Land Use / Land Cover Theme

National Geospatial Data Asset

Strategic Plan

2017 - 2022

Theme Leads:
Jonathan H. Smith, US Geological Survey, jhsmith@usgs.gov
Greg Reams, US Forest Service, greams@fs.fed.us

Abstract
The Land Use/ Land Cover (LULC) theme of the National Spatial Data Infrastructure (NSDI) is comprised of geospatial datasets that are critical to our Nation's geospatial practitioners, land managers and decision makers. The U.S. Forest Service and U.S. Geological Survey (USGS) lead the theme, with the individual geospatial datasets managed by personnel both within and outside these two agencies. This Strategic Plan, meant to complement the NSDI Strategic Plan published in December 2013, was developed with input from these partners. The goals and objectives in the plan define areas of critical importance to the continued development of the LULC Theme and provide a roadmap to follow over the next five years:

- Goal 1: Ensure the Effective Development of the LULC NGDA Datasets
  - Objective 1.1 Datasets are updated and published with the most current possible information in accordance with their specific mission requirements in a manner conducive to their broad application
  - Objective 1.2 Accuracy of datasets is assessed, with results published in a manner accessible to users
  - Objective 1.3 Datasets are capable of being integrated with other geospatial data
- Goal 2 Facilitate the Sharing of LULC Geospatial Data
  - Objective 2.1. Provide the most advanced available web services for visualizing, querying and assessing LULC NGDA datasets
  - Objective 2.2. Leverage the Geospatial Platform.
  - Objective 2.3. Support multi-agency efforts to create, maintain and disseminate LULC information
- Goal 3: Provide Leadership to the LULC Geospatial Community
  - Objective 3.1. Lead and participate in the development and coordination of national and international standards applicable to the LULC geospatial community
  - Objective 3.2. Lead the LULC geospatial community and advocate the sharing of methodologies and resources

Background

Executive Order 12906, "Coordinating Geographic Data Acquisition and Access," describes the National Spatial Data Infrastructure (NSDI) as "the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data."

The NSDI is composed of 16 National Geospatial Data Asset (NGDA) Themes, one of which is Land Use – Land Cover (LULC). Each NGDA Theme consists of a related group of NGDA Datasets that meets at least one of the following criteria: supports mission goals of multiple federal agencies; statutorily mandated; supports Presidential priorities as expressed by Executive Order or by the Office of Management and Budget (OMB).

The LULC Theme includes datasets that describe the surface of the earth (land cover), or how humans have decided to utilize its available natural resources (land use). The United States Geological Survey (USGS) of the Department of Interior (DOI) and the United States Forest Service (USFS) of the Department of Agriculture (USDA) are the lead federal agencies for the LULC Theme. Currently, the LULC Theme consists of 14 NGDA Data sets:

Dataset	Responsible Agency
Coastal Change Analysis Program (C-CAP) High Resolution Land Cover and Change	Department of Commerce, National Oceanic and Atmospheric Administration (NOAA)
Coastal Change Analysis Program (C-CAP) Regional Land Cover Data and Change	Department of Commerce, National Oceanic and Atmospheric Administration (NOAA)
CropScape - Cropland Data Layer (CDL)	Department of Agriculture, National Agricultural Statistical Survey (NASS)
US Forest Service Forest Inventory and Analysis (FIA) Database	Department of Agriculture, US Forest Service, (USFS)
LANDFIRE Potential Vegetation	Department of Agriculture, US Forest Service, (USFS)
LANDFIRE Existing Vegetation	Department of Agriculture, US Forest Service, (USFS)
LANDFIRE Historical Fire Regimes	Department of Agriculture, US Forest Service, (USFS)
LANDFIRE Canopy Fuels	Department of Agriculture, US Forest Service, (USFS)
LANDFIRE Surface Fuels	Department of Agriculture, US Forest Service, (USFS)
Monitoring Trends in Burn Severity (MTBS)	Department of Agriculture, US Forest Service, (USFS)
National Land Cover Database (NLCD) Land Cover Collection	Department of Interior, US Geological Survey, (USGS)
National Land Cover Database (NLCD) Percent Developed Imperviousness Collection	Department of Interior, US Geological Survey, (USGS)
National Land Cover Database (NLCD) Percent Tree Canopy Collection	Department of Interior, US Geological Survey, (USGS)
North American Land Change Monitoring System (NALCMS) Collection	Department of Interior, US Geological Survey, (USGS)

It is important to note that not all of NGDA Datasets are managed by the USGS, or USFS. Thus, management of the LULC Theme is a multi-agency effort, involving multiple personnel from participating federal agencies.

Guiding Principles for the LULC Theme

The guiding principles for the LULC Theme are that federal agencies that produce, collect, maintain, or use LULC spatial data will (1) recognize and manage their LULC spatial data as capital assets, (2) facilitate non-Federal participation in the development of the NSDI, and (3) collaborate through the Federal Geographic Data Committee (FGDC) to provide effective and efficient use and management of geospatial data for the benefit of the Nation. These include:

- Ensuring that spatial data from multiple sources (Federal, State, Tribal, regional, and local governments; academia; and the private sector) are available and easily integrated to enhance the understanding of our physical, natural, and cultural world.
- Facilitating the development of authoritative NGDAs that are complete, accurate, current, standards-compliant, and at the appropriate scale needed for shared uses by Federal, State, Tribal, regional, and local governments, academia, the private sector, and the public.
- Enabling access for all citizens to spatial data, information, and derivative and interpretive products, in accordance with OMB Circulars A–130 and A–16 and the Open Data Policy (OMB Memorandum M-13-13).
- Enabling interoperability of information through the use of open and machine-readable formats to enable access to resources from multiple agencies and partners.
- Ensuring that investment and policy decisions consider the expected return on investment and effective use of resources.

Goals and Objectives

The LULC Theme of the NSDI Strategic Plan consists of three strategic goals that were developed from the NSDI Strategic Plan and from consultations with the managers/owners of the individual LULC Theme NGDA datasets. The strategic goals include objectives and actions that describe how the goals will be accomplished. The following section describes the strategic goals, objectives and actions in the Strategic Plan; and also describes the outcomes that will result from their implementation.

Goal 1: Ensure the Effective Development of the LULC NGDA Datasets

The LULC Theme is committed to developing, maintaining, and distributing authoritative LULC geospatial data. This includes creating up-to-date products at the highest possible thematic and spatial resolutions in the most expeditious and cost effective manner as possible.

Objective 1.1 Datasets are updated and published with the most current possible information in accordance with their specific mission requirements in a manner conducive to their broad application

Anticipated Outcome: Datasets contain up-to-date information that is of use to its customers and partners

Action 1.1.1 Recent remote sensing data is incorporated in accordance with dataset revision schedule

Action 1.1.2 Most current in-situ data is incorporated in accordance with dataset revision schedule

Action 1.1.3 Datasets are published on schedule, including making source data, methodological documents, metadata, and accuracy assessments available via the internet.

Objective 1.2 Accuracy of datasets is assessed, with results published in a manner accessible to users

Anticipated Outcome: Datasets contain accuracy assessment information that is of use to its customers and partners and can be incorporated into resource assessments and modeling systems

Action 1.2.1 Rigorous, comprehensive accuracy assessments are performed

Action 1.2.2 Accuracy assessment results are made available via the internet

Objective 1.3 Datasets are capable of being integrated with other geospatial data

Anticipated Outcome: Metadata is of sufficient quality to enable the dataset to be incorporated into resource assessments and environmental analyses

Action 1.3.1 Reviews of metadata are conducted periodically to insure accuracy, currentness and completeness

Goal 2 Facilitate the Sharing of LULC Geospatial Data

The LULC theme community is committed to developing and distributing the NGDA datasets that comprise the theme. Widely and openly sharing these resources is critical to leveraging tight budgets and reducing, if not eliminating, duplication of effort. This includes dataset managers coordinating across agencies and providing their data via the most user-friendly and expeditious manner possible. Cross-posting of dataset and analysis tools locations on sites such as the Geospatial Platform is encouraged to widely disseminate links to data and tools. In addition, actively engaging the stakeholder community is a critical avenue to reduce duplication of effort and leverage budgets through partnerships.

Objective 2.1. Provide the most available advanced web services for visualizing, querying and assessing LULC NGDA datasets

Anticipated Outcomes. Current data and analytical tools are easily available and searchable via on-line tools

Action 2.1.1. Develop, maintain, and publish web services for the LULC datasets

Action 2.1.2. Web services are registered on the Geospatial Platform

Action 2.1.3. Market the web services to other agencies and the stakeholder community in order to encourage feedback and partnerships

Action 2.1.4. Maintaining and updating LULC analytical tools, such as:

- Evaluation, Visualization and Analysis (EVA) (http://www.mrlc.gov/eva/)
- Digital Coast (https://coast.noaa.gov/digitalcoast/)
- Cropscape (https://nassgeodata.gmu.edu/CropScape/)
- Landfire Data Analysis Tool (http://www.landfire.gov/datatool.php)

Objective 2.2. Leverage the Geospatial Platform

Anticipated Outcomes. Efficient, effective use of shared technology infrastructure to encourage and support better information sharing and reduce dataset costs

Action 2.2.1. Publish dataset web services on the Geospatial Platform

Action 2.2.2. Develop and maintain the LULC community pages on the Geospatial Platform

Objective 2.3. Support multi-agency efforts to create, maintain and disseminate LULC information

Anticipated Outcomes. Sharing of available source data and advances in methodologies will reduce dataset costs and promote dataset inter-operability and applicability

Action 2.3.1 Support multi-agency efforts to coordinate LULC mapping efforts, such as the Multi-Resolution Land Characteristics (MRLC) Consortium and Landfire

Goal 3: Provide Leadership to the LULC Geospatial Community

The LULC theme seeks to provide a leadership and facilitation role in promoting the application of LULC information in resource assessments, environmental analyses and assessing community risk and vulnerability to hazardous events. This role includes providing institutional leadership for the development and coordination of LULC geospatial standards and policies, developing a management framework that supports the objectives of the NSDI, and fostering collaboration across agencies. As part of the Federal geospatial community, the LULC theme can play an important role in communicating the value of geospatial information in enabling informed analyses and knowledgeable decision-making.

Objective 3.1. Lead and participate in the development and coordination of national and international standards applicable to the LULC geospatial community

Anticipated Outcomes. Enhanced interoperability of geospatial data, services, and systems

Action 3.1.1. Consult and collaborate with both existing and emerging geospatial communities to advance common standards and methodologies

Objective 3.2. Lead the LULC geospatial community and advocate the sharing of methodologies and resources

Anticipated Outcomes. Increased usage of shared services, resulting in lower costs and greater inter-operability

Action 3.2.1. Produce comprehensive, effective, and applicable LULC geospatial data that will demonstrate the government's commitment to the NSDI and its stakeholders

Action 3.2.2. Engage with the stakeholder communities, including resource managers and scientists, and federal agencies, to keep them informed of LULC geospatial activities and to solicit their feedback on useful data and services

External Factors, Challenges and Opportunities

A major area of concern for LULC dataset managers is their dependence on remotely sensed images acquired by satellites, or aircraft to update and create the datasets. The resolutions and accuracy of these datasets are dependent on access to appropriate images, some of which are available free of charge from US agencies (USGS, NASA and NOAA) or purchased from commercial providers. Each imagery source has a unique combination of plusses and minuses. Government satellite systems tend to acquire images systematically, but are few in number, so any malfunction may have serious consequences on any operational data production. There are more commercial satellite options, but these images tend to be expensive, so funding becomes an issue. Aerial images such as those acquired through the National Agriculture Imagery Program (NAIP), provide high resolution data that is readily available to government researchers, but is itself a relatively expensive operation.

There are many opportunities for collaboration, with a number of LULC dataset managers already collaborating either formally through the Multi-Resolution Land Cover (MRLC) consortium or through bilateral agreements. A major on-going effort is the collaboration between the USGS and USFS to identify synergies in using the entire Landsat satellite image archive to identify forest changes using the Landscape Change Monitoring System (LCMS) and monitor land cover change using the Land Change Monitoring, Assessment, and Projection (LCMAP) system. These efforts will be critical in maintaining and updating USGS and USFS datasets in the future. These new methodologies, based on integrating information from in-situ measurements, NAIP images and satellite datasets in high powered computing environments provide the opportunity to create higher resolution and more accurate LULC datasets, as well as create customized products for specific needs.