

Behind the Portal: Use of GOS Map and Data Services

September 30, 2009

Agreement Number

NSDI CAP G09AC00105

Project Title

The Coeur d'Alene Tribe, North Carolina Department of Environmental and Natural Resources, and US Environmental Protection Agency GOS Integration Project

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Executive Summary

The Coeur d'Alene (CDA) Tribe, North Carolina Department of Environment and Natural Resources (NCDENR), and U.S. Environmental Protection Agency (EPA) Geospatial One-Stop (GOS) Integration Project illustrates how partners can leverage GOS features to collaborate and share critical environmental resources. This project leverages new and existing metadata catalogs provided by our partner organizations in order to allow users to search for information from different application environments and to be able to view the results in various output formats. The flexibility provided by the features developed for this project allows individuals to more easily use GOS resources from within their own environments and tools of choice.

This project extends a pre-existing application called Geo Finder for the Environment (GFE). The GFE has been augmented for this effort to provide a web-service based reusable application programming interface (API) that supports numerous metadata catalog implementations and output formats. To date, GFE has been extended to provide support for various implementations of the Catalog Service for the Web (CS-W) specification and Z 39.50 implementations and supports search results output to Google Maps, the Google Earth Plug-in, Microsoft Bing, DHTML, HTML, GeoRSS, and KML. GFE currently provides the capability to search EPA's geospatial metadata catalog and the CDA tribe metadata collection (as well as other providers that are not part of this specific effort). NCDENR is currently planning to implement a geospatial metadata catalog using GeoNetwork and will interface with the GFE application when that is available (anticipated for late Fall 2009).

Each partner implementation illustrates a different aspect of the application's capabilities (described in greater detail below). The next phase of the project will focus on working with our partners to help them utilize GFE within their own organizations. Further tweaking of application components will be performed to meet specific customer needs and implementation requirements. This will be followed by a general training session that will be available to any interested party in order to allow them to learn how to use these components (as well as basic GOS API features) in their own applications. The training sessions will be web-based and will build on the contacts used during a prior CAP training effort carried out for metadata training.

Project Narrative

The goal of the CDA Tribe, NCDENR, and EPA GOS Integration Project is to provide resources that will allow partner agencies to effectively implement the GFE within different partner environments in order to more easily find and access geospatial resources. Key project activities to date have been focused around enhancing the existing GFE application and customizing it to meet the needs of partners. These activities (described in greater detail below) are categorized into the following four areas:

1. Enhancements to the core functionality of GFE
2. Collaboration activities with our partners
3. Providing new output formats
4. Expose a URL-based API to allow GFE to be used by our partners

1. Enhancements to Core GFE Functionality

Numerous enhancements were made to GFE’s underlying search infrastructure. Enhancements started out with upgrades of the GFE code base to Java 5 and Dojo 1.3.1. The new version of Dojo includes a fix for a bug affecting the display of metadata records that was discovered and fixed previously by Innovate personnel (<http://trac.dojotoolkit.org/ticket/8045>). The GFE code base upgrade was followed by updates to core GFE functionality that included:

- Enhancements to support ESRI CSW 2.0.0 implementation:
 - o Support spatial search
 - o OGC filter tree-pruning to avoid crashing the server
 - o Detect connector inserted metadata linkages
- Support for ESRI CSW 2.0.2 implementation
- Improve consistency of search experience across providers, protocols (Z39.50 and CSW), implementations (Isite, ESRI, GeoNetwork) and metadata record formats (CSDGM, ISO, DC).
- Extract all linkages from metadata records
- Server-side XML pretty-printing to achieve consistent viewing of XML metadata across browsers.
- Implement mechanism to retrieve XML metadata from sources that support a unique identifier
- Implement mechanism to retrieve readable (HTML) metadata from sources that support a unique identifier
- Support for GOS source identifier
- Support dynamic HTML output
- Support static HTML output
- Support KML output
- Support GeoRSS output
- Demonstrative use of static and dynamic HTML outputs in browser
- Demonstrative use of KML output in Google Earth browser plug-in, Microsoft Bing and desktop tool.
- Demonstrative use of GeoRSS output in Google Maps and desktop/browser RSS viewer.

2. Collaboration Activities with Partners

A key aspect of this project is enabling partner organizations to effectively reuse resources within their own environments. As such, considerable effort was put into defining how the GFE could be used to meet the needs of our partners. Our team developed a “Requirements, Use Cases and Design” document and reviewed this with partners. We coordinated across teams to understand how best to customize the use of the GFE application to best meet user needs. The implementations chosen by each organization are described in more detail below.

The EPA implementation utilizes the KML output from the GFE API within its custom Enterprise Google Earth implementation (called EPA Earth). This implementation allows users to search for and access geospatial information from EPA’s geospatial catalog and from the GOS catalog directly from the EPA Earth application. Users can display the search results directly within EPA Earth using the KML output option returned by the GFE application. The KML file displays the footprint of the bounding box of the data set described by the metadata and allows the user to view additional details about the metadata (title, abstract, link to full metadata, link to geospatial content where applicable). EPA Earth programmers were interested in the spatial search aspects of GFE. Initially the team was concerned about the approach that required that data returned be completely within the search coordinates. The EPA Earth team was

initially interested in having spatial search function using “overlap” rather than “completely within”. The rationale for this approach was explained by the need to eliminate returning records that have national or global coordinates (which can often be the case for many records).

The CDA tribe implementation utilizes the DHTML output from the GFE API. The DHTML output is embedded into an internal web page to allow users to view updated information about environmental data within their tribal area. The search has been configured to point to CDA tribe data specifically as well as to data from other organizations that falls within the geographic extent of the tribe (or greater region around the tribal area). Users are able to view the metadata record’s title, abstract, online linkage (where available), and a link to the full metadata record. Because of feedback from the tribe, we have also added support for CSS style sheets in the DHTML and HTML output formats. Additionally, at the request of the CDA tribe, the team will also augment the GFE to provide additional flexibility for users to specify their own XSL stylesheets in order to control which metadata elements are presented to the user from the search results. This capability is currently being added to the GFE.

As part of this effort, the CDA tribe was able to take advantage of SDE metadata harvesting capabilities that had originally been developed for EPA. Although this feature was not planned as part of this effort, the functionality provided through this inter-agency collaboration is a good example of how CAP grant activities enhance geospatial application and code reuse across organizations. The SDE harvesting feature was originally developed as a component for EPA to use internally to support users in harvesting metadata directly to EPA’s internal metadata catalog from an SDE database. The CDA tribe was hoping to retire their ArcIMS metadata service as they moved toward ArcGIS Server and was also interested in ensuring that the information provided to GOS was up to date with the content in their local database. This dynamic “SDE to WAF” capability creates a dynamic web accessible folder (WAF) from a local database that can then be directly harvested by GOS. A user can choose to configure the application to point to their entire metadata table, or they can choose to point to a view of their records that allows them to harvest only records that they are interested in having harvested to GOS. Because CDA tribe individuals can use GFE to allow users to search for and browse their metadata catalog, they can effectively retire the ArcIMS metadata explorer and still provide the functionality for contributing to GOS and allowing for user access to records.

NCDENR is currently working to implement their metadata catalog. It is anticipated that the NCDENR catalog will be implemented as a GeoNetwork catalog that supports CS-W 2.0.2. Once the catalog is established, it is anticipated that NCDENR will utilize the dynamic HTML output from the GFE REST API to allow users to search their Geo Network Catalog (in progress) and display the results within a departmental web page. Additional details regarding this implementation will be finalized with NCDENR personnel in upcoming weeks.

3. Providing new output formats

The GFE application may be accessed using the GFE web interface (<http://98.118.127.218:8080/GFE/>). The GFE web interface allows users to search for information and view results. In addition to viewing results within the standard GFE user interface, users can now request output in several different formats:

- Google Maps
- Google Earth Plug-in
- Microsoft Bing
- Static HTML
- Dynamic HTML

- GeoRSS
- KML

Each format is now functioning, although further tweaking and refinement is ongoing. The output format can be selected from the GFE user interface using a drop-down box. Output options can also be selected via setting a parameter value in the REST API (shown in examples provided below).

Several output formats are illustrated below. Figure 1 shows an example of output in Google Maps, which utilizes the GFE’s GeoRSS output format. If the metadata record provides bounding box information, bounding boxes will be displayed visually on the map. Clicking on a box displays the abstract from the metadata. Figure 2 illustrates EPA metadata records shown in the Google Earth plug-in, which uses the KML format. Figure 3 illustrates the DHTML output, which takes advantage of Dojo and javascript on the user’s browser. For each search provider selected, a collapsible table is displayed. Clicking on any row will bring up a window in the foreground, displaying the detailed data. In Figure 4, data relevant to the Coeur d’Alene Tribe is returned into a frame directly within their existing web page.

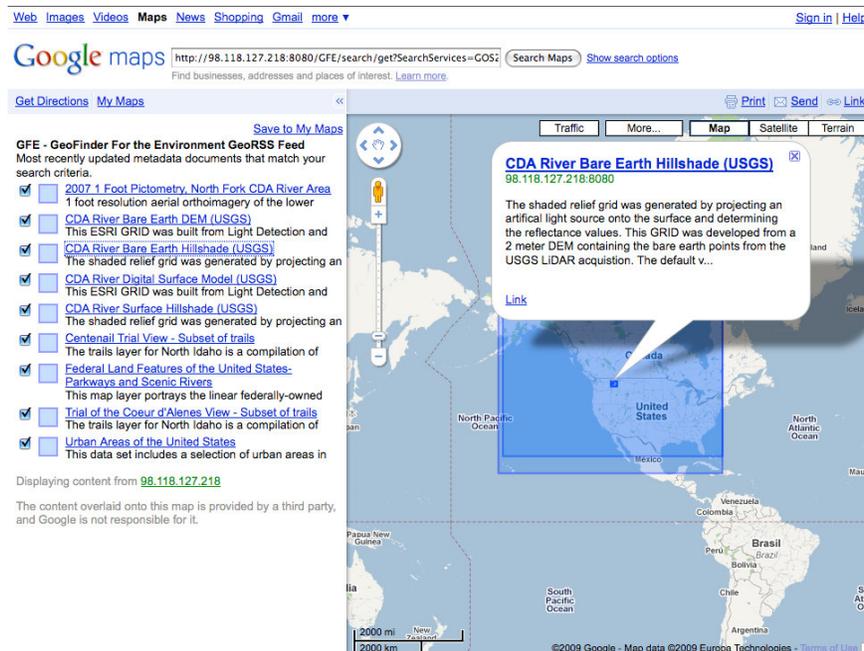


Figure 1 - GeoRSS Output in Google Maps



Figure 2 - KML Output in Google Earth Plugin

Geospatial One Stop - CSW 2.0.2

Rank	Title	Type	Date
1	EAP Alternatives	Downloadable Data	2008-11-06 09:58:04.0
2	Idaho Population Density	Downloadable Data	2008-11-06 09:58:31.0
3	LandSat imagery of Coeur d'Alene Basin - False Color	Unknown	2008-02-03 06:47:46.0
4	Public Land Survey Sections for Washington, Idaho and Montana	Unknown	2009-02-20 03:26:17.0
5	Public Land Survey Townships for Washington, Idaho		-20 03:26:19.0
6	Study		-06 09:58:37.0
7	Geogr		-20 03:24:38.0
8	Geogr		-20 03:24:40.0
9	Geogr		-20 03:24:43.0
10	Geogr		-20 03:24:45.0
11	Geogr		-20 03:24:47.0
12	Geogr		-20 03:24:49.0
13	Geogr		-20 03:24:51.0
14	Geogr		-20 03:24:53.0
15	Geogr		-20 03:24:54.0
16	Geogr		-20 03:24:56.0
17	Geogr		-20 03:24:58.0

Resource Type:
Unknown

Linkage:
[Server=cda3.Service=sde.sclserver.cda3.Database=NationalDatasets;User=sde.Version=sde.DEFAULT](#)

Publication Date:
2009-02-20 03:26:19.0

Keywords:
planningCadaastre

Abstract:

Combined Public Land Survey townships from Washington Department of Natural Resources, Inside Idaho and Montana Natural Resource Information System. Abstract, Washington Department of Natural Resources: The Legal Description spatial layer covers the entire upland area of the State of Washington and consists of often overlapping areas that provide the structure and building blocks for the delineation of parcels of land, a parcel being briefly described as a portion of land identified for purpose of ownership, encumbrance, taxation or governmental administration. Legal Description areas are referred to in written legal descriptions used in the conveyance of parcels. In the Public Land Survey states, of which most non-colonial states including Washington are counted, the most widely recognized legal description area is called a Section. Normally there are 36 Sections in a Township, which is another legal description area. In Washington (and in Oregon) many early land claims took the form of Donation Land Claims, which are, like Sections, confined to being a part of a Township. Tracts, which are used by federal surveys to denote irregular areas where the claim to ownership is based on bona fide rights, and Protracted Blocks, which are a buffer between surveyed areas and areas of unsurveyed (protracted) Sections, are two additional subdivisions of Townships. Sections were not normally subdivided, except in theory, by the federal surveys. The subdivisions of Sections performed by county and local surveyors, using the federal design or schema for section subdivisions, are also part of the Legal Description layer. The fabric of Townships, Sections and their subdivisions, Donation Land Claims, Tracts and Protracted Blocks comprise what is known as the Public Land Survey System (PLSS). These PLSS surveys are referred to as Rectangular Surveys, due to their characteristic orientation to true meridian and to the normally square-like character of the areas encompassed. Other irregular federal surveys are included in the Legal Description layer. These include Mineral Surveys, Homestead Entry Surveys, Townsites and non-rectangular Indian Allotments. Under the authority of Counties and Cities many local subdivisions of the PLSS have been created and are included in the Legal Description Layer. Local subdivisions include the streets.

Figure 3 - Dynamic HTML

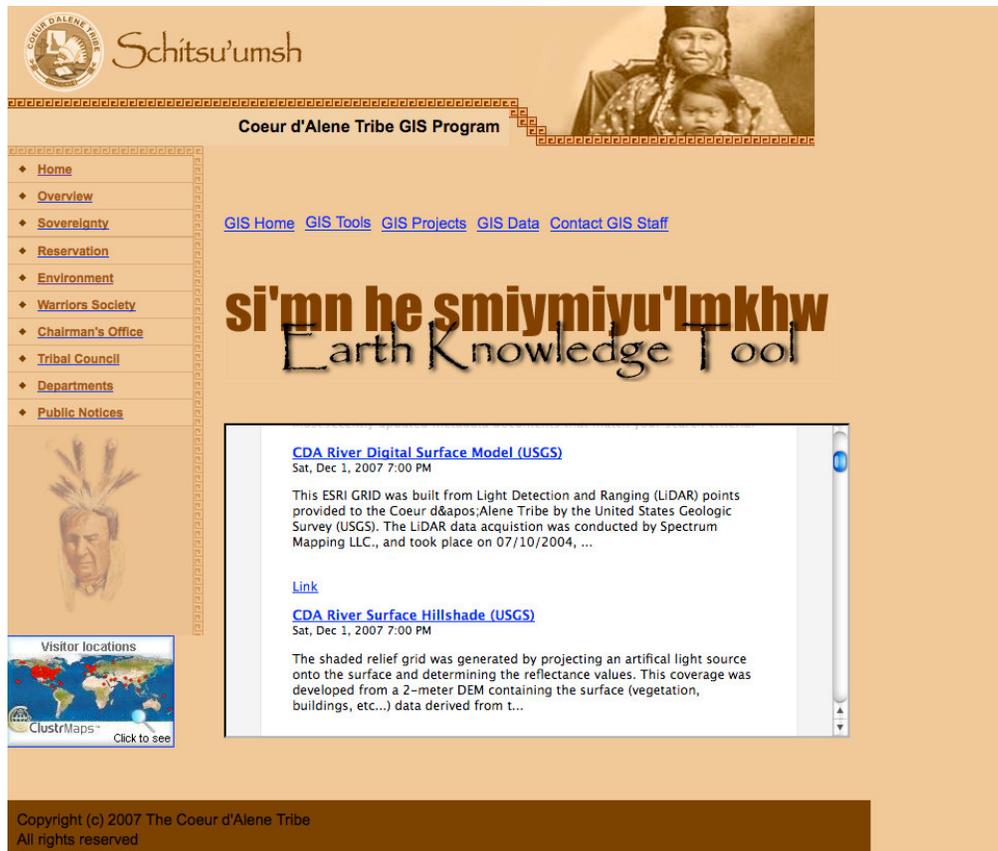


Figure 4 - GeoRSS Feed in Coeur d'Alene Web Page

4. Expose a URL-based REST API to allow GFE to be used by our partners

Another major area in which work was done is the development and exposure of a URL-based API. This simple API allows access to all of the features of GFE that are available via the user interface. Parameters select search service providers and search criteria, such as bounding boxes and keywords. Another parameter selects the output format. The API was designed to be easy to use, yet it gives access to all of the features of GFE. All of the illustrations above were produced using the API. Some examples of the API are shown below.

API Parameters:

Base URL String: <http://98.118.127.218:8080/GFE/search/get?>

- Keywords
- Keyword type (all, any, phrase)
- Bounding coordinates (180 to -180; 90 to -90)
 - Eastbc
 - Westbc
 - Southbc
 - Northbc
- Output format (kml, georss, html, html_static)
- SearchServices (GOS2, EPA_GDG_PUB)
- Source (10787, 3667): 10787=GDG; 3667=CDA

Examples:

- EPA Records Shown in Google Earth Plugin:
<http://98.118.127.218:8080/GFE/GEPlugin.html?searchUrl=http%3A%2F%2F98.118.127.218%3A8080%2FGFE%2Fsearch%2Fget%3FSearchServices%3DGOS2%26Keywords%3DIdaho%26KeywordType%3Dall%26f%3Dkml%26source%3D10787>
- CDA Records in GeoRSS Output:
<http://98.118.127.218:8080/GFE/search/get?SearchServices=GOS2&Keywords=boundary&KeywordType=all&source=3667&f=georss>
- CDA Records shown in Google Maps:
http://maps.google.com/maps?f=q&source=s_q&hl=en&q=http%3A%2F%2F98.118.127.218%3A8080%2FGFE%2Fsearch%2Fget%3FSearchServices%3DGOS2%26Keywords%3DCDA%26KeywordType%3Dall%26f%3Dgeorss%26source%3D3667

Next Steps

Much of the work to develop the capabilities for this project is complete. Over the next few months, the project team will work to finish the implementation, test with partners, and formally release the application. After this is complete, the team will develop training materials and provide training on reusing the resources provided by this application (and by GOS). The training will be conducted using web conferencing and will be made available to any interested party. The training information will be made available to FGDC to post at their website(s) as desired. It is anticipated that the training will be carried out in late January and early February. The project team will provide all training feedback and summary information to FGDC.