Lesson 5: Land Records, Census and Addresses
Overview

Learning Objective Questions:

1. Why are land records important?
2. What are the US Public Land Survey System (PLSS) and Metes and Bounds cadastral control survey systems?
3. What are the elements of a land parcel data model?
4. How do tax parcels differ from development parcels?
5. What are the main differences between a multipurpose land cadastre and a multipurpose marine cadastre?
6. What are the elements of the census feature dataset?
7. Why are Census topological rules so important?
8. How are street address reference systems and coordinate reference systems similar and different?

Lesson Preview

Learning objective questions act as the lesson outline.

Questions beg answers.
1. Why are cadastre records important?

Cadastre – a record of interest in earth coverage. Most interest deals with land coverage. However, some interest increasingly deals with water coverage. Thus, land cadastre versus marine cadastre.

Parcel land record is most used GIS data in the Puget Sound region based on a survey of GIS managers in 1988.

More applications use land data records data than any other single data category.

Most frequently used data in regional and urban GIS. Why?
Parcel Thematic Layers

see graphic A&Z p. 175 – Oakland County CA GIS Installation

The following categories are for working with maps – not necessarily, a geodatabase structure

- Administrative areas – boundaries for spatial orientation
- Site Addresses, regulated use and restrictions – activities on the land
- Separated rights and encumbrances – rights, interests, limitations
- Ownership and tax parcels – (record of interest in ownership and taxation)
- Parcel framework – boundary control and framework
- Corners and boundaries – extent of land subdivisions
- Survey network – foundation of positional accuracy for coordinates
- Digital orthophotography and hydrography – map background and reference

Key terms
Parcel framework
Corners
orthophotography
Public Land Survey System – Survey of Public Lands

2. What are the US Public Land Survey System (PLSS) and Metes and Bounds cadastral control survey systems?

Key terms
PLSS
Metes and Bounds

PLSS states in white.
Metes and Bounds in shaded.

(Bureau of Land Management 1973)
PLSS framework

Roots in America revolutionary war; land sold to replenish USA treasury
First surveys are in Ohio; took five tries to get it right

(Bureau of Land Management 1963)
Principal Meridian intersects Base Line to form Initial Point

Township (N-S) and Range (E-W) referencing for Townships

Township stacking has offset every fourth row N & S to address longitudinal convergence

Key terms
Township
Range
Principal Meridian
Baseline
Initial Point

(Bureau of Land Management 1973)
Townships are subdivided into sections

36 sections in each township
Each section 1 mile on side (640 acres in one section)
One section in 36 sold to fund public education (land grant colleges)

Key terms
Section

(Bureau of Land Management 1973)
Sections (640 acres) subdivided into $\frac{1}{4}$ sections (160 acres)

$\frac{1}{4}$ $\frac{1}{4}$ section equivalent to “back 40 acres” on a farm

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<tr>
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<td>660 FT</td>
<td>660 FT</td>
</tr>
</tbody>
</table>

Key terms

$\frac{1}{4}$ section
$\frac{1}{4}$ $\frac{1}{4}$ section

Bureau of Land Management 1973
Sections subdivided with local properties
Local property survey (plats) within a section (Bureau of Land Management 1973)

Key terms
plat

Bureau of Land Management (1973)
Local Land Surveying
3. What are the elements of a land parcel data model?

See A&Z GDD graphic p. 177

Feature datasets - maroon
Feature classes – purple
Topology Rules – orange
Relationship classes – green
Feature Datasets

Administrative – feature dataset
  TaxDistrict – polygon feature class
  MapIndex - polygon feature class
  RegulatedUse - polygon feature class
  Restriction - polygon feature class
  SiteAddress - point feature class

ParcelFeatures - feature dataset
  PLSSSTownship - polygon feature class
  PLSSFirst Division - polygon feature class
  PLSSSecondDivision - polygon feature class
  Encumbrance - polygon feature class

Key terms
Encumbrance
# Parcel feature record – City of Seattle

<table>
<thead>
<tr>
<th>FEATURE:</th>
<th>PARCEL</th>
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| FEATURE DEFINITION: | An area of land, usually contiguous which is under the same ownership. A parcel is delineated based on the segregation/merger process of the King County Department of Assessments. |

| COMMENTS: | Parcels are created for taxation purposes and uniquely identified by a single Parcel Identification Number assigned by the King County Department of Assessments. Parcels are created and altered as a result of platting activities, Lot Boundary Adjustments, and the segregation/merger process of the King County Department of Assessments. New parcels are also created when property is acquired through the City’s Open Space Program. A parcel may be coincident with all or part of one or more platted lots. A parcel will be coincident with tax lots in unplatted areas. |

| GRAPHIC ELEMENT TYPE: | Polygon |

| GRAPHIC ELEMENT DEFINITION: | The polygon is defined by the parcel boundaries as delineated for taxation purposes. |

| EXAMPLE: | |

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<thead>
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<th>ATTRIBUTES:</th>
<th>(examples)</th>
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<td>Situs Address Area</td>
<td>Owner Name</td>
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<tr>
<td>Jurisdiction</td>
<td>Taxpayer Name</td>
</tr>
<tr>
<td>Zvalue</td>
<td>Recording Number</td>
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<tr>
<td>Legal Description</td>
<td></td>
</tr>
</tbody>
</table>
ParcelFeatures_Topology

TaxParcel - polygon feature class
SimultaneousConveyance - polygon feature class
SurveyFirstDivision - polygon feature class
SurveySecondDivision - polygon feature class
Boundary - line feature class
Corner - point feature class
Corners, Monuments and Corner Coordinates

Monument - point feature class

CornerHasMonuments – relationship between Corner and Monument


See GDD graphic A&Z p. 178-179

Attributes for each Relationship classes between feature classes

Note pointer IDs

Key terms
monument
Boundary – simple feature class (polyline)

See GDD graphic A&Z p. 181

Subtypes of Boundary - purple

Coded value domains - red
Properties of Parcel Frameworks

Commonly measured by survey, are tied to corners and monuments

A hierarchical framework
Describe boundaries, ownership, taxing, and other interests, often in separate cadastres

Cadastre is a record of “interest” in earth coverage: land, water, air, subsurface (See A&Z p. 192)

Boundaries must close, no leaks of interest.
Oakland data model: simultaneous conveyance and PLSS
Simultaneous Conveyance

- Several parcels are created at the same moment
- Non-parcels (aliquot part) have priority of senior conveyance to other parcels
- External boundary is senior to interior boundaries as in subdivision
- External boundary is often rendered as heavier line
- SurveyFirstDivision – subdivision boundary
- SurveySecondDivision - lot lines internal to the subdivision

See GDD graphic A&Z p. 184-185
4. How do Tax Parcels differ from Development Parcels?

TaxParcel – area to be assessed (valued) for levying “property taxes”

Tax Rolls – cadastre maintained as list
  of ownership
  of assessed value and tax

See GDD graphic A&Z p. 188-189

Development Parcel – ‘improvements’ that can be built on a land parcel.

Lot – boundary of a land parcel; one or more lots forms a land parcel;
  parcel has ownership

Property parcel – owned property, often referring to land, but more general

Key terms
Tax parcel
Development parcel
Ownership and Rights to Property Parcels

**Key terms**
- Title
- Deed

Title is the bundle of rights to interests in property

Documented in a deed to property

See GDD graphics A&Z p. 195
ParcelFeatures_Topology

Parcel...
Must not have dangling lines
Boundary must be covered by
Boundary must not overlap

GDD graphics A&Z p. 206-207
5. What are the main differences between a multipurpose land cadastre and a multipurpose marine cadastre?

http://marinecadastre.gov/

Marine waters application versus land applications

Application to coastal waters within US jurisdiction...

Territorial waters - https://en.wikipedia.org/wiki/Territorial_waters

- jurisdictional boundaries
- restricted areas
- laws
- critical habitat locations
- other important features.

Key terms
Multipurpose cadastre
Census and Addresses
Census Thematic Layer Framework

Census Administrative units – delineate census units such as blocks and block groups

Census boundaries - Linework from which other census features are generated

Points of Interest – Background map with point and polygon landmarks

Other Administrative units – Depict districts to local, regional, state, and federal level

Streets and addresses – Street network analysis and address locations
6. What are the elements of the census feature dataset?

Census_Topology
Census Administrative Units - hierarchy
- United States
- Region
- Division
- State or equivalent – polygon feature class
  - County or equivalent
  - CensusTract / AmericanIndianCensusTract
  - BlockGroup / AmericanIndianBlockGroup
  - CensusBlock

Key terms
- Administrative unit
- Tract
- Block Group
- Block
Census_Topology - continued

Census boundaries
   Rail - Line feature
   Road
   Hydrography
   MiscTransport
   Physical
   Water
Census_Topology - continued

Points of Interest

KeyGeographicalLocation
Landmark
Other Area Landmark
OtherPointLandmark
CountySubdivision
MetropolitanArea
TrafficAnalysisZone
VotingDistrict
ZipCodeTabulationArea
Census_Topology - continued

Administrative Boundaries
  Administrative boundaries, federal level
    Several feature classes

Administrative boundaries, state level
  Several feature classes

Administrative boundaries, county level
  Several feature classes
7. Why are Census topological rules so important?

Census blocks cannot overlap and must nest within block groups

Block groups cannot overlap and must nest within census tracts

Traffic analysis zones must be covered by counties

Voting district layer must be covered by the county layer

Administrative Topology

TIGER
Topologically Integrated Geographically Encoded Referencing

Key terms
Traffic analysis zone

GDD graphics A&Z p. 97
Principal Attributes

FENAME – feature name
FEDIRP – cardinal direction of the feature, e.g., N, SE, W
FETYPE – feature type, e.g. street, avenue
CFCC – Census feature class code
SOURCE – Origin of physical feature
TLID – TIGER line ID
Attributes for addressing

FRADDL – from address, left side
TOADDL – to address, left side
FRADDR – from address, right side
TOADDR – to address, right side

Key terms
From
To
### Census unit ID

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<th>State</th>
<th>County</th>
<th>Tract</th>
<th>Block group</th>
<th>Block</th>
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<td>071</td>
<td>003602</td>
<td>1</td>
<td>003</td>
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**Key terms**
Census Unit ID
8. How are street address reference systems and coordinate reference systems similar and different?

Coordinates and addresses are both geocodes; hence arise from geocoding (reference) systems. The dimensionality of the reference systems are different, thus the geocodes will be different.

Elements of coordinates are drawn from continuous dimensional domains.

Elements of addresses are drawn from continuous and discrete dimensional domains:
- House, building number, or numeric range
- Street name, e.g. Main, or Main Street
- Street Type, e.g. street, road or avenue
- Directional component, e.g., N, NW, W, SW
- Zones, such as city, state, or postal code

Key terms
Spatial reference
Coordinate
Geocode
Address
Two examples of addresses

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<th>State</th>
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<td>1052</td>
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<td>Salt Lake City</td>
<td>UT</td>
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Thematic Layers of Address Data Model

Buildings – building footprints
Points of Interest – define addresses for points of interest
Parcels – Define land ownership and use for taxation
Streets – Street centerline network
Addresses and subaddresses – Address numbers for points of interest
Names – Define names for features and addresses
Zones – Define valid zone combinations for addresses
Geodatabase structure for addresses

See GDD A&Z p. 142-143
Streets with address ranges
Buildings with addresses
Parcels with addresses
Points of Interest with Addresses
Addresses and subaddresses
Names
Postal and Administrative Zones
Range Zones
Address ranges, zones, and names
Address locators
Summary

In this lesson, you learned about...

1. Importance of cadastre records
2. US Public Land Survey System (PLSS) cadastral control survey approach
3. Elements of a land parcel data model
4. Tax parcels and development parcels
5. Main differences between a multipurpose land cadastre and a multipurpose marine cadastre
6. Elements of the census feature dataset
7. Importance of Census TIGER system topological rules
8. Similarity and differences between street address reference systems and coordinate reference systems
Contact me at nyerges@uw.edu if you have questions or comments about this lesson.

GEOG 482/582: GIS Data Management
END Lesson 5: Land Records, Census and Addresses