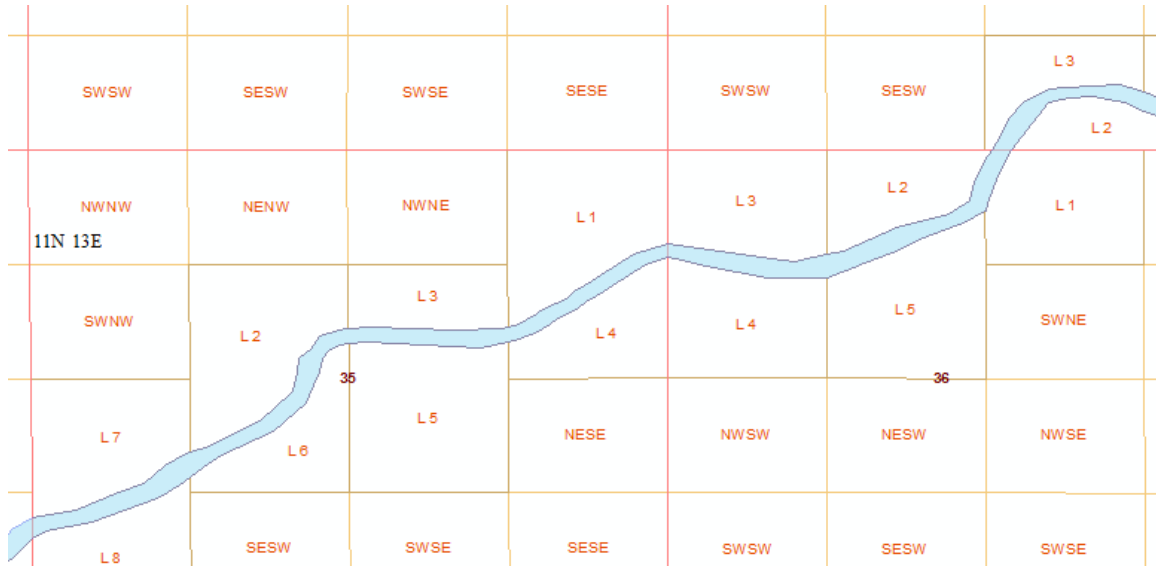


Standardized PLSS Data Set (CADNSDI) Users Reference Materials

May 2011



Handbook for PLSS Standardized Data – Version 1

If you have comments, suggestions, corrections or additions for the material in this document please send them to plss@nationalcad.org

Comments will be accumulated, reviewed and incorporated into the next version of this material.

Please see the information listed with the PLSS Work Group on the FGDC Cadastral Subcommittee publication site (<http://www.nationalcad.org>) for an additional download site for this document.

► National Subcommittee

▼ Projects & Business Applications

- PLSS Work Group
- Federal Parcel Work Group
- State Parcel Management Work

PLSS Work Group

This work group will oversee the development of a standardized PLSS nationwide that can be used to support the GIS mapping and vertical integration of themes to the PLSS.

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Introduction

This document provides supporting documentation for the Cadastral National Spatial Data Infrastructure (CADNSDI) standardized data sets.

The Frequently Asked Question section provides responses to questions most asked by those generally familiar with the Public Land Survey System (PLSS) and are starting to use this data set for the PLSS representation in a Geographic Information System (GIS).

The Key Concepts and Definitions section provides links to source documents that provide additional detail and background on key terms and concepts related to the Public Land Survey System (PLSS), cadastral data, related data standards and the specific procedures and processes used in the Bureau of Land Management (BLM) Cadastral Survey to develop coordinate positions on PLSS corners.

Application of Concepts to the Standardized Data section is an overview of some of the key concepts of the PLSS and their manifestation in the standard. This section provides a layman's description of some of the idiosyncrasies of the PLSS.

The CADNSDI Description section describes the specific content of the Cadastral National Spatial Data Infrastructure (CADNSDI) standardized data sets. This is the data dictionary for the standard.

Appendix A is a list of acronyms.

Throughout this document the Feature Class names are in *italics*. Field names (attributes) are in CAPITOL letters. ArcMap is the Esri mapping software used by the BLM and is the software used in the implementation of this data set.

Frequently Asked Questions

These answers are intended to give the users that are generally familiar with the data a quick start to using the data.

General Questions

What is NSDI?

The [NSDI](#)¹ is the National Spatial Data Infrastructure, which has been defined as the framework data sets that provide a basis to support decision-making and encourage the broad use of geographic information. The goal of this Infrastructure is to reduce duplication of effort among agencies, improve quality and reduce costs related to geographic information, to make geographic data more accessible to the public, to increase the benefits of using available data, and to establish key partnerships with states, counties, cities, tribal nations, academia and the private sector to increase data availability. The Cadastral components of the NSDI, sometimes called the CADNSDI, are the core or essential elements of cadastral information that provide the framework for building and using cadastral (land records) information nationwide.

How was the data compiled?

The data in the standardized PLSS CADNSDI data set was developed by identified data stewards, who are recognized agencies that have the authority to develop and maintain cadastral information, using the best available information. This is typically survey data, control observations and supplemental measurements. In the Bureau of Land Management (BLM) Cadastral Survey the Geographic Coordinate Database (GCDB) program has compiled the information typically using the GCDB Geographic Measurement Management (GMM) software tools.

In some cases survey information has not been completely abstracted or is not available and in these cases non-GCDB sourced data such as digitized maps or data from other sources have been used. In all cases the data steward is identified in the data sets and in the metadata records.

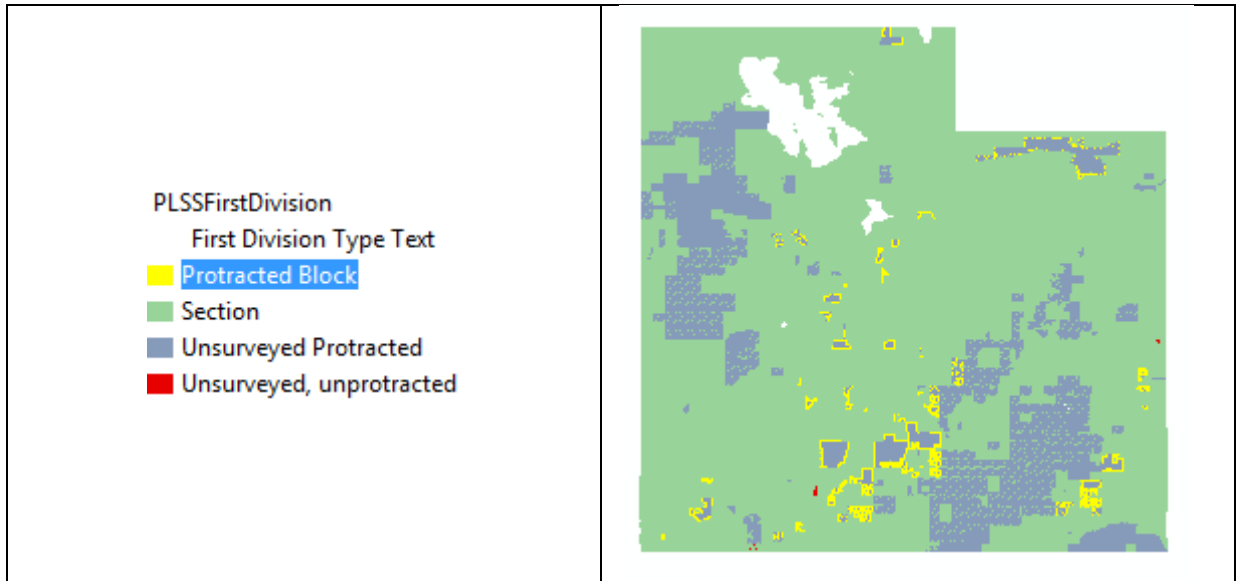
Is there any difference between legal record and the CADNSDI?

The source documents or records that are used to develop the information contained in the CADNSDI are the authoritative source. Any legal decisions will need to refer to the most authoritative record, the survey plat and notes. The CADNSDI features are the best available representation of the Cadastral Records for use in GIS applications, but in some cases there may be nuanced differences due to complexity in the cadastral records or incomplete abstraction of data from surveys and records. The data stewards are continually updating and clarifying the information the CADNSDI data sets.

¹ This is the web site for the Federal Geographic Data Committee that explains the background and authority for the National Spatial Data Infrastructure <http://www.fgdc.gov/nsdi/nsdi.html> last access April 2011

How accurate is the CADNSDI data?

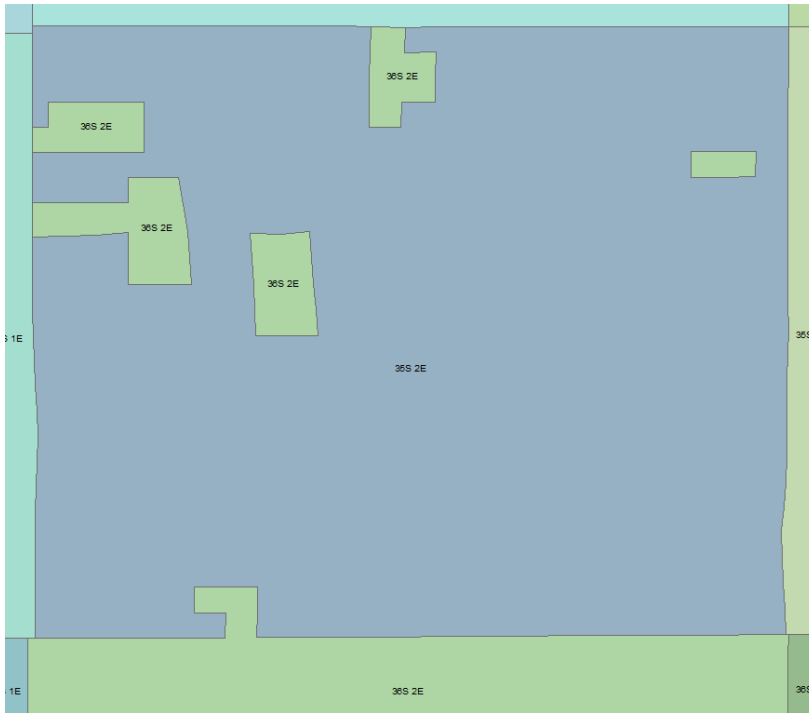
Accuracy is defined in a number of ways. The spatial accuracy of the data can be found from the reliability and/or the error in X, Y and Z contained in the *PLSSPoints* feature class. This is the best estimate of spatial accuracy on a point-by-point basis. The completeness of the data can be determined by looking at the number of polygons that have been surveyed. If a polygon is identified as being either unsurveyed protracted or unsurveyed unprotracted, then that area is missing survey measurements. For example from the *PLSSFirstDivision* feature class the types of first divisions are shown on the left and the right is a graphic of where these types occur. The yellow, red and gray shaded polygons have not been surveyed.



There are also cases where data has not been completely abstracted from survey plats and notes due to the complexity of the data, but the data stewards are continually updating the CADNSDI. The third type of accuracy is the attribute consistency and accuracy. The CADNSDI has been through a series of quality checks to catch as many potential coding errors as possible. Each data set varies but in general the attribute accuracy is approaching 99% for most of the data sets.

Why does the geometry stored in the derivative feature classes appear to be incorrect?

In GCDB, attribution is assigned to the parcels in the GMM process. If attributes are incorrectly assigned to the parcel, then the incorrect attributes will perpetuate throughout the derivative datasets. The data stewards are most likely aware of these issues and will address them in ongoing maintenance. The image below represents parcels in the *PLSSTownship* feature class that are actually coded incorrectly in the *PLSSIntersected* feature class, but perpetuated into the PLSS Township layer.



How up to date is the data and when does the database get updated?

The last revised date, which can be found in the *MetadataGlance* feature class and in individual polygons in the *PLSSIntersected* feature class indicate when the data was revised. The publication date in the metadata will indicate the most recent publication date for the entire data set. The data set with the version number 1.1 for most states contains the most currently available data through June 2010. Updates and the procedures for tracking updates and reporting update schedules are continuing to be developed.

Is the BLM responsible for all of the data even though some of it comes from other federal agencies?

The data steward will indicate the authoritative source for the data that is the agency that provided the source data and the agency responsible for updates. The BLM has combined the data from multiple sources into a single data set for convenience of use and access. For the versions that are currently available the BLM Cadastral contact identified in the metadata should be the first resource for questions on the source or content of the data. As the CADNSDI develops it is expected that other federal agencies such as the Forest Service may assume data stewardship for CADNSDI in areas where Forest Service manages the surface rights. But this is speculation and the best approach is to contact the identified data steward in the metadata.

If errors are found how should I go about getting the data corrected?

The data stewards should be contacted if errors are found in the data. For the current data sets the first resource should be the data contact identified in the metadata.

The naming convention is confusing; can we simplify? Can we create GIS friendly attributes and maybe eliminate some attributes that GIS doesn't use?

The naming convention reflects the national Cadastral Data Content Standard. The alias names provide a more user-friendly version of the attribute names. Certainly within a local copy of the data set the GIS user could change the alias names. If there is a particular naming convention that is causing concern this might be a solution, but as the GIS person works with the data and they will become more familiar with the naming conventions provided in the standard. The full PLSS data set has many nuances and subtleties and the naming conventions used in the standard acknowledge these characteristics rather than to simplify the data set and lose some of these important distinctions.

The GIS user can certainly ignore attributes that do not apply to their situation. GIS users could make a copy of the data and delete attributes. However this is not recommended because keeping the copies of data synchronized with the authoritative sources could be difficult. The use of attributes might be an issue of familiarity and we have found as people work with the data the naming convention and attribution begins to make sense.

Which feature class to use? Do GISers really need all of these feature classes?

This depends on your applications. The components of the PLSS have been broken out to allow the GIS user to set scale extents, to add only the data they need and to support symbolization. The data sets can be exported as layer files to simplify use. Also there are two feature classes, the *PLSSReference* and the *PLSSQuarterReference* that simplify the presentation of the data for some applications. Cadastral data is a complicated data theme and the nuances of the content need to be acknowledged. There is supporting educational material available to help the GIS user understand what layers are needed for specific applications.

It is not recommended that the casual user take on the PLSS Intersected feature class. This is the atomic feature class that is similar in some ways to the formerly used Arc Info coverages. The dependent themes are built from the *PLSSIntersected* using many rules for combining and building the dependent data sets. In one sense the derived feature classes are similar to regions that were used with coverages in earlier version of Arc Info.

Where can I find historic survey information that is not contained in the PLSS Second Division or PLSS Special Survey feature class?

It is common for BLM to conduct cadastral resurveys of land for a number of reasons. Resurveys can cause issues in the way legal descriptions have historically been captured. For example, the original survey of the Northeast $\frac{1}{4}$ of the Northeast $\frac{1}{4}$ of Section 1 may have been described as Government Lot 1. A resurvey of that section could change the bearings and distances as well as acreage for Lot 1. The resurvey would then officially rename Lot 1 to Lot 5 and provide the updated acreage for Lot 5. In GCDB, Lot 1 is now considered Historic or Replaced and Lot 5 is the official parcel. The historic or replaced parcels are stored in the PLSS Intersected Feature Class as "stacked polygons", along with the official or current parcel and has a survey note of R indicating that the original land description has been replaced. The current polygon is the only polygon that should be used in the derivative

feature classes (ie *PLSSFirstDivision*, *PLSSSecondDivision*, and *PLSSSpecialSurvey* feature classes.)

PLSS Reference Grid Feature Classes

I don't like the Sections Feature class... first, because it's name "PLSSReferenceGrid" and second, because the section's field name is called "Reference Grid Nominal Location"... rather than "Section"

The feature class is called a reference grid because it is a simplification of the real data and is only intended to be used as a reference. This feature class contains the nominal township and section polygons in one feature class to support simplified mapping and query applications. These feature classes also have an expiration date, indicating that the intent is to have users understand the information sufficiently by a specified date so the need for this feature class can be removed.

The reason that field is called reference nominal location is to acknowledge that this feature class is a simplified representation that contains the areas that are nominally sections even if these areas are not always, technically, called sections. The local user could update the alias to be section for this attribute. We have submitted this comment as a possible update to the alias fields in version 2.

There are a lot of feature classes to weed through and something as simple as "section" is not easily identifiable.

The *PLSSReferenceGrid* feature class is intended to provide the uninitiated user with a simple representation of the “PLSS Squares”. The term section is used in the keywords and in ArcGIS the keywords play an important part in the search. The numbers of feature classes are necessary to represent the PLSS data in the most flexible and useable form as well as to collect the nuances of the cadastral data set.

There appear to be some labeling issues with the PLSSReferenceGrid feature class. When labeling on "Reference Grid Nominal Location", or Sections... There are two labels showing up per section sometimes.

This occurs through the simplification process and is one of the problems with simplifying a very complex data set. In this case there may be nominal locations for multiple polygons that created the stacked polygon situation. Coding geopolitical splits in GCDB is one example that creates this situation. We will examine the processing routines again to see if we can find a way to further simplify this feature class or to remove the stacked “sections” in the PLSS Reference grid feature classes to avoid this situation.

Conflicted Areas

How should a GISer work around conflicted areas?

The conflicted areas are presented so the GIS user knows that some areas are unresolved in the actual survey data. There is not a work around for the conflicted areas which is why they

are included in the data set. For some general applications perhaps conflicted areas can be ignored such as for indexing or symbolization. This may be expedient but the GIS User needs to understand the potential risks of oversimplifying the information by neglecting the conflicted areas.

Survey System and Parcel Feature Classes

The feature classes "Survey System" and "Parcel" do not have any data in them, why is this?

This data set (CADNSDI) in its current versions is the PLSS Reference data based primarily on BLM records. The Survey System and Survey System Division feature classes are primarily for non-federal agencies and they contain the data for Subdivisions and Condominiums. These are essential as reference data for non-PLSS states and for non-federally maintained Cadastral Reference data.

Parcel Core data does exist for many counties in the United States, but parcels are not something the federal government has focused on or addressed. There is a working group developing federal parcel content standards that will eventually, presumably, populate federal parcels in the *NSDICoreParcel* feature class.

Because these feature classes do not have data, in some cases they may not have a defined spatial extent that can cause an error in ArcMap when adding these features to your canvas. Just remove these feature classes from your canvas.

PLSS Township

Can a GIS User update the labels? For example, in the PLSS Township feature class could the labels be updated to include a "T" and an "R" and also zeros. For example, if a record's label is "15N 7W", can it be "T15N-R07W"?

The structure and format of the label field is not specified in the national standard. The convention that is included in the CADNSDI data set was agreed upon several years ago. If the GIS person would like to update or change the content or structure of the label field this can be done in the data or it can be done through the map labels. The map labels will easily build this label because all of the components are in the data set and then the user can set the scale dependencies and symbol set. The resulting labels could also be exported to an annotation feature class.

Why is the PLSS Township number three digits?

The three-digit township and range is necessary of a national standard. However counties and states that only have two digit township and range numbers and do not want to have the three-digit field with the leading zeros have several options. (1) truncate the township and range numbers in the label field, (2) construct a query for a map label that will eliminate the leading zeros, (3) export the labels to an annotation feature class that can be managed independently or linked to the source field, or (4) add another field to the local data set that has a field length of 2 for the township and range numbers.

Metadata at a Glance

What is MetadataGlance feature class?

The *MetadataGlance* feature class represents areas of data stewardship. It will eventually deviate from the *PLSSTownship* feature class as stewardship areas become more refined and are defined below the PLSS Township level. In some states for example, the county manages half of the township and half is managed by the BLM. In that case the metadata at a glance will have two polygons for the *MetadataGlance* and the *PLSSTownship* will have one polygon. This feature class is also useful for symbolizing the last revised date as townships are incrementally updated.

PLSS Intersected

Perhaps the PLSSIntersected data should be maintained and the other data should be created by a dissolve rather than maintaining several different feature classes.

That is exactly what is done. The *PLSSPoints* are the other maintained feature class. The rules for creating the derivative feature classes are quite extensive and involve much more than just dissolve but that is the basic principle.

GIS Quick Start

There are quite a few nuances in this data set. On the face of it the PLSS appears to be a simple system of Townships and Sections dividing the 30 states it covers into six-by-six mile townships with 36 square mile square sections, the actual system on the ground bears on a passing resemblance to this idea.

However a few starting tips make it easier to get the GIS users up and running.

Starting Layers

Navigate to the CADNSDI Geodatabase and the Cadastral Reference Feature Data Set. These are the Feature Classes for the PLSS.

Add Township lines to your ArcMap canvas:

Right click on the *PLSSTownship* feature class in the table of contents and set the symbology properties to no fill and set the outline color to gray 50% and the line width to 2. Set the display to about 50% transparency. Verify that the township label field is TWNSHPLAB.



Figure 1 - PLSS Township Outlines with Labels

Add Section lines:

The *PLSSFirstDivision* feature class is the sections and other types of divisions that divide the PLSS Townships.

Again symbolize as an outline or hollow, select a color for the outline, a light red or coral works pretty well and verify that the label field is the “First Division Label.”

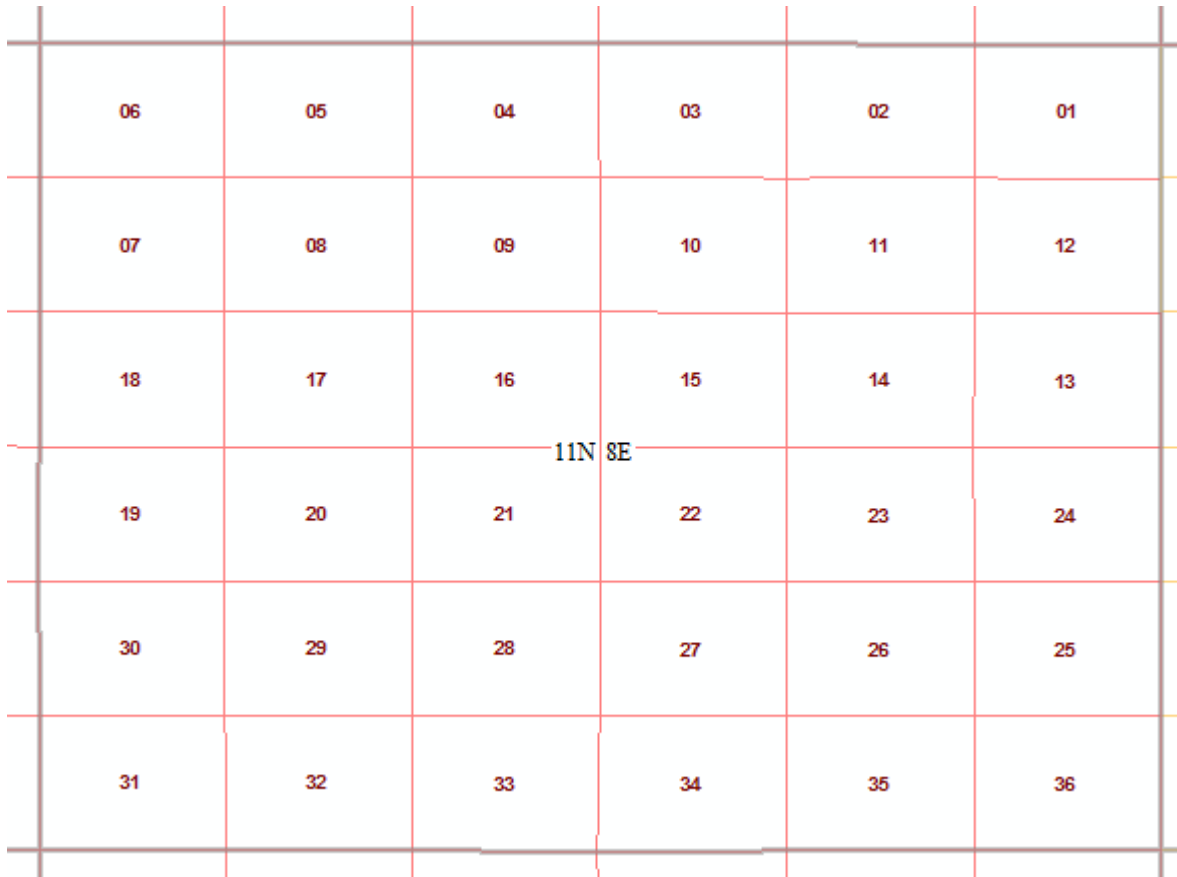


Figure 2 - PLSS First Division Outline with Labels

There are some variations with these two feature classes that can illustrate the data set a little more. If the PLSS Townships are symbolized on the SURVTYP field, the townships that have not been surveyed, i.e. protracted as well as the unsurveyed and unprotracted townships can be outlined with slightly lighter gray or even dashed lines.



Figure 3 - PLSS Township Outlines Symbolized by SRVTYP

Another variation is to symbolize the first divisions by FRSTDIVTYP.

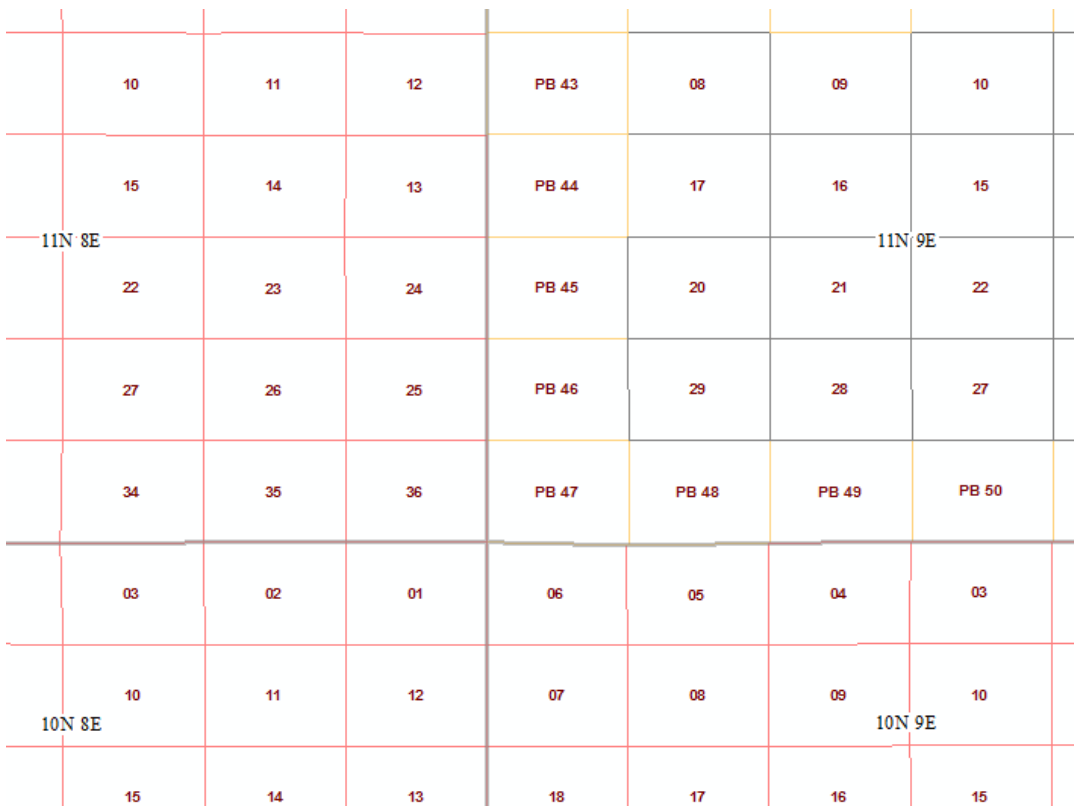


Figure 4 - First Division Outlines Symbolized by FRSTDIVTYP

Add Section subdivision lines:

The *PLSSSecondDivision* feature class is used to draw aliquot parts and further subdivisions. Again symbolize as hollow and color the outline a gold with a line weight of 1 and check that the label field is the SECDIVLAB.

A typical township might look like as shown in Figure 5

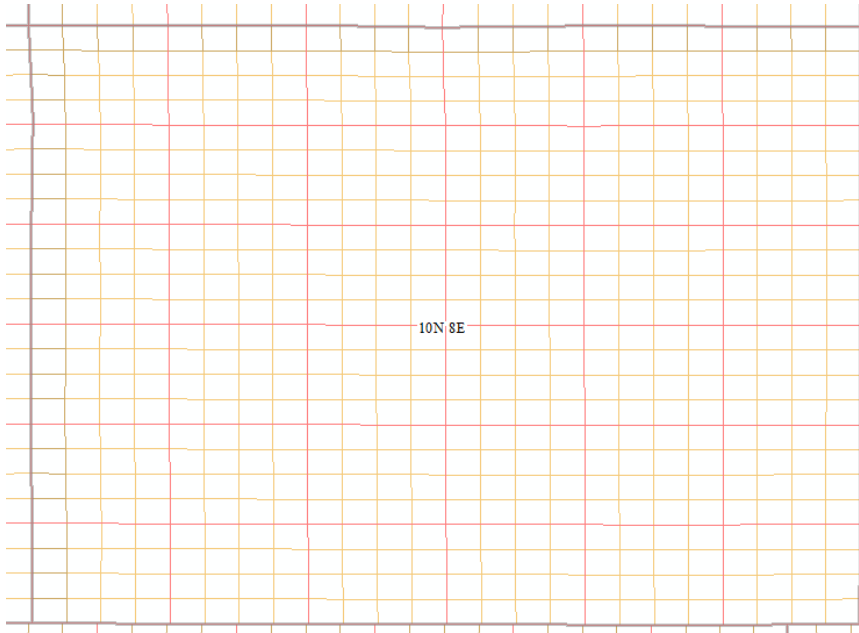


Figure 5 - PLSS Township with First and Second Division Outlines

Zooming in to the northwest portion with the labels on it might look as shown in Figure 6.

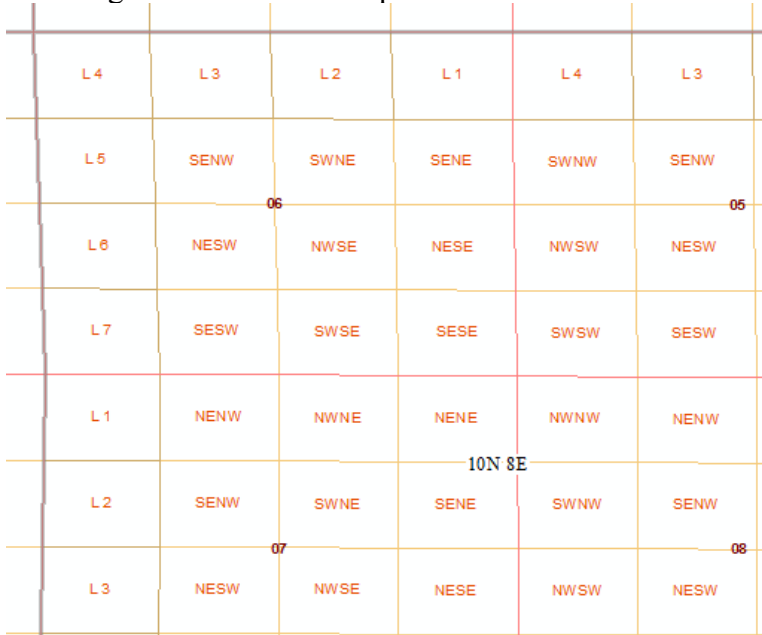


Figure 6 - Zoomed in View of Figure 5

the table of contents for these three feature classes (PLSS Township, First and Second Division) might look as shown in Figure 7 when symbolizing on the *PLSSSecondDivision* feature class.

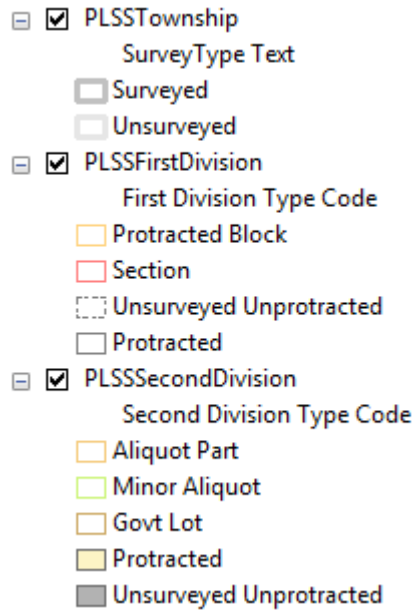


Figure 7 - ArcMap Table of Contents

And now as you look around the data set you will begin to see some of the nuances of the PLSS data set. There will be areas with no second divisions. This is because these areas have not been subdivided in the PLSS data set. There will be sections divided into many lots (Shown in Figure 8) and there will be surveyed “islands” where only one section or only a portion of a section has been surveyed and the areas around it are protracted.

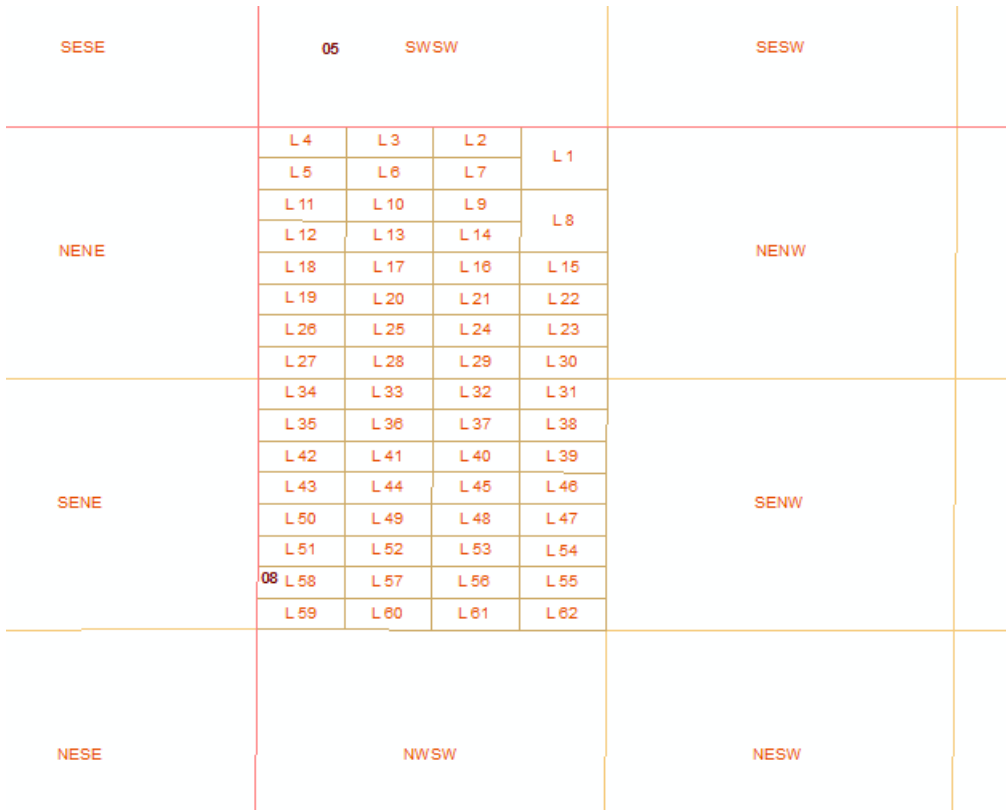


Figure 8 - Section Divided into Lots

Adding Meandered Water:

The *MeanderWater* feature class is used to show meandered water bodies. This can be symbolized with the Lake symbol set to about 50% transparency.

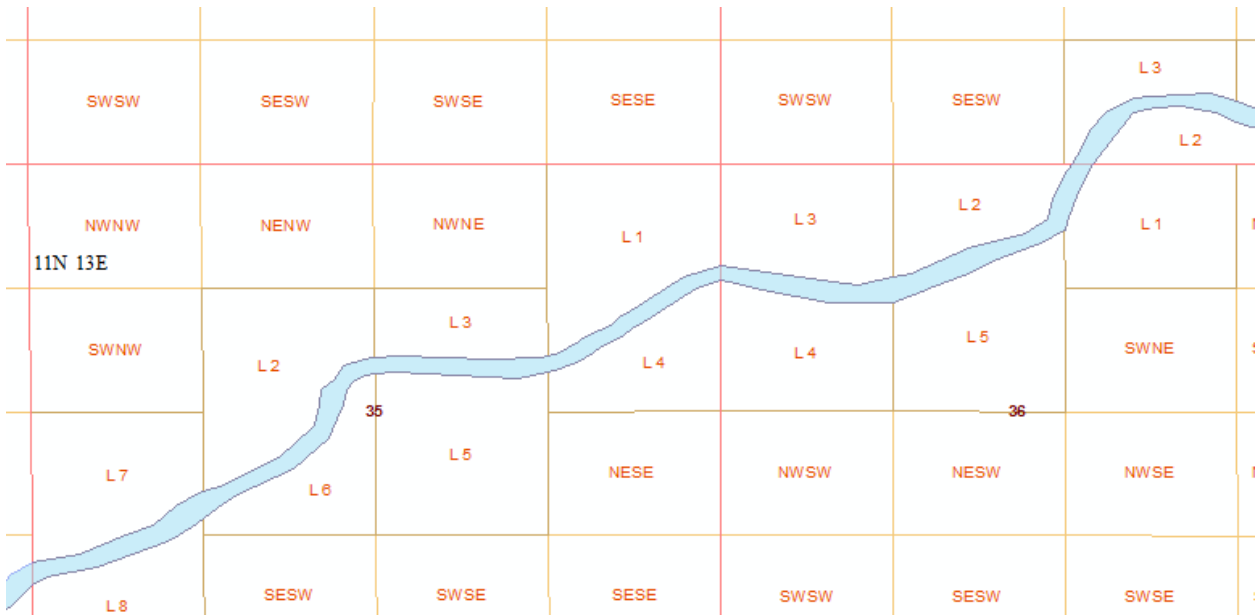


Figure 9 - Meandered Water with PLSS Rectangular Features

Other Layers

The *PLSSSpecialSurvey* feature class is the next feature class to add and again it can be symbolized according to the survey type, it might be hollow to illustrate the overlapping special surveys or it might be a transparent fill. There are many display options as other feature classes are added depending on the project or map requirements.

The *PLSSReferenceGrid* and *PLSSQuarterReference* are two feature classes that can be used for relatively quick mapping referencing.

The *PLSSReferenceGrid* has computed “nominal” sections and combined them with PLSS Townships. This simplifies the data but the data is not exactly correct from a true PLSS Labeling and polygon identification perspective. For example Protracted Blocks are identified as section divisions. Figure 10 shows the *PLSSReferenceGrid* with the *PLSSTownships* and *MeanderedWater*.

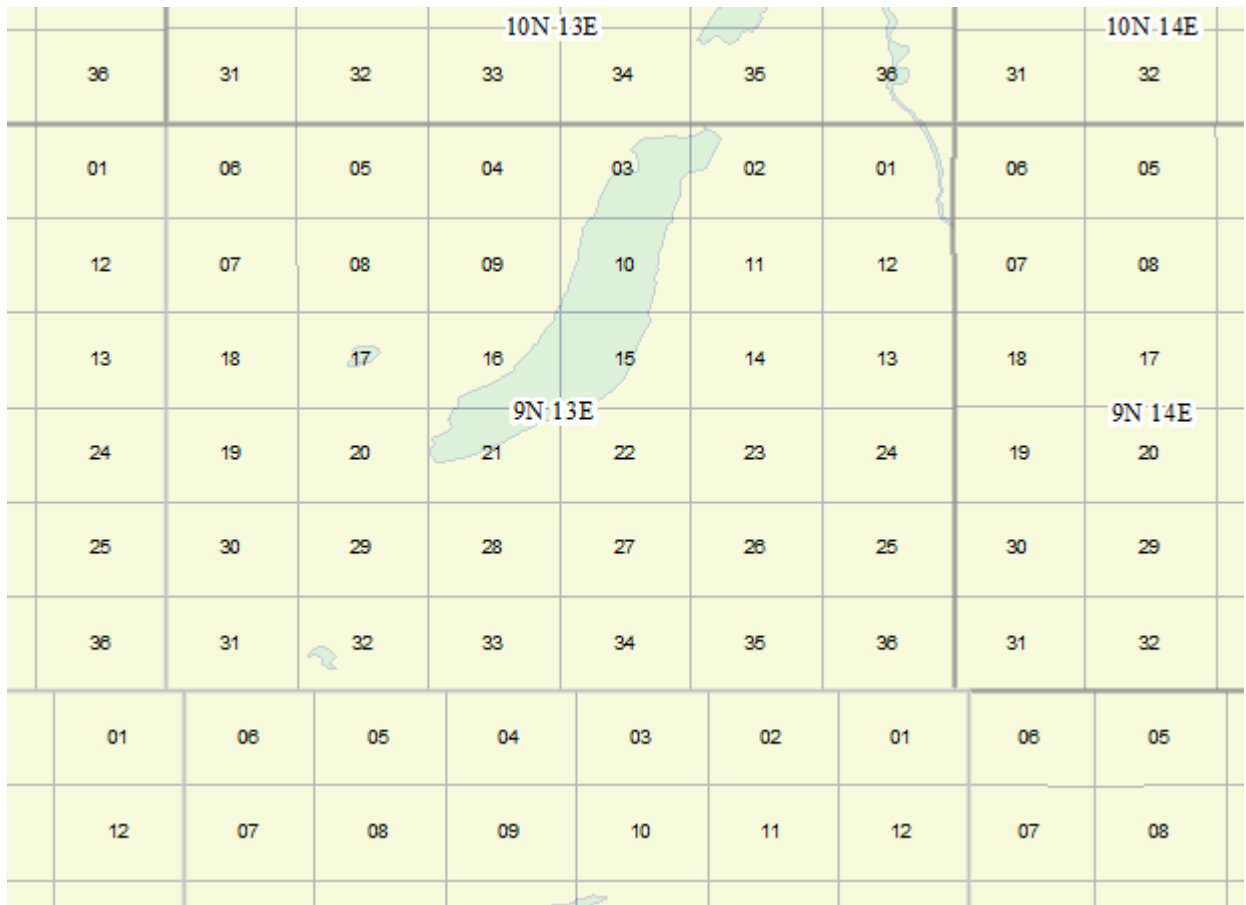


Figure 10 - PLSS Reference Grid with PLSS Townships and Meandered Water

In Figure 11 the *PLSSFirstDivision* is added to the PLSS Reference Grid for comparison. So while the *PLSSReferenceGrid* feature class may be simplified, it does not capture some of the important nuances of the PLSS as can be seen in Figure 11.

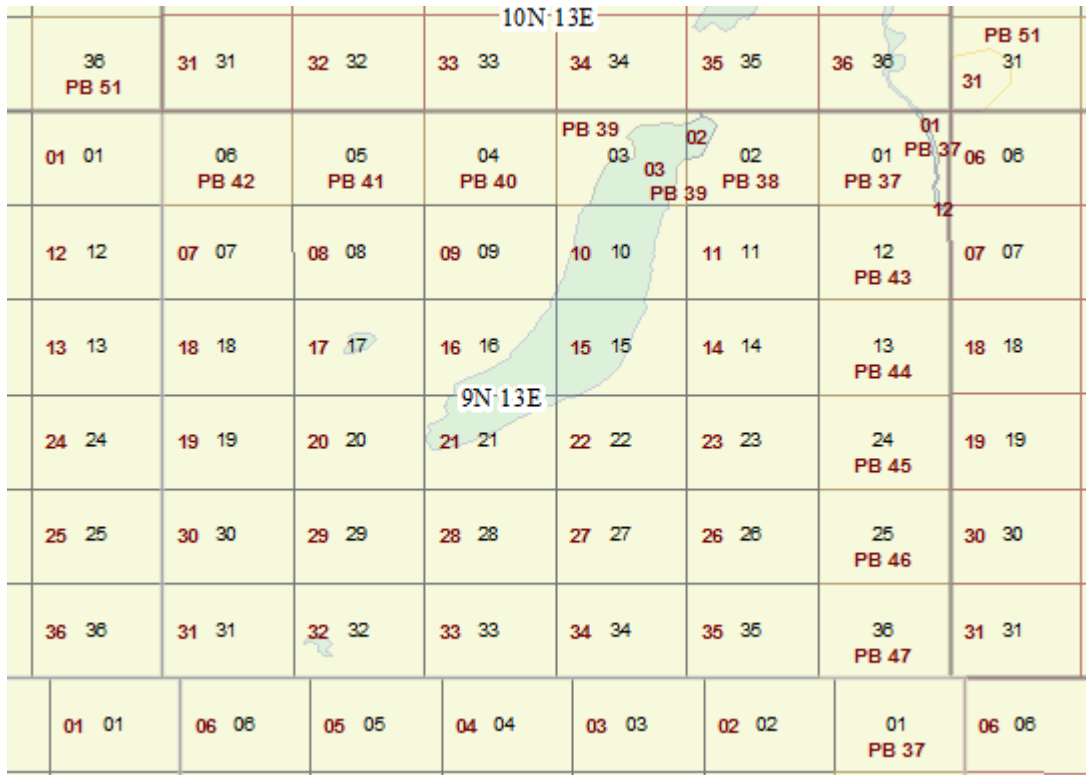


Figure 11 - PLSS Reference Grid with PLSS First Division

Similarly the *PLSSQuarterReference* “nominally” divides the “sections” into quarters.

The two reference feature classes have an expiration date because it is expected as GIS users become more familiar with the correct representation of the PLSS, there will be less dependency on these simplified mapping representations.

Key Concepts and Definitions

The Public Land Survey System (PLSS) concepts and terms

The Public Land Survey System (PLSS) is a way of subdividing and describing land in the United States. All lands in the public domain are subject to subdivision by this rectangular system of surveys, which is regulated by the U.S. Department of the Interior, Bureau of Land Management (BLM).



The PLSS is used to divide public domain lands, which are lands owned by the Federal government for the benefit of the citizens of the United States. The original public domain included the land ceded to the Federal Government by the thirteen original States, supplemented with acquisitions from native Indians and foreign powers. It encompasses major portions of the land area of 30 southern and western States.

A brief history and basic concepts and terms describing the components of the PLSS can be found in the national atlas [PLSS summary](#)².

A more complete history of the PLSS and discussion of the components of the PLSS and the role BLM has played in the development and maintenance of the PLSS can be found at the BLM Cadastral Survey web site. [BLM Cadastral Survey Web Site](#)³

Manual of Instructions 2009

The Land Ordinance of 1785 established the Public Land Survey System (PLSS), and the first nationwide official Manual was distributed in 1855. The most recent manual of instructions, [the 2009 edition](#)⁴, is the 9th Manual circulated.

² The Public Land Survey System (PLSS) http://www.nationalatlas.gov/articles/boundaries/a_plss.html last accessed March 2011

³ The BLM Cadastral Survey Web Site can be found at this link http://www.blm.gov/wo/st/en/prog/more/cadastralsurvey/cadastral_history.html last accessed March 2011

⁴ The web site for the 2009 Manual of Instruction can be found at this link <http://www.blmsurveymanual.org/> last accessed March 2011

The Manual has guided the original surveys and resurveys of the Public Lands, first through the General Land Office, and since 1946, through the Bureau of Land Management, Department of the Interior. While not written specifically for non-Federal surveyors, the principles contained in the Manual on the subject of retracement are an integral part of private surveying in the 30 Public Land States. Further, many States have formally adopted the Manual in statute, rule, and/or case law as guidance for private licensed surveyors. Thus, the book is a fundamental piece of the complex subject of boundary surveys here in the United States.

Authority and Authoritative Sources (2008)

[Authoritative and Trusted Sources](#)⁵ are terms used with cadastral data. Because of the legal issues related to ownership and rights in land, the use of the terms *authority* and *authoritative* for cadastral data need to be clearly articulated. Similarly the term *trusted source* defines an Internet publication source for cadastral data that is recognized and acknowledged by the authoritative source of the data. The vision for the National Spatial Data Infrastructure (NSDI) and the Cadastral data within the NSDI is to have local sources of *authoritative cadastral data* that is controlled and managed by designated [data stewards](#)⁶. Data Aggregators or Integrators compile and combine the data as a trusted source at state or regional levels to facilitate access to the data.

Production, Publication and Project Data

The different types of GIS data include [Production, Publication and Project Data](#)⁷. When users and producers are discussing sharing data these concepts can cause considerable confusion. *Production Data* is the “master” database that is managed by the data steward for their daily business operations, maintenance and updates; *Publication Data* is a subset of the *Production Data*, it is designed to meet 95% of the user community needs, it is structured to support consumer and business needs and is not intended to support maintenance operations; *Project Data*, as the term implies, is additional information needed for a “project” that includes a specific data requests identified from the publication data. Requests for project data are directed to the data steward.

Standards

The Federal Geographic Data Committee (FGDC) Subcommittee on Cadastral Data (Subcommittee) has developed content and implementation standards for the PLSS. The Subcommittee’s standards can be divided into production and publication standards. The Cadastral Data Content Standard is the production standard while the remaining standards are focused on standards for publication. The BLM Point ID Standard is critical for allowing users to uniquely identify corners in the Public Land Survey System (PLSS) and to share this data. The

⁵ FGDC Cadastral Data Subcommittee, *Authority and Authoritative Sources: Clarification of Terms and Concepts for Cadastral Data*, August 2008, <http://www.nationalcad.org/showdocs.asp?docid=1045&navsrc=Report&navsrc2> last accessed March 2011

⁶ FGDC Cadastral Data Subcommittee, PLSS Stewardship, December 2010, <http://www.nationalcad.org/showdocs.asp?docid=1159&navsrc=Project> last accessed April 2011

⁷ FGDC Cadastral Data Subcommittee, *Parcel Data: Production, Publication and Project Data*, Internet, 2008, <http://www.nationalcad.org/showdocs.asp?docid=1064&navsrc=Project> last accessed March 2011

Cadastral NSDI Reference Document describes the publication standard for both the PLSS and parcels. It was found that the user community was usually concerned with either the PLSS or parcels but not both so two documents are being developed, the Cadastral NSDI Reference for Core Parcel Data was written to describe the parcel data publication standard and the Cadastral NSDI Reference for Corners of Common Control is a work in progress.

Cadastral Data Content Standard

The FGDC Standard Reference Model, *Cadastral Data Content Standard for the National Spatial Data Infrastructure, Version 1.4, Third Revision*⁸, (Content Standard) was created to address all conditions for surface and subsurface rights and interests in the United States. The target audiences for the Content Standard are database managers, system developers and designers. The format of the standard (semantic definitions), which is dictated by the FGDC Subcommittee standards process, can be daunting to read. Normally such a database is better expressed in terms of an entity relationship diagram. The Florida Department of Revenue's [Florida Parcel Data Model](#)⁹ is one expression of the standard that is in this more familiar format. Nancy von Meyer's book, *GIS and Land Records: the ArcGIS Parcel Data Model*¹⁰, provides a guide for implementation of the Cadastral Standard.

PLSS – BLM Point ID Standard (2006)

The standardized data includes a consistent and standardized method for identifying corner features following the [BLM Corner ID Standard](#)¹¹. The publication of corners with this ID supports the Cadastral NSDI development and enhances data sharing and data integration. The [Wisconsin Corner Point Identification System](#)¹² provides an example a state implementation of a unique corner identification system that is consistent with the principles of the data content standard but differ from the BLM's implementation.

Production – Operation and Maintenance

The procedures for data creation and maintenance vary among the data stewards. The publication format described in the CADNSDI is an effort to standardize the information produced by many data stewards into a national standard format that can be consumed by all users. Because much of the data in the first versions for the CADNSDI for the PLSS originate

⁸ FGDC Cadastral Data Subcommittee, *Cadastral Data Content Standard for the National Spatial Data Infrastructure, Version 1.4, Third Revision*, Internet, May 2008,

<http://www.nationalcad.org/showdocs.asp?docid=1037&navsrc=Standards&navsrc2=> last accessed March 2011

⁹ Florida Department of Revenue, *Florida Parcel Data Model*, FGDC Cadastral Data Subcommittee, Internet, 2006, <http://www.nationalcad.org/showdocs.asp?docid=165&navsrc=Search&navsrc2=>, last accessed March 2011

¹⁰ Nancy von Meyer, *GIS and Land Records, The ArcGIS Parcel Data Model*, ESRI Press, 2004

¹¹ Bureau of Land Management, *Geographic Coordinate Database (GCDB), Publication Point ID's*, FGDC Cadastral Data Subcommittee, Internet,

<http://www.nationalcad.org/showdocs.asp?docid=157&navsrc=Standards&navsrc2=>

¹² *Wisconsin Corner Point Identification System*, Wisconsin Department of Natural Resources, FGDC Cadastral Data Subcommittee, Internet, 2006, <http://www.nationalcad.org/showdocs.asp?docid=156&navsrc=Report&navsrc2=> last accessed March 2011

from the BLM cadastral Survey there are two background documents on BLM operations that may be valuable background references.

BLM GCDB

The Bureau of Land Management (BLM) Geographic Coordinate Data Base (GCDB) is a collection of geographic information representing the Public Land Survey System (PLSS) and some Non-PLSS surveys of the United States. The GCDB information is computed from BLM survey records (official survey plats and field notes), local survey records and geodetic control information. The GCDB data, combined with PLSS alternate source data, is being used by many Federal agencies, local governments and private companies as the framework for their in-house geographic information system (GIS) systems. For more information on this program refer to the [GCDB Home Page](#).¹³

GCDB Users Guide

The [GCDB User's Guide](#)¹⁴ has been compiled to give the novice user an introduction to the Geographic Coordinate Data Base (GCDB). The guide familiarizes the user with the corner identification used in the output files created by the Public Land Survey System Coordinate Computational System (PCCS) software, and by GCDB Measurement Management (GMM) software, and their functionality. The GCDB was developed to render the most dependable coordinates available for the U.S. Public Land Survey System (PLSS) corners from BLM Survey Plats and Records data. To satisfy the need for more accurate and more complete set of coordinates of the PLSS corners, a system of computer programs, PCCS and GMM have been developed by the BLM to compute the geographic coordinates of PLSS corners using official cadastral survey record data and to provide an estimate of the approximate relative position coordinate dependability.

Information on the codes and coding as well as the adjustment and computation process that most states use can be found in the User's Guide.

¹³ The BLM Cadastral Survey GCDB Home page can be found at this link <http://www.blm.gov/wo/st/en/prog/more/gcdb.html> last accessed March 2011

¹⁴ The GCDB User's guide as hosted by the BLM Colorado State Office can be found at this link http://www.blm.gov/co/st/en/BLM_Programs/geographical_sciences/cadastral/gcdb/gcdb_users_manual.html last accessed March 2011

Application of Concepts to the Standardized Data

The PLSS may appear to be a relatively simple system of hierarchical squares but in fact it is a very complex and highly variable system. For every rule there are a myriad of exceptions. For example the simple fact that all PLSS Townships are defined as being north or south of a baseline is not even universally true as there are many PLSS Townships that are referenced East and West.

One of the most common misconceptions about the PLSS is that it covers all thirty states with a continuous and uniform grid of six-mile squares that are then further divided into one-mile squares. This couldn't be further from reality. The PLSS is *NOT* a mathematical system, it is a legal land division that is defined by corners on the ground that were established according to sets of instructions to surveyors that evolved over time. The "rules of engagement" for land surveyors establishing the PLSS changed as the PLSS evolved. What was true in one area may be different in another.

The following sections describe how this highly nuanced data has been developed into a standard data set and explains some of the reasons why the feature classes are defined as they are. The four most asked about topic areas are described in this section. If an apparently unusual situation exists in the standardized data set, ask the data steward identified in the data set before presuming the anomaly is an error.

Rectangular versus non-Rectangular

The PLSS is not all rectangular. There are important components of the PLSS that are irregular or non-rectangular. The rectangular PLSS is a simultaneous land description meaning that all of the lands covered by a rectangular survey were described in one survey and all of the lands within that described area of equal standing, meaning there are no junior or senior rights. The condition is commonly called a simultaneous conveyance in the parlance of land surveyors but it isn't a conveyance as much as it is a land description.

The elements of the rectangular PLSS are described in Chapter 3 of the 2009 BLM Manual of Instructions¹⁵. These are surveys where the PLSS contains elements that are defined with the nested hierarchy. An irregularly shaped PLSS Township, fractional townships and half townships are all rectangular surveys.

Another important characteristic of rectangular surveys is that lost corners can be re-established using proportionate measures. This is because of the simultaneous nature of the land description and is similar to what happens with lot and block corners in an urban subdivision.

Non-rectangular PLSS surveys are called special surveys. They are described in Chapter 10 of the BLM Manual of Instructions, 2009 edition.

¹⁵ The BLM 2009 Manual of Instructions is not available in digital form but information on ordering the Manual can be found at this link <http://www.blmsurveymanual.org/> (last accessed April 2011)

10-1 Special surveys are surveys that involve unusual applications of or departures from the rectangular system. They often carry out the provisions of a special legislative act. A particular category of special surveys focuses on various types of water boundaries. In some cases, the special instructions merely expand the methods outlined in chapter III. In more complicated special surveys, the methods must be carefully detailed.

The following discussion illustrates what is to be emphasized in the special instructions for each type of special survey.

Tracts, Lots, and Parcels

10-2 Special surveys may involve areas of land that are not aliquot parts of sections but are designated as tracts, lots, or parcels. In common usage, the term "tract" is applied to an expanse of land of no particular size, often irregular in form. In modern Federal land surveys, the term is used specifically to mean an expanse of land that lies in more than one section or that cannot be identified in whole as a part of a particular section. It is properly described by tract number and township. Tracts within a township are numbered beginning with 37 or the next highest unused numerical designation to avoid confusion with section numbers. Tracts that have been segregated in the course of an independent resurvey are treated as described under that subject.¹⁶

In this section the Manual of Instructions is indicating that special surveys are created when it is necessary to protect an existing interest or pre-existing condition, when particular rights or interests have been designated by legislation and require a special surveying method or to separate federal interests from private or other non-federal interests.

In most cases the special surveys create “holes” in the rectangular data. That is, in areas where a special survey is created the underlying rectangular information is either no longer valid or never existed. There are some exceptions, as there are with all things cadastral.

In Figure 12 there is an apparent “hole” in the rectangular survey. This is an area where special surveys were conducted to protect pre-existing private interests. These may have been settlements or claims that existed prior to survey or interests that were conveyed using rectangular surveys that were vacated and the subsequent corrected rectangular survey protected the pre-existing rights and interests.

¹⁶ IBID – Chapter 10

uplands from the water. The meander line is not necessarily the current shoreline and is not intended to change or update as the water body changes. It is a line run at the time of survey.

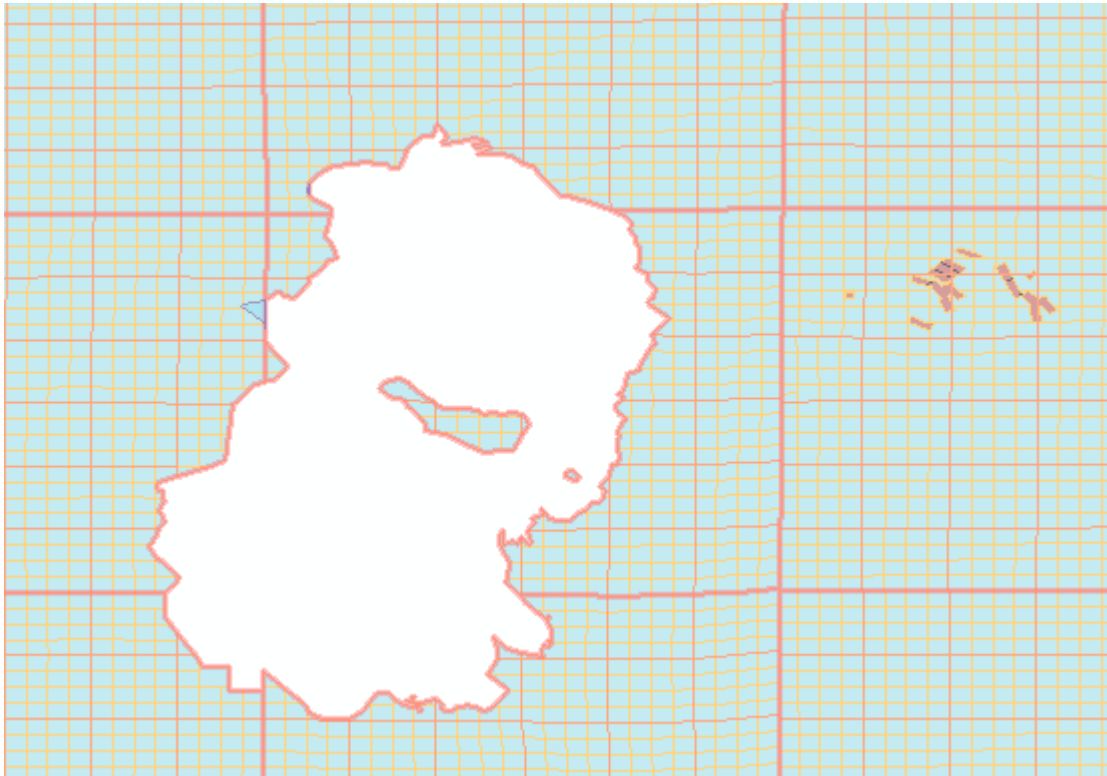


Figure 14 - Meandered Water Body

Notice in Figure 14 the island in the water body does have rectangular surveys.

To summarize the general rules for PLSS rectangular versus PLSS non-rectangular surveys are:

General Rules for the Rectangular PLSS

- The rectangular survey is a simultaneous conveyance
- The polygons are created as a nested hierarchy with no internal junior or senior rights
- Surveys are not segregated
- Lost corners within rectangular surveys can be re-established by proportionate methods because of equal rights among polygons

General Rules for Non-Rectangular PLSS or Special Surveys

- They protect an existing private right
- They carve out a new right
- They may be measured by metes and bounds and may have crossing closing corners
- They have a junior/senior right relationships for rights among themselves and with the rectangular PLSS
- They may be segregated

Nominal Locations

In the early days of automated land records and GIS a system for land descriptions in the BLM called Legal Land Descriptions (LLD) coded the rectangular PLSS into a text file and superimposed the PLSS Rectangular grid in areas where the PLSS Rectangular survey did not exist along with text coding for those areas. The LLD data set attempted to define a “nominal location” which is a 1/16th or quarter-quarter part of every section and to define sections and townships across all of the BLM managed lands. This created a text based and description grid that could be used to “nominally” plot or locate land descriptions in BLM land records. Another database system in the BLM called CASE records then used the entries in the LLD data set to provide a location for record documents that reflected the legal description in the document.

Early on GCDB perpetuated the nominal descriptions in LLD by providing a polygon for the LLD nominal locations and creating a grid location for non-rectangular PLSS surveys. These nominal locations are still present in much of the CADNSDI data and will be found in areas where the rectangular PLSS extends through non-rectangular surveys such as water. This will be particularly evident in the *PLSSIntersected* feature class.

Segregated Surveys and Lotting

Segregation is the process of defining lots (sometimes called government lots) around a non-rectangular PLSS survey to provide land descriptions for land that does not follow the regular quartering and halving for aliquot parts but are still lands in the rectangular PLSS land description system. Figure 15 shows lotting against two tracts.

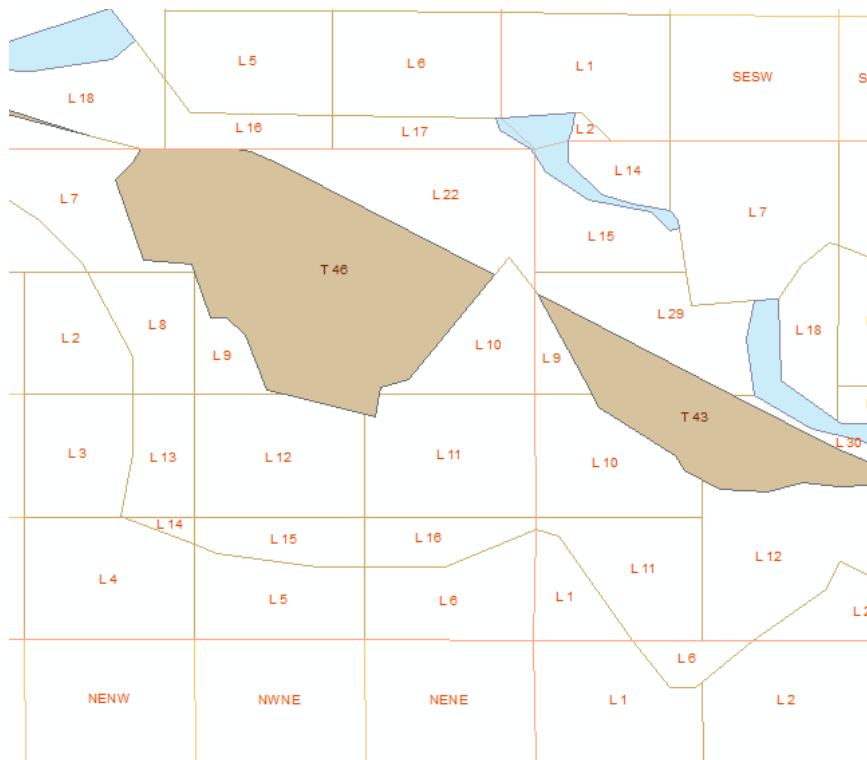


Figure 15 - Lotting Around Tracts

The two tracts shown in Figure 15 (tracts 40 and 43) have government lots (the numbered polygons with the leading L). These lots segregate the tracts from the regular aliquot parts, seen along the bottom edge in Figure 15. The lots will have more or less than the expected 40 acres in a normal 1/16th and will have an irregular or non-rectangular boundary.

The other common use of lotting is on the closing boundaries of townships, typically the north and west boundary but not always. Figure 16 shows the “regular” or non-segregation lotting in a PLSS Township.

Section 36		9N 1E		Section 31		Section 32		Section 33					
NWSE	NESE	L3	NESW	NWSE	NESE	NWSW	NESW	NWSE	NESE	NWSW	NESW	NWSE	NESE
9N 1W		L4	SESW	SWSE	SESE	SWSW	SESW	SWSE	SESE	SWSW	SESW	SWSE	SESE
L2	L1	L4	L3	L2	L1	L4	L3	L2	L1	L4	L3	L2	L1
SWNE	SENE	L5	SENW	SWNE	SENE	SWNW	SENW	SWNE	SENE	SWNW	SENW	SWNE	L5
Section 01		Section 06		Section 05		Section 04							
NWSE	NESE	L6	NESW	NWSE	NESE	NWSW	NESW	NWSE	NESE	NWSW	NESW	NWSE	L6
SWSE	SESE	L7	SESW	SWSE	SESE	SWSW	SESW	SWSE	SESE	SWSW	SESW	SWSE	L7
NWNE	NENE	L1	NENW	NWNE	NENE	NWNW	NENW	NWNE	NENE	NWNW	NENW	NWNE	NENE
SWNE	SENE	L2	SENW	SWNE	SENE	SWNW	SENW	SWNE	SENE	SWNW	SENW	SWNE	SENE
Section 12		Section 07		Section 08		Section 09							
NWSE	NESE	L3	NESW	NWSE	NESE	NWSW	NESW	NWSE	NESE	NWSW	NESW	NWSE	NESE
8N 1W		8N 1E											
SWSE	SESE	L4	SESW	SWSE	SESE	SWSW	SESW	SWSE	SESE	SWSW	SESW	SWSE	SESE
NWNE	NENE	L4	NENW	NWNE	L3	NWNW	NENW	NWNE	NENE	NWNW	NENW	NWNE	NENE
SWNE	SENE	L5	L6	L7	L8	SWNW	SENW	SWNE	SENE	SWNW	SENW	SWNE	SENE
Section 13		Section 18		Section 17		Section 16							
NWSE	NESE	L1	NESW	NWSE	NESE	NWSW	NESW	NWSE	NESE	NWSW	NESW	NWSE	NESE
SWSE	SESE	L2	SESW	SWSE	SESE	SWSW	SESW	SWSE	SESE	SWSW	SESW	SWSE	SESE

Figure 16 - Non-Segregation Lotting in a PLSS Township

The lots, labeled with an “L” preceding the number are generally along the north and west boundary of the township, but notice that there is also lotting internal to sections 18 and 4. These areas will be notably greater or less than 40 acres. From the survey plat perspective where these lots have been identified the underlying “nominal” 1/16th part, such as the Northwest of the Northwest of Section 6, T 8N, R 1E, known also as NWNW, Section 6, T8N, R1E, does not exist. A land description for this 1/16th nominal may be included in the BLM’s LLD data set and it will also be in the *PLSSIntersected* if it was collected by GCDB, but it will not be in the standardized CADNSDI.

CADNSDI Description

This section describes the structure and components of the CADNSDI geodatabase.

Overview – Versions Revision Vintage

Version

A version is a specific form or variation of something. For the standardized Public Land Survey System (PLSS) data, CADNSDI, the version is the definition of the format and structure of the standardized data set. The version number for the PLSS CADNSDI data set reflects the version of the standardized data template. It is the first number in the data set version/revision number. The first CADNSDI data set for a state will be version 1.0. This means the data structure follows the standard template version 1 and this is the first published data content for the state in the standardized format.

There is currently one standardized template version, version 1. There is a second version of the standardized template (version 2) in development that corrects some of the aliases including spelling errors and updates one or two attributes. This version is still in review, but the changes are primarily cosmetic and will not affect the functional operation of the standardized data

Revision

A revision is to alter something already published to make corrections, improve, or update. For the PLSS CADNSDI the revision is defined when the entire data set is reprocessed to update coding, improve the definition of features or update data content. The revision number for the PLSS CADNSDI data set reflects the sequence of the entire data set processing. The revision number is the number following the decimal point. For example the first data sets in any version will be .0, for example version 1.0. If the entire state is reprocessed to update a significant proportion of content, improve the data processing to define features or change the way processing rules are applied to the data set to reflect new coding rules, the data set is assigned a new revision such as version 1.1 or 1.2. Many of the initial data sets for the CADNSDI have been reprocessed to reflect refinements in how survey type codes are applied.

Vintage

The vintage is the year or place in which something is produced. For the PLSS CADNSDI the vintage of the complete data set is *published date*, which is found in the metadata. The vintage of individual features is described by attribution in the feature class Metadata at a Glance called revised date. A change in the vintage does NOT change the file name, or the version or the revision. The vintage date will not be stored as part of the CADNSDI file name, but will be found in the metadata and the *MetadataGlance* feature class. In the future when updates are made to CADNSDI data sets, the entire state will not be reprocessed, only the areas that have new or updated information will be changed. In these cases the vintage for the data will be found in the *revised date* for the features. The vintage of the entire data set will remain the published date. The publication date will be updated when any information in the data set is updated.

Overview Data Structure

The CADNSDI geodatabase is a publication data structure and is a physical implementation of the FGDC Cadastral Data Content Standard. As a physical implementation it has been de-normalized, which means that some of the data is repeated across feature classes and codes and their descriptions are included together in the feature classes. The de-normalization makes it easier for users less familiar with the database tables and GIS to use the data and it may in some cases increase the speed and decrease the complexity for end users.

The structure of the CADNSDI is not optimized for production, i.e. operation and maintenance. For data producers the data should be structured to support editing and data quality assurance tools. These same tools should be able to automatically generate the formats for publication from the production data sets. As examples, in the production data set the attribute information about parcels may be managed in a real estate tax data system and the GIS may have only the parcel number. The attributes and the geometry would be joined and standardized for publication. Similarly in the Cadastral Reference Feature Data Set, the attributes for labeling and identifying PLSS Townships (State, Principal Meridian, Township and Range) could be stored in a related table and not repeatedly entered and then joined and extracted for the publication data set.

At the root level of the geodatabase there are three components.

Cadastral Reference Feature Data Set

This feature data set contains the data for the framework or structural framing for the description and indexing of landownership or land management parcels. The cadastral reference data does not define specific parcels or rights and interests; it provides the control or reference for describing parcels and rights and interests. Typically the cadastral reference information changes much less frequently than the parcel data and in many organizations the cadastral reference is maintained by a different group than the parcel data.

Parcel Feature Data Set

This feature data set contains the information on the core parcel information, which is the core parcel data representing the delineation of parcel information and associated core attributes. This data set is not populated for information originating from federal agencies, but it is available and used for states that have acquired local parcel data. Eventually it is expected that there will be a federal parcel feature and a state owned lands feature class in the feature data set to represent the federal and state managed lands. These feature classes will have different attributes than the core parcels for privately owned lands.

Attribute Tables

The attribute tables all start with LU_ and provide look up tables for coded values in the feature classes. These codes with their code descriptions are provided as root level tables because

- It is easier for data consumers to view the table contents without requiring opening a domain of values.
- Some of the coded value tables have three or four columns providing additional detail about the coded values and domains only allow for two columns (the code and description)
- The tables can be helpful in translating incoming data into standardized codes and may be easier to manipulate as tables rather than domains.
- The content of the tables could be imported into domains if a data producer wanted to use the domains in their production systems.
- Listing the codes and descriptions in tables is potentially less vendor dependent than vendor specific domain of values implementation.

The feature classes coded values are accompanied with the code description so the listings in the LU tables is not necessary to consume the data set.

There are some underlying principles and practices that permeate all of the feature classes.

Data Stewards and MetadataGlance Feature Class

The data steward is the authoritative source for the PLSS data. The data steward is identified for *every* polygon and then is selected out through a series of combines and dissolves in the *MetadataGlance* feature class. The largest polygon in the *MetadataGlance* feature class is the PLSS Township, but as the data stewards evolves the granularity of the data stewardship definition will increase. In the data set metadata a primary contact is identified for the entire data set and this data set contact should be the first point of contact for any questions on the data content.

Figure 17 shows the *MetadataGlance* feature class for a portion of Idaho. The Data Steward symbolizes the polygons.

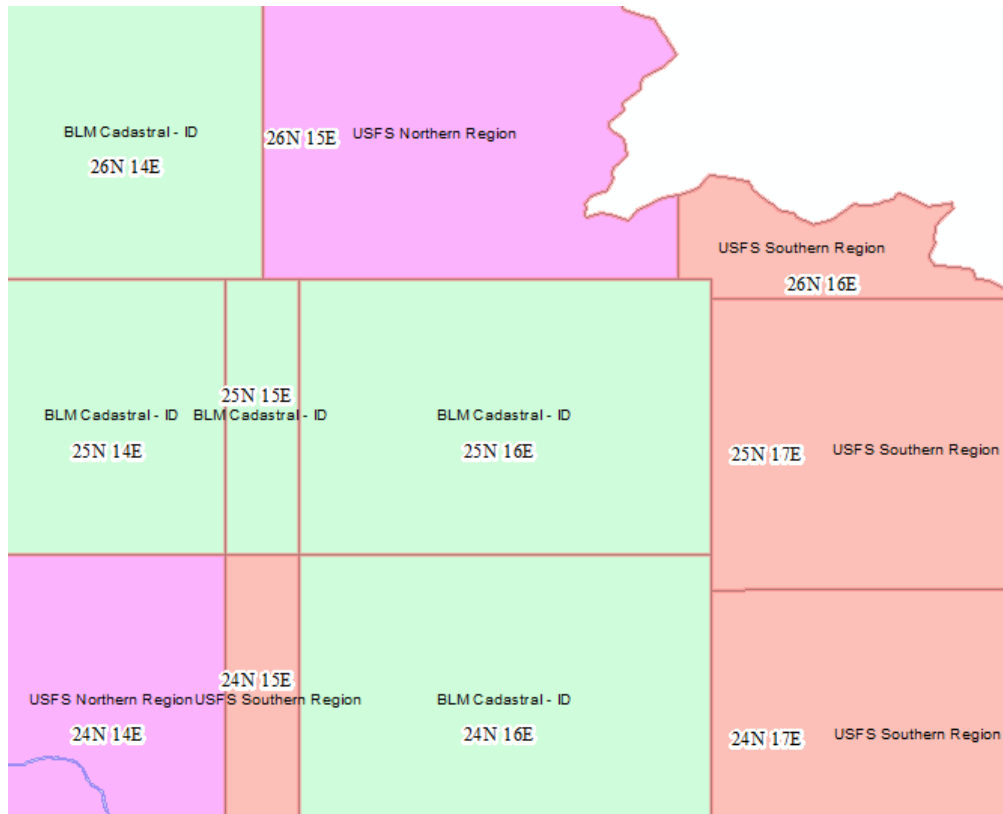


Figure 17 - *MetadataGlance* Symbolized by Data Steward

Polygon Identification Codes

Every polygon in the standardized data has a unique identifier or identification code. These identifiers are “intelligent” in the sense that they are built from the polygon type and location. The Subcommittee recognized that a sequentially assigned non-intelligent identifier is a preferred approach in database design references and texts, but given the volume of existing data, the preferences of users, and the challenge in building a nationwide systematically assigned non-intelligent identifier that would be recognized by the multitude of data producers would be difficult and costly to build and then effectively maintain. Many states and local government have internal identifiers that can be used to construct the national standard identification code.

Revised Date

The revised date is used to indicate the last date a record was changed. It is not the capture or survey date, it is the date the digital record was last updated. Because the current practice is to update entire townships at one time, the date revised is captured in the *MetadataGlance* feature class for the entire township. It may also be possible to only update the special surveys or a portion of the township, but the tools and processes for this have not been developed for version 1 for the standardized data.

Feature Classes in Cadastral Reference

PLSSIntersected

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. The fully intersected data is the atomic level of the PLSS that is similar to the Esri coverage or the smallest pieces used to build the PLSS. Polygons may overlap in this feature class. This feature class will also contain retired or replaced areas of the PLSS.

The fully intersected polygons are used for conversion and for maintenance. This contains the atomic and fully attributed components of the other PLSS features. This is the feature class used to derive other feature classes in this feature data set. This feature class also contains retired or replaced features.

MetadataGlance

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. This is a graphic representation of the data stewards for the Public Land Survey System (PLSS). For BLM data sets the data steward is identified at the township level or smaller area. The Data Steward is the agency that will be responsible for updates of the PLSS. In the shared environment of the National Spatial Data Infrastructure (NSDI) the data steward for an area is the primary coordinator or agency responsible for making updates or causing updates to be made. Any questions about data content should be directed to the data steward. The purpose of this feature class is to provide a visual reference for the metadata about stewards and revision dates.

PLSSTownship

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. This feature class contains the Public Land Survey System Townships that are the primary unit of survey for the PLSS, nominally six miles on a side, usually containing 36 sections. PLSS Townships are numbered from base lines and principal meridians. This feature class provides the polygons for the PLSS Townships. These polygons are built from the PLSS Fully Intersected feature class by dissolving on the PLSSID in the *PLSSIntersected* feature class.

PLSSFirstDivision

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. The PLSS First Division is commonly the section but can also be lots or tracts or protracted blocks. This feature class is the first set of divisions for a PLSS Township. If the first division is a section the nominal size is one mile on a side and 640 acres,

but actual sections will vary. Symbolizing this feature class on the first division type will help GIS users see where sections exist and where other types of divisions are used to divide the PLSS Townships.

PLSSSecondDivision

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. This feature class is the second division of the PLSS and is the quarter, quarter-quarter, sixteenth or government lot divisions of the PLSS. The second and third divisions are combined into this feature class as an intentional de-normalization of the PLSS hierarchical data. The polygons in this feature class represent the smallest division that has been defined for the purposes of PLSS Cadastral Framework needs. For example in some cases sections have only been divided to the quarter. Typically divisions below the sixteenth are in the *PLSSSpecialSurvey* or *NSDIParcel* feature class, but in some cases in the BLM managed data sets smaller aliquot divisions are included in the second division. This feature class provides the graphic of the aliquot or government lot divisions of the PLSS Township. This feature class is only the second division polygons and is not the combination of all divisions, so this feature class does not include Townships and First Divisions.

The PLSS Second division also includes the indication of surveyed or protracted status for the division. This is useful for symbolizing the areas where no surveys exist and the PLSS divisions have been derived from protraction (unsurveyed, protracted) or even calculated from division rules. (unsurveyed unprotracted)

PLSSSpecialSurvey

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. This feature class contains the Special Surveys that are non-rectangular components of the PLSS from BLM survey records. These special survey areas are generated from combinations of special survey codes, designators, notes and suffix information in the *PLSSIntersected* feature class. These are the graphic representation of non-rectangular PLSS components determined from surveys reflecting official BLM records. In many cases the non-rectangular components in this feature class are essential to completing the PLSS representation for many GIS applications.

ConflictedAreas

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. The conflicted areas feature class is a depiction of known overlaps or gaps resulting from two or more different surveys of the same area. The *ConflictedArea* feature class is to inform PLSS CADNSDI users on existing conflicted areas and provides the data stewards. For more information on the origins, impacts and possible resolution of conflicted areas contact the data stewards identified in the conflicted area.

PLSSPoint

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. These are the corners of the PLSS. This feature class contains summary information about the coordinate location and reliability of corner coordinate information. Alternate names or aliases for corners are also included in this feature class. The *PLSSPoint* feature class provides the essential observed coordinate information for PLSS corners. This is not the complete data set for corners. These are the most current coordinates and a summary of information about the accuracy and quality of the coordinate values. Contact the identified Data Steward for more information.

PLSSReferenceGrid

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. The PLSS Reference Grid is a generalized data set providing the Township and First Divisions of the PLSS as a separate feature class to support data requests, mapping and indexing. The spatial location and position and attributes of this feature class are the same as those in the primary data sets from which this data is built. These data are often used for map sheet layouts and general location reference. The PLSS Reference Grid supports indexing and rapid reference and query generally for web applications as well as map book and map sheet layouts

PLSSQuarterReference

This feature class is part of the Cadastral National Spatial Data Infrastructure (NSDI) CADNSDI publication data set for rectangular and non-rectangular Public Land Survey System (PLSS) data set. The metadata description in the Cadastral Reference System Feature Data Set more fully describes the entire data set. The *PLSSQuarterReference* feature class is a companion feature class for the *PLSSReferenceGrid* that provides a quarter section division of the sections for reference only. This is a reference grid used to support some web and query applications. It provides the township, sections and quarter section divisions of sections. This is a reference theme to support cartographic applications.

Appendix A - Acronyms and Abbreviations

Acronym	Description	Brief Discussion
BLM	Bureau of Land Management	A Division of the Department of Interior that includes Cadastral Survey
PLSS	Public Land Survey System	The system of measuring and inventorying land in thirty states
NSDI	National Spatial Data Infrastructure	The goal of NSDI is to reduce duplication of effort among agencies, improve quality and reduce costs related to geographic information, to make geographic data more accessible to the public, to increase the benefits of using available data, and to establish key partnerships with states, counties, cities, tribal nations, academia and the private sector to increase data availability.
CADNSDI	Cadastral National Spatial Data Infrastructure	
FGDC	Federal Geographic Data Committee	An organization within The US Geologic Survey, which is part of the Department of Interior, charged with coordinating the development of the NSDI
GCDB	Geographic Coordinate Database	A program within Cadastral Survey to develop and maintain coordinate values on corners of the PLSS to support mapping and GIS applications
LLD	Legal Land Description	A database in the BLM that provides land descriptions for transactions.
PCCS	Public Land Survey System Coordinate Computational System	A software program developed by Bill Ball in the 1970's to perform computations on the PLSS.
GMM	GCDB Measurement Management	A program developed by cadastral survey in the 1990's to replace PCCS and introduce full least squares analysis of PLSS measurements.
DOI	Department of Interior	