

Web-Based Demo to Show A Land Use Code Ontology

www.ssec.wisc.edu/landuse/

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If there were **local** land use codes in a parcel layer, one could ask:

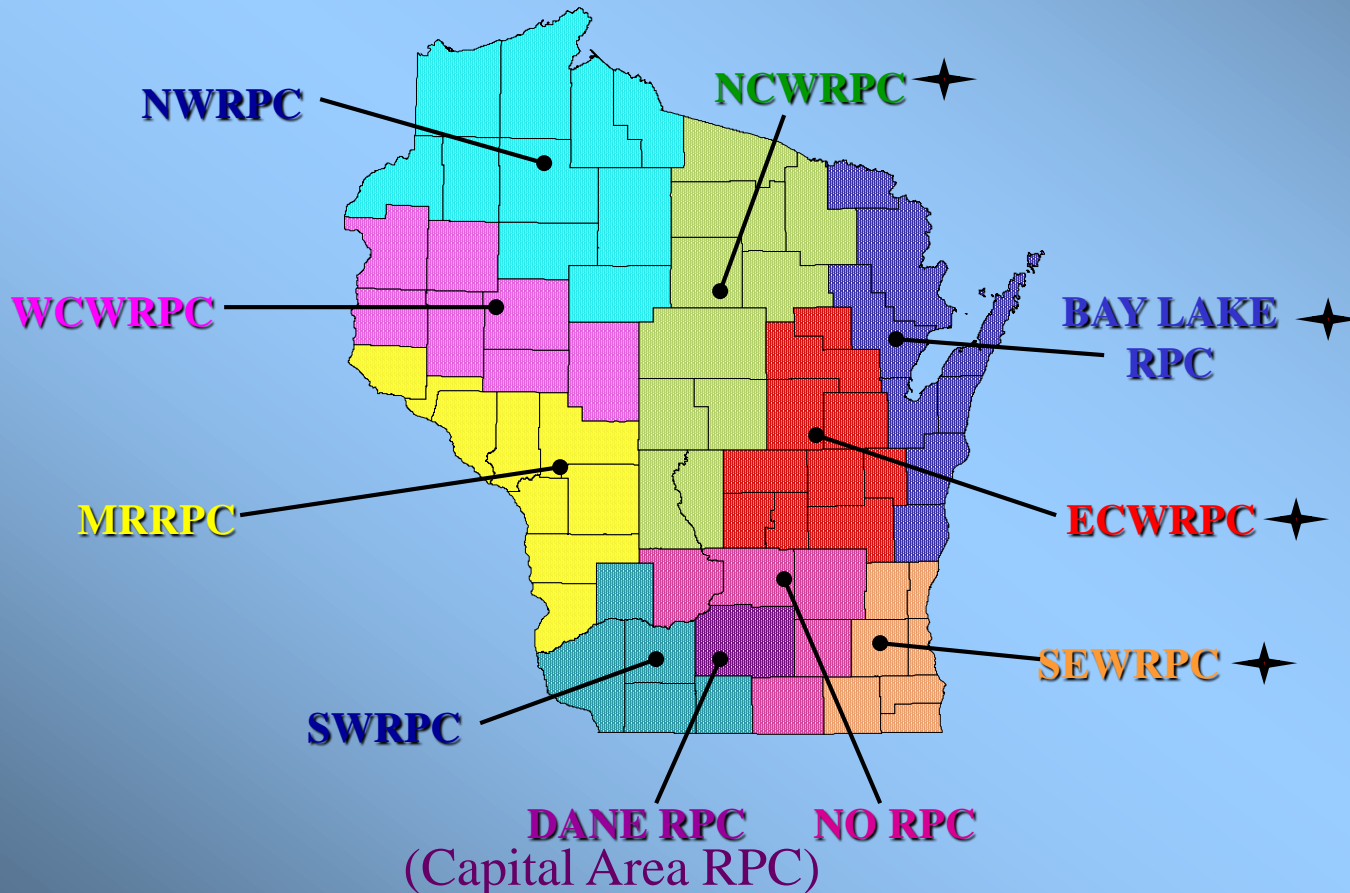
Where are all the Airports, Fish Hatcheries, Lumber Yards, or Single Family residences?



Statewide Parcel Layer

<https://maps.sco.wisc.edu/Parcels/>

Land Use Codes In Wisconsin Vary by Jurisdiction



Regional Planning Commissions (old)

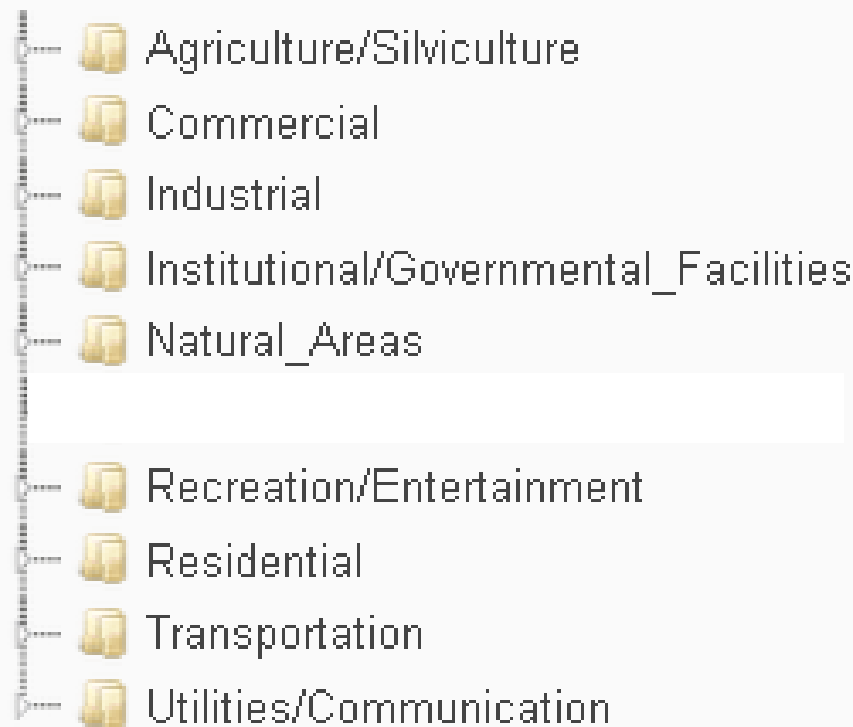
Problem

- Differences in land use codes across the state because they're developed locally
- Need to determine how codes relate to each other
 - e.g., *Single Family* is a **synonym** to *One Family*
 - *Local Group Quarters* is a **subset** of *Group Quarters*

Merged 7 code sets

Integrated Land Use Ontology

Double click a code to select it for the query above



(Screenshot of demo)

- Created a hierarchy with classes, subclasses, sub-subclasses, etc.
- Formalized using Semantic Web technologies

Entered into Protégé to create an OWL file

```
<Declaration>
  <Class IRI="#Wool_Scouring,_Worsted_Combing_and_Towing_to_Top"/>
</Declaration>
<Declaration>
  <Class IRI="#Yarns_and_Threads"/>
</Declaration>
<EquivalentClasses>
  <Class IRI="#Dorms"/>
  <Class IRI="#Residence_Halls"/> Dorms, Residence Halls
</EquivalentClasses>
<EquivalentClasses>
  <Class IRI="#Multiple_Family"/>
  <Class IRI="#Three_Or_More_Family"/>
</EquivalentClasses>
<EquivalentClasses>
  <Class IRI="#One_Family_Unit"/>
  <Class IRI="#Single_Family"/>
</EquivalentClasses>
<EquivalentClasses>
  <Class IRI="#Two_Family"/>
  <Class IRI="#Two_Family_Unit"/>
</EquivalentClasses>
<SubClassOf>
  <Class IRI="#101+_Units"/>
  <Class IRI="#Household_Units"/> 101+_Units subclass of Household_Units
</SubClassOf>
<SubClassOf>
  <Class IRI="#101+_Units"/>
  <Class IRI="#Multiple_Family_with_5+_Dwellings"/>
</SubClassOf>
```

Viewing an existing OWL file on the Web

geosciml.org/doc/vocabularies/iso-19115-codelists.owl

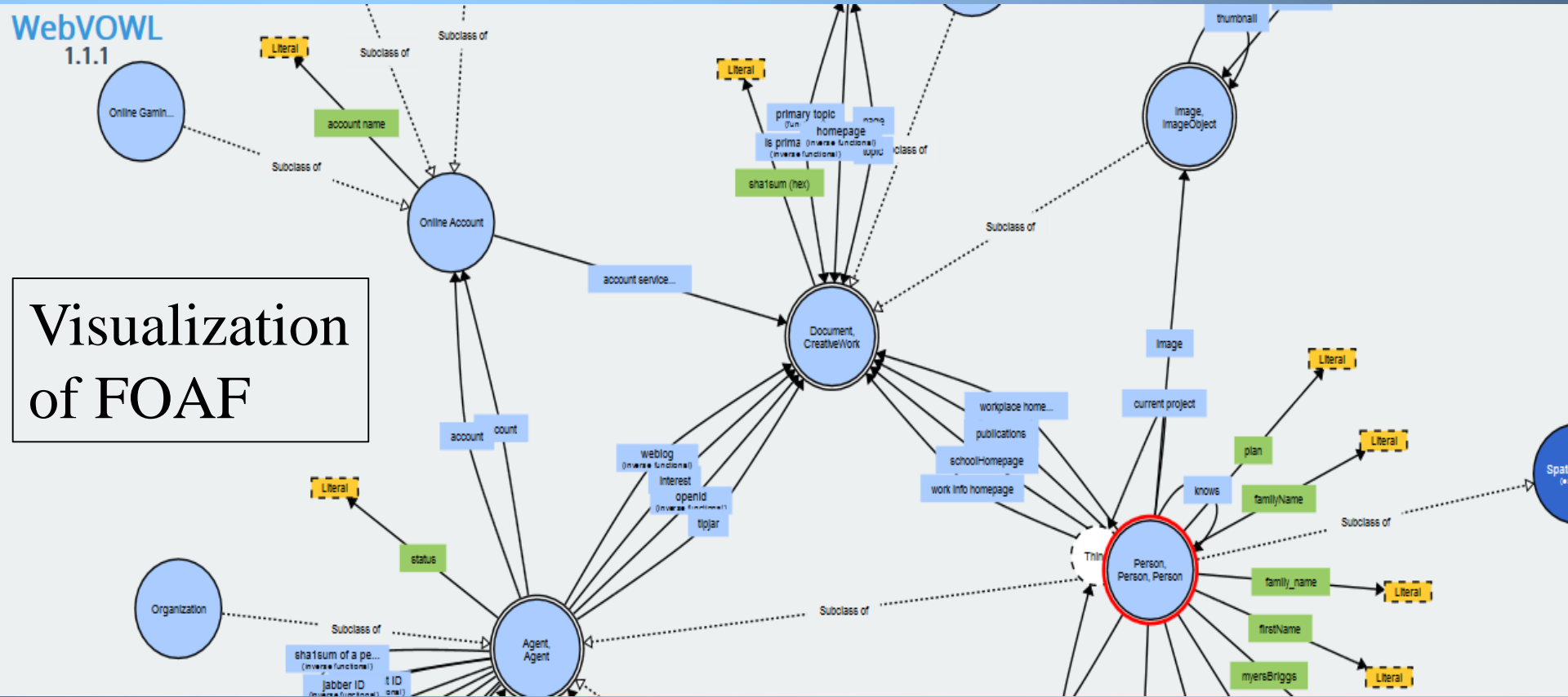
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
- <rdf:RDF xml:base="http://www.geosciml.org/vocabularies/iso-19115-codelists.owl">
  <!-- Ontology Information -->
  - <owl:Ontology rdf:about="">
    - <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
      2008-03-10 version by Simon Cox, CSIRO Exploration and Mining. 1. Refactored Codelists and Enumera
      instances of terms 2. Replaced _shortname and _domainCode with Domain_code 3. use rdfs:label for offic
      prepended to overcome name clashes)
    </rdfs:comment>
    - <rdfs:comment xml:lang="en">
      title- Ontology for Geographic Information Metadata - ISO 19115:2003. creator- Akm Saiful Islam, Luis E
      ISO 19115. Vocabulary terms are declared using OWL language to support RDF applications. publisher- I
    </rdfs:comment>
    <owl:versionInfo rdf:datatype="http://www.w3.org/2001/XMLSchema#string">2.0</owl:versionInfo>
  </owl:Ontology>
  <!-- Classes -->
  - <owl:Class rdf:about="#CI_DateTypeCode">
    <iso-19115-codelists:stereotype rdf:datatype="http://www.w3.org/2001/XMLSchema#string">CodeList-
    <rdfs:comment xml:lang="en">identification of when a given event occurred</rdfs:comment>
    <rdfs:label xml:lang="en">CI_DateTypeCode</rdfs:label>
    <rdfs:subClassOf rdf:resource="#CodeList"/>
  </owl:Class>
```

Problem: How to let users view and query the ontology

- Options:
 - Read the OWL code directly
 - Visualization software
 - Ontology editors, e.g., Protégé, download and learn including how to query
 - Ontology browsers, e.g., BioPortal or eagle-i
- All of the above are not easy

Web-based Visualization of Ontologies WebVOWL



Scroll to see classes and subclasses

Protégé's OntoGraph, Search for 'Duplex'

The image shows the Protégé interface with a search for 'duplex'. The search results are displayed in the OntoGraph, showing a hierarchy of classes. The search bar at the top contains 'duplex' and the filter is set to 'contains'. The search results are as follows:

- Duplexes** (green box) is a superclass of:
 - Single_Unit_In_A_Duplex** (green box)
 - Two_Family** (grey box)
- Farm_Duplexes** (green box) is a subclass of **Duplexes**.
- Farm_Residences** (grey box) is a superclass of **Farm_Duplexes**.
- One_Family_Unit** (grey box) is a superclass of **Single_Unit_In_A_Duplex**.

The left sidebar shows the ontology structure, with 'One_Family_Unit ≡ Single_Family' selected. The search results are highlighted in green boxes, indicating they contain the search term 'duplex'.


Ontology Browser of eagle-i (resource discovery tool for biomedical research)

The screenshot shows a web browser window with the URL <https://search.eagle-i.net/model/#t=http://xmlns.com/foaf/0.1/Person&of=score>. The page features the eagle-i logo and a navigation menu with links for ABOUT, GET INVOLVED, NEWS + EVENTS, FAQ, CONTACT US, and HELP. Below the navigation is a search instruction: "Enter a term name in the search box below to see a list of matches in the eagle-i vocabulary. Alternatively, browse the term hierarchy using the left sidebar. Contact us with any [term comments](#)." The main content area is divided into two columns. The left column contains a search box with "Person" entered, followed by sections for "Resource Types" (with a link to "< All Resource Types" and "Person" listed), "Embedded Types" (with links for "Antibody target", "Cell line QC report", "Construct insert", "Data", "Diagnosis", and "Immunogenic material"), and "Additional Name" (with "string" listed). The right column displays the "Person" ontology entry with the following details: "Definition: A single human being (Homo sapiens).", "Annotations: ClassGroup_InstanceCreate", "URI: http://xmlns.com/foaf/0.1/Person", and "Properties: * indicates a required property". Below these are links for "Author of Document", "Co-PI of Laboratory", and "Contact for Instrument Service Reagent Human".

http://www.ssec.wisc.edu/landuse/

Land Use Demo

Home



Land Use Code

Areas

All

Bay Lakes RPC Dane County

Eau Claire County ECWRPC

Madison City MCWRPC

SEWRPC

Run Query

Results

No results for query

Integrated Land Use Ontology

Double click a code to select it for the query above

- Agriculture/Agriculture
- Commercial
- Industrial
- International/Governmental_Facilities
- Natural_Areas
- No_Landuse_Description_Available
- Recreation/Entertainment
- Residential
- Transportation
- Utilities/Communication

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Land Use Demo



[Home](#)



Land Use Code

Areas

- All
- Bay Lakes RPC
- Eau Claire County
- Madison(city)
- SEWRPC
- Dane County
- ECWRPC
- NCWRPC

Run Query

Results

Type in 3 letters; it autofills.



Land Use Code

Resi|

Accessory_Residential_Uses/Buildings

Farm_Residences

Fly_Ash_and_Other_Fire_Residue_Disposal

Garages/Residential_Storage

Home_Occupations_In_Farm_Residences

Land_Under_Residential_Development

Mixed_Residential/Commercial

Mixed_Residential/Commercial_(Commercial)

Other_Residence_Halls/Dorms

Other_Residential







Parking_Lots_in_Residential_Area

<http://www.ssec.wisc.edu/landuse>

Or, choose a code from the ontology below.

Integrated Land Use Ontology

Double click a code to select it for the query above

-  Agriculture/Silviculture
-  Commercial
-  Industrial
-  Institutional/Governmental_Facilities
- 
-  No_Landuse_Description_Available
-  Recreation/Entertainment
-  Residential
-  Transportation
-  Utilities/Communication

Return:
local term,
internal
code, and
relation
to the
query
term



Land Use Code

Areas

✓ All

Bay Lakes RPC

Dane County

Eau Claire County

ECWRPC

Madison(city)

NCWRPC

SEWRPC

Run Query

Results

[Bay Lakes RPC \[110\]: Single Family](#)

Bay Lakes RPC [110]: Single Family

[Dane County \[111\]: Single Family](#)

[ECWRPC \[9411\]: Single Family](#)

[Eau Claire County \[RS\]: Single Family](#)

Madison(city) [1110]: *One Family Unit*

[Madison\(city\) \[1110\]: One Family Unit](#)

synonym of Single Family **synonym** of Single Family

[Madison\(city\) \[111\]: Single Family](#)

NCWRPC [5]: *Residential* **superclass** of
Single Family

[NCWRPC \[5\]: Residential](#)

[SEWRPC \[111\]: Single Family](#)





Output from the Demo

- Could be incorporated into a statewide parcel system that contained local codes
- User query would result in a list of parcels by jurisdiction along with the relation
- Or, a mapped result

Idea for
eventual
mapping

‘Single
Family’

NCWRPC
(Residential)

-  Superset
-  Exact
-  Synonym
-  Subset

**Bay Lake
RPC**
(Single Family)

Madison(city)
(One Family)



We set the Jurisdiction and Internal Value using Annotations in Protege

```
<AnnotationAssertion>  
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>  
  <IRI>#Air_Related</IRI>  
  <Literal datatypeIRI="&rdf;PlainLiteral">Bay Lakes [460]  
    ECWRPC [481] Dane County [43] Madison [43]  
</Literal>  
</AnnotationAssertion>
```

Internal OWL Demo Format

- For each land use code in the ontology, we listed all the jurisdictions having that code (and the actual representation)
 - **Air Related** (Bay Lakes, 460), (ECWRPC, 481), (Dane County, 43), (Madison, 43)
 - **Airports/Flying Fields** (Madison, 431), (Madison, 4310), (ECWRPC, 481), (Dane County, 43), (Eau Claire, IA)
 - Private Landing Strips (Eau Claire, IA)
 - **Air Fields** (SEWRPC, 463)
 - Associated Operations (Eau Claire, IA)

Demo Summary

- Wanted an easy ontology viewer, reminiscent of e.g., ShapeViewer for ESRI shape files
 - Web-based, available to anyone
 - No login, no software to be installed
 - See relations between terms
- We needed a special kind of ontology viewer because of the merged ontology
- Nevertheless, idea could be adapted to other applications or re-written to be general purpose

Thank you!

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