

Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services

CDI SSF Category 2: Computational Tools and Services

Principle Investigators

David Blodgett, USGS Wisconsin Water Science Center, 8505 Research Way, Middleton, WI 53562, 608-821-3899, dblodgett@usgs.gov

Meredith Warren, USGS Wisconsin Water Science Center, 8505 Research Way, Middleton, WI 53562, 608-821-3878, mwarren@usgs.gov

Abstract

The Geo Data Portal (GDP) is a web application that supports global change assessments by providing access to raw and processed geospatial and climate data. The current web application provides capabilities for identifying climate change projections and historical climate and weather data available within a user specified area, calculating area weighted statistics, and downloading data. This project will facilitate the integration of multiple U.S. and global land use land cover (LULC) datasets, both historical records and model projections, from federal agencies and academia into the GDP interface. The LULC data integration will be built upon the existing GDP data integration framework and processing services, with the necessary enhancements made for the unique characteristics of this type of data. Specifically, the GDP will be designed to integrate high spatial resolution LULC data sets and models covering various spatial and temporal scales. The existing infrastructure is designed for processing low resolution data only. The enhancements to the GDP include web service offerings, processing capabilities for high resolution gridded data, new scripting services, and broad visibility of national LULC data sets and models. The improvements will facilitate the inclusion of other high resolution dataset used in global change assessment in the future.

Total funding requested: \$40,033

Total in-kind funding: \$103,177

Datasets

- National Land Cover Data Set; US National; 1992, 2001, 2006
- Integrated Climate and Land Use Scenarios (ICLUS) Version 1.3; Contiguous US; 2010-2100
- SLEUTH Model (Slope, Land use, Excluded, Urban, Transportation and Hillshade); Southeast US including the states of FL, GA, LA; 2010-2100
- MODIS derived land cover data; Global; variable

Summary

Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services CDI SSF Category 2: Computational Tools and Services

Introduction: The Geo Data Portal (GDP) assembles open-standard web services through an integrated data retrieval and analysis web application to create commonly needed derivatives and formats of large datasets. The portal's success is attributed to the design which streamlines time-consuming and resource-intensive data management tasks. The long-term vision is a centralized access-point and processing service for datasets used in global change assessments (e.g. climate change projections, land use land cover (LULC) records, and evapotranspiration datasets, among others). The current web application provides capabilities for identifying climate change projections and historical climate and weather data available within a user specified area, calculating area weighted statistics, and downloading data.

This project will facilitate the integration of multiple LULC datasets, both historical records and model projections, from federal agencies and academia into the GDP. The geographic extent of the datasets includes LULC historical records and model projections for the Southeast and Contiguous U.S and global satellite images. The LULC data integration will be built upon the existing GDP data integration framework and processing services with necessary modifications made for the data's high spatial resolution and various temporal scales. The existing infrastructure is designed for processing low resolution data only. The enhancements to the GDP include web service offerings, processing capabilities for high resolution gridded data, new scripting services, and broad visibility of national LULC data sets and models. The improvements will facilitate the inclusion of other high resolution datasets in the future.

Principle Investigators

- David Blodgett 608.821.3899, dblodgett@usgs.gov
- Meredith Warren 608.821.3878, mwarren@usgs.gov
USGS Wisconsin Water Science Center, 8505 Research Way, Middleton, WI 53562

Other Project Personnel

- Thomas Kunicki 608.821.3851, tkunicki@usgs.gov
- Jordan Walker 608.821.3887, jiwalker@usgs.gov
USGS WI Water Science Center, 8505 Research Way, Middleton, WI 53562
- Jennifer LaVista 303.202.4764, jlavista@usgs.gov
USGS Office of Communications, Denver Federal Center, Bldg 25, MS 150, Denver, CO 80225

Collaborating USGS Programs & External Organizations

- Philip Morefield 703.347.8613, morefield.philip@epa.gov
US Environmental Protection Agency, 1200 Pennsylvania Ave, 8601P, Washington, DC 20460
- Jamie A. Collazo 919.515.2631, jaim_collazo@ncsu.edu
North Carolina State University, 225 David Clark Labs, Raleigh, NC 27695
- Lauren Hay 303.236.7279, lhay@usgs.gov
USGS, National Research Program, Denver Federal Center, Bldg 25, MS 412, Denver, CO 80225
- Gary Rowe 303.236.1461, glrowe@usgs.gov
Regional NAWQA Program Officer, Denver Federal Center, Bldg 25, MS 406, Denver, CO 80225
- Tom Sohre 605.594.2886, tsohre@usgs.gov
USGS EROS, LP DAAC, Mundt Federal Building, 47914 252nd Street, Sioux Falls, SD 57198
- Emily Fort 703.648.4082, efort@usgs.gov
National Climate Change Wildlife Science Center, 12202 Sunrise Valley Drive, Reston, VA 20192

Project Scope

Goal

To provide USGS researchers, collaborators, and external entities with a portal for exploring, processing, and downloading high spatial resolution, gridded LULC records and projections at user-specified spatial and temporal scales.

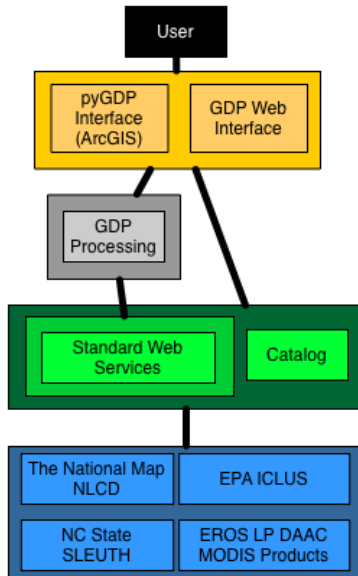


Figure 1. Land Use Land Cover Geo Data Portal Data Integration Framework

Steps, Products, and Outcomes

Integration of data into the GDP will be founded on *Standard Web Service* applications for each dataset (Figure 1). The *GDP Processing* services, *GDP Web Interface* will be expanded and modified to accept and distribute the LULC data and models provided through data-owner supported *Standard Web Services* and included in the *GDP Catalog* (Figure 1). The *pyGDP Interface* and scripting services will be expanded to include the new LULC data. The proposed enhancements to the *GDP Processing* services, *GDP Web Interface*, and *pyGDP Interface* will ultimately allow *Users* to translate large LULC datasets into the format needed to address science questions and improve our understanding of earth systems. This includes spatial and temporal subsets of data and both categorical and continuous spatial statistics (e.g. percent NLCD land cover class within specified boundary; average probability of urbanization based on model predictions).

Partners

The Center for Integrated Data Analytics (CIDA) will work with partners to establish data management and publishing capabilities using *Standard Web Services*. The following datasets (data-owner/partner) will be included: (1) National Land Cover Data Set for 1992, 2001, and 2006 (The National Map/ USGS); (2) ICLUS (Integrated Climate and Land Use Scenarios) model (USEPA), (3) SLEUTH (Slope, Land use, Excluded, Urban, Transportation and Hillshade) model for the southeast United States (NC State University and South East Climate Science Center), and (4) MODIS-derived land cover data (USGS/NASA Land Processes Distributed Active Archive Center (LP DAAC)).

CDI Mission & USGS Research Objectives

This project meets the overarching data integration mission of CDI by improving the interoperability and dissemination of LULC data to support USGS and collaborator research. This project encompasses the Data, Scientific Data Life Cycle Processes, Applications, and Web Services components of the CDI Science Support Framework (SSF). Through the use of the GDP Web Interface Application users will be able to discover, process, and download data. The modified architecture will also allow for the integration and management of related LULC data sets to support research and decision-making.

The project will advance USGS and collaborator research in a number of ways:

- The USEPA, NC State University, The National Map, and the USGS/NASA LP DAAC will have new data delivery mechanisms, making data more accessible and usable by scientists.
- The project will support studies completed by National Climate Change Wildlife Science Center (NCCWSC) and DOI Climate Science Centers.
- The NAWQA program as part of Cycle 3 will be able to utilize the integrated LULC data to develop dynamic models for extrapolation and forecasting water-quality and ecosystem response to climate and land use change, assist with water-quality monitoring network design, develop data analysis products, and ultimately distribute program data.
- New datasets will be made available to the South East Climate Science Center's South East Regional Assessment Project providing efficiencies for new models.

- USGS National Research Program's Modeling of Watershed Systems National Hydrologic Modeling effort will benefit from the integrated data sets.
- Modern techniques demonstrated will satisfy data dissemination challenges facing federal consortia including: White House EOP OSTP Subcommittee on Water Availability and Quality (Task Force on Hydrologic Information Sharing) and Integrated Water Resources Science and Services (IWRSS).
- It is also anticipated that project outcomes will also be useful to the USGS Climate and Land Use, Natural Hazards, Environmental Health, and Ecosystems Mission Areas.

Product Communication

The project will be communicated via regular stakeholder meetings where project progress, direction, and plans will be discussed. All project information artifacts will be managed using the My USGS confluence wiki. Outcomes of the project will be published in a fact sheet summarizing the new GDP functionality, and the Office of Communications will be consulted to publicize project outcomes via press releases and social media.

Technical Approach

Establishing Standard Web Services and Expanding GDP Catalog

The current GDP web services and catalog include climate change scenarios and historical climate and weather data. An important component of the proposed project will be the technical support and testing of new web services and expanding the GDP catalog. This project will rely on a foundation of data web services supported by each data-owner. Processing will be configured using the *OGC standard Web Processing Service (WPS)* protocol. Data will be transferred using the *OGC Web Coverage Service* and *OPeNDAP* standard for gridded data. CIDA will support the various data-owners by training them to use free and open-source software for distributing their data including *GeoServer* and *THREDDS* data server.

Web services publication of the datasets defined in this proposal are at various levels of completion. The National Map's NLCD services have been completed, but will require adjustments to work with GDP processing services. Web services for the USEPA ICLUS model are currently under development for an internal project; the web services will need to be configured to work with both the USEPA site and the GDP. CIDA has already been offering technical support on web service publication to NC State University and the USGS/NASA LP DAAC with funding support from the National Climate Change and Wildlife Science Center (NCCWSC). Funding resources from the NCCWSC are offered as project matching funds to continue and expand involvement with the LP DAAC and to reach out to the USEPA ICLUS team.

LULC Data Processing Services

The GDP web processing services are based on the *52N Web Processing Framework* (<http://52north.org/maven/project-sites/wps/52n-wps-webapp/>). CIDA will leverage this framework for integrating the LULC data and will be working closely with 52 North to modify the framework to accommodate USGS data processing and research needs. The GDP web processing services will be supported by: *GeoTools* for GIS-based processing of data, (i.e., changing data projections on-the-fly), *NetCDF Java* for reading and processing the information associated with the data sets, and *Java Topology Suite* for establishing the gridded data intersections necessary for running statistical analyses on data of interest. Web processing algorithms, developed with NCCWSC support, will be incorporated with the user interface and will support GDP utility by project collaborators, as well as other CIDA-supported projects, including the National Water Census.

The current GDP web processing services are designed to handle gridded, low spatial resolution downscaled climate change model outputs and historical weather and climate data. Spatial resolution of the climate data ranges between 4 km and 12 km and the temporal resolution is at hourly to monthly time-steps. The web processing services allow users to select data sets for user-specified areas defined using a bounding box or by uploading a shapefile via the GDP Web Interface. The data can be directly downloaded or processed using an area weighted statistics algorithm.

Integrating LULC data will require expanding the GDP web processing service to handle high-resolution, gridded data with inconsistent temporal characteristics. The resolution of LULC data ranges between 30m and 1km, compared to a 4 km to 12 km range with climate data. The temporal resolution is often on the scale of years or decades, not hours or months. The high resolution makes area weighted statistics calculation prohibitively expensive given the significant increase in grid intersection calculations. Therefore, an un-weighted, or point-based, areal statistics algorithm will need to be established.

GDP Web Interface Processes

The GDP Web Interface will need to be refactored to allow processing of LULC records and projections. The interface improvements will include the following.

(1) The user interface will relate processing algorithms to data available from the GDP catalog thus limiting data or processing options to those that are appropriate for a user’s application. This is required because new data types and processing methods could be combined inappropriately. The technical approach and utility functionality implementation to support this has been designed and will be incorporated into the GDP for existing and new data types.

(2) Processing and datasets will be chosen and configured as a simple workflow rather than being specified step-by-step, greatly increasing the potential for new data types and processing algorithms (Figure 2.). The basic requirement for this approach will be enhanced usability. Some users know what dataset they want to process while others know what sort of process or output they need. The technical approach for this has been designed. Implementation of will be the primary new development on this proposal.

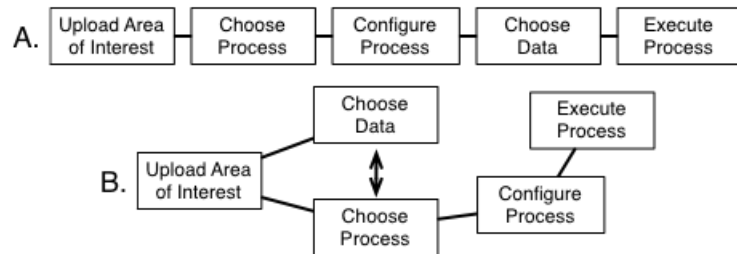


Figure 2. A. Existing “wizard” GDP workflow. Process must be chosen before data. B. Desired flexible GDP workflow. Data can be chosen separate from process.

(3) Users will be able to save their application context containing process inputs and outputs. This context will allow multi-session interaction, visualization, and provenance tracking. This has been a major request from GDP users. The technical approach to accomplish it has been vetted and implemented in several CIDA projects and is ready to be implemented for the GDP using ISO metadata.

pyGDP Client Package and ScienceBase

Necessary adjustments and additions will be made to the pyGDP Python client package (completed using CDI resources in FY2012) for processing LULC data. These modifications are not expected to be substantial. The GDP– ScienceBase integration, supported by NCCWSC and CDI in FY12, will also be maintained and augmented where needed throughout development of new GDP Web Interface functionality. This integration will allow users to access this functionality from the ScienceBase system and manage outcomes of the work within the ScienceBase system automatically.

Infrastructure

The GDP will be hosted on CIDA infrastructure at the Earth Resources Observation Systems (EROS) Data Center. Project development will take place on infrastructure at the Wisconsin Water Science Center. Web services for the defined datasets will be hosted by the data-owners as outlined above.

Project Experience

Dave Blodgett has been leading the GDP research and development effort for several years. He is the project lead for CIDA’s NCCWSC and National Water Census work and is involved with the Open Geospatial Consortium Hydrology Domain Working group. Blodgett’s research emphases have been around open standard data encodings and web service interfaces. A special focus of Blodgett’s work is on creative use of ISO metadata and leveraging associated tools.

Meredith Warren is a certified land use planner currently leading some of the NAWQA Cycle 3 data analysis and distribution projects at CIDA. Warren is also working to identify data interoperability challenges with respect to climate change impact assessments on water. Warren has a background in water resource management, climate and land use change impact analyses, climate and land use scenarios development, and watershed modeling.

Thomas Kunicki, CIDA’s lead software architect, is a veteran Java developer with in-depth knowledge of Open Geospatial Consortium standards and application to projects. Kunicki is one of the original developers of the GDP and regularly contributes to several opensource software libraries implementing open standards, including: GeoTools, GeoServer, NetCDF Java, THREDDS Data Server, OpenLayers, the 52N WPS Framework, and others.

Jordan Walker, a CIDA software developer, has a Master’s of Computer Science and specializes in implementation of Java web service utilities and managing large datasets. Walker worked extensively on the existing GDP framework and processing services. Walker has an in-depth knowledge of THREDDS data server configuration and data management, as well as the nuances of integrated systems of distributed large-data providing web services.

Jennifer LaVista has over 10 years of experience in communications and has worked with USGS since 2006. LaVista’s core competencies include developing and executing communication strategies, achieving national and international news coverage, producing videos and multimedia tools, crisis communications, and organizing press conferences and Congressional briefings.

Commitment to Effort

The GDP is used by numerous applications within and outside the USGS. It forms a large data processing core for the DOI Climate Science Center (CSC) network and has ongoing support from the NCCWSC. Other USGS and CSC projects contribute to and leverage the GDP data integration, cataloging and processing capabilities. Upon completion of this project, the GDP will be used by project collaborators for distribution of their individual datasets. CIDA plans to maintain the GDP into the foreseeable future using funding from the projects and collaborators described above and general CIDA infrastructure overhead funding.

Timeline

Task	Nov 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	June 2013	July 2013	Aug 2013
Submit proposal										
Land use web processing capabilities										
Establish SLEUTH data web services										
Cooperator communication/training										
Receive award										
Reconfigure GDP Web Interface										
Update GDP Catalog										
Establish ICLUS data web services										
TNM/CDI Annual Meeting										
Reconfigure pyGDP client package										
Submit final report										

Budget

With an infusion of a modest amount of resources, CDI will enable CIDA to expand the GDP and bring capabilities together in a way that will foster reuse and leverage a large amount of resources compared to the investment (see Appendices).

Project Budget: Land Use Land Cover Geo Data Portal and Supporting Data Services	Requested Funding	Proposed Matching Funds	Source of Matching Funds
1. SALARIES			
USGS-CIDA: Meredith Warren (100 hours @ \$39/hr.)		\$3,900	50% NCCWSC; 50% NAWQA NCCWSC match NCCWSC match NCCWSC match Match outside CIDA/USGS Match outside CIDA/USGS Match outside CIDA/USGS
USGS-CIDA: David Blodgett (100 hours @ \$ 41/hr.)		\$4,125	
USGS-CIDA: Jordan Walker (290 hours @ \$40/hr.)	\$11,673		
USGS-CIDA: Thomas Kunicki (290 hours @ \$59/hr.)	\$17,197		
USGS-OOC: Jennifer LaVista (20 hours @ \$42/hr)		\$840	
USEPA Staff (80 hours @ \$32.50/ hr.)		\$2,600	
NC State University Staff (40 hours @ \$50/hr)		\$2,000	
Total SALARIES	\$28,870	\$13,465	
2. INDIRECT CHARGES			
USGS-CIDA Infrastructure Overhead		\$13,954	NCCWSC match
USGS-CIDA Operations and Administration Overhead		\$13,923	NCCWSC match
USGS-Wisconsin Water Science Center Overhead	\$8,889	\$10,246	NCCWSC match
Total INDIRECT CHARGES	\$8,889	\$38,123	
3. TRAVEL EXPENSES			
<i>The National Map/CDI Annual Meeting</i>			
Per Diem	\$330		
Airfare	\$700		
Lodging Cost	\$745		
Vehicle Cost	\$500		
Total TRAVEL EXPENSES	\$2,275		
TOTAL:	\$40,033	\$103,177	Combination of NCCWSC, NAWQA, and outside CIDA/USGS projects match

Note: Fringe Benefits, Field Expenses, and Other Direct Charges do not apply to this project.

Appendices

Letters of support from:

- USEPA
- USGS NAWQA Program
- USGS National Research Program
- USGS/NASA LP DAAC
- USGS NCCWSC

Phil Morefield
U.S. EPA
Mail Code: 8601P
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

November 9, 2012

Center for Integrated Data Analytics (CIDA)
8505 Research Way
Middleton, WI 53562

Re: Community for Data Integration FY2013 RFP Submission: Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services

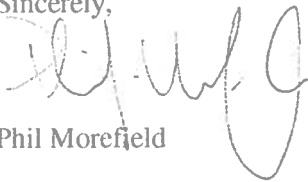
Dear Center for Integrated Data Analytics,

I am writing to express my support for the proposed project, **Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services**. This project will greatly benefit current and future research, model development and analyses at our agency.

Our office will provide data for inclusion in the initial release of the Land Use Land Cover Geo Data Portal. We will also work closely with CIDA to develop the data services necessary for the Geo Data Portal to access and process our datasets. We anticipate that our office will provide 80 hours of staff time to support data formatting, manipulation and testing for this project amounting to \$2600 of in-kind contribution.

We are excited to be included in this project since the outcomes will improve the ability of the public and other researchers to access, acquire and analyze our primary data products. We anticipate a successful outcome beneficial to all cooperators. I wish you the best of luck on your proposal submission, and look forward to collaborating with you on this work.

Sincerely,



Phil Morefield

Gary L. Rowe
Regional NAWQA Program Officer, Central Region
Denver Federal Center, Bldg 25
P.O. Box 25046, MS 406
Denver, Colorado, 80225-0046
e-mail: glrowe@usgs.gov

10/31/2012

Center for Integrated Data Analytics (CIDA)
8505 Research Way
Middleton, WI 53562

Re: Community for Data Integration FY2013 RFP Submission: Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services

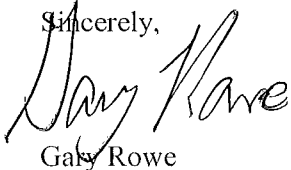
Dear Center for Integrated Data Analytics,

I am writing to express my support for the proposed project, **Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services**. This project will benefit water-quality network design, water-quality forecasting studies, and data distribution within Cycle 3 of the USGS National Water Quality Assessment Program (NAWQA).

The NAWQA Program will be relying on outside partners for data to support the various Cycle 3 research objectives. Additionally, an increasing amount of data products will be made available online. To assure research objectives and data product needs are met, NAWQA will provide assistance with domain experts to help define technical requirements of the initial release of the Land Use Land Cover Geo Data Portal. We anticipate that NAWQA will provide needed support for maintaining this project in the future as part of its overall web application portfolio.

We are excited to be included in this project as the outcomes will help advance the scientific capacity of NAWQA water-quality models. Having worked with the Center of Integrated Data Analytics, and specifically Nate Booth, Jessica Thompson and Dave Blodgett on past projects, we anticipate a successful outcome beneficial to all cooperators. I wish you the best of luck on your proposal submission, and look forward to collaborating with you on this work.

Sincerely,



Gary Rowe

Cc:
David Wolock
Hydrologic Systems Team Leader, NAWQA
4821 Quail Crest Place
Lawrence, Kansas 66049
Email: dwolock@usgs.gov

November 6, 2012

Center for Integrated Data Analytics (CIDA)
8505 Research Way
Middleton, WI 53562

Re: Community for Data Integration FY2013 RFP Submission: Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services

Dear Center for Integrated Data Analytics,

I am writing to express my support for the proposed project, **Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services**. The Modeling of Watershed Systems group is a huge supporter of the Geo Data Portal, using it in hydrologic modeling studies to derive climate forcings for current and future conditions. A land use land cover component would greatly benefit all projects currently underway, simplifying the ability to derive static and dynamic model parameterization based on LULC.

Our team will be happy to test any LULC data sets provided for inclusion in the initial release of the Land Use Land Cover Geo Data Portal. We will also work closely with CIDA to develop the data services necessary for the Geo Data Portal to access and process datasets relevant to our modeling studies. We anticipate that our group will provide 40 hours of staff time, to support this project amounting to 2K in-kind contribution.

We are excited to be included in this project since the outcomes will help with all our modeling efforts. Having worked with many of the Center of Integrated Data Analytics personnel in the past, we anticipate a successful outcome beneficial to all cooperators. I wish you the best of luck on your proposal submission, and look forward to collaborating with you on this work.

Sincerely,

Lauren Hay, Ph.D.

Lead Scientist
USGS, National Research Program
Modeling of Watershed Systems
Denver, CO 80225
303 236 7279
lhay@usgs.gov

Tom Sohre
Land Processes Distributed Active Archive Center (LP DAAC)
USGS EROS
Mundt Federal Building
47914 252nd Street
Sioux Falls, SD 57198

October 31, 2012

Center for Integrated Data Analytics (CIDA)
8505 Research Way
Middleton, WI 53562

Re: Community for Data Integration FY2013 RFP Submission: Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services

Dear Center for Integrated Data Analytics,

I am writing to express my support for the proposed project, **Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services**. This project will benefit our user community with data discovery and use at the NASA Land Processes Distributed Active Archive Center (LP DAAC) located here at USGS EROS.

Our office will provide standards-based web services (OGC and OPeNDAP) on selected MODIS datasets for inclusion in the initial release of the Land Use Land Cover Geo Data Portal. We will also work closely with CIDA to develop the data services necessary for the Geo Data Portal to access and process our datasets. We anticipate that the LP DAAC will provide ongoing data services and support to this project as needed to meet their objectives.

We are excited to be included in this project since the outcomes will help support LP DAAC User Working Group (UWG) recommendations. Having worked with the Center of Integrated Data Analytics, and specifically David Blodgett and Jordan Walker on past projects, we anticipate a successful outcome beneficial to all cooperators. I wish you the best of luck on your proposal submission, and look forward to collaborating with you on this work.

Sincerely,

Tom Sohre, LP DAAC Project Manager

Cc: David Meyer, LP DAAC Project Scientist

Emily Fort
12201 Sunrise Valley Drive, MS 400
Reston, VA 20192

November 2, 2012

Center for Integrated Data Analytics (CIDA)
8505 Research Way
Middleton, WI 53562

Re: Community for Data Integration FY2013 RFP Submission: Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services

Dear Center for Integrated Data Analytics,

I am writing to express my support for the proposed project, **Establishing the Land Use Land Cover Geo Data Portal and Supporting Data Services**. This project will benefit many projects and activities currently funded by our program, as well as the community that we are serving. The National Climate Change and Wildlife Science Center is focused on helping resource managers understand the impacts of climate change. This project will help that community immensely by making high-value datasets more accessible. We have heard several times from our partners, who include the Landscape Conservation Cooperatives, that making high-quality, large datasets is an incredibly valuable activity. Additionally, by using the USGS Geo Data Portal (GDP), this project leverages an investment made by the National Climate Change and Wildlife Science Center, which helped fund the GDP's original development

Our office will provide based funding and support for the Geo Data Portal and work with several Climate Science Centers to identify data sets for inclusion in the initial release of the Land Use Land Cover Geo Data Portal. We will also work closely with CIDA to develop the data services necessary for the Geo Data Portal to access and process our datasets. We anticipate that our program will provide \$200,000 of base Geo Data Portal funding which assists with the development of the Land Use component.

We are excited to be included in this project since the outcomes will help with decision-making in the resource management community and science conducted by the Climate Science Centers. Having worked with the Center of Integrated Data Analytics, and specifically Dave Blodgett, Tom Kunicki, and Jordan Walker on past projects, we anticipate a successful outcome beneficial to all cooperators. I wish you the best of luck on your proposal submission, and look forward to collaborating with you on this work.

Sincerely,



Emily Fort
Data and Information Coordinator
National Climate Change and Wildlife Science Center
12201 Sunrise Valley Drive MS 400
Reston VA 20192
703.648.4082
efort@usgs.gov