Land Cover Characterization Program

Advanced very high resolution radiometer (AVHRR) images of the United States. At left is the mosaicked three-band false color image; the center image shows the seasonal land cover classes derived from the AVHRR data combined with topographic, climatic, and soils information; normalized difference vegetation index (NDVI) is shown on the right, another product from the AVHRR data that combines two bands to derive relative vegetation greenness. All of these products are used regularly in a variety of applications.

The U.S. Geological Survey (USGS) has a long heritage of leadership and innovation in land use and land cover mapping. The USGS Anderson system defined the principles for land use and land cover mapping that have been the model both nationally and internationally for more than 20 years. The Land Cover Characterization Program (LCCP) is founded on the premise that the Nation's needs for land cover and land use data are diverse and increasingly sophisticated. The range of projects, programs, and organizations that use land cover data to meet their planning, management, development, and assessment objectives has expanded significantly. The reasons for this are numerous, and include the improved capabilities provided by geographic information systems, better and more data-intensive analytic models, and increasing requirements for improved information for decision making.

The overall goals of the LCCP are to: (1) identify the broad range of user requirements; (2) identify sources, develop procedures, and organize partners to deliver data and information to meet user requirements.

The LCCP builds on the heritage and success of previous USGS land use and land cover programs and projects. It will be compatible with current concepts of government operations, the changing needs of the land use and land cover data users, and the technological tools with which the data are applied. The Program is founded on the following guiding principles:
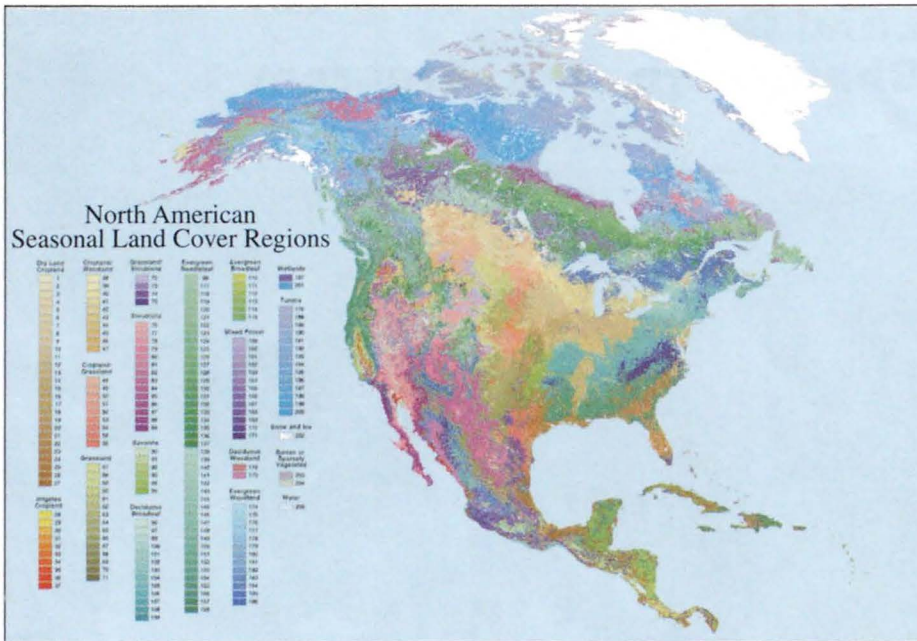
Guiding Principles

- Compatible with Previous USGS and Other Federal Agency Programs

- Built on Partnerships

- Flexible Database Strategy

- Multiresolution Databases

- Needs Based and User Driven

- Dynamic, with Monitoring Capability

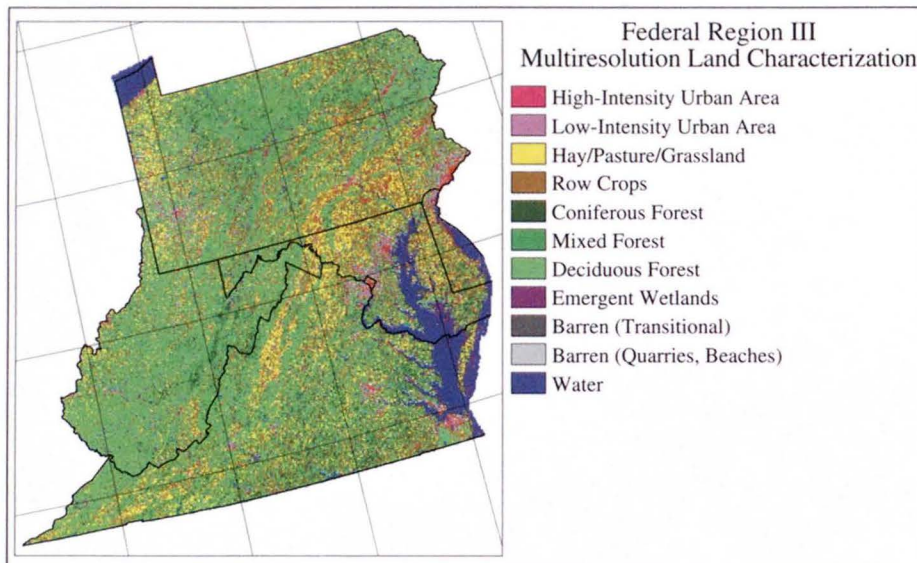- Integrated Strategy of Research and Production

Program Components

Three of the four LCCP components, each with unique but complementary land cover, land use, and associated data products, are illustrated on the reverse side. The fourth component, Special Projects, will provide unique land cover characteristics data not provided by the other components.
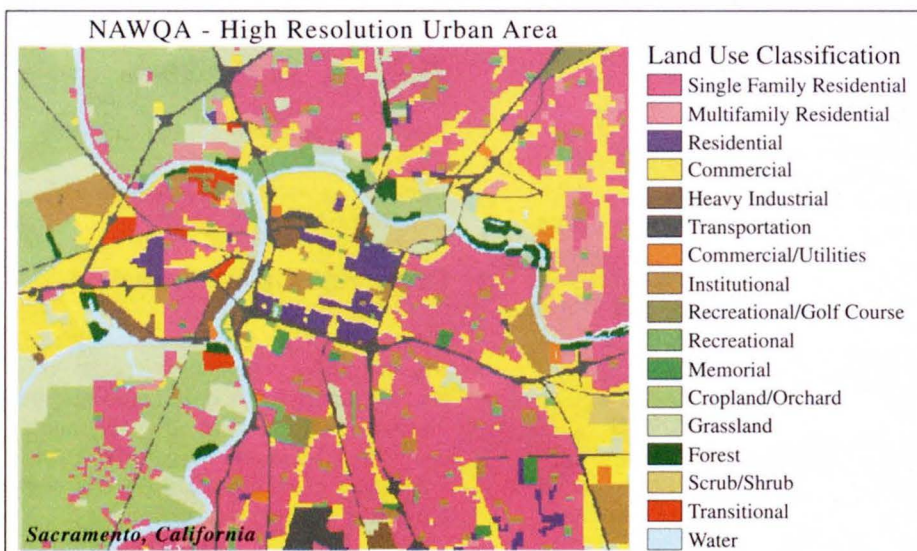
North American Seasonal Land Cover Regions

Global Component (1:2,000,000)

- advanced very high resolution radiometer satellite data source
- global land cover characteristics raster database
- 1-sq km grid cell size
- support for national operational programs
- completion in 1997
- derived thematic maps that translate the land cover regions into common land cover classification legends:
  - USGS Anderson system
  - National Terrestrial Land Cover
  - Biosphere-Atmosphere Transfer scheme
  - Simple Biosphere Model
- applications: global change research, international studies, global climate modeling

Federal Region III Multiresolution Land Characterization

Legend:
- High-Intensity Urban Area
- Low-Intensity Urban Area
- Hay/Pasture/Grassland
- Row Crops
- Coniferous Forest
- Mixed Forest
- Deciduous Forest
- Emergent Wetlands
- Barren (Transitional)
- Barren (Quarries, Beaches)
- Water

National Component (1:100,000)

- Landsat thematic mapper (TM) satellite data or an equivalent source
- national-level raster database
- 30-m grid cell size
- flexible database to support multiple classification systems
- support for Federal programs:
  - Ecological Mapping and Assessment Program (EPA)
  - Coastal Change Analysis Program (NOAA)
  - National Water Quality Assessment Program (NWQA) and Gap Analysis Program (GAP)
  - U.S. Forest Service Programs
- completion in 1999
- applications: regional land management, planning, and environmental assessment

NAWQA - High Resolution Urban Area

Sacramento, California

Land Use Classification:
- Single Family Residential
- Multifamily Residential
- Residential
- Commercial
- Heavy Industrial
- Transportation
- Commercial/Utilities
- Institutional
- Recreational/Golf Course
- Recreational
- Memorial
- Cropland/Orchard
- Grassland
- Forest
- Scrub/Shrub
- Transitional
- Water

Urban Component (1:24,000)

- aerial photography or equivalent source
- detailed land use and land cover
- high-resolution raster and vector data consistent with 1:24,000-scale USGS products
- 5-acre minimum mapping unit
- applied to rapidly growing metropolitan areas
- recurring coverage (10-year cycle)
- applications: NAWQA Urban Studies, infrastructure resources, water studies, natural hazards analysis, and pollution monitoring
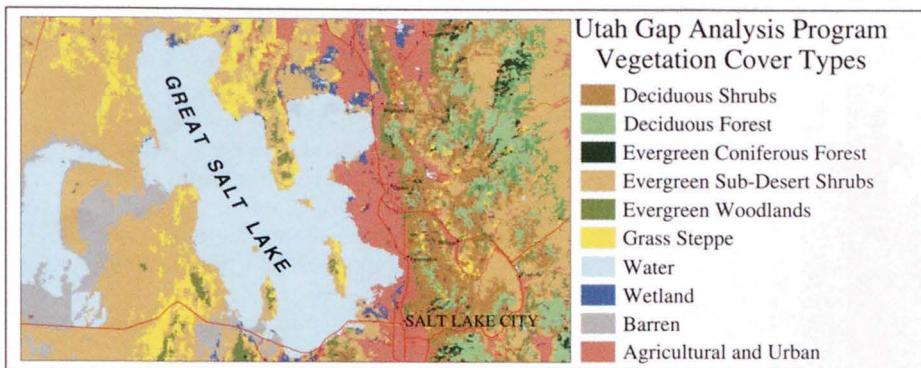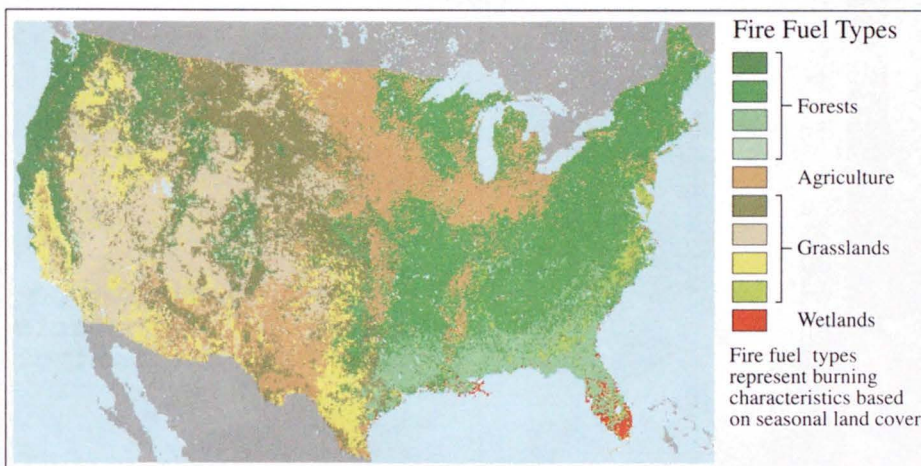
Applications of Land Cover Data

Land cover is the changing fabric of the Earth's surface, recording the effects of natural forces and human activities. Satellite images and aerial photography allow us to view these changes as they occur, as well as to monitor long-term changes. Storm movement, volcanic eruptions, floods, logging, irrigation, and urban development are all visible from space. Using compute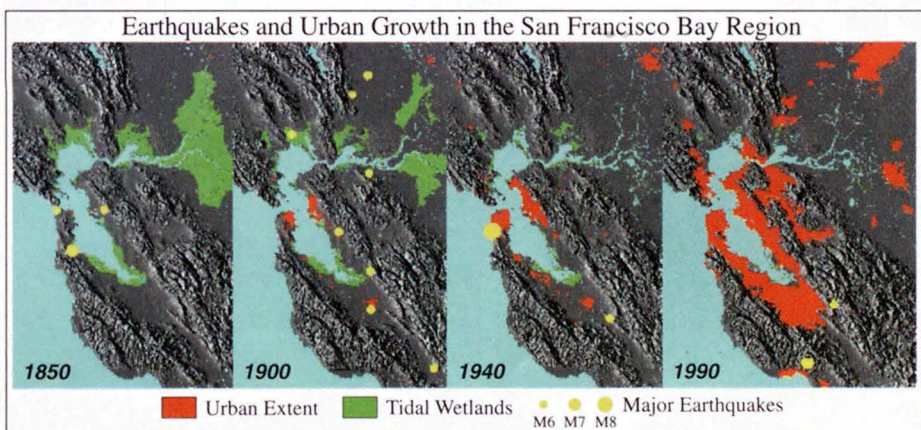rs and software tools, analysts can interpret the satellite images and photographs to produce maps of land cover that have a wide variety of applications as illustrated in the examples below. All of these activities support wise management of our resources.

Utah Gap Analysis Program Vegetation Cover Types

- Deciduous Shrubs
- Deciduous Forest
- Evergreen Coniferous Forest
- Evergreen Sub-Desert Shrubs
- Evergreen Woodlands
- Grass Steppe
- Water
- Wetland
- Barren
- Agricultural and Urban

A portion of the Gap Analysis Program land cover map of Utah, showing the dominant natural vegetation derived from Landsat TM data. This information is compared with maps showing areas that are currently protected as parks, refuges, and wilderness areas to develop long-term conservation strategies for plant and animal species.

Inventory

- Vegetation Type
- Canopy Closure
- Wildlife Habitat
- Urban Development
- Agricultural Land Use
- Damage from Natural Hazards
- Snowpack for Water Supply

Fire Fuel Types

- Forests
- Agriculture
- Grasslands
- Wetlands

Fire fuel types represent burning characteristics based on seasonal land cover.

Fire does an estimated $43 billion of damage in the United States each year. The USGS delivers satellite data products to assist the U.S. Forest Service in monitoring fires and fire danger on public lands. This Fire Fuels map is generated weekly and is used in a model along with weather and topography to calculate fire danger. In this image, grasses appear in red, yellow, and beige, and trees are shown in shades of green.

Modeling

- Irrigation Depletion
- Fire Danger Assessment
- Risk of Disturbance
- Fire Danger Assessment
- Urban Growth
- Climate Effects
- Global Change

Earthquakes and Urban Growth in the San Francisco Bay Region

1850 1900 1940 1990

Urban Extent Tidal Wetlands Major Earthquakes M6 M7 M8

San Francisco Bay Region maps of urban development and wetland loss from 1850 to the present derived from historic maps, air photos, and satellite images. Epicenters of major earthquakes show the history of seismic activity in this populous area.
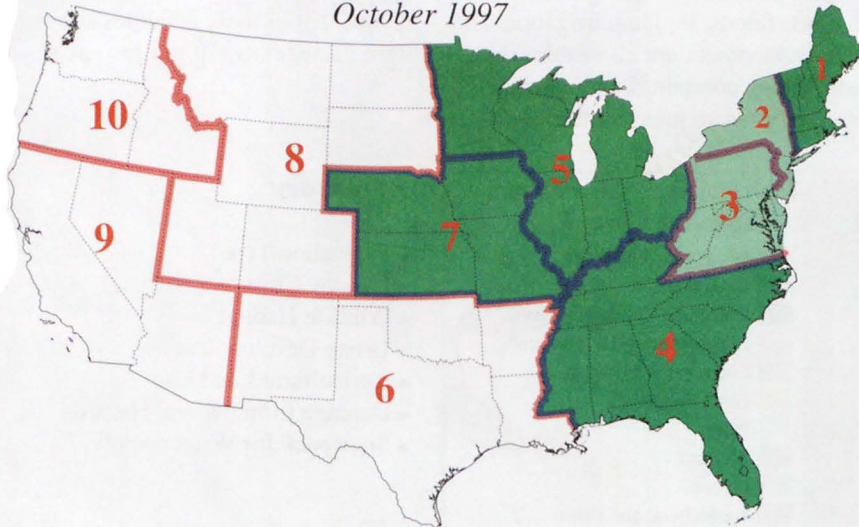
Monitoring

- Forest Health
- Irrigation Activity
- Agricultural Productivity
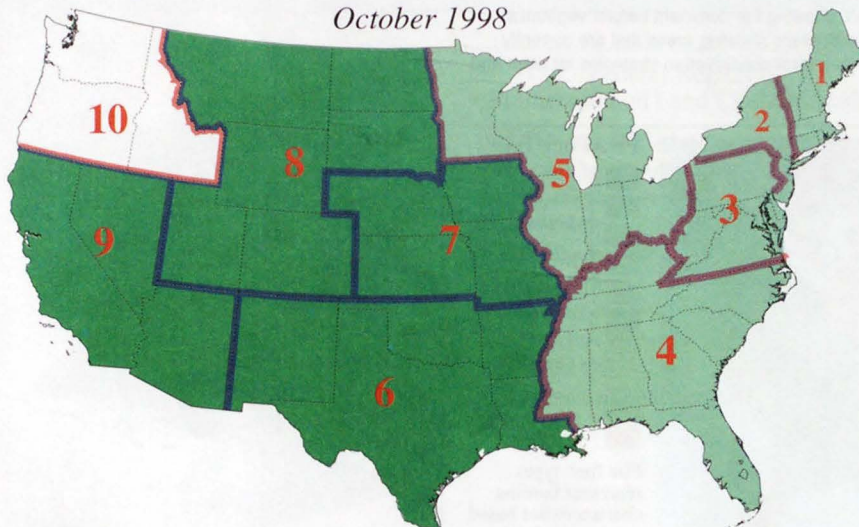- Urban Expansion
- Coastal Changes
- Lake Levels
- Fire Fuel
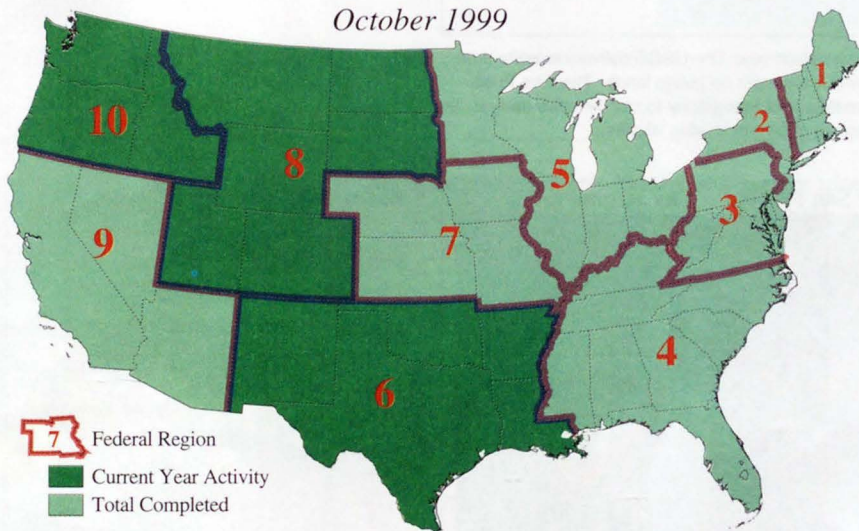
National Land Cover Dataset

October 1997

October 1998

October 1999

Legend:
- 7 Federal Region
- Current Year Activity
- Total Completed

Maps illustrate the schedule for completion.

National Land Cover Dataset

The primary goal of the National Component of the LCCP is completion of the National Land Cover Dataset by 1999. Using the 1992 Multiresolution Landscape Characterization (MRLC) Landsat TM source data, the USGS will produce a land cover dataset with the following specifications:

- 30-m spatial resolution
- hierarchical land cover legend
- Albers Equal Area projection
- raster data structure assembled by Standard Federal Regions
- incorporates data from other Federal programs
- some mapping through private sector contract

Completion of the National Land Cover Dataset will require close coordination among Federal, State, and private sector activities, and represents an excellent opportunity for cooperation in achieving a common goal. While existing coordination committees are being used, important land cover mapping projects may not be known to these groups. The LCCP invites inquiries regarding potential cooperation in building the National Land Cover Dataset.

For more information on the Land Cover Characterization Program, contact:

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For information on other USGS products and services call, 1-800-USA-MAPS or receive information from the EARTHFAX fax-on-demand system, which is available 24 hours a day at 703-648-4888.

Please visit the USGS home page at <URL: http://www.usgs.gov/>