

Cadastral PLSS Stewardship
December 2010 – Updated December 2013

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Table of Contents

1. Overview	2
2. Underlying Principles	3
2.1 Defined from Existing Standards	3
2.2 Based on Business Needs	3
2.3 Authoritative Sources and Stewards	3
2.4 Trusted Data Publishers	4
2.5 Update Cycle is at least annually	4
2.6 Denormalization.....	4
2.7 Data Publishers will provide data for download and distribution	4
2.8 First Stop Data Source	5
2.9 Characteristics of Published PLSS data.....	5
4. Compliance with the PLSS Publication Standard	7
4.1 PLSS Steward	7
4.2 Data Set Format and Structure.....	7
4.3 Metadata and Data Quality Reporting	7
4.3.1 Linking Metadata Records to Features.....	8
4.4 Completeness and Consistency of Attribution.....	8
4.4.1 Corner Aliases	9
4.4.2 Required Attributes	9
4.5 Completeness of Coverage	10
4.6 Topology.....	10
4.6.1 Topology Rules	10
4.7 Vertical Integration.....	11
5. Levels of PLSS Stewardship	12
6. Reference Documents	14
Appendix A – PLSS Corner Standard Identifier	15
Introduction.....	15
PLSS Points	15
Appendix B – Cadastral Data Stewardship Concepts and Examples	18
Data stewards.....	18
Cadastral Reference.....	19
Examples.....	21

1. Overview

The Public Land Survey System (PLSS) is a cadastral reference data theme that provides a basis for legal descriptions and mapping the rights and interests in land. The PLSS is maintained by two authorities (1) federal authority and (2) state authority. On federally managed lands the Bureau of Land Management (BLM) is the legally identified PLSS authority. On all lands without a federal right or interest the PLSS is under state authority or the state delegated authority. The Manual of Survey Instruction, 2009, defines survey procedures and provides definition to the PLSS nationwide.

The authorities for the PLSS maintenance should not be confused with the spatial representation of the PLSS. The best available GIS data source should come from a PLSS Steward that is knowledgeable about the PLSS components and is a recognized authority on the PLSS. The GIS representation of the PLSS should reflect the best available data about the PLSS as provided by the PLSS Stewards. *See Section 2.3 Authoritative Sources and Stewards.*

In 2005 the Federal Geographic Data Committee (FGDC) Cadastral Subcommittee completed the initial guideline for publishing PLSS data that complied with the FGDC Cadastral Data Content standard in a physical database format. This PLSS publication data structure was developed to support data sets within the Cadastral National Spatial Data Infrastructure (PLSS CadNSDI). This publication format was developed with input from business application areas, stewards, GIS experts, cadastral surveyors, and PLSS subject matter experts. The publication format represents a template for data published for use in a Geographic Information System (GIS). The PLSS publication data is NOT a substitute for an on the ground survey nor is it intended to support legal conveyance. It is a representation of the best available information for the PLSS.

The current standard format is version 2. The format itself may contain what appear to be redundant or extraneous information. It has been developed as a national standard based on business drivers. Data stewards should complete the attributes for the data sets to the extent they can. It is also important to recognize the publication standard is a minimum data set and data stewards can add other attributes, feature classes, and feature data sets as needed to support local needs.

The BLM's Geographic Coordinate Data Base (GCDB) was used to assist with establishing initial data sets in the western states because it provided a level of detail and granularity that was not available in many state data sets in the western states. The BLM GCDB Program was established in 1990's to provide a basis for mapping lands patented by the federal government as well as federal rights and interests and federally authorized uses on public lands. In the eastern states the best available statewide coverage was used as the starting data set and this data typically came from individual states using various forms of data

creation and maintenance. The starting data sets will be able to be maintained and updated with locally generated control.

2. Underlying Principles

The following are the underlying principles and foundations for PLSS standardization and continued maintenance of the GIS data sets representing the PLSS. These concepts are background for the compliance requirements. Some of the same terms and concepts presented here are repeated in compliance portion of this document.

2.1 Defined from Existing Standards

The PLSS Publication standard is derived from the FGDC Cadastral Data Content Standard. The definitions of entities and attributes in the publication standard come from that standard. In addition the BLM Manual of Survey Instruction (most recently revised in 2009) provides the underlying definitions and is the authoritative source for the survey methods and application of legal definitions for PLSS features. Therefore, topological relationships and dependencies for the PLSS publication data must conform to the basic principles defined in the BLM Manual of Instruction and expressed in the FGDC Cadastral Data Content Standard.

2.2 Based on Business Needs

The data structure for the PLSS publication data is based on analysis of business applications that use or derive information from the PLSS to support business decisions. As examples some of the business applications examined include state oil and gas commissions for administering lease programs, right of access management programs, local government parcel mapping, and Internet search and discovery.

2.3 Authoritative Sources and Stewards

PLSS Stewards are the identified authoritative source for PLSS data sets. An Authoritative Source is an entity authorized by a legal authority to develop or manage data for a specific business purpose. The data this entity creates or causes to be created are authoritative data. The PLSS stewards (or PLSS Data Stewards) are the authoritative source and these are considered the primary source for cadastral data. One of the principles of the Cadastral Publication Guidelines is that the authoritative source approves and provides the publication data.¹

In any given area there should be one identified data steward. This is the authority that will

- provide the best available coordinate information for the PLSS features,

¹ For more information on this see the Subcommittee Report of Authoritative and Trusted Sources <http://nationalcad.org/download/authority-and-authoritative-sources/>

- will be knowledgeable about the PLSS, its components, and legal basis,
- will provide updates on a regular basis,
- will coordinate with data producers within their stewardship boundaries, and
- will coordinate with adjoining data stewards on the definition and update of shared boundaries.

The PLSS stewards should be a land surveyor or should work under the guidance of a land surveyor. The PLSS steward is identified for each corner in the PLSS Publication data set and on stewardship boundaries both stewards are identified. The stewards are also identified in the metadata at a glance feature class.

2.4 Trusted Data Publishers

The Trusted Data Publishers or Data Custodians may be a different agency or entity than the PLSS steward. In many cases the state serves as a data integrator or aggregator and publisher, assembling the best available information from local data sources and other contributors or stewards. This role could be termed a data custodian, a data aggregator, data integrator, or data publisher. The custodial role is to maintain seamless edge matched, both internally and at the state boundaries, data sets that are standardized, publicly available, and can be linked to the PLSS steward.

2.5 Update Cycle is at least annually

The Subcommittee has determined that annually updated information meets a majority of business needs. In some areas the PLSS may be updated more frequently but at a minimum the data stewards should review their data sets and determine the need for updates at least annually.

2.6 Denormalization

The publication data sets are intentionally “denormalized” which means data is repeated in and across feature classes. This duplication is recognized and is in place to support business applications, to provide more efficient access to data for all users, and to support cartographic display, data linking, and search.

2.7 Data Publishers will provide data for download and distribution

It is important that business applications have the ability to incorporate PLSS data into their solutions and systems. Web based viewing and browsing are appropriate and important for navigation and discovery of PLSS data and in some cases a web service that supports adding data to a canvass from an Internet REST point, Web Feature Services (WFS) or their equivalent, meets business needs. There are business applications

that run on secure systems that will need to download the PLSS data to incorporate it into their systems. The published data should also be made available in a form that allows it to be incorporated into applications (apps).

2.8 First Stop Data Source

The Subcommittee vision for the PLSS Cadastral NSDI is that state integrated data sets will become the first stop to determine where Cadastral Data exists and who the PLSS stewards are. It is the Subcommittee's vision that the state hosted and integrated data sets can evolve as a definitive first stop. The Subcommittee recognizes that this will need to evolve over time and will depend on local and state customs and practices as well as available resources and partnerships.

2.9 Characteristics of Published PLSS data

The Subcommittee has reviewed the concept documents for the NSDI, the content and distribution of other themes as well as the needs and requirements from the business processes that drive the need for published cadastral data. Based on these findings the following are the common and essential characteristics of published PLSS data.

- Published PLSS data sets will have a single authoritative steward in a defined geographic extent. The updates and content of the data must be controlled and managed by designated stewards (authoritative sources). Compiling and integrating the authoritative data into trusted data sources at state, regional, or community levels facilitate access to the data. This reduces duplication of effort and assures that the best available information is available for decision-making.
- Attributes are as important as spatial information for decision support.
- PLSS data should be updated or reviewed at least annually.
- Published PLSS data must be standardized so information can be integrated across jurisdictional boundaries.
- Published PLSS data should provide linkages to data stewards so more detailed information about the data set can be obtained from the data steward if it is needed.

The PLSS CadNSDI Data set format and metadata is provided on the nationalcad.org web site in the PLSS Work Group.

3. Benefits

The benefits of having a single representation of the PLSS that represents the best available data are as follows

For the counties and local data providers:

- A single representation of the PLSS allows county data sets to be seamlessly integrated by providing a common reference framework.
- Many local data producers are focused on parcel data and do not maintain a separate representation of the PLSS. That is, the PLSS data is an inherent part of the parcel data sets. Extracting the best available PLSS data and providing it as a separate data set enhances the local parcel data sets by providing PLSS area search functionality and cartographic display supporting the parcel data. This does can be done without creating an additional workload on local governments.
- Allows local parcel producers to integrate federal and state managed land into their data sets to increase the quality and definition of tax-exempt lands in local parcel data sets.

For the State:

- Seamless and standardized PLSS data can be placed in context with other state data sets providing solutions for many cross-jurisdictional data needs.
- Provides an opportunity to establish partnerships and communication with local data stewards and federal agencies.
- Provides an essential data set for State operations to build other statewide data sets including seamless county boundaries derived from their legal definitions that are commonly the PLSS.
- Increases the essential role of state coordination.
- Increases the likelihood that data stewards will work in a coordinated effort reducing duplication of effort and increasing the quality of data.

For Federal Agencies:

- Standardized seamless PLSS data provides a basis for defining edge matched state boundaries. Many state boundaries are tied to the PLSS and tying these state boundaries to the best available PLSS improves the accuracy and authority of the state boundary representations.
- Reduces redundant efforts in the collecting, assembling and analysis of PLSS data.
- Allows for applications to be built around a consistent data source.
- Provides for a consistent, standardized and machine-readable spatial data format used for geocoding non-spatial tabular information.

For Business Applications:

- Assures that the best available PLSS has been vetted by a data steward and can be relied upon and will be updated.
- Eliminates confusion and saves resources in analyzing multiple PLSS data sets.

4. Compliance with the PLSS Publication Standard

The Subcommittee has defined the publication data set for the PLSS as a series of features that are interrelated and based on the hierarchical nature of the PLSS. The descriptions of these features are in Appendix A.

There are some essential characteristics of this publication format that are based on minimum compliance with the Cadastral Data Content Standards. Assessing the degree or percentage of a data set that conforms to these elements establishes the percent compliance.

4.1 PLSS Steward

The reason for this critical compliance element is that the PLSS Steward information establishes the authoritative source and identifies who users will contact regarding, updates, legal basis or standing, questions, or additional information.

4.2 Data Set Format and Structure

The feature attribute content, entity, or feature naming conventions and the topologic and logical relationship among the features are described in the FGDC Data Content Standard and provided in a physical format in the FGDC Cadastral Subcommittee Publication Guidelines. Domains of values can be adjusted as necessary and still conform to the standard guideline. These deviations should be documented in the metadata to assist consumers that may want to merge data across data stewardship boundaries.

Additional attributes or feature classes may be added to the standard data sets, if the data steward or data custodian identify a need for added information and the maintenance procedures for this data.

4.3 Metadata and Data Quality Reporting

The information in the attribute fields that describe the quality or basis of the information for a feature needs to be correctly identified. This information is important for consumers to understand the quality and fitness for use of the provided data. Additionally the data set metadata must be completed to the level of the essential metadata as defined by the FGDC Cadastral Subcommittee.

The FGDC Cadastral Subcommittee worked with the FGDC Metadata Committee to develop the essential metadata standard for the CadNSDI. The content and data elements requirements for the essential cadastral data metadata were finalized in November 2009.

The CadNSDI Data Set has many feature classes and the essential metadata contains information that is the same across many of those feature classes. The metadata requirements do not specify how the metadata is provided, only that

the metadata be available for to data consumers. The data stewards may manage the metadata in a database, a separate program, a separate file, related tables, or any other means appropriate for the producer.

The compliance is determined by the ability to create a single file describing the data set metadata for each data steward.

Data Set Metadata

Identification Information

Summary information about the data set as a whole, Data Steward contact information, the publication date, and keywords

Data Quality

Summary information on the processes and sources used to create the data set including a summary of processing or lineage as needed to support data use.

Spatial Data Organization and Spatial Reference

Summary information describing the coordinate system and projection of the published data set.

Stewards and Distribution Contact Information

Contact information for both the steward and data publisher (trusted source).

Feature Class Information

Entity and Attribute Information

Provide the definitions of feature data sets, features classes, and attributes in the feature classes. The publication template provides this information for the standard defined attributes, feature classes, and feature data sets. This information is provided in the national template.

4.3.1 Linking Metadata Records to Features

In the feature classes there is an attribute for the steward. The content of this field should be standardized so it can be linked to the metadata file.

There is also a feature class called Metadata at a Glance. This feature class has an attribute for the steward and expresses the spatial extent of the area of responsibility of the steward.

4.4 Completeness and Consistency of Attribution

Attributes that are used to uniquely identify features or identify a location need to be populated for all features. Consumers of the data sets use these attributes in

queries, labeling, and reports. Attributes need to be used consistently throughout the data set for consumers to be able to understand and use the data correctly.

The PLSS CadNSDI Data set format and metadata is provided on the nationalcad.org web site in the PLSS Work Group.

4.4.1 Corner Aliases

A critically important aspect of the completeness of attribution for standardized PLSS data is the identification of multiple names or identifiers for PLSS Corners. Many PLSS naming or corner identification systems are PLSS Township based. This means that one corner on a township boundary can and often does have multiple names or identifiers but it is one logical corner. Maintaining one record for each corner and assigning an alias to the corner is an important component for maintaining edge matching between adjoining townships. There is more than one approach to accomplishing this important aspect and these have been described in more technical and detailed implementation documents.

4.4.2 Required Attributes

The following are the required attributes for features

PLSS Townships must have Principal Meridian, State, Township Number, Township Direction, Range Number and Range Direction.

PLSS Townships must have a unique PLSSID formatted as described in the Publication Standard.

PLSS First Division must have a unique identifier, a PLSS Township Identifier, and first division designator or number.

PLSS Second Division must have a unique identifier, a PLSS First Division Identifier, and a second division designator or number.

PLSS Special Survey must have a special survey type description and may have a special survey type code. If the special survey designator or number is available, it should be present.

Survey System features are non-PLSS features that combine to form a complete cadastral reference data set. These are often lands that were occupied and claimed prior to PLSS survey. These features must have a type description and a designator or number.

Metadata at a Glance must identify the steward and the last date of update.

Meander Water should only be included if it represents the water meandered on PLSS survey plats. The Meandered Water feature is *not* a hydrography or water feature class.

PLSS Points must have a unique point identifier, see Appendix A for suggested national guidelines on PLSS Point Identifiers, and the source coordinate values, which may be different than the GIS presented coordinate values.

4.5 Completeness of Coverage

The data set needs to provide a continuous and complete coverage. Gaps in the data sets create inconsistencies that create mis-understandings for the consumers. The data set will have as complete a representation of the PLSS as possible from the stewards.

4.6 Topology

The PLSS features will be edge matched. If there is a known gap or overlap in the PLSS coverage this area will be described and placed in the Conflicted Area feature class. These areas represent a conflict in the survey record, indicating that the actual boundary has not been reconciled.

4.6.1 Topology Rules

No slivers or gaps or overlaps at PLSS Township boundaries including at the state boundaries. This also means that each township boundary must have the same number of corners along the boundary. Closing and offset corners from an adjacent township must be accounted for in the adjoining township.

No overlaps of PLSS First Division in the rectangular PLSS. There may be gaps in the PLSS First division but there can be no overlaps.

First Division Lines on the exterior of the PLSS Township must be coincident with the PLSS Township boundaries.

No overlaps of the PLSS Second division in the rectangular PLSS. There may be gaps in the PLSS second division but there can be no overlaps.

PLSS Corners must be exactly under PLSS lines. Rectangular and special survey corners must be on the lines defining the features. There maybe control or location monuments that are not on the PLSS lines but all corners must be on a line.

Land Grants cannot overlap.

Donation Land Claims cannot overlap.

Tracts cannot overlap.

Homestead Entries cannot overlap.

Other special surveys may have overlaps.

Compliance with this component is measured by:

The data sets conformance to the topology rules in terms of percentage of records that conform to the specified topology rules.

4.7 Vertical Integration

The data themes need to be vertically aligned, as examples the PLSS Intersected polygon edges should be exactly in line with PLSS Township edges, exterior section boundaries need to align exactly with the bounding Township line and PLSS corners need to be coincident with nodes or intersections or lines in the polygons, unless the corner is non-polygon bounding corner such as location monument or a geodetic control monument. Consumers of the data need to have confidence that the data set is internally consistent and not be placed in a position of having to select one representation over another.

To meet the requirements for vertical integration the standardized PLSS must have coincidence of lines. That is if a section line is also a PLSS Township line there two lines must coincide exactly. Similarly if a corner is at the intersection of two lines the corner will be mapped exactly at that intersection. In the publication data standard the PLSS features are derived from a single feature class called the PLSS Fully Intersected Feature Class. The PLSS Fully Intersected Feature Class was defined to assure that the essential vertical integration of PLSS features or layers are sustained.

Compliance with this component is measured by:

The data sets conformance to the vertical integration in terms of percentage of records that conform to the vertical integration.

5. Levels of PLSS Stewardship

The levels of PLSS Stewardship describe the progress a state or other data publisher has made toward publishing a single trusted source for standardized PLSS data. The PLSS levels of stewards parallel the parcel data levels of stewardship. The Subcommittee has found with the parcel data that it is useful to have measures for progress and these levels are suggested as progression levels for data publishers.

For the lower levels of PLSS stewardship the sources of PLSS data have been identified and the various data stewards recognize one another and recognize a need for a common standardized data set. The benefits of having defined data stewards, established stewardship boundaries and providing a seamless maintained PLSS data set are achieved in the higher levels of stewardship.

The Subcommittee recognizes that the PLSS stewardship will evolve and develop over time as data stewards are defined and data sets are completed, partnerships and agreements are established and data management capabilities develop. Some of the key characteristics of the data and stewardship at each level are summarized in Table 1.

Table 1
Levels of PLSS Stewardship

Level	
1	<i>Organization</i> - State recognizes the need for a seamless standardized PLSS data set and has established a state coordination activity. This could be a committee that meets regularly or a single coordinator that works with PLSS Stewards in the state. In most states this also includes establishing or modernizing a PLSS Corner remonumentation program.
2	<i>Data Inventory</i> – An initial statewide PLSS data set that represents an inventory of PLSS areas for the state including an inventory of PLSS Corners with corner aliases is developed. This first data set may not be the best available but it will provide an inventory and starting point. At this level the state PLSS Program has adopted a PLSS Publication standard format including a corner point identification system
3	<i>Stewards</i> - Stewards are identified by geography. This will include tribal, federal and state agencies as well as local data stewards. Federal lands will have an identified steward, typically the GCDB manager for that state, state managed lands will commonly have an identified state lands steward and local stewards will typically follow

	county boundaries. This step includes establishing initial stewardship boundaries.
4	<i>Trusted Source</i> – Concurrent with Level 3 activities a centrally managed trusted source needs to be identified and agreed upon by all participating data stewards. This central source will provide data integration services, aggregating standardized data from the multiple data stewards, assuring the stewardship boundaries are maintained and providing data publication services including data browsing, data services, data download, metadata services and data distribution. Edge matching with adjoining states must also be assured by the trusted source.
5	<i>Best Available Single Source</i> – The best available PLSS data for a state is edge matched with adjoining states and is available through the trusted source for viewing, download, and data distribution.
6	<i>Linked Control Point Publication</i> – As a part of the maintenance of the PLSS control coordinates are established through ongoing surveys and projects. A statewide system for publishing corner monument and recovery information as well as reporting on newly observed coordinated values supports the maintenance and update of the PLSS data set.

6. Reference Documents

FGDC Cadastral Data Subcommittee, **Authority and Authoritative Sources: Clarification of Terms and Concepts for Cadastral Data** (2008),
<http://nationalcad.org/download/authority-and-authoritative-sources/>

FGDC Cadastral Data Subcommittee, **Cadastral PLSS Handbook**, October 2013, <http://nationalcad.org/download/cadnsdi-plss-handbook/>

FGDC Cadastral Subcommittee, **CadNSDI Publication Standard Version 2**, October 2012
<http://nationalcad.org/download/cadnsdi-publication-standard-version-2/>

FGDC Cadastral Data Subcommittee, **Cadastral Data Content Standard version 1.4**, May 7, 2008,
<http://nationalcad.org/download/cadastral-data-content-standard-ver-1-4/>

Stage, David and Nancy von Meyer, **Parcel Data and Hurricane Isabel: A Case Study**, FGDC Cadastral Data Subcommittee, August 2004
<http://nationalcad.org/download/parcel-data-and-hurricane-isabel/>

Stage, David; Nancy von Meyer and Bob Ader, **Parcel Data and Wildland Fire Management**, FGDC Cadastral Data Subcommittee, January 2008
<http://nationalcad.org/download/parcels-and-wildland-fire-2007-report/>

Von Meyer, Nancy; **State Parcel Data Stewardship**, September 2004
<http://nationalcad.org/download/state-parcel-data-stewardship/>

Appendix A – PLSS Corner Standard Identifier

This information is taken from the Cadastral Publication Guideline

Introduction

This paper describes a standard point identifier for Public Land Survey System (PLSS) corners. This standard point identifier conforms to the requirements of the Federal Geographic Data Committee (FGDC) Cadastral Data Content Standard requirements for a unique identifier for cadastral corners. The standard system presented here allows published coordinate information to be related to source data and to perpetuate corner identifiers as coordinate values for corners are improved over time.

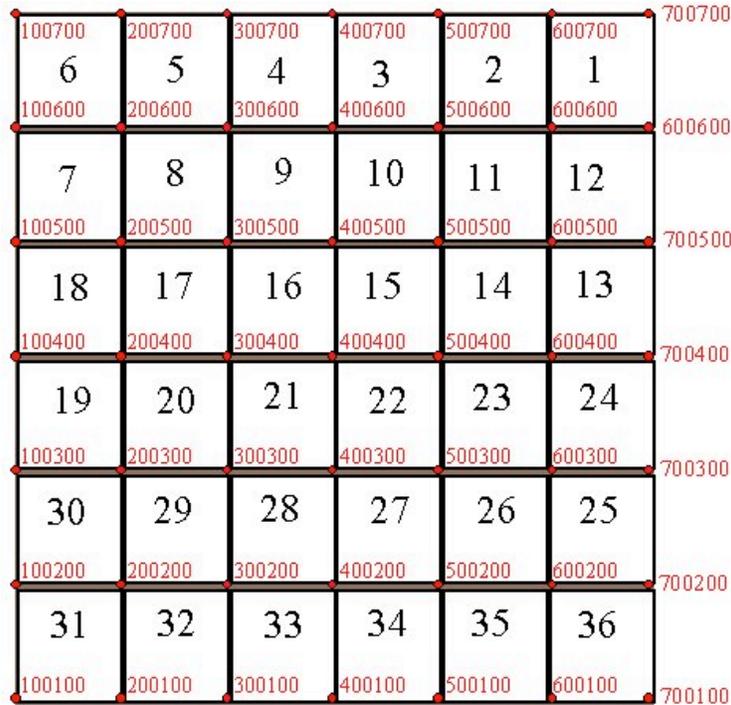
The uniqueness of the survey point ids will help facilitate data maintenance and data sharing within the Bureau of land management (BLM) and other Cadastral Reference data stewards. This paper describes the format and structure of the corner point identifiers for the publication of corner information that conforms to the national cadastral data standards.

PLSS Points

The Geographic Coordinate Data Base (GCDB) uses a six-digit numbering system to name PLSS points in a township. This six-digit corner number is only unique within a PLSS township. This number is repeated in each township, to make it easier to determine the location of a corner within a Township by its number.

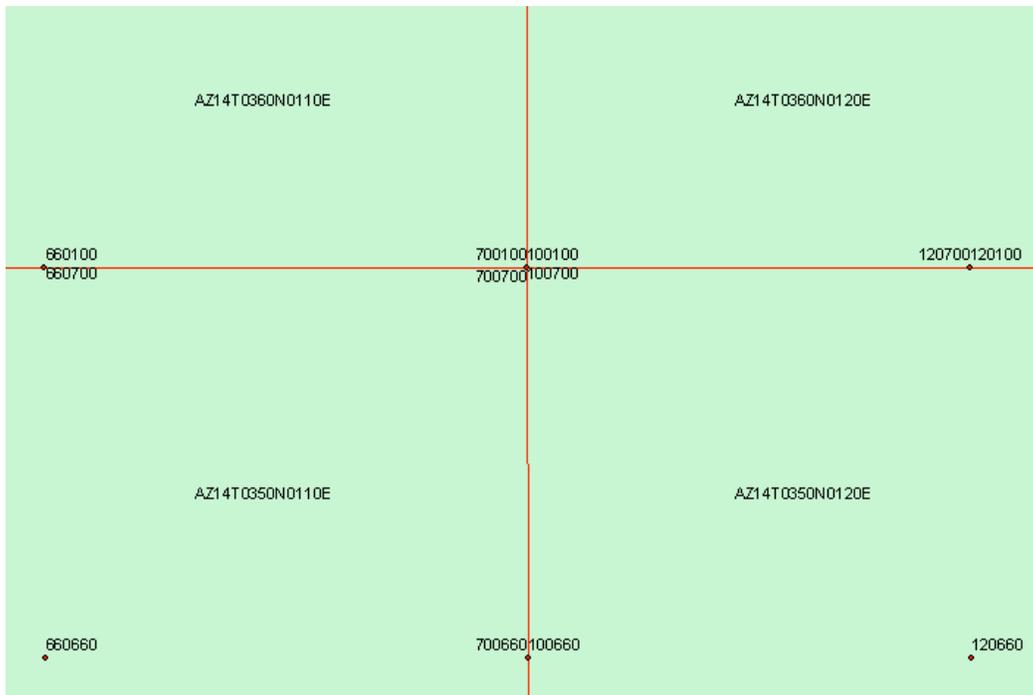
The first three digits of this number refer to the east-west position in the township. The second three digits indicate the north-south position in a township.

The following picture shows the corner numbering convention for a single township subdivided down to sections. This numbering scheme is repeated in each township.



Due to this naming convention, four adjacent townships will name the same corner four different ways (100100, 100700, 700700, 700100). Each corner number should have the exact same coordinate values because this is in fact the same corner.

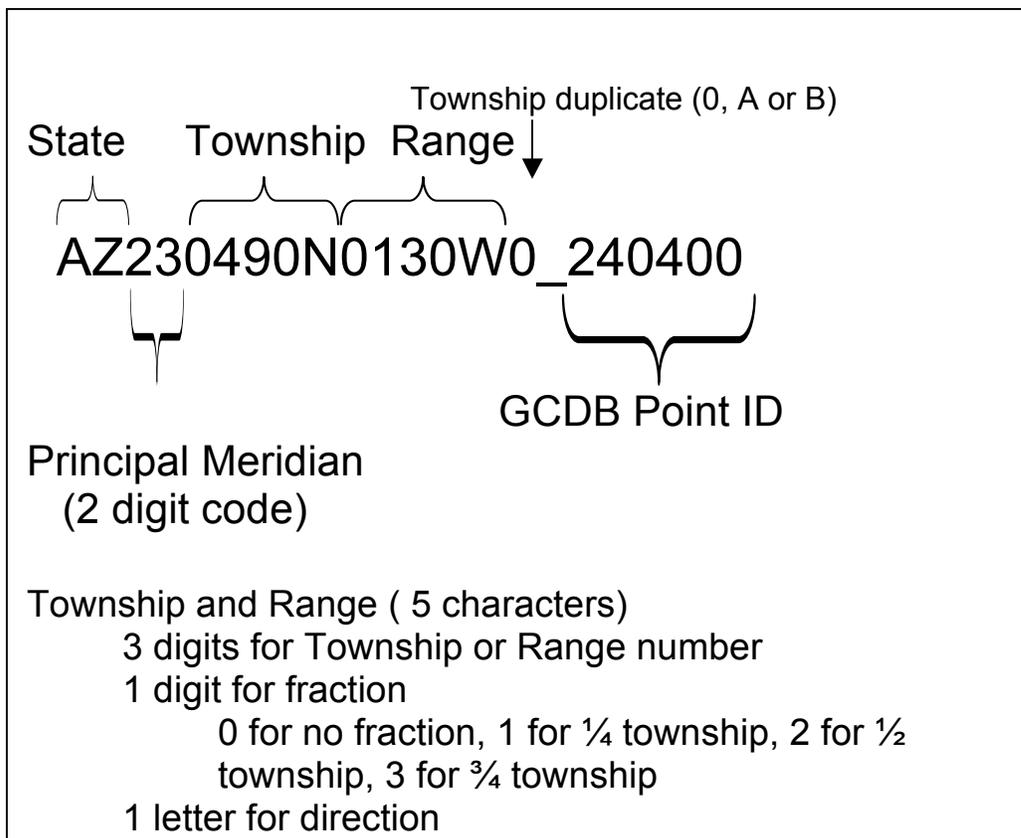
The following picture shows an example of the point duplication at township corners and township lines where sections subdivisions are coincident.



Unique PLSS Corner Numbers

To make the corner numbers unique, the proposal is to add a point prefix to the PLSS corner number. This prefix is a concatenation of the State, Principal Meridian, Township and Range in which the point resides. This point prefix can be derived from the directory structure of the output directory from the BLM’s Data Preparation Software (DCCS V 1.04) or from the attributes in the standard PLSS Township Feature classes and is a standard 15 characters long. This identifier has been termed the township identifier or TWIP in other systems.

The uniqueness is established by making a business rule that the lowest six digit corner number will become the primary number and all other numbers will become aliases or other corner numbers for the same corner. The following diagram shows the proposed corner numbering convention.



Appendix B – Cadastral Data Stewardship Concepts and Examples

Data stewards

Data stewards are cadastral data producers that provide data for the Cadastral NSDI. Federal and state land management agencies are generally the stewards of public lands while local government tax assessment offices are the stewards of private properties. A data steward may provide cadastral reference information or parcel information or both. The Cadastral NSDI will have defined data stewards based on geographic extent and Cadastral NSDI component. For example in the figure below (Figure 1) the cadastral reference is shown as one layer of information and the parcel geometry with related parcel information as another layer. These two components of the Cadastral NSDI may have different stewards, for example the cadastral reference may be maintained by a federal agency, a state organization or a surveying department in a county. The parcels may be maintained by the tax assessor or some other county department. In this case the geometry is integrated because the parcels are tied to and dependent on the cadastral reference, but there are two Cadastral Data Stewards for the same area. However, data stewards for a given Cadastral NSDI component do not overlap. That is, in any given geographic there will only be one data steward for the cadastral reference and one data steward for the parcels. The stewardship boundaries and any changes along those boundaries will need to be agreed to by the data stewards.

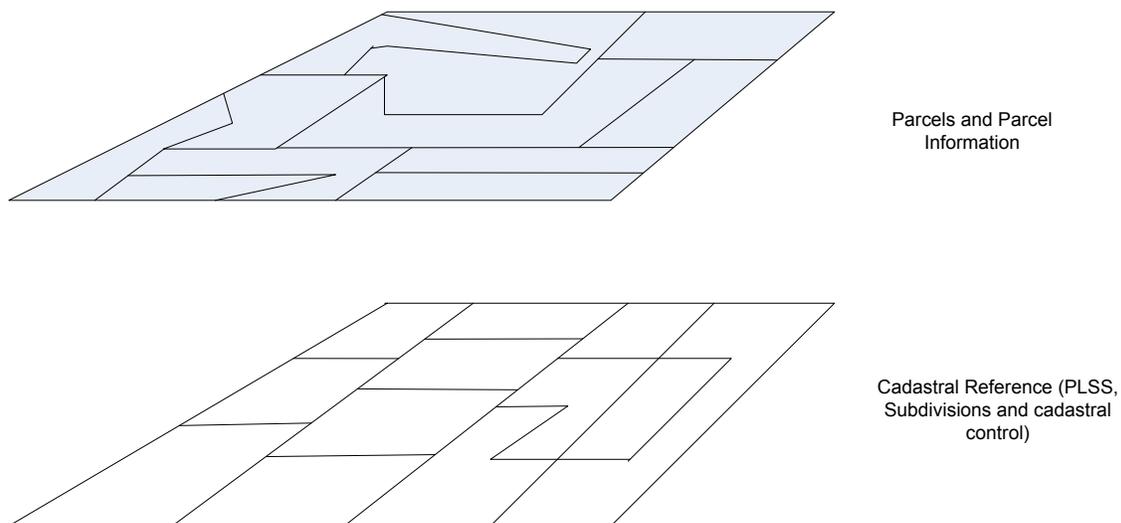


Figure 1 – Two cadastral components in the same geographic extent.

A second type of data steward is a data integrator. The data integrator combines information from producers to generate regional or statewide views. The data

integrators will publish at least the core set of information and provide linkages to more detailed source information from the data producers.

Cadastral Reference

The Cadastral reference is the set of information that allows parcel level information to be registered to other data themes and to be tied to features on the ground. Cadastral reference is composed of the spatial reference data (geodetic control and orthophotography) and survey frameworks such as the Public Land Survey System (PLSS), parcel map grids, subdivision boundaries or municipal boundaries. Parcels are nested into and tied to the reference data and the cadastral reference.

One example of an eastern cadastral framework is in North Carolina where the Cadastral NSDI reference is provided through the state. In this case the State has developed orthophotography standards to meet a wide range of uses, including cadastral information and other reference data such as county boundaries, municipal boundaries, subdivision boundaries and map grids. The parcels are nested in this framework.

The cadastral reference elements are needed to support query, mapping and navigation and are part of legal descriptions. This includes information about survey systems, such as subdivisions, geopolitical areas, land grants and the public land survey system. Figure 2 illustrates the cadastral reference concepts.

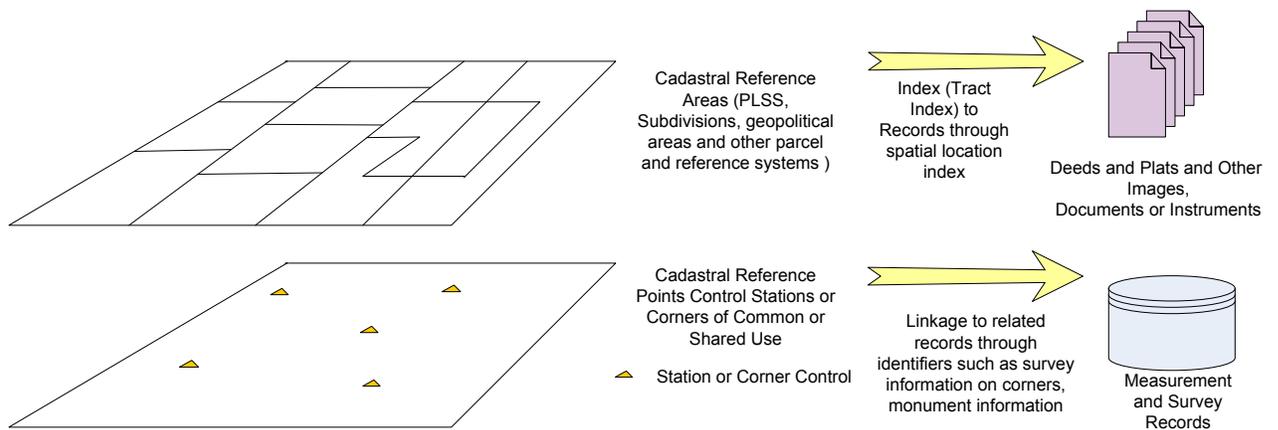


Figure 2 – Cadastral NSDI – Cadastral Reference

Figure 2 illustrates that the Cadastral NSDI provides linkages to more detailed information while meeting the basic business needs for many applications.

Parcels are the detailed information about property and its characteristics that are needed to meet the business needs of the user community. Spatially the parcels are tied to the earth through the cadastral reference information. Figure 3 illustrates the parcel component of the Cadastral NSDI.

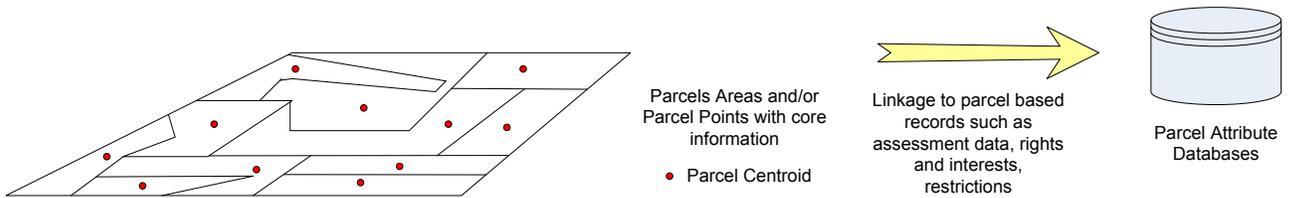


Figure 3 - Cadastral NSDI – Parcel Information

The parcel information may be polygons or parcel points. The attributes in the parcel component of the Cadastral NSDI contain sufficient information to link to the rich attribute databases from the data producer. On federally managed public lands the parcels represent transactions or decisions such as grazing leases, mineral surveys or use authorizations. On private lands the parcels are typically tax parcels but may include use restrictions such as easements or rights of ways.

Stewardship areas are the areas over which a particular steward is responsible for the cadastral information. A steward may be a Cadastral Reference Steward, a Parcel Steward or both. The entire area (state or county) should be covered by at least one stewardship polygon and every corner should be in at least one polygon. If a corner is on the boundary of a stewardship polygon then it means it has shared stewardship and both stewards would have to agree before a corner could be updated.

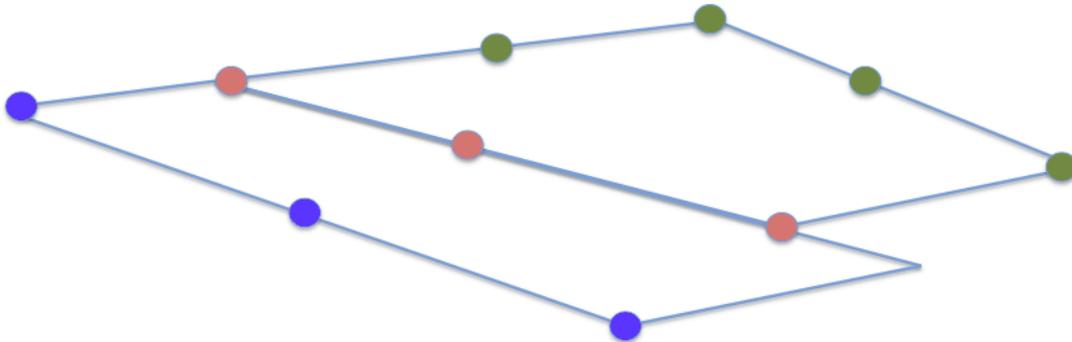


Figure 4 - Cadastral NSDI – Corners with Stewardship Areas

In Figure 4 the red corners have two stewards, if you query for steward 1's corners - you will get the green and orange corners, if you query for steward 2's corners you will get the orange and blue corners.

If you query an orange corner you will get stewards 1 and 2. If you query a blue corner you will get steward 2.

In corner report application - if you select a corner that you would like to report a possible change to, an email goes to all stewards who have a polygon that covers that corner.

Examples

In the following example the Forest Service and the County independently collected and mapped parcel information. This was in a non-PLSS state so there was not a common PLSS reference grid.

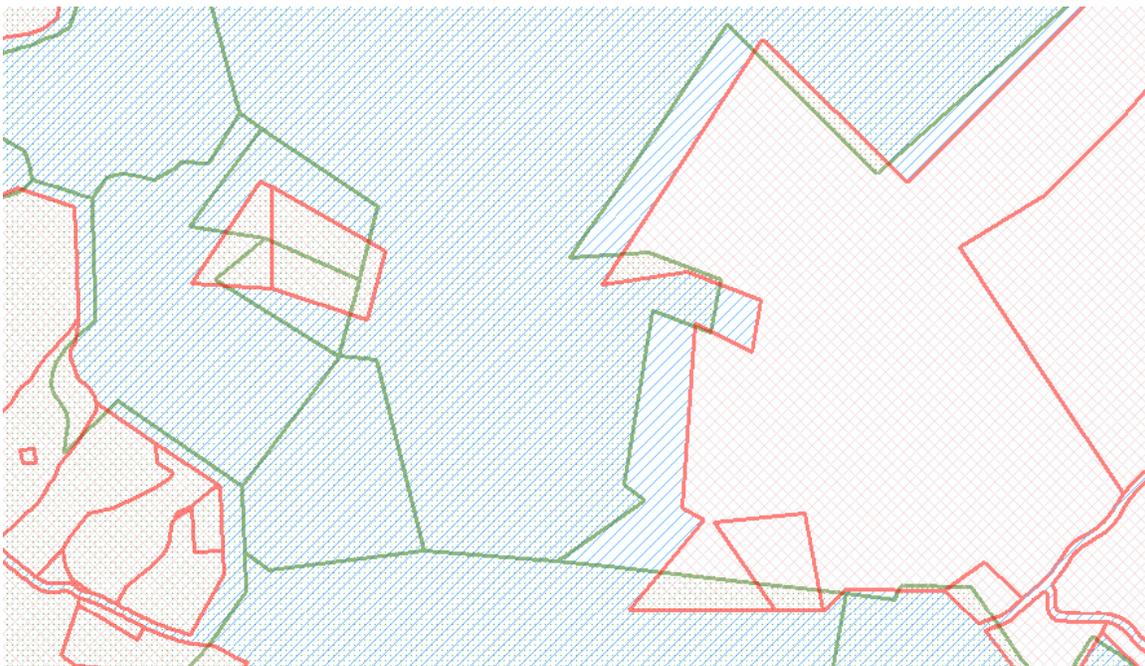


Figure 5 – County and Federal Collected Parcels – no Common Framework

The green outline polygons were collected by the Forest Service as Forest Service managed areas. The red lines are county tax parcel boundaries with the hatched areas being tagged as exempt from real estate taxes. The average distance difference is about 250 feet. But the shape and the pattern of the parcels indicate that the generally the intent was to map the same set of rights and interests. The county tax map also indicates that the areas managed by the Forest Service are exempt from taxes. No analysis was done on the comparison of the areas identified as eligible for Payment in Lieu of Taxes (PILT).

In the next scenario the County and federal agencies both use the Public Land Survey System as the primary Cadastral Reference Theme. And both agencies started with the same information from original government surveys and subsequent resurveys of the PLSS. Over time the representation of the PLSS between the federal and local agencies changed due to survey and control projects that were not shared. Figure 6 shows an overlay of the County tax parcels with the Federal Geographic Coordinate Database PLSS references and federally managed areas (federal parcels)

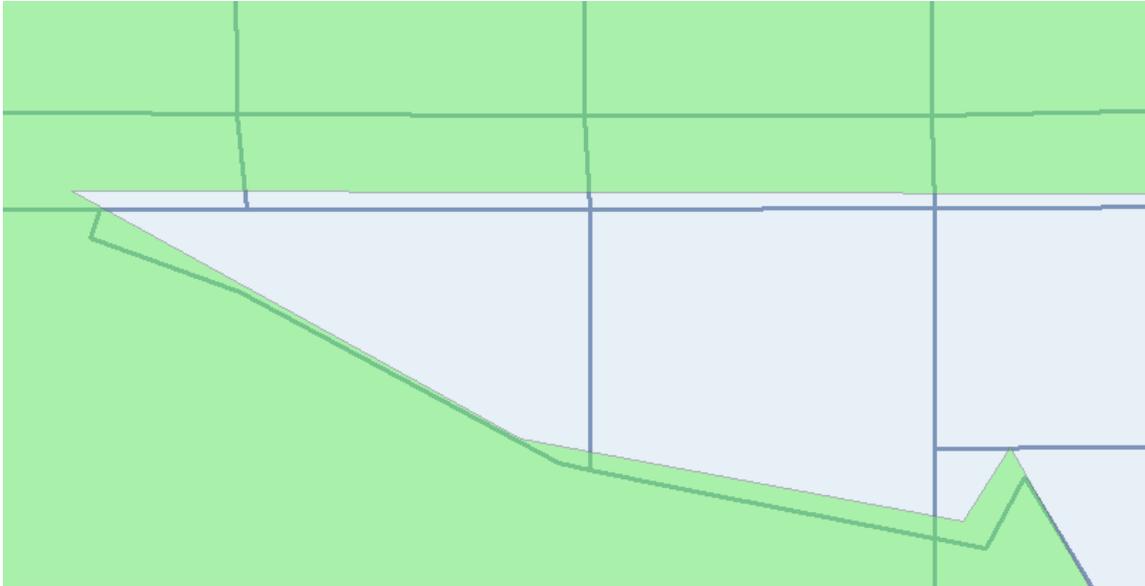


Figure 6 – Federal Cadastral Reference and County tax Parcels

With both agencies starting with the same original description the differences between the two systems is much less than the example in Figure 5 where there was no common starting point. In this case the differences between the county corner locations and the federal corner locations average 100 feet in this area but as with example in Figure 5 the general pattern of the intent to map the same areas can be seen.

In this same area the image in Figure 7 shows the county buildings and structures data with the federal Cadastral Reference and the Federal Parcels. This example shows one of the benefits that closer stewardship relationship could produce which is the County has captured building footprints for the entire county even though this area is clearly exempt from local real estate taxes.

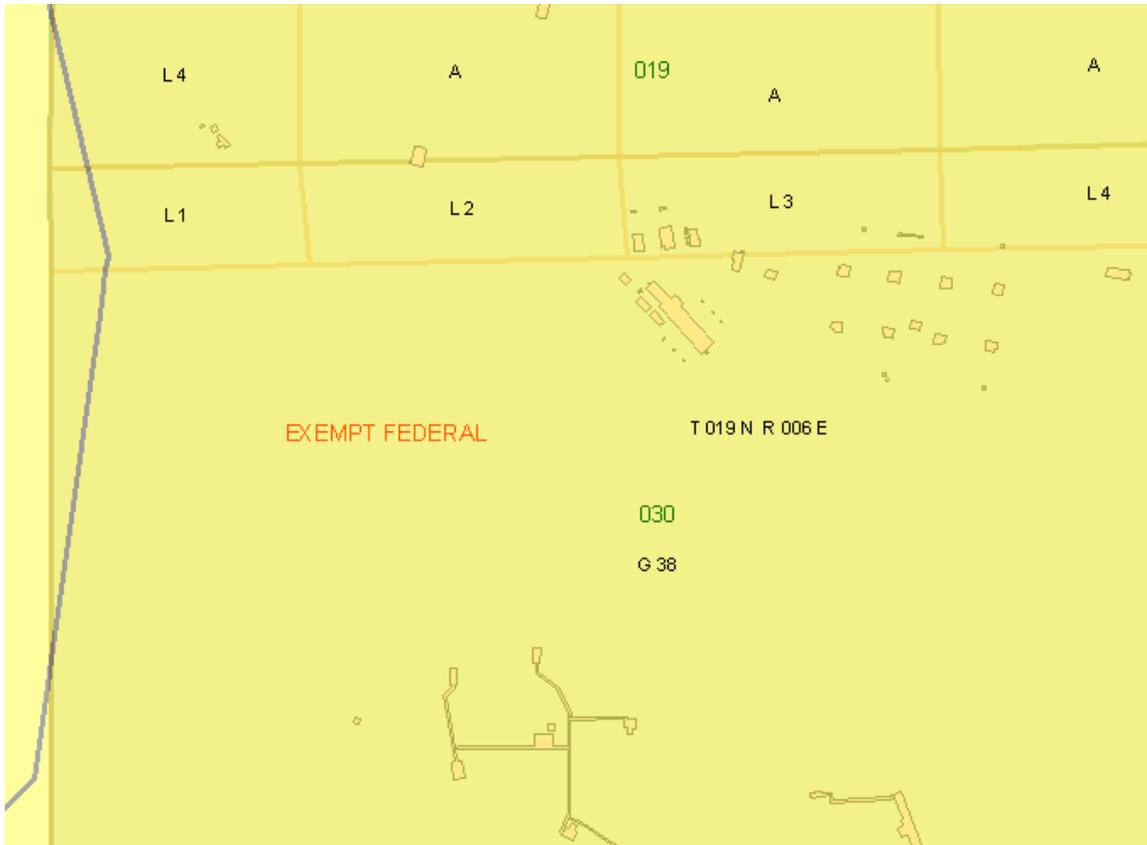


Figure 7 – Federal Lands with Locally collected Structure Information

In this last example the County and Federal land agencies have developed stewardship arrangements for the Cadastral Framework (PLSS) and the parcels (county tax parcels and federal parcels). For those areas that private or non-federal, non-Tribal public the County does the parcel mapping. The federal agencies maps parcels on federal lands and the Tribes manage the Tribal areas. All of the agencies share the use of a commonly agreed Cadastral Reference framework. If enhancements are planned or made to the locations of corners the results are shared with all participants and the resulting common framework is updated.



Figure 8 – Federal and Local Mapping with Stewardship Agreements

In Figure 8 the county parcels have been color coded based on the type of owner (surface owner classification) and with the reconciled PLSS and the owner classification from the tax records. It is relatively simple to identify PILT lands or see areas where ownership may need to be listed in federal land systems and to see the all important state owned lands are as well. The state agencies need to participate in the stewardship arrangements.

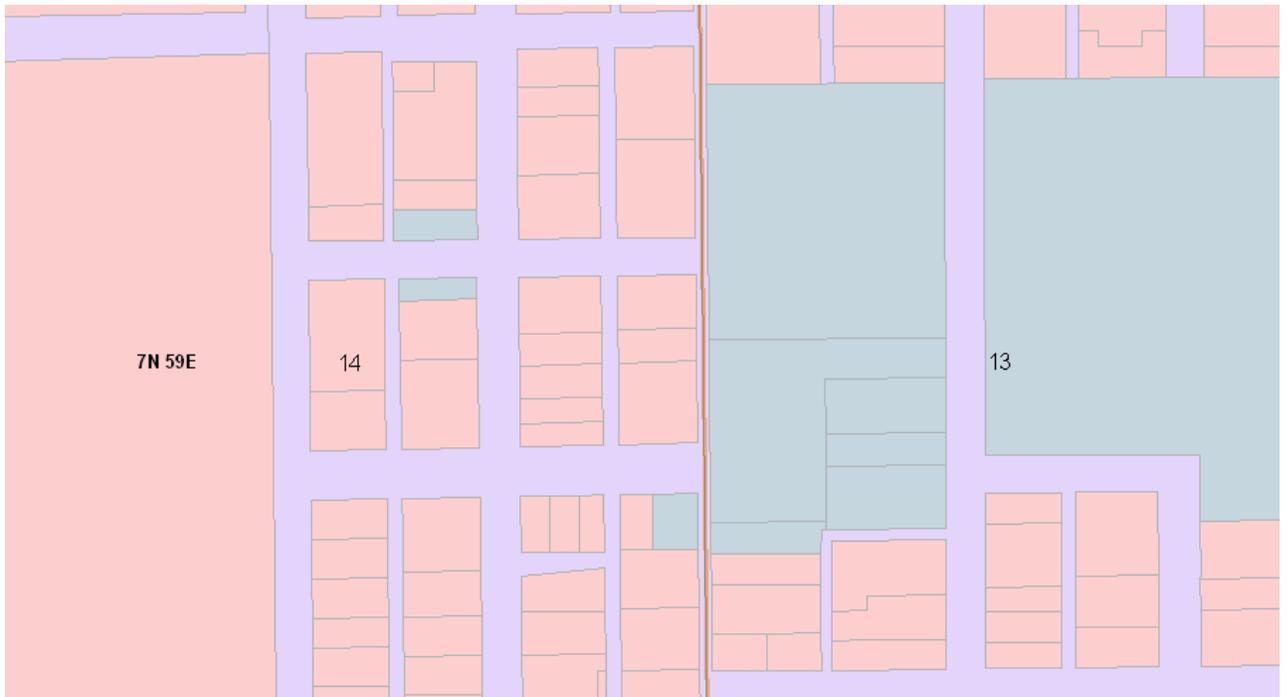


Figure 9 – Urbanized Area of County with Stewardship Arrangements

This is an urbanized area of the county and subdivision plats and other surveys have superseded the PLSS as the primary Cadastral Reference and the basis of most legal descriptions even though many of the subdivisions in this are referenced to the PLSS.

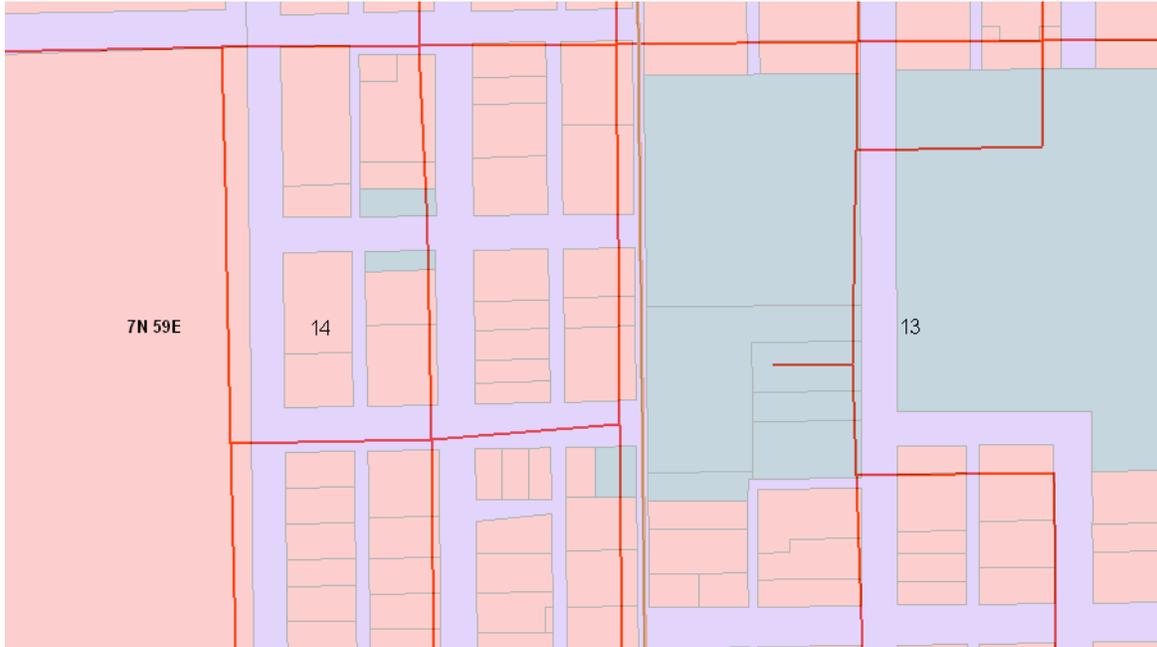


Figure 10 – PLSS and Parcel data with USGS (TIGER) Roads

Even in this ideal situation where stewardship of the PLSS and other framework data and parcel information has been defined issues remain with non-cadastral data sets, in this case the roads from USGS quad sheets have not been reconciled to right of way areas.