

# Batch Parsing XML Metadata for Cataloging GIS Data

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# Problem

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Need to create *GIS Lookup* Cataloging Records for multiple data layers contained within various data collections in a time efficient manner.

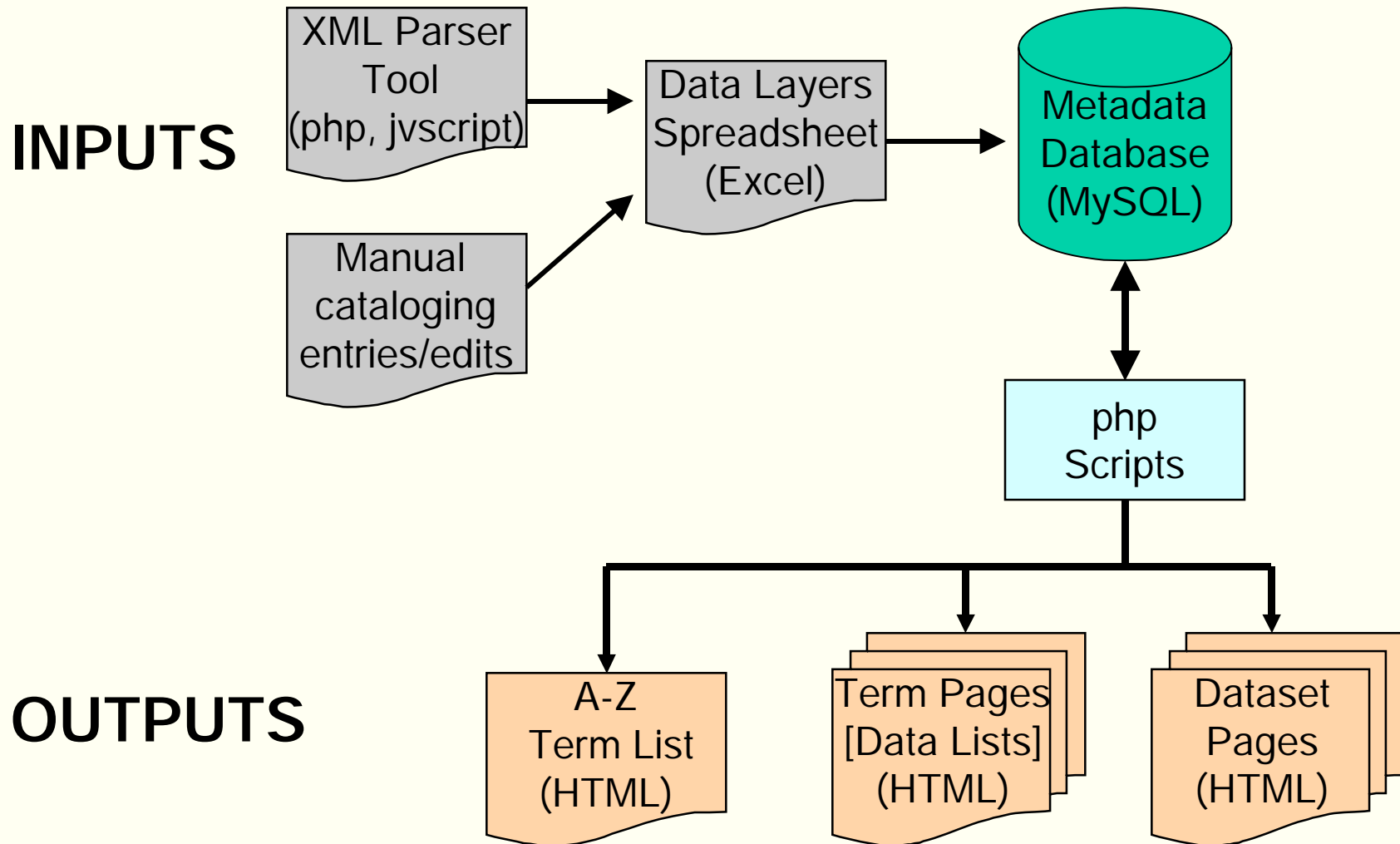
# What is *GIS Lookup*?

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- Database of cataloged geospatial data layers
- Allows keyword and thematic searching
- Provides data layer identification, access instructions, related terms, description, source info, coordinate system info, etc.
- Links to data download, metadata, collection web pages, related data, web mapping, other docs.
- As of May 2005, contains 2027 records.

Note: The following screenshots were taken prior to implementing NCSU Libraries' 2005 website redesign.

# GIS Lookup Architecture



NCSU Libraries: GIS Data Search - Microsoft Internet Explorer provided by NCSU Libraries

File Edit View Favorites Tools Help

Address <http://www.lib.ncsu.edu/stacks/gis/search/search.php?q=roads&rk=1&s=ds>

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**GIS Lookup: Keyword Search** Search Term(s):  Search

[Remove Possible Related Terms](#) [Thesaurus A-Z List](#)

**Possible Related Terms:** [Addresses](#), [Bridges](#), [Buildings](#), [Causeways](#), [Cfcc](#), [Cities](#), [Counties](#), [Digital Line Graphs](#), [Digital Orthophoto Quarter Quadrangles](#), [Digital Raster Graphics](#), [Divided Highways](#), [Elevation](#), [Federal Highways](#), [Ferries](#), [Fords](#), [Freeway Exits](#), [Freeways](#), [Freeways Or Expressways](#), [Geocoding](#), [Highways](#), [Hypsography](#), [Infrastructure](#), [Interstate Highways](#), [Interstates](#), [Interstate Transportation Network](#), [Land Cover](#), [Land Use](#), [Line](#), [Linear Referencing System](#), [Location](#), [Major Roads](#), [Major Streets](#), [National Highway Planning Network](#), [National Parks](#), [Pipelines](#), [Railroads](#), [Railroad Stations](#), [Railroad Yards](#), [Road Feature Codes](#), [Road Lanes](#), [Road Maintenance Date](#), [Road Pavement](#), [Road Proximity](#), [Roads](#), [Road Surface](#), [Road System](#), [Routes](#), [Routing](#), [Slope](#), [Snowsheds](#), [Speed Limits](#), [SPOT](#), [State Highways](#), [State Maintained Road System](#), [Streams](#), [Street Addresses](#), [Street Centerlines](#), [Streets](#), [Traffic Counts](#), [Trail](#), [Transportation](#), [Trees](#), [Tunnels](#), [Unimproved Roads](#), [Universe File](#)

Title	Source	Type	Scale	Date ▼
<a href="#">CGIA: Primary roads</a>	NC Center for Geographic Information and Analysis	Line	unspecified	2004
<a href="#">CGIA: Interstate highways</a>		Line	unspecified	2004
<a href="#">ESRI: Europe Major Roads</a>	AND Products B.V. and AND Data Ireland Limited; AND Global Road Data	Polyline	1:10,000	2004
<a href="#">ESRI: U.S. Streets</a>	Geographic Data Technology, Inc.; GDT TIGER/Line 2000 Streets	Polyline	1:50,000	2004
<a href="#">ESRI: U.S. Major Roads</a>	Geographic Data Technology, Inc. (GDT); Dynamap/2000 v. 12.0	Polyline	1:50,000	2004
<a href="#">ESRI: U.S. Highways</a>	Geographic Data Technology, Inc.; GDT TIGER/Line 2000 Streets	Polyline	1:100,000	2004
<a href="#">ESRI: U.S. Major Highways</a>	Geographic Data Technology, Inc.; GDT TIGER/Line 2000 Streets	Polyline	1:100,000	2004

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Address [http://www.lib.ncsu.edu/stacks/gis/search/datainfo.php?datasetid=2259\\_bp8&rk=1&s=ds](http://www.lib.ncsu.edu/stacks/gis/search/datainfo.php?datasetid=2259_bp8&rk=1&s=ds) Go Links

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### CGIA: Primary roads - 2004

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**Description:** Interstate routes, US routes, and selects state routes in NC, to be used as a general-purpose roads layer. Arcs are assigned US, state and interstate route designations and numbers.

**Keywords and Themes:** [highways](#), [freeways](#), [interstates](#), [routes](#), [transportation](#), [Roads](#), [Interstate Highways](#), [State Highways](#), [Federal Highways](#)

**FTP Location:** <ftp://gisdata.lib.ncsu.edu/cgia83/BasinPro8/infrastructure>

**Mapped Drive Folder:** cgia83/BasinPro8/infrastructure  
[Click here](#) for mapped drive and off-campus FTP access information

**File Name:** prds

**Total size of data files:** 4.8 MB

**Data Type:** ESRI Shapefile      **Feature Type:** Line

**Coordinate System:** StatePlane\_North\_Carolina\_FIPS\_3200

**Datum:** NAD\_1983      **Map Units:** Meters

**Spatial Extent:** North Carolina

**Source Scale:** unspecified

**Created by:** NC Center for Geographic Information and Analysis

**Released by:** NC Center for Geographic Information & Analysis

**Content Date:** 0

**Published Date:** 19981201

**Collection Name:** [BasinPro 8](#)

Internet


6:26

NCSU Libraries: GIS Data Search - Microsoft Internet Explorer provided by NCSU Libraries

File Edit View Favorites Tools Help

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Address [http://www.lib.ncsu.edu/stacks/gis/search/theme\\_list.php](http://www.lib.ncsu.edu/stacks/gis/search/theme_list.php) Go Links

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**GIS Lookup: Thesaurus A-Z List**

Select a term below to find relevant data resources and links to related terms. Links to networked data, metadata, and Web-based mapping utilities are provided. Use available metadata to evaluate and select data resources.

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[1-9](#) - [A](#) - [B](#) - [C](#) - [D](#) - [E](#) - [F](#) - [G](#) - [H](#) - [I](#) - [J](#) - [K](#) - [L](#) - [M](#) - [N](#) - [O](#) - [P](#) - [Q](#) - [R](#) - [S](#) - [T](#) - [U](#) - [V](#) - [W](#) - [X](#) - [Y](#) - [Z](#)

**1-9**

[1:24000](#)

[1:100000](#)

[1:250000](#)

[3 Digit ZIP Codes](#)

[5 Digit ZIP Code Boundaries](#)

[5 Digit ZIP Code Centroids](#)

[5 Digit ZIP Codes](#)

[9 Digit ZIP Code Centroids](#)

[9 Digit ZIP Code Ranges](#)

[9 Digit ZIP Codes](#)

[14-digit](#)

**A**

[Abandoned Railroads](#)

Done Internet

NCSU Libraries: GIS Data Search - Microsoft Internet Explorer provided by NCSU Libraries

File Edit View Favorites Tools Help

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Address http://www.lib.ncsu.edu/stacks/gis/search/coll\_layers.php?cn=edm04&view=c Go Links

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## ESRI® Data & Maps 2004

The following is a categorical list of data layers available from the ESRI® Data & Maps 2004 data collection. Click the data title links for details about each data layer.

[Click here to see the list sorted alphabetically](#)

[Canada](#) | [Europe](#) | [Germany](#) | [Mexico](#) | [North America](#) | [USA](#) | [World](#)

### Canada

[ESRI: Canada FSA Postal Centroids](#)  
[ESRI: Canada Indian Reserves](#)  
[ESRI: Canada Major Cities](#)  
[ESRI: Canada Middle Cities](#)  
[ESRI: Canada Municipalities](#)  
[ESRI: Canada National Parks](#)  
[ESRI: Canada Provinces](#)  
[ESRI: Canada Provincial Parks](#)  
[ESRI: Canada Regional Municipalities](#)  
[ESRI: Canada Telephone Area Code Boundaries](#)

### Europe

[ESRI: Europe Ferries](#)  
[ESRI: Europe Level 1 Provinces](#)  
[ESRI: Europe Level 2 Provinces](#)  
[ESRI: Europe Level 3 Provinces](#)  
[ESRI: Europe Major Roads](#)

Internet

8:26



NCSU Libraries: GIS Data Search - Microsoft Internet Explorer provided by NCSU Libraries

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Address [http://www.lib.ncsu.edu/stacks/gis/search/coll\\_layers.php?cn=edm04&view=a](http://www.lib.ncsu.edu/stacks/gis/search/coll_layers.php?cn=edm04&view=a) Go Links

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- [ESRI: Canada Major Cities](#)
- [ESRI: Canada Middle Cities](#)
- [ESRI: Canada Municipalities](#)
- [ESRI: Canada National Parks](#)
- [ESRI: Canada Provinces](#)
- [ESRI: Canada Provincial Parks](#)
- [ESRI: Canada Regional Municipalities](#)
- [ESRI: Canada Telephone Area Code Boundaries](#)
- [ESRI: Europe Ferries](#)
- [ESRI: Europe Level 1 Provinces](#)
- [ESRI: Europe Level 2 Provinces](#)
- [ESRI: Europe Level 3 Provinces](#)
- [ESRI: Europe Major Roads](#)
- [ESRI: Europe Major Water](#)
- [ESRI: Europe Places](#)
- [ESRI: Europe Province/State Demographics](#)
- [ESRI: Europe Railroad Stations](#)
- [ESRI: Europe Regional Demographics](#)
- [ESRI: Europe Water](#)
- [ESRI: Germany Five-Digit Zip Code Areas \(PLZgrenzen\)](#)
- [ESRI: Germany One-Digit Zip Code Zones \(PLZgrenzen\)](#)
- [ESRI: Germany Two-Digit Zip Code Regions \(PLZgrenzen\)](#)
- [ESRI: Global Digital Elevation Model \(ETOPO2\)](#)
- [ESRI: Global Digital Elevation Model \(GTOPO30\)](#)

Internet

# Solution

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- Parse XML metadata files for element content needed for cataloging
  - Geospatial data are increasingly accompanied by XML metadata files, usually in FGDC format.
  - XML advantage: automated extraction of metadata elements needed for cataloging
  - Batch processes can very quickly extract elements from a large set of XML files
  - Extraction process must remain independent of any metadata structure standard

## Goal:

Develop an automated process for harvesting selected metadata elements from multiple XML files.

Data Layer Title



```
http://www.lib.ncsu.edu/stacks/gis/xml2wtab/xmlfiles/dtl_cnty.sdc.xml - Microsoft Internet Explorer provided by NCSU Libraries
File Edit View Favorites Tools Help
Back Forward Stop Home Search Favorites Refresh Mail Print
Address http://www.lib.ncsu.edu/stacks/gis/xml2wtab/xmlfiles/dtl_cnty.sdc.xml Go Links

<?xml version="1.0" ?>
<!-- <!DOCTYPE metadata SYSTEM "http://www.esri.com/metadata/esriprof80.dtd" -->
- <metadata xml:lang="en">
- <Esri>
  <MetaID>{80FB5E47-D9E2-4BD9-891B-8A9DAD4A7153}</MetaID>
  <CreaDate>20021204</CreaDate>
  <CreaTime>15060400</CreaTime>
  <SyncOnce>FALSE</SyncOnce>
  <SyncDate>20040320</SyncDate>
  <SyncTime>08513400</SyncTime>
  <ModDate>20040320</ModDate>
  <ModTime>11274400</ModTime>
  <Sync>FALSE</Sync>
  <PublishedDocID>{E46657AB-88A7-45DA-B9B2-8F493CCB14B9}</PublishedDocID>
</Esri>
- <idinfo>
  <native Sync="TRUE">Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 3; ESRI
  ArcCatalog 9.0.0.532</native>
  - <descript>
    <langdata Sync="TRUE">en</langdata>
    <abstract>U.S. Counties represents the counties of the United States in the 50 states and the
    District of Columbia.</abstract>
    <purpose>U.S. Counties provides detailed boundaries that are consistent with the tract and
    state data sets and are effective at regional and state levels.</purpose>
    <supplinf>Largest scale when displaying the data: 1:100,000.</supplinf>
  </descript>
  - <citation>
    - <citeinfo>
      <origin>Geographic Data Technology, Inc.</origin>
      <pubdate>20040301</pubdate>
      <title>U.S. Counties</title>
      <ftname Sync="TRUE">dtl_cnty.sdc</ftname>
      <geoform Sync="TRUE">vector digital data</geoform>
      <edition>2004</edition>
    - <serinfo>
      <sername>ESRI@ Data & Maps</sername>
      <issue>2004</issue>
    </serinfo>
    - <pubinfo>
```

# Existing Tools

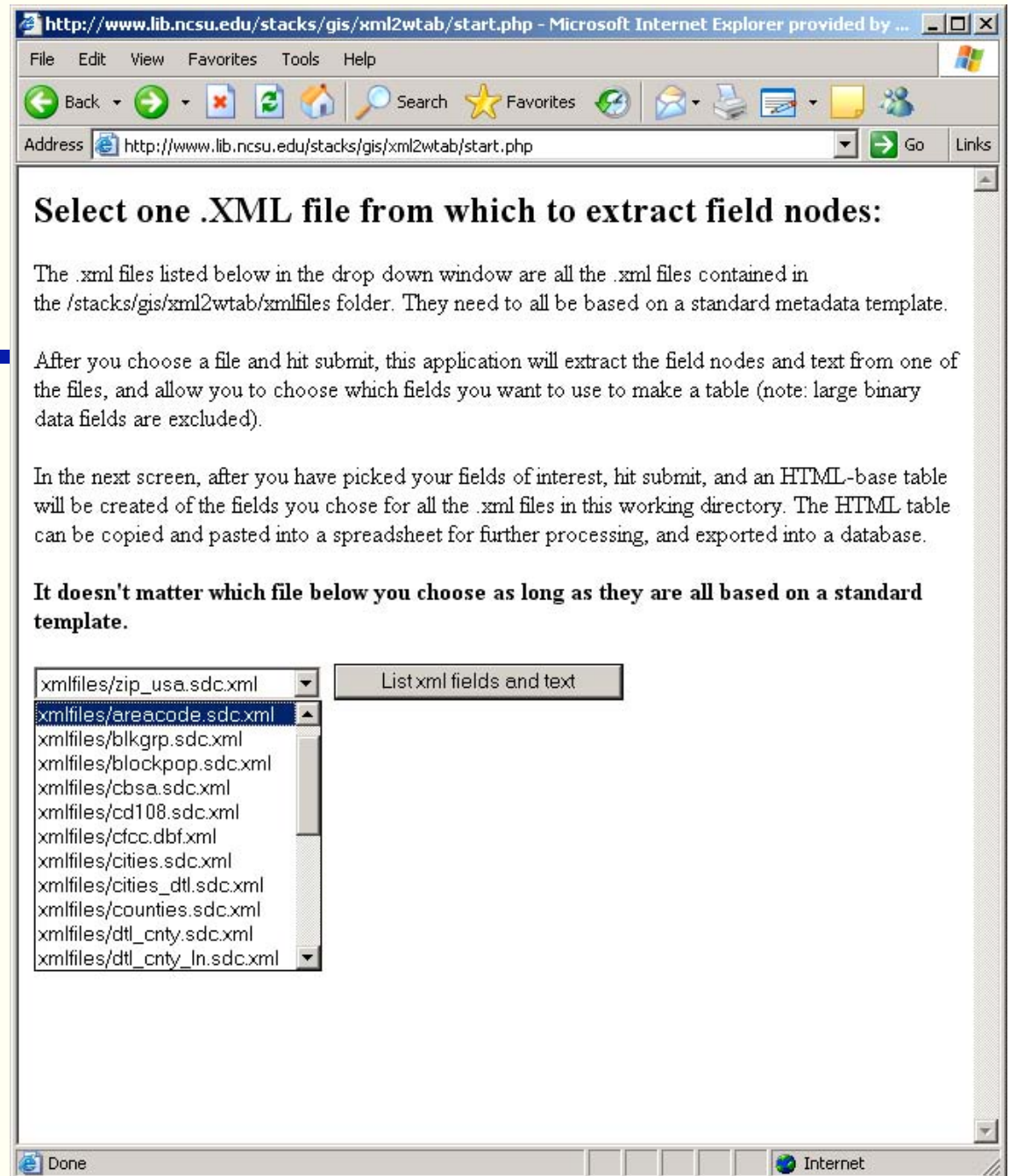
---

- Internet search for software tools, scripts, utilities, etc. did not yield any turnkey solutions.
  - Majority of tools were designed for XML file creation or did not offer structure independence flexibility.
  - However, php and javascript provide robust capabilities for interacting with XML

# XML Parser Tool: Client Interface

Files to parse are located in the /xmlfiles folder.

Choose any file from the drop-down menu in order to list the fields and sample text.



The screenshot shows a Microsoft Internet Explorer browser window displaying the XML Parser Tool client interface. The address bar shows the URL: <http://www.lib.ncsu.edu/stacks/gis/xml2wtab/start.php>. The page content includes the following text:

**Select one .XML file from which to extract field nodes:**

The .xml files listed below in the drop down window are all the .xml files contained in the /stacks/gis/xml2wtab/xmlfiles folder. They need to all be based on a standard metadata template.

After you choose a file and hit submit, this application will extract the field nodes and text from one of the files, and allow you to choose which fields you want to use to make a table (note: large binary data fields are excluded).

In the next screen, after you have picked your fields of interest, hit submit, and an HTML-base table will be created of the fields you chose for all the .xml files in this working directory. The HTML table can be copied and pasted into a spreadsheet for further processing, and exported into a database.

**It doesn't matter which file below you choose as long as they are all based on a standard template.**

The interface features a drop-down menu with the following file names:

- xmlfiles/zip\_usa.sdc.xml
- xmlfiles/areacode.sdc.xml
- xmlfiles/blkgrp.sdc.xml
- xmlfiles/blockpop.sdc.xml
- xmlfiles/cbsa.sdc.xml
- xmlfiles/cd108.sdc.xml
- xmlfiles/cfcc.dbf.xml
- xmlfiles/cities.sdc.xml
- xmlfiles/cities\_dtl.sdc.xml
- xmlfiles/counties.sdc.xml
- xmlfiles/dtl\_cnty.sdc.xml
- xmlfiles/dtl\_cnty\_ln.sdc.xml

To the right of the menu is a button labeled "List xml fields and text". The browser's status bar at the bottom shows "Done" and "Internet".

Select the metadata fields you would like included in the final table. Use the Text column for reference.

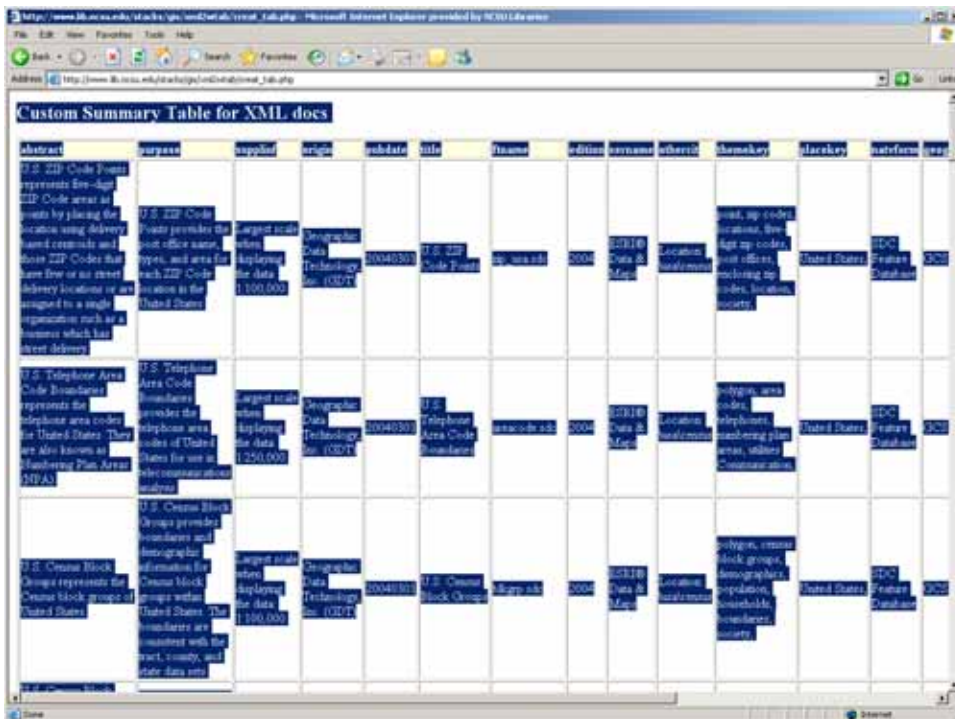
Generate Table

Reset

Element Path	Element Text
<input type="checkbox"/> /metadata/Esri/MetaID	{80FB5E47-D9E2-4BD9-891B-8A9DAD4A7153}
<input type="checkbox"/> /metadata/Esri/CreaDate	20021204
<input type="checkbox"/> /metadata/Esri/CreaTime	15060400
<input type="checkbox"/> /metadata/Esri/SyncOnce	FALSE
<input type="checkbox"/> /metadata/Esri/SyncDate	20040320
<input type="checkbox"/> /metadata/Esri/SyncTime	08513400
<input type="checkbox"/> /metadata/Esri/ModDate	20040320
<input type="checkbox"/> /metadata/Esri/ModTime	11274400
<input type="checkbox"/> /metadata/Esri/Sync	FALSE
<input type="checkbox"/> /metadata/Esri/PublishedDocID	{E46657AB-88A7-45DA-B9B2-8F493CCB14B9}
<input type="checkbox"/> /metadata/idinfo/native	Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 3; ESRI ArcCatalog 9.0.0.532
<input type="checkbox"/> /metadata/idinfo/descript/langdata	en
<input checked="" type="checkbox"/> /metadata/idinfo/descript/abstract	U.S. Counties represents the counties of the United States in the 50 states and the District of Columbia.
<input checked="" type="checkbox"/> /metadata/idinfo/descript/purpose	U.S. Counties provides detailed boundaries that are consistent with the tract and state data sets and are effective at regional and state levels.
<input checked="" type="checkbox"/> /metadata/idinfo/descript/supplinf	Largest scale when displaying the data: 1:100,000.
<input checked="" type="checkbox"/> /metadata/idinfo/citation/citeinfo/origin	Geographic Data Technology, Inc.
<input checked="" type="checkbox"/> /metadata/idinfo/citation/citeinfo/pubdate	20040301
<input checked="" type="checkbox"/> /metadata/idinfo/citation/citeinfo/title	U.S. Counties
<input checked="" type="checkbox"/> /metadata/idinfo/citation/citeinfo/ftname	dfl_cnty.sdc
<input type="checkbox"/> /metadata/idinfo/citation/citeinfo/geoform	vector digital data
<input checked="" type="checkbox"/> /metadata/idinfo/citation/citeinfo/edition	2004
<input checked="" type="checkbox"/> /metadata/idinfo/citation/citeinfo/serinfo/sername	ESRI® Data & Maps
<input type="checkbox"/> /metadata/idinfo/citation/citeinfo/serinfo/issue	2004

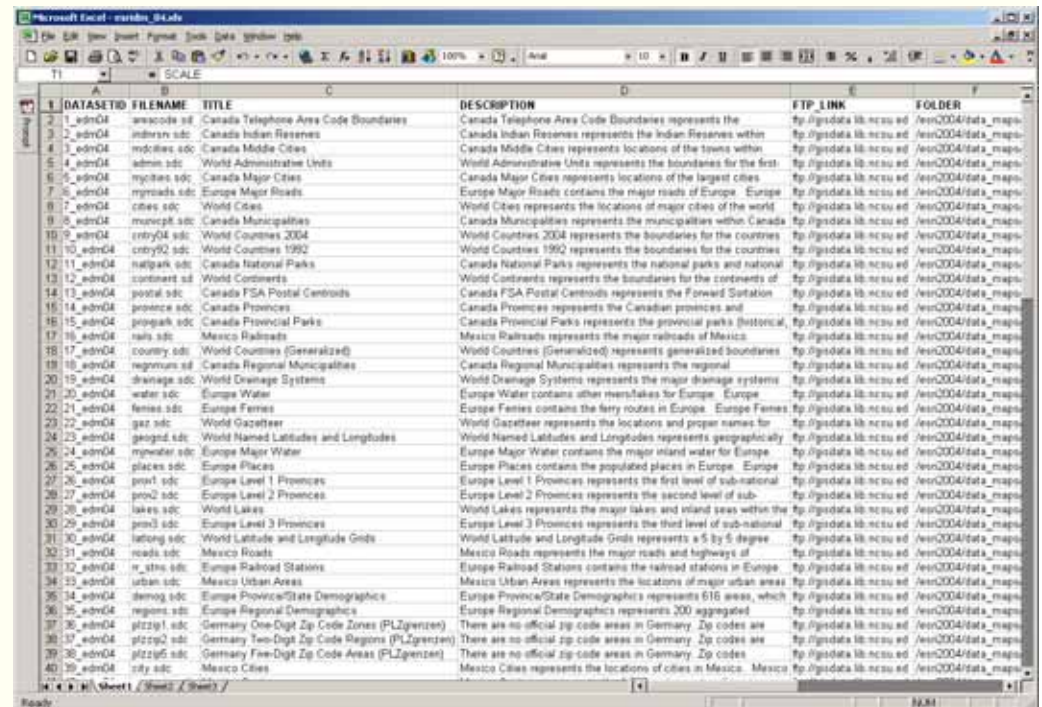
### Custom Summary Table for XML docs

abstract	purpose	supplinf	origin	pubdate	title	fname	edition	sername	othercit	themekey	placekey	natvform	geog
U.S. ZIP Code Points represents five-digit ZIP Code areas as points by placing the location using delivery based centroids and those ZIP Codes that have few or no street delivery locations or are assigned to a single organization such as a business which has street delivery.	U.S. ZIP Code Points provides the post office name, types, and area for each ZIP Code location in the United States.	Largest scale when displaying the data: 1:100,000.	Geographic Data Technology, Inc. (GDT)	20040301	U.S. ZIP Code Points	zip_usa.sdc	2004	ESRI® Data & Maps	Location: \usa\census	point, zip codes, locations, five-digit zip codes, post offices, enclosing zip codes, location, society,	United States,	SDC Feature Database	GCS
U.S. Telephone Area Code Boundaries represents the telephone area codes for United States. They are also known as Numbering Plan Areas (NPA).	U.S. Telephone Area Code Boundaries provides the telephone area codes of United States for use in telecommunications analysis.	Largest scale when displaying the data: 1:250,000.	Geographic Data Technology, Inc. (GDT)	20040301	U.S. Telephone Area Code Boundaries	areacode.sdc	2004	ESRI® Data & Maps	Location: \usa\census	polygon, area codes, telephones, numbering plan areas, utilities Communication,	United States,	SDC Feature Database	GCS
U.S. Census Block Groups represents the Census block groups of United States.	U.S. Census Block Groups provides boundaries and demographic information for Census block groups within United States. The boundaries are consistent with the tract, county, and state data sets.	Largest scale when displaying the data: 1:100,000.	Geographic Data Technology, Inc. (GDT)	20040301	U.S. Census Block Groups	blkgrp.sdc	2004	ESRI® Data & Maps	Location: \usa\census	polygon, census block groups, demographics, population, households, boundaries, society,	United States,	SDC Feature Database	GCS
U.S. Census Block													

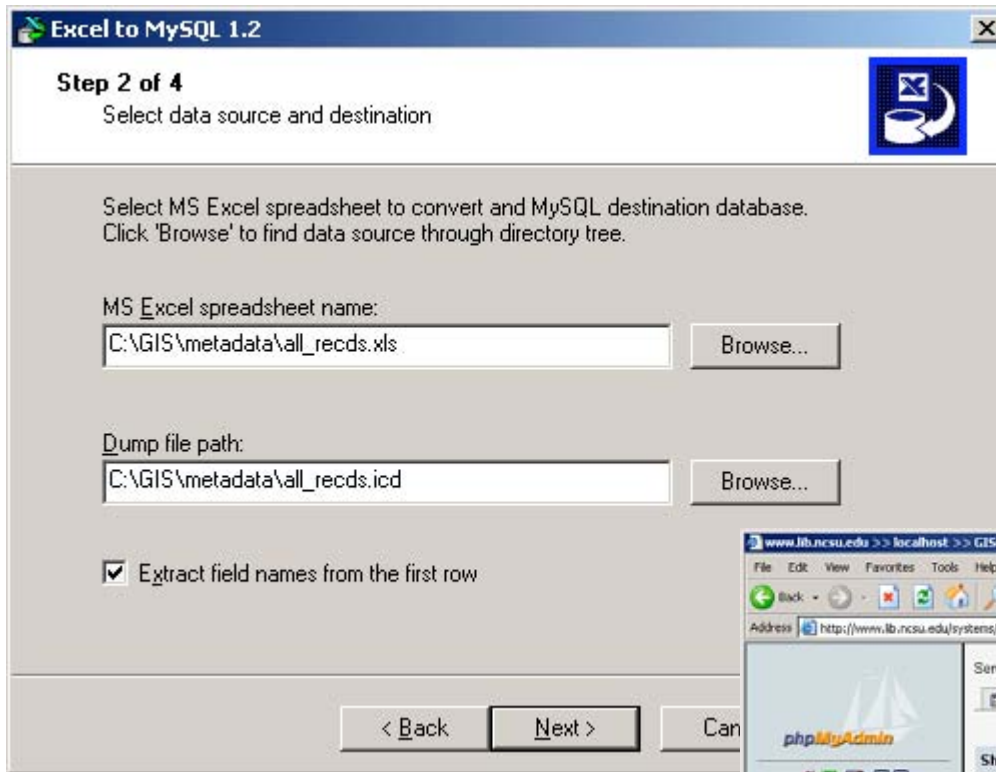


“Select All” of the output HTML table and copy it to the system clipboard...

...paste contents into a spreadsheet document and clean up as necessary.

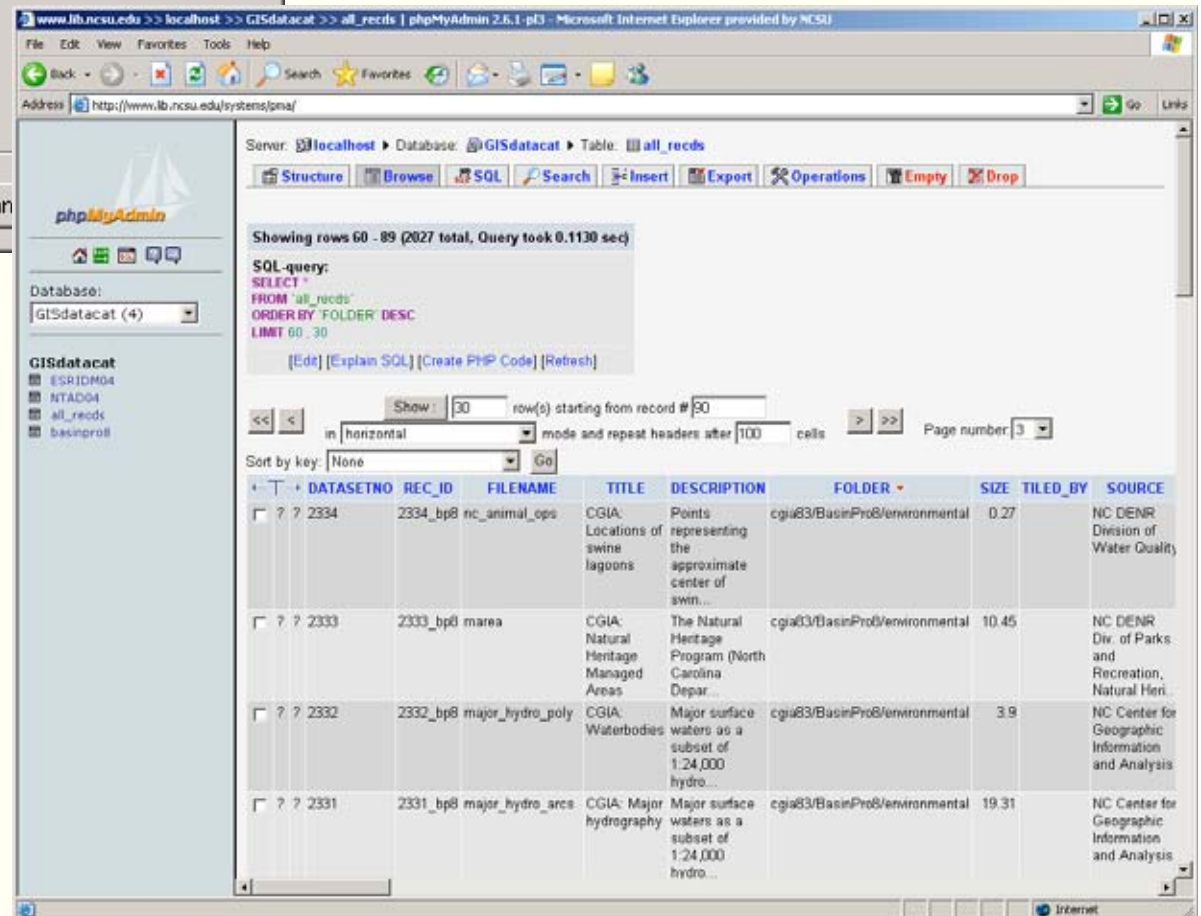






Convert data layer records in spreadsheet document into SQL INSERT statements for database...

...Import INSERT statements into database, and perform final edits if needed.



# How it works – Script Backend

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- Six Files, ~ 10 KB
- config.php:
  - Specifies the /xmlfiles folder as where the XML files are located.
  - Specifies the file type to parse (XML)
- start.php:
  - Gives basic instructions
  - Reads the list of XML files to a dropdown list
  - Users selects one of the files to use for listing metadata fields and content

## How it works – cont.

---

- `sel_fields.php`
  - Calls a javascript to load the selected XML file using `Microsoft.XMLDOM`
  - Calls a javascript which loads `xslstyle_x2w.xsl`
  - Calls a javascript to display the results of `xslstyle_x2w.xsl`

## How it works – cont.

---

- `xslstyle_x2w.xsl`
  - xsl template that generates a checkbox, element pathname, and element content for each metadata field in the selected XML file.
  - Since XML files may contain binary data (e.g. preview graphics), the xsl does not select nodes with > 10,000 characters
  - Passes the selected element paths to `creat_tab.php`

## How it works – cont.

---

- `xsl_tabstyle.xsl`
  - Output table stylesheet
  - Dynamically written by `creat_tab.php`
  - Instructs output table to contain the value of each selected element
  - Is executed for each XML file by `creat_tab.php`
  - Must be a pre-existing file (can be zero length) with write permissions. Content is overwritten whenever `creat_tab.php` is executed.

## How it works – cont.

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- `creat_tab.php`
  - Generates the output table stylesheet template and writes it on-the-fly to `xsl_tabstyle.xsl`
  - If multiple “keyword” fields exist, concatenates them into one comma separated field
  - Creates output table headers and structure
  - Loops through all XML files in the `xmlfolder`, calling a javascript to extract data from the selected elements, as specified by the `xsl_tabstyle.xsl` template
  - Outputs element names and content for all XML files in an HTML table

# Time Efficiency

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- Cataloging NC BasinPro 8 took a span of about 5 weeks for approximately 80 data records.
- Cataloging ESRI Data and Maps 2004, which has about 130 records, took 3 days.

# Limitations

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- Limited by XML metadata content, formation
- Designed and tested to work only in Internet Explorer 6 - javascript relies on an IE ActiveX object call to work. Does not work in Firefox.



# Future Applications

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- Use for batch parsing any set of XML files
- Will be exploring using this tool for extracting layer information from WMS / WFS capability files

# Code Distribution

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Issues pertaining to distribution of the code have not been decided as of June 3, 2005, the date of submission of this presentation to ESRI. Contact [jeff\\_essic@ncsu.edu](mailto:jeff_essic@ncsu.edu) for later status information.