The Nevada Geospatial Data Browser

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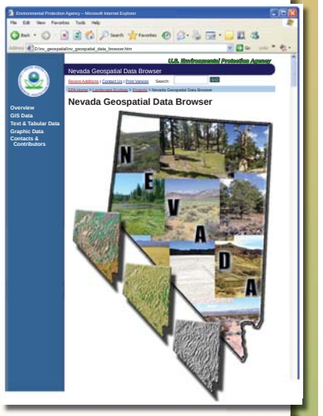
Abstract

The Southwest Regional Gap Analysis project (SWReGAP) is a 5-state (Arizona, Colorado, Nevada, New Mexico, and Utah) interagency program that maps the distribution of plant communities and habitat for selected animal species and compares these distributions with land stewardship to identify areas (gaps) where conservation efforts may not be sufficient to maintain diversity of living natural resources. SWReGAP uses satellite imagery (Landsat 7) and geographic information systems (GIS) technology to assemble and view large amounts of biological and land management data. One of the key objectives of the project is to provide "information products to the public and those entities charged with land use research, policy, planning, and management." The Landscape Ecology Branch of the U.S. Environmental Protection Agency (Las Vegas, NV) with the assistance and collaboration of the University of Idaho (Moscow, ID) and Lockheed-Martin Environmental Services (Las Vegas, NV) has developed the *Nevada Geospatial Data Browser,* a spatial data archive to centralize and distribute the geospatial data used to create the land cover, vertebrate habitat models, and land ownership/stewardship maps produced for the Nevada ecoregional component of the SWReGAP project. The purpose of the data browser is to provide a one-stop, easy-access product for the user community to assist in natural resource management and improve environmental decision-making. The *Nevada Geospatial Data Browser* utilizes data from a number of sources and has assembled 37 complete GIS datasets into 10 data categories (land cover maps, land cover training data, digital elevation model, soils and geology, climate data, ecoregional boundaries, political boundaries, hydrology, miscellaneous land cover [i.e., sand dunes and fire history], and miscellaneous vector data [i.e., roads, quad boundaries, Landsat scene boundaries, cities and towns]) for the entire state of Nevada. The data browser includes important metadata information relative to acquisition, location, processing level, projection, file size, and format. The *Nevada Geospatial Data Browser* is currently available on-line via the EPA Web site (www.epa.gov/nerlesd1/land-sci/gap.htm) and distributed in limited release on DVD.

Key words: Gap Analysis, Nevada, geographical information systems, spatial data archive, remote sensing, digital land cover, geospatial data



Introduction

The Gap Analysis Program (GAP) is a national program of the U.S. Geological Survey (USGS) Biological Resources Discipline that develops digital maps and relational habitat models to assist in conservation of biodiversity.

The previous GAP projects were conducted by individual states and utilized different methodologies and data for land cover mapping which often yielded surprisingly inconsistent vegetation and animal habitat maps across state boundaries. In response to these limitations, GAP embarked on a second-generation effort beginning in 1999 to conduct the program at a regional scale using a vegetation classification scheme applicable across the U.S. and using ecoregional units as the basis for classifying imagery. This first regional GAP effort includes the five states of Arizona, Colorado, Nevada, New Mexico, and Utah comprising the Southwest Regional Gap Analysis Project (SWReGAP). The three basic elements of SWReGAP include Land Cover Mapping, Land Stewardship, and Wildlife Habitat Relationship Models.

Land Cover Mapping: The SWReGAP project used contemporary (1999-2001) Landsat 7 Enhanced Thematic Mapper imagery from three seasons, i.e., spring (leaf-on), summer (peak greenness), and fall (leaf-off). The dataset comprised 63 triplicate Landsat scenes for the state of Nevada which were composited into biogeographically unique mapping units that spanned the political boundaries of the adjacent states. Vegetation mapping was conducted at the "ecological systems" level of the National Vegetation Classification provided by NatureServe (Comer et al. 2003) into 73 natural and semi-natural ecological systems land cover types. The dataset used to "train" the imagery contained over 17,500 ground-truth sites collected across the state (92,100 for the total 5-state project area).

Land Stewardship: The SWReGAP project produced a land stewardship map of the state that identifies individual management units by land ownership, management designation, and management status. A primary objective of the Gap Analysis Program is to provide an assessment of the management status for certain elements of biodiversity (vegetation communities and animal species) and to provide land stewards with information on the representation of these elements so they can make better informed decisions about their management practices regarding biodiversity.

Wildlife Habitat Relationships: The SWReGAP project modeled the predicted distribution of habitat for 833 terrestrial vertebrate species that reside, breed, and use habitat in the 5-state area for a substantial part of their life history, including important migration stopovers. More than 520 species are estimated to occur within the Nevada state boundary. The land cover map was used as an essential variable to predict the geographic distribution of vertebrate species habitat, in addition to topographic, edaphic, and landscape context variables. Collectively, these digital map products are integrated to analyze the representation of biotic elements and to determine "gaps" in long-term protection.

In addition to producing the basic map elements and providing gap analysis, a key objective of the project is to provide all information to the public, especially decision-makers and scientists with responsibility for land use management, planning, policy, and research applications. Products include printed reports on methods and results plus digital products delivered in a user-friendly Web site format available on-line and on DVD. The *Nevada Geospatial Data Browser* was designed to provide an intuitive interface for all geospatial data used to create land cover, vertebrate habitat models, and land stewardship data produced for the state of Nevada.

Methods

The *Nevada Geospatial Data Browser* (EPA/600/C-05/005) includes complete GIS datasets (n=37) and supporting information (metadata) for the entire state of Nevada. The GIS datasets and metadata are available for download. A variety of data themes have been developed under the GIS Data section and each download file contains a folder with the dataset in a GIS format as specified, Federal Geospatial Data Committee (FGDC) metadata file(s), and a .pdf document of the map index or attribute list (Table 1). The information has been acquired from a number of sources and includes data generated within the EPA and other agencies. The metadata comply with minimum FGDC standards and include important information relative to acquisition, location, processing level, file size, and format. All GIS data are in the following projection:

Projected Coordinate System: NAD_1983_Albers
Projection: Albers
False_Easting: 0.00
False_Northing: 0.00
Central_Meridian: -96.00
Standard_Parallel_1: 29.50
Standard_Parallel_2: 45.50
Latitude_of_Origin: 23.00

The *Nevada Geospatial Data Browser* is currently accessible on-line at the EPA Web site (www.epa.gov/nerlesd1/land-sci/gap.htm). Additionally, a limited number of DVD copies were produced and distributed. In regard to system requirements, the data browser DVD will run on computer operating systems such as Microsoft Windows (98/ME/2000/NT/XP) that have Internet browser software installed. Supported Internet browser software include, but are not limited to, Microsoft Internet Explorer Version 4 and above and Netscape Navigator Version 4 and above. Current versions of both Internet browsers can be downloaded on-line at www.microsoft.com/downloads/ and http://channels.netscape.com/ns/browsers/, respectively. The data browser contains links to other Web sites that require Internet connection services to access the links. GIS software such as ESRI's ArcView or ArcGIS are required to manipulate and analyze the GIS datasets and images. For best viewing of the *Nevada Geospatial Data Browser* Web site, the Windows desktop viewing area should be set to 1024 by 768 pixels or higher. Some 15-inch monitors may require adjustments to the desktop viewing area.

In addition to the GIS data, the data browser provides important information relative to Text and Tabular Data (Table 2). Specifically, this information includes complete support documentation in regard to ecological systems descriptions for the Nevada land cover classes, field training manual, training site database information, vertebrate species listed for Nevada, contact and credit information, and various fact sheets and brochures. Lastly, the data browser includes three digital wall posters for plant communities, topography, and land ownership for Nevada (Figures 1, 2, and 3).

Table 1. GIS Data Table

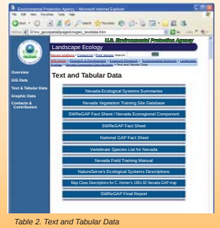


Table 2. Text and Tabular Data

Figure 1. *PLANT COMMUNITIES OF NEVADA: 73 natural and semi-natural cover types; Ecological System level of NVCS; Total = 63 triplicate Landsat 7 ETM scenes, spring, summer, and fall (1999 - 2001); 17,500 field training sites.*

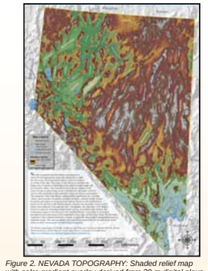


Figure 2. *NEVADA TOPOGRAPHY: Shaded relief map with color-gradient overlay derived from 30 m digital elevation model.*

Figure 3. *LAND OWNERSHIP OF NEVADA: 87% Public Trust (Federal & State): 68.1% BLM; 12.8% Private; 8.3% USFS; 5.2% DOE/DOD; 2.0% USFWS; 0.9% NPS; and 0.01% TNC.*

Conclusions

The West is the fastest growing region of the U.S. according to U.S. Census records. This growth results in changes to the landscape and the goods and services it supports. The growth taking place in the West often results in impacts to the air, water, and natural habitats and affects key societal values associated with watershed condition and biodiversity. Regional and local decision-makers are concerned about how continued development will alter living conditions and the ability of the environment to sustain productivity and quality. The digital land cover map and associated GIS datasets developed for the project area comprise the most comprehensive digital database ever assembled for the region. They provide source data for decision analysis relative to resource management, environmental protection, and future conditions. This product provides easy public access to a comprehensive, long-term database which can be used by the community stakeholders to help understand their environment, set priorities, and make decisions for improvement. The database can be easily updated to include new GIS datasets as they become available and could be used as a prototype science communication tool for other GAP initiatives.

Acknowledgments

The geospatial data contained within the *Nevada Geospatial Data Browser* have been either developed directly by the SWReGAP project investigators or acquired from a number of other sources. We thank those agencies who readily made data available to us, encouraged our efforts, and reviewed our interim products. Users are advised that verification of the quality of and use of any data supplied via this product is the responsibility of the user. The digital land cover and associated spatial data for the Southwest Regional Gap Analysis Project models were completed in collaboration with the U.S. Geological Survey (Biological Resources Discipline), Utah State University, New Mexico State University, Colorado Division of Wildlife, NatureServe, Eastern Nevada Landscape Coalition, Nevada Natural Heritage Program (Department of Conservation and Natural Resources), U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and the Nevada Department of Wildlife. Funding to EPA was provided via interagency agreement No. RW14939145 from the USGS, Biological Resources Discipline.

See **www.epa.gov/nerlesd1/land-sci/gap.htm** *for more information*

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