURGO and NASIS data models can be found at: <http://soils.usda.gov/technical/nasis/documents/metadata/index.html>

**11) Data Stewards:**

Data access services for this theme are provided by the MSL-NRIS program in cooperation with the Montana NRCS. FGDC compliant metadata is included with the files for each SSURGO survey, and is also distributed through the Montana State Library Portal.

**12) Montana GIO:**

At this time there is no direct role in supporting this theme that can be played by the Department of Administration's Geographic Information Officer, or other policy organizations in State government. To support framework themes in general it is possible that the GIO could play a role in encouraging other State agencies to develop internal policies that would require the use of framework layers. However, based on the organizational chart for the Information Services Division of the Montana Department of Administration (<http://itsd.mt.gov/content/about/docs/orgchart>) it appears that any authority of the GIO is only extended to the ITSD GIS Bureau. Consequently, it may be unlikely or impossible for this position to influence GIS policy throughout State government.

Without more information about what roles and responsibilities are specified in the position description and performance plan for the GIO it would not be possible to answer the question of what GIS support needs this position can legitimately meet.

**13) Professional Community:**

The professional expertise within MAGIP could certainly be used to support educational workshops for this and other framework themes.

**14) Your Request to GIO or Council:**

None that I am aware of.

**15) Do you have any additional comments?**

No

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: STRUCTURES

### 1) **Theme Name:**

Montana Structures Framework

### 2) **Theme Definition:**

Currently the framework is officially titled the Montana Critical Infrastructure and Structures Framework but it is recommended that name be changed to the Montana Structures Framework to better describe the dataset. The American Heritage Dictionary defines the term “infrastructure” as: “The basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water and power lines, and public institutions including schools, post offices and prisons.” The critical aspect of infrastructure and structures is context dependant. For example, a structure that is considered critical in a wildfire incident may not be considered critical in a pandemic outbreak. Up until this point, the Critical Infrastructure and Structures Framework has focused on data not available in other framework themes, specifically structures and their functions. While it is recognized that some of the structures (police and fire stations, hospitals, schools, etc.) contained in the Framework are critical and will continue to be maintained, it is felt that “critical infrastructure” misrepresents the themes contained in the Framework. This name change will help to clarify the roles and responsibilities of this framework.

### 3) **Theme Description:**

Critical Infrastructure & Structures Data Model (CISDM). The CISDM is a federated geodatabase containing data aggregated from multiple data providers. The CISDM contains feature classes for point, line and polygon data as well as attribute tables for holding contact information, database metadata and feature-level metadata. The CISDM also contains links to the Geographic Names Information System (GNIS). At the federal level, GNIS is being integrated with structures and other NSDI framework themes, which will impact how frameworks are maintained and developed at the state level.

### 4) **Sub-theme Descriptions:**

There are no formal sub-themes - although function categories could be exported as sub-themes from the model. The following themes are complete statewide:

- Police station / sheriff office
- Fire station
- Ambulance service
- Emergency shelter
- Emergency Operations Center (EOC)
- Airport
- Heliport
- Border crossing / port of entry
- Radio / TV broadcast facility

A complete list of function categories, including those functions that are not completely populated statewide, can be found at: [http://giscoordination.mt.gov/%5Ccritical\\_infra%5CCISDM\\_Data\\_List.asp](http://giscoordination.mt.gov/%5Ccritical_infra%5CCISDM_Data_List.asp)

Critical infrastructure themes that are sensitive and not open to the public (for example: transmission lines, power plants, pipelines, community water supplies, etc.) are held by the Department of Justice (DOJ) and Department of Military Affairs, Disaster & Emergency Services Division (DES). Additionally, DOJ and DES may have non-sensitive themes that the Montana Structures Framework has, but with additional attribution that is sensitive.

**5) Primary Data Users and Stakeholders:**

The Framework was originally developed primarily for the Homeland Security and Disaster and Emergency Services communities. Data is shared with the USGS and incorporated into the National Map. Montana Department of Military Affairs, Disaster & Emergency Services Division and the Montana Department of Justice also use this Framework. TechniGraphicS, Inc. (TGS), a contractor for the National Geospatial-Intelligence Agency (NGA), uses this Framework as the starting point for building value added datasets for NGA, and provides the unclassified versions of those datasets back to this Framework. The Framework is currently used as part of the National Center for Landscape Fire Analysis Wildland Fire Base Map application. However, a structures layer, critical or not, has many potential uses. For example, planners may use a structures layer to determine the best route for a new power transmission line. Or, a conservation biologist may use the framework to study how development, even just a few structures in a remote area, may have an impact on animal habitat or migratory patterns. With increased outreach, more user groups would probably be realized.

**6) Theme Completeness:**

Hundreds of structural categories are considered important in the all hazards approach to disaster planning and mitigation. A portion of those are considered sensitive data and therefore not suitable for inclusion in the Montana Structures Framework. Of those considered non-sensitive, the Framework currently contains nine themes that are complete statewide (see themes without asterisks in the above referenced data list). The target for the Framework is a routinely updated statewide layer of structures with addresses, functions and Geographic Names Information System (GNIS) identifiers associated with those structures. Currently, 30 of 56 counties have complete (see question 7 for clarification of "complete") structures layers, with an additional four counties that have structures data that lack functions.

**7) Theme Stewardship Status:**

Due to the dynamic nature of structures data, this theme relies on local governments, primarily counties, to aid in the development and maintenance of structures, where possible. Some counties have complete structures themes with address and structure type attribution while others have structures layers with little or no attribution or only have partial coverage. The Base Map Service Center (BMSC) integrates provided data into a standardized data model and performs the additional stewardship roles of coordination, data distribution and outreach. Additionally, the Montana GIS Portal at the Montana State Library distributes metadata and supports search and discovery for this theme.

**8) Theme dependencies:**

When better spatial information, such as GPS locations, is not available, structure locations are often based on other frameworks including orthoimagery, cadastral and transportation. Also, structures and GNIS will become dependent on each other as more structures are related to GNIS.

**9) Standards and Best Practices:**

- The database schema used closely follows the USGS Best Practices Data Model for Structures and utilizes common or similar attribute domains.
- Montana Persistent Identifier Best Practice
- FGDC-compliant metadata

The Montana Structures Framework does not require data providers to alter their existing databases or business processes, rather the data is converted as necessary and standards are enforced as the BMSC integrates provider data into the database.

**10) Data model, schema, or documents:**

The data model and FGDC-compliant metadata are available at: <http://giscoordination.mt.gov>

**11) Data Stewards:**

This theme relies on the natural stewards of structures data to provide and maintain those data. Currently, most of the data comes from counties and local government and TGS, with some data created by grant-funded student interns the BMSC. The BMSC integrates the data into the structures database and distributes it through various methods (database downloads, web services and web mapping applications), as well as providing overall framework coordination and outreach. The Montana GIS Portal is the primary means of discovering and distributing metadata about the framework.

**12) Montana GIO:**

The GIO could help to clarify and coordinate the roles of the theme lead, theme steward and the other organizations that are collecting and storing critical infrastructure and structures data in Montana. Currently, the BMSC, the Montana Department of Military Affairs, and the Montana Department of Justice all maintain databases with some type of critical infrastructure or structures data. As originally envisioned, the BMSC database would contain all non-sensitive critical infrastructure layers. This has never been realized for a variety of reasons including the immenseness of such an undertaking, lack of funding, support and staffing, and issues regarding the sensitivity of many critical infrastructure themes.

With a clarification of roles, the next priority for the GIO would be the issue of funding. The Montana Structures Framework has never had a stable source of funding. Funding initially came from homeland security funds. As federal homeland security funding priorities have changed, funding has shifted to the MLIA and USGS. It is unlikely additional significant funding will be available from the USGS, which means this Framework will be increasingly reliant on MLIA funds, which are seeing increasing competition. A priority for the GIO should be to find a secure and permanent funding source for this Framework theme. Currently, a significant amount of time is spent applying for grants that would be better spent advancing the theme. Also, the theme lead is limited to working on only the priorities set within the grants.

**13) Professional Community:**

The role of the MAGIP and Disaster & Emergency Services communities with this theme and other framework themes should be to promote their use and be actively engaged with the theme leads and stewards to provide feedback and help set the direction and priorities for future development. For example, MAGIP could promote a best practice encouraging the use of MSDI framework themes over other less accurate sources of similar data.

**14) Your Request to GIO or Council:**

The BMSC recommends that along with changing the name of the framework to the Montana Structures Framework, that the role of the Montana Department of Military Affairs and Montana Department of Justice be acknowledged and evaluated as they continue to maintain sensitive structures information for classified uses. The GIO and MLIA Council should also be aware that at the federal level, GNIS is being integrated with other NSDI vector framework themes, which will impact how frameworks are maintained and developed at the state level. For structures, this means populating relevant structures with GNIS identifiers and official names and potentially submitting name or location updates to GNIS. The BMSC acknowledges that this is will result in a better Framework theme, but reminds the GIO and Council that these are additional coordination and data maintenance duties.

**15) Do you have any additional comments?**

Theme name needs to be vetted through council.

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: TRANSPORTATION

1) **Theme Name:**

State of Montana Transportation Framework

2) **Theme Definition:**

The Transportation Framework Theme contains digital representations of all public ground transportation routes in Montana, including roads, ramps, bridges, trails and railroad lines; and, an Address Ranges and Road Attributes tables.

3) **Theme Description:**

The Transportation Framework Theme program utilizes a federated approach where the primary goal is the creation and maintenance of a statewide, seamless, maintainable GIS dataset comprised of common transportation networks, facilities and features. In this collaborative approach, data is collected and maintained by the respective organizations (federal, state, tribe, county, city, private) according to their business needs and practices. After the providers update their datasets with new features, attributes and geometries, providers send their data to the Base Map Service Center (BMSC) where they undergo data standardization and quality control/quality assurance procedures. The BMSC subsequently updates transportation features and accompanying tables along with the metadata, and then loads this data into the Framework and makes it publicly available. Using data from the local providers assures the best possible coverage across the state and results in one seamless, uniformly formatted and attributed layer containing the best-available data.

4) **Sub-theme Descriptions:**

The Transportation Framework Theme contains roads, ramps, bridges, trails and railroads features. It is constructed by integrating common datasets from numerous sources. The BMSC manages each feature class as a separate sub-theme to support multi-modal applications.

5) **Primary Data Users and Stakeholders:**

The Transportation Framework currently has approximately 40 county data providers; two state agencies including the Department of Transportation (supplying the rest of the counties) and the Department of Natural Resources and Conservation; and, one Federal Agency, the U.S. Forest Service (USFS). Examples of data consumers include the Montana Department of Emergency Services (DES), who recently launched a DES Base Map web service using the framework data as the base road file. The Montana Department of Natural Resources and Conservation used the data for a fire hazard road mapping analysis to develop emergency response planning. The U.S. Environmental Protection Agency employed the road data to develop a water quality simulation model for a watershed in Montana. They consider accurate road data one of the most significant model inputs. The National Center for Landscape Fire Analysis also uses the data for their ArcServer base map application. A recent example of a private sector organization includes Tele Atlas, a company that develops location-based and mapping technologies, which used the Framework dataset to update their base road map application.

The BMSC has established positive working relationships with several of its data providers and has further strengthened the outreach by making personal visits to discuss collaboration strategies. Over the next several months, the BMSC will be visiting additional counties and cities to establish documented relationships and methodologies to insure maintainability, further collaboration and improve data sharing to reduce duplication of effort, improve quality and reduce costs related to data development.

**6) Theme Completeness:**

The Framework has advanced from an initial release containing a "one-time" representation of all public roads statewide to a maintenance phase with new roads and features integrated, and attribute enhancements. The dataset is dynamic, requiring the incorporation of new data as well as the development of new features and attributes. Complete should not be interpreted as "done" but should imply that new datasets are integrated into the statewide model and agreements are in place with a set of federated partners to update those features on an agreed-upon schedule. Over the course of 2009, the BMSC will be further collaborating with and establishing agreements with the federated partners to provide Framework data at agreed-upon schedules. The road centerline data was (in most cases) GPS collected, and in some cases manually adjusted to the 2005 National Agriculture Imagery Program (NAIP) imagery. It easily meets minimum resolution or horizontal accuracy standards of 7.6 meters. The Framework meets the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata, Version 2. The BMSC will continuously maintain and update the Framework and data integration processes as needed to meet the minimum "currentness" standard of one year.

**7) Theme Stewardship Status:**

The data providers, as described above, conduct initial data production and maintenance for the Framework. The BMSC integrates provider data on an annual (or better) basis for the Montana Department of Transportation (MDT) and the urban counties with GIS, and on an "as available basis" for the other counties and USFS.

The BMSC provides data distribution, as well as some coordination and promotion, through the Framework website at <http://giscoordination.mt.gov/transportation/msdi.asp>.

The BMSC manages the Transportation Framework in accordance with the FGDC standards incorporated into the model built on a modified Environmental Systems Research Institute (ESRI) Transportation Data Model

(UNETRANS)

template:

<http://support.esri.com/index.cfm?fa=downloads.dataModels.filteredGateway&dmid=14>

The BMSC sends notices of updates via the Montana Association of Geographic Information Systems Professionals (MAGIP) email list-serve, and metadata and data are discoverable through the Montana State Library GIS Portal.

In addition to data hosting, the BMSC website currently is developing more web services utilizing framework data. BMSC is actively conducting data provider outreach as described in question 5.

**8) Theme dependencies:**

Presently, the Transportation Framework is dependent on the orthoimagery, hydrography and boundaries framework themes. Orthoimagery helps to spatially adjust and verify roads centerlines, if needed. Hydrography assists in adjusting bridge feature locations. The boundary theme has been used to confirm emergency service zones along the roads, as well as to truth the anchor points between jurisdictional boundaries. The Transportation Framework theme is not entirely dependant on, but has a close relationship (quasi-dependency) with the addressing model (though technically not a framework theme) and the critical structures theme. This is due to the development of a combined model integrating the transportation, addressing and critical structures/infrastructure themes. We believe that additional research should be conducted to define a working relationship between the addressing, structures, and transportation themes that would eliminate potential stovepipes (non-interoperability) and allow flexibility.

**9) Standards and Best Practices:**

The Transportation Framework subscribes to the FGDC standards (see 6) incorporated into the model, which was build on a modified ESRI Transportation Model (UNETRANS) template. It also subscribes to the best practices as published in the MAGIP Vector, January 2009. As noted in the Vector, development of the best practices is an ongoing effort for the most common standards in Montana, many of which are already in use. The Framework utilizes the following best practices adopted by MAGIP: metadata compliant with the Montana GIS Portal; implement and maintain persistent unique identifiers; and, utilize the same spatial reference system of Montana State Plane NAD 83 meters.

**10) Data model, schema, or documents:**

The Transportation Framework model is published and available for download from the BMSC website. One can extract the schema from the model through a variety of methods. The metadata document contains detailed descriptions of the features and processes employed to develop and maintain the dataset. Both the data model and metadata are also discoverable through the Montana State Library GIS Portal (<http://gisportal.mt.gov/Portal>).

**11) Data Stewards:**

Please see questions 5 and 7 for a more complete description of the stewarding process and relationships. The BMSC additionally provides education, outreach and coordination among data providers and data users.

**12) Montana GIO:**

To support the Transportation Framework theme, the GIO needs to actively promote and market this framework data effort. Securing permanent program funding for the Transportation Framework should be a top priority for the GIO. The current annual grant funding mechanism for the Transportation theme is not sustainable for the long-term. From my perspective, there is an underlying uncertainty and uneasiness that the program will not be fully funded and fully staffed through MLIA funds. In addition, the time spent writing the grant applications each year is better spent advancing the model. It is inefficient to keep reapplying for funding each year for an established program. In review of the previous years' MLIA Transportation Grant documents, the priority goal of permanent long-term stable funding consistently appeared. The goal states that a white paper will be written with the State's GIO researching and documenting permanent funding options. I believe one viable option is that the GIO propose to the MLIAC a designated amount of MLIA funds be set aside to permanently fund the frameworks. The frameworks stewarded by the BMSC have applied for and received yearly MLIA grant funds to sustain them, and it seems logical to request the known annual operating costs. Securing permanent funding should follow as a priority as identified.

**13) Professional Community:**

MAGIP needs to promote and encourage members to use the Transportation Framework (and other framework layers) as authoritative sources for any projects requiring the best-available transportation data. Users of the data should be encouraged to provide any feedback they have from use of the dataset. MAGIP could foster education and data standardization. MAGIP sponsored events in conjunction with the BMSC and other framework stewards would encourage outreach and promote work group meetings.

**14) Your Request to GIO or Council:**

The factors most pertinent to the Transportation Framework theme are securing permanent funding (see 12) and better marketing to policy makers. Improving local government data provider technical

skills would improve data integration, so local government support should be encouraged. They should also encourage more educational and training opportunities.

**15) Do you have any additional comments?**

No

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: WETLANDS AND RIPARIAN AREAS

1) **Theme Name:**

Montana Wetlands and Riparian Areas Framework

2) **Theme Definition:**

All wetlands and riparian areas in Montana as defined by the U.S. Fish and Wildlife Service National Wetland Inventory (NWI) wetland classification system and the Western U.S. Riparian mapping system.

3) **Theme Description:**

The completed wetlands and riparian areas theme is a digital map of functional wetlands and riparian areas in Montana following U.S. Fish and Wildlife Service classification standards. The 2005 National Agriculture Imagery Program (NAIP) Color Infrared (IR) imagery (or updates) is the image source for mapping along with ancillary information to aid in identifying functional wetlands and riparian areas. Wetlands are classified with the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Riparian areas are mapped and classified according to A System for Mapping Riparian Areas in the Western United States (U.S. Fish and Wildlife Service, USFWS 1997). These classification systems are the proposed Federal Geographic Data Committee (FGDC) standard for wetland and riparian mapping. Mapping also includes polygon attribution with hydrogeomorphic modifiers that link wetland types to wetland functions.

4) **Sub-theme Descriptions:**

No sub-themes

5) **Primary Data Users and Stakeholders:**

State and local government agencies, including conservation districts and watershed involved in natural resource management and water quality restoration and protection; consultants, planners, and project proponents involved in land development; restoration and mitigation practitioners including federal, tribal, state, local, and non-governmental organizations involved in identifying potential restoration and mitigation sites; land trusts and other organizations involved in locating protection priorities for sensitive lands and habitats that harbor sensitive species, species of concern, and threatened and endangered species.

6) **Theme Completeness:**

The target for this theme is statewide coverage of functional wetlands and riparian areas at 1:12,000 scale that meets the USFWS National Wetlands Inventory and riparian classification standards and FGDC wetland mapping standards. The theme will also include periodic updates of the Montana Wetlands and Riparian Areas Framework layer to evaluate rates of wetland and riparian change and to better understand the transient nature of wetlands. The following information is current as of May 15, 2009:

- 3% of Montana's quads (97 of 3,019) are completed and have been incorporated into the USFWS NWI master geodatabase.
- 29% of Montana's quads (888 of 3,019) are under contract to be mapped. Of these, 468 quads or 53% have been completed.

**7) Theme Stewardship Status:**

Lynda Saul, Montana Department of Environmental Quality (MDEQ) Wetland Program Coordinator, is the MSDI Wetlands Theme Steward. Linda Vance, Montana Natural Heritage Program (MTNHP) Montana Wetland and Riparian Mapping Center, is the lead theme developer of wetlands and riparian areas. Both Lynda Saul and Linda Vance promote and coordinate funding for theme development. Ultimately, the Montana Wetlands and Riparian Areas framework layer will be accessible via the Montana GIS Portal (<http://gisportal.mt.gov/Portal>) along with the other 12 MSDI Framework Layers. The digital wetland and riparian data will be maintained and housed by the Montana State Library Natural Resource Information System (MSL-NRIS) and MTNHP. MTNHP and MSL-NRIS are currently working to make wetland and riparian maps available online as well. The U.S. Fish and Wildlife Service (USFWS) is the principle Federal agency that provides information to the public on the extent and status of the nation's wetlands. Each USFWS Region has a National Wetland Inventory (NWI) coordinator responsible for final review and of data developed and submits maps for inclusion into the NWI National Geodatabase. <http://wetlandsfws.er.usgs.gov/NWI/index.html>. USFWS is responsible for NWI maintenance. Riparian features and hydrogeomorphic attributions are not included in data downloaded from the USFWS NWI website. These features will be included when data are downloaded from MSL-NRIS/MTNHP.

- Lynda Saul, MDEQ Wetland Program Coordinator, [lsaul@mt.gov](mailto:lsaul@mt.gov), 444-6652.
- Linda Vance, Senior Ecologist, MT NHP, [livance@mt.gov](mailto:livance@mt.gov), 444-3380
- Karen Newlon, Ecologist/Project Manager, MTNHP, [knewlon@mt.gov](mailto:knewlon@mt.gov), 444-0915
- <http://mtnhp.org/ecology/wetlands/default.asp>
- Kevin W. Bon, Regional Wetland Coordinator, Rocky Mountain Region, U.S. Fish & Wildlife Service, National Wetlands Inventory, Denver, CO. 303-236-4263. [Kevin\\_Bon@fws.gov](mailto:Kevin_Bon@fws.gov)

In addition, the USFWS has a lead on riparian mapping and classification in the west.

- Jim Dick, Regional Wetlands Coordinator, Southwest Region, U.S. Fish & Wildlife Service, National Wetlands Inventory, P.O. Box 1306, Albuquerque, NM 87103, 505.248.6660, [jim\\_dick@fws.gov](mailto:jim_dick@fws.gov)

**8) Theme dependencies:**

Montana Orthoimagery, Montana Hydrography, Montana Soils, Elevation

**9) Standards and Best Practices :**

Wetlands are classified with the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Riparian areas are mapped and classified according to A System for Mapping Riparian Areas in the Western United States (USFWS 1997). These classification systems are the proposed FGDC standard for wetland and riparian mapping. Mapping also includes polygon attribution with hydrogeomorphic modifiers that link polygon types to wetland functions. Field reconnaissance trips are conducted as necessary to determine whether polygons have been correctly classified and to review any questionable types. QA/QC procedures follow National Standards and Quality Components (USFWS 2004) including submission to the USFWS NWI regional coordinator. A Federal Geographic Data Committee national wetland mapping standard has recently been established for all federally funded wetland mapping activities. For all other efforts, use of the standard would be strongly encouraged. <http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/>

**10) Data model, schema, or documents:**

- Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Washington, D.C. FWS/OBS-79/31.
- U.S. Fish and Wildlife Service. 1997. A system for mapping riparian areas in the western United States. U. S. Fish and Wildlife Service., Washington, DC. 15 pp.
- U.S. Fish and Wildlife Service. 2004a. National standards and quality components for wetlands, deepwater, and related habitat mapping. U. S. Fish and Wildlife Service, Arlington, VA. 19 pp.
- U.S. Fish and Wildlife Service. 2004b. Technical procedures for mapping wetland, deepwater, and related habitats. U.S. Fish and Wildlife Service, Branch of Habitat Assessment, Arlington, Virginia. 46 pp.

**11) Data Stewards:**

New mapping is conducted by the Montana Wetland and Riparian Mapping Center of the Montana Natural Heritage Program. New wetland and riparian mapping are distributed through MSL-NRIS and MTNHP.

**12) Montana GIO:**

Montana's GIO can continue to support MLIA grant funding for the Montana Wetlands and Riparian Areas Framework. This funding is critical to accomplish the goal of statewide theme coverage. While the National Wetland Inventory is a federal mandate dating from the 1970's, it is an unfunded and incomplete mandate. Due to a lack of funding, Montana is one of the two least mapped states in the Nation. Historically, funding has come from private sources for priority areas, such as Ducks Unlimited funding for the Prairie Pothole region of Montana, or targeted funding for specific jurisdictions such as the National Park Service, Tribal lands, or other specific geographic areas. Consequently, theme coverage is fragmented. The complexity of wetland regulation and land use management has increased to make wetlands and riparian areas data layers critical for local government land use decisions. We have engaged multiple stakeholders in contributing to the Wetland and Riparian theme development and have successfully formed funding collaboratives for specific geographic areas for this theme based on MLIA grant funding proposals.

Other policy organizations – Saul is working with several, but would always appreciate help, Montana Association of Counties (MACO), Montana Association of Conservation Districts (MACD), Montana Association of Planners (MAP). Help identifying other grant funding sources? Support funding for Light Detection and Ranging (LIDAR) mapping?

**13) Professional Community:**

MAGIP could play a valuable role in training GIS professionals how to use the Montana Wetlands and Riparian Areas Framework, including data limitations and range of use. MAGIP could provide links at appropriate MAGIP and other websites. MAGIP professionals could use the information and present at meetings to inform others of the framework data layer and its uses. The Wetland Theme Steward could be included in MAGIP conference planning to promote the theme and train users.

**14) Your Request to GIO or Council:**

MLIA funding is critical to accomplish the goal of statewide theme coverage. Agency partners such as the U.S. Bureau of Land Management (BLM) and USDA Forest Service have been critical to the completion of mapping on lands owned by those agencies. However, this results in fragmented theme coverage. MLIA funding is necessary to fill in gaps where we do not have agency partners.

Because many of local land use management decisions rely upon several of the 13 data framework themes, implementing the base map service center concept will be very valuable. The Montana Wetlands and Riparian Areas Framework data contain more information than the USFWS NWI currently serves. For example, the Wetland and Riparian Mapping Center attributes features with hydrogeomorphic (HGM) modifiers that link wetland type to wetland function. HGM attribution is not served by the NWI Master Geodatabase. Additionally, riparian mapping and classification information are also not currently served by the USFWS. This enhanced information should be included in the Montana Wetlands and Riparian Areas Framework.

**15) Do you have any additional comments?**

Wetlands and riparian areas are dynamic systems that are subject to climatic variability and human alteration, and as such are transitory on the landscape. Digital wetland mapping represents a snapshot a time and should not be viewed as a “one-time” only data layer, but rather a data layer that requires periodic updates.

## MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME PROFILE: GEOGRAPHIC NAMES

1) **Theme Name:**

Geographic Names

2) **Theme Definition:**

A collection of official names used to identify physical and cultural geography in Montana. This includes both current and historical names, and names or spellings that differ from the official name. Toponyms, or geographical names, are used by us all every day to describe our surroundings and to tell others where we have been or where we plan to go. When we use maps we expect the names to help us identify features of the landscape.

3) **Theme Description:**

Geographic names in its purest form are simply a table of named geography with no spatial reference. Geographic features (geometry) are derived from geographic datasets such as framework datasets. The intersection of geographic names with geographic features results in named features (named geometry). Geographic names are related to geographic features, and vice-versa, through a persistent unique identifier assigned to each name. The fundamental reason for a single table of geographic names is to support place-based queries on names regardless of supporting feature geometry, and thus discover the geography through the name.

The federal Geographic Names Information System (GNIS) has a very solid data model with a system of unique persistent identifiers, and Montana leveraged and compliments that effort. Montana has extended the federal geographic names database to meet local needs while maintaining the ability to share information that can improve federal GNIS content. Montana will take advantage of federal and tribal contributions to GNIS by capturing federal GNIS content to serve locally in Montana. A few Montana-specific enhancements to the federal effort include representation in Montana State Plane Coordinate System, the inclusion of road names, and the potential ability to attach photos and sound clips. Sound clips can offer the correct pronunciation of names and used to synthesize speech for location-based services. This has cultural significance in providing an opportunity to retain the correct pronunciation of Native American names or historical names.

4) **Sub-theme Descriptions:**

None

5) **Primary Data Users and Stakeholders:**

The following MSDI framework datasets would rely on the Geographic Names Theme for the correct representation of the official name and associated information: Cadastral, Governmental Units, Elevation (elevation points), Hydrography, Hydrologic Units, Structures and Critical Infrastructure, Transportation, and Wetlands. The Geographic Names Theme relies on these themes for the geographic representation of the associated named feature.

A primary use of the Geographic Names Theme is to serve as a resource to applications that require a search by geographic name. This would include applications like the Montana GIS Portal, the National Center for Landscape Fire Analysis (NCLFA) Montana Wildland Fire Base Map Service, the Montana Base Map Services Center Disaster and Emergency Services Base Map Service, and the Economic Development Geospatial Portal for the State of Montana. A Geographic Names Theme will serve as a resource to local public applications like E911 Emergency Service as well as private sector applications and business process needs.

**6) Theme Completeness:**

The target for this theme is a statewide database of all available in-use geographic names with a documented maintenance schedule. The National Center for Landscape Fire Analysis compiled a report assessing the accuracy and completeness of the federal GNIS (“GNIS in Montana: Final Report from the National Center for Landscape Fire Analysis to the USGS, June 2008”). The federal GNIS effort contains most of the natural feature name, but is very deficient in names for cultural/administrative features.

**7) Theme Stewardship Status:**

This theme has been developed through funding from the State of Montana Base Map Services Center, the U.S. Geological Survey(USGS), the National Center for Landscape Fire Analysis, and The University of Montana College of Forestry and Conservation. This theme does not have an approved development, maintenance, or distribution steward at this time.

**8) Theme dependencies:**

Named geographic features are carried in the following MSDI framework datasets: Cadastral, Governmental Units, Elevation (elevation points), Hydrography, Hydrologic Units, Structures and Critical Infrastructure, Transportation, and Wetlands. These themes rely on the Geographic Names Theme for the correct representation of the official name and associated information. The Geographic Names Theme relies on these themes for the geographic representation of the associated named feature.

**9) Standards and Best Practices:**

The Geographic Names Theme adheres closely to standards provided by the USGS. The federal GNIS standards are published in “Principles, Policies, and Procedure, Donald J. Orth, Executive Secretary, Domestic Geographic Names (emeritus) and Roger L. Payne, Executive Secretary, United States Board on Geographic Names and Domestic Geographic Name. Third printing (revised), 1997. Online Edition (revised), 2003

The Montana representation of Geographic Names database is documented in the report “GNIS in Montana: Final Report from the National Center for Landscape Fire Analysis to the USGS, June 2008”

([http://firecenter.umt.edu/files/images/GNIS\\_in\\_Montana\\_NCLFA\\_FinalReport\\_June08.pdf](http://firecenter.umt.edu/files/images/GNIS_in_Montana_NCLFA_FinalReport_June08.pdf)).

Since this is an ongoing effort, additional documentation is available through the Montana Department of Administration Base Map Services Center, who is currently taking a lead in coordinating this effort.

**10) Data model, schema, or documents:**

The draft data model is published in the report “GNIS in Montana: Final Report from the National Center for Landscape Fire Analysis to the USGS, June 2008” ([http://firecenter.umt.edu/files/images/GNIS\\_in\\_Montana\\_NCLFA\\_FinalReport\\_June08.pdf](http://firecenter.umt.edu/files/images/GNIS_in_Montana_NCLFA_FinalReport_June08.pdf)).

Since this is an ongoing effort, additional documentation is available through the Montana Department of Administration Base Map Services Center, who is currently taking a lead in coordinating this effort.

**11) Data Stewards:**

A primary resource for this theme is the federal GNIS database as it represents official contributions from federal agencies and tribal governments. This theme relies on the following framework themes for content: Cadastral, Governmental Units, Elevation (elevation points), Hydrography, Hydrologic Units, Structures and Critical Infrastructure, Transportation, and Wetlands. Additional content is provided through the public and private sector, including individual citizens. The Geographic Names

Theme is currently exploring the development of a web interface for the retrieval and maintenance of geographic names.

**12) Montana GIO:**

- Approve the Geographic Names theme as an official Montana MSDI theme.
- Identify a host agency for Montana Geographic Names Theme stewardship.
- Identify a sustainable source of funding the support the Geographic Names Theme.
- Develop and advance legislation that would recognize the Montana Geographic Names Database as the official repository of geographic names for official use in Montana by state and local governments.

**13) Professional Community**

MAGIP and the professional community can assist this effort by being actively involved. MAGIP can help educate users in the state and provide outreach to potential users.

**14) Your Request to GIO or Council:**

See 12

**15) Do you have any additional comments?**

No

# MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME REPORT

PREPARED FOR THE MONTANA LAND INFORMATION ADVISORY COUNCIL  
JUNE 4, 2009

## Framework Theme Review Committee

*Doug Burreson, Missoula County;*  
*Lance Clampitt, US Geological Survey;*  
*Kris Larson, CDM;*  
*Chris Stump, Montana Department of Environmental Quality;*  
*Michael Sweet, University of Montana*

## INTRODUCTION

The Framework Data Layer Review Committee interviewed each of the Framework Theme Stewards, and in some cases interviewed multiple people regarding one data layer.

Several commonalities were identified among all themes, and these will be discussed in detail within a formal report. The over-arching issues that the Framework Data Review Committee offers to MLIAC to address are:

- **Management and Support** – Includes developing institutional support, possible legislative action, more interactions with administration at the entity where the framework layer resides, identifying a peer review process, and statewide perspective.
- **Technical Review and Education** – Review framework data layers and establish minimal technical requirements such as standards, best practices, and data dictionaries. Provide educational opportunities for Framework Theme Stewards.
- **Marketing** – Identify a common consistent web presence, easy to locate information, communicate beyond the GIS professional arena, and recognize contributing parties.
- **Funding** - Identify long-term, stable funding sources. Unstable or unknown funding directly affects the ability to recruit and retain highly qualified staff, and impacts the ability of entities to build sustainable business procedures.

In its initial assessment, the Committee noted some overlap with goals stated in the MLIAC 2010 Land Information Plan.

## DISCUSSION

The Framework Data Layer Review Committee had insufficient time to complete a final analysis and summary report of its observations. A report will be completed in June 2009. In the interim we believe there is sufficient information to begin taking action.

- Initiate a GIO-led framework review process.
- Recommend that MLIAC members or a subcommittee of policy-level council members review each theme report and formulate their own conclusions.  
Recommend that MLIAC invite MAGIP to form a subcommittee or develop a process to assess and address technical concerns.
- Recommend that the GIO present to MLIAC in September 2009 one or two high-priority action items for each of the major headings above.
- Recommend that MLIAC discuss need for a ‘user’ survey (refer to ROI item).

The **National Spatial Data Infrastructure** (NSDI) was created in 1994 to assemble geographic data nationwide. The framework is a collaborative community based effort in which these commonly needed data themes are developed, maintained, and integrated by public and private organizations within a geographic area. The framework concept was developed by representatives of county, regional, State, Federal, and other organizations under the auspices of the Federal Geographic Data Committee (FGDC). It allows users of geographic data a way to share resources, improve communications, and increase efficiency. Seven Framework Data Layers have been established at the national level: Geodetic Control, Cadastral, Orthoimagery, Elevation, Hydrography, Administrative Units and Transportation.

When the **Montana Spatial Data Infrastructure** (MSDI) was established, GIS practitioners in our state identified six additional Framework Data Layers as critical in our state: Geology, Hydrologic Units, Land Use/Land Cover, Soils, Wetlands and Critical Infrastructure. The backbone of the Montana Land Information Act (MLIA) is Framework Data Layers. The stated purpose of the MLIA (MCA-90-401) is: “To collect, maintain, and disseminate information (in digital format) about the natural and artificial land characteristics of Montana. “ To ensure that digital land information is:

- 1) Collected consistently – in accordance with standards
- 2) Maintained accurately - in accordance with standards, and
- 3) Made available in common ways for all potential uses and users, both private and public.

The Council also has the duty to:

- 1) Promote coordination to minimize duplication of effort, facilitate documentation and facilitate data distribution and exchange
- 2) Advocate for the development of consistent policies, standards and guidelines for land information

The National Spatial Data Infrastructure (NSDI) identified seven Framework Data Layers in 1994 to build geospatial resources for our nation:

- Geodetic Control
- Cadastral
- Orthoimagery
- Elevation
- Hydrography
- Administrative Units
- Transportation.

The Montana Spatial Data Infrastructure (MSDI) identified six additional Framework Data Layers:

- Geology
- Hydrologic Units
- Land Cover/Land Use
- Soils
- Wetlands and Riparian
- Structures

# MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK THEME TECHNICAL REVIEW

PREPARED FOR THE MONTANA LAND INFORMATION ADVISORY COUNCIL  
AUGUST 31, 2009

## Technical Review Committee

*Jason Danielson, Lewis & Clark County*

*Nathan Holm, Flathead County*

*Dave Johnson, Department of Natural Resources and Conservation*

*Catherine Love, CDM*

## INTRODUCTION

Tasked with providing a technical review of the Montana Spatial Data Infrastructure (MSDI) Framework Themes, the Montana Association of Geographic Information Professionals (MAGIP) sought out seven individuals with an interest in the technical workings of those themes to read and discuss the Framework Theme Review document:

[http://itsd.mt.gov/content/policy/councils/mliac/MSDI\\_2009\\_Theme\\_Review/responses](http://itsd.mt.gov/content/policy/councils/mliac/MSDI_2009_Theme_Review/responses)

The goals of the group were to look for common technical issues across themes and to make recommendations to the Montana Land Information Advisory Council (MLIAC) as to how to advance Montana's framework data effort.

As the review progressed, however, it became apparent to the group that the initial questionnaire failed to seek out technical responses from the Framework Stewards (in fact, stating that "well-constructed responses to the questions are preferred over highly-technical explanations"). Due to this lack of technical information, the task became difficult to accomplish and several members chose to remove themselves from the group as frustrations set in. In spite of these difficulties, the remaining members felt that there were indeed technical issues that were identified during the review process—as general as they may be—and it was in the best interest of MAGIP, MLIAC, and the Montana GIS community that they outline those concerns rather than dissolve the group and provide nothing at all. In the end, the group identified three areas of technical concern where it believes MLIAC should focus its efforts:

- 1. Framework Theme Dependencies**
- 2. Adoption and Use of Framework Themes / User Buy-In**
- 3. Coordination and Collection of Framework Theme Data**

## DISCUSSION

The following discussion addresses each of the three topics and outlines recommendations that might be implemented to advance the MSDI Framework Themes.

### 1. Framework Theme Dependencies

Many of the framework themes are dependent on other themes for spatial accuracy and reliability, yet there was little documentation found in the review as to how or when updates cascade from one theme to another.

**Recommendation:**

MLIAC (and MAGIP) should promote and support regularly scheduled meetings of the framework theme stewards. Discussion of current issues and advancements would be beneficial in providing information to theme stewards as other themes are developed and would ensure that nothing is “lost in the shuffle”. Additionally, the group felt that a visual depiction of the interworking relationships between framework themes should be developed. Not only would this help to identify areas where error may be introduced, but it might also improve user buy-in of the framework themes (see No. 2 below).

**2. Adoption and Use of Framework Themes / User Buy-In**

Several theme stewards expressed their frustration with the fact that framework data are not being used. There are many possible reasons why an entity might use (or not use) framework data in its operation(s), but it is in the best interest of the GIO, MLIAC, and MAGIP to promote the use and visibility of framework layers across all sectors of the community.

**Recommendation:**

The end goal should be for MLIAC to promote policy that requires the use of framework data by state agencies where decisions are being made that affect the public. While there would obviously be exceptions to this type of policy, its development and support would not only promote consistency and transparency amongst geographic analyses and the resulting decisions, but it would also aid in reducing the duplication of efforts to create and maintain datasets throughout the state of Montana. It should be noted that this recommendation is in many ways a longer term goal, as some framework themes may currently be ready for such a mandate while other themes are not.

Additionally, development of a visual depiction of the framework themes (as described in No. 1 above) would provide the public with a better understanding of the interworking relationships of the framework themes. With increased knowledge of how the framework layers are developed, it is thought that users who are not mandated by policy will then be more likely to trust and use the data.

**3. Coordination and Collection of Framework Theme Data**

There was concern amongst the group regarding the quality and reliability of data that is collected in a federated system. While it is often felt that the local source for data is always the best source for data, framework stewards must be careful to ensure that only the highest quality data is entered into the system.

**Recommendation:**

MLIAC (and MAGIP) should promote and support educational opportunities throughout Montana. Best practices should be developed to provide the basis for sound and reliable data. To ensure that only the highest quality data is being used, a formal and transparent process for QA/QC should be developed and implemented, including some sort of mechanism for two-way communication between data users and theme stewards.

**CONCLUSION**

While not technical in nature, nearly all of the theme stewards expressed a need for stable and reliable funding to assure continued development and maintenance of the framework themes. Without stable sources of funding, the considerable investment that the Montana GIS Community has already put into framework data is indeed jeopardized. It is the hope of this group that solutions to the technical issues outlined in this document, as well as sources of stable funding, are sought out and implemented in some form by MLIAC to further the development and use of the MSDI Framework Theme Layers.

# MONTANA SPATIAL DATA INFRASTRUCTURE FRAMEWORK POLICY REVIEW

PREPARED FOR THE MONTANA LAND INFORMATION ADVISORY COUNCIL  
SUMMER, 2010

## POLICY REVIEW OF MONTANA SPATIAL DATA INFRASTRUCTURE (MSDI) FRAMEWORK THEMES

### Policy Review Committee

*Jon Sesso*

*Alan Peura*

*Connie Eissinger*

## POLICY ISSUES

### 1. Funding

- The greatest need expressed throughout the MSDI Framework Themes is the need for the GIO to aggressively seek and secure stable, long-term adequate funding. *(GIO & MLIAC)*
- Adequate and stable funding is critical for data maintenance, framework application advancement and planning
- Permanent funding is essential to the fostering of the Base Map Service Center and all other stakeholders responsible for developing the Framework Themes.
- Public and private partnerships must be fostered for boosting non MLIA funding. *(GIO)*

### 2. Marketing

- The GIO must promote the benefits and needs of MSDI Framework Themes to policy makers, especially the Governor and his cabinet members, and to campaign for the integration of themes and stewardship programs into state agencies as a necessary part of their business processes. State Departments of Revenue, Transportation, Fish, Wildlife and Parks, Environmental Quality, even Health and Human Services must become regular contributors to framework theme data development. *(GIO & MLIAC)*
- All statewide elected officials – the Attorney General, the Secretary of State, Superintendent of Schools and State Auditor – must embrace the benefits of GIS and the MSDI and consider ways to contribute through their business processes.
- Theme application discussions should be regularly disseminated to MACO, the Montana League of Cities and Towns, the Montana Conservation Districts, the Montana Association of Realtors, the Montana Association of Planners, and other public/private interest groups (e.g. surveyors, title insurance companies, Clerks and Recorders, etc.) *(GIO, NRIS & BMSC)*
- Examples of “best practices” should be marketed to encourage user of MSDI Framework Themes over less accurate similar data, with added emphasis on the development of metadata. *(MAGIP)*

- State agencies must be encouraged to develop internal policies to require the use of and contributions to the development of the framework layers. *(GIO)*

### **3. Training**

- The professional community is a vital participant in providing training opportunities and there should be greater focus on the work of the Montana Association of GIS Professionals. *(MAGIP)*
- Training may be provided through websites but must be continually updated.
- Training may be facilitated through theme stakeholders' meetings as well as integrated theme meetings.
- By improving local government data provider technical skills through education and training opportunities, data integration (for those themes that require local data input) would improve, as would local government support.

### **4. Data Integration and Standardization**

- Framework data sets must be adopted as the standard for state agencies, local governments and all other data users. *(GIO)*
- Clarification and coordination of roles of and between theme stewards and counties is imperative. *(GIO & MAGIP)*
- Development of themes must be coordinated with seamless integration and with intent for no duplication of efforts.
- Promote networking, stimulate technological growth, and advance ideas.

In addition to the above policy issues, another common issue expressed was the distress over the time involved in writing grant applications to fund the various themes. It is also recommended that all references to CAMA in the Cadastral Theme be replaced with the Orion database.