

Urban and rural land use in Puerto Rico

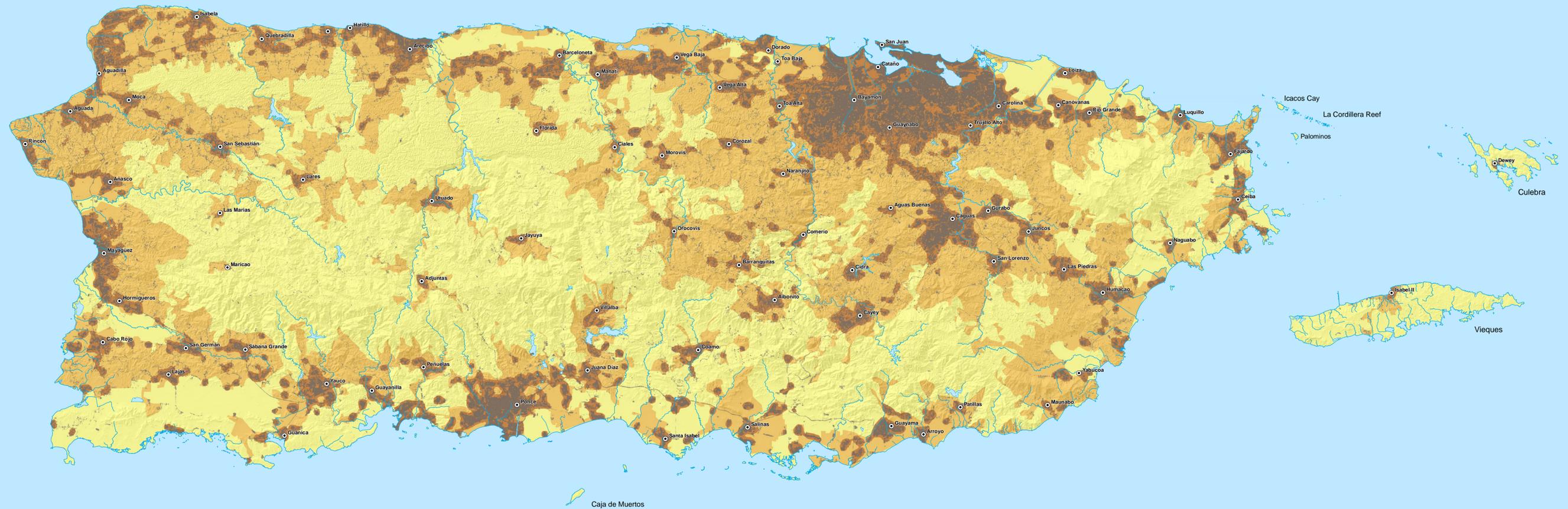
Sebastián Martinuzzi, William A. Gould, Olga M. Ramos González, Maya Quiñones, and Michael E. Jiménez
 USDA Forest Service International Institute of Tropical Forestry (IITF)



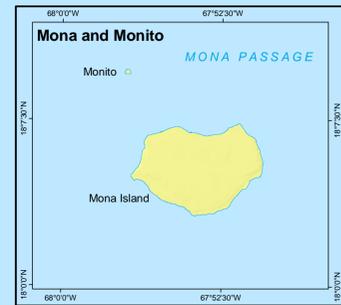
PRGAP ANALYSIS PROJECT
 IITF GIS and Remote Sensing Lab
 A center for tropical landscape analysis



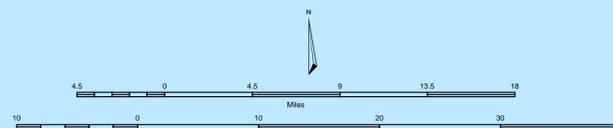
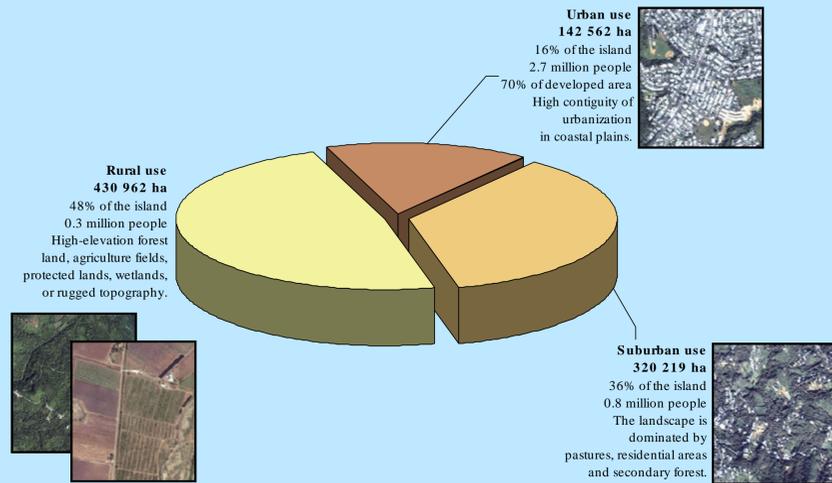
ATLANTIC OCEAN



CARIBBEAN SEA



Map Description
 We have developed three land use regions for Puerto Rico: Urban, Suburban, and Rural (Gould et al. 2008; Martinuzzi et al. 2007). These three regions can also be considered urban, densely-populated rural, and sparsely-populated rural or as urban and wildland with a wildland-urban interface. The suburban use is the most dynamic in terms of population growth and land cover change. *Developed surfaces* refer to built-up and non-vegetated areas that result from human activity. These areas were identified using remote sensing techniques to analyze a mosaic of Landsat ETM+ satellite images from the years 2000 to 2003. *Urban use* refers to those places in the landscape where the presence of developed/built-up areas per km² is more than 20 percent. Rural use refers to those places in the landscape where the presence of developed/built-up areas is less than 20 percent. The rural areas were subdivided into two classes, based on the U.S. Census 2000 approach for the identification of densely and sparsely populated territories: *densely-populated rural* or *suburban* with core census block groups or blocks that have a population density of at least 1,000 people per mi² plus surrounding census blocks that have an overall density of at least 500 people per mi², and *sparsely-populated rural* or



SCALE: 1: 260 000
 Lambert Conformal Conic Projection
 North American Datum of 1983 (NAD 83)

United States Department of Agriculture Forest Service has developed this information for the guidance of its employees, its contractors, and its cooperating Federal and State agencies. It is not responsible for the interpretation or use of this information by anyone except its own employees. The use of trade, firm, corporation, or association names in this publication is for the information and convenience of the reader and does not constitute an endorsement by the Department of any product or service. This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture, Forest Service. Geographic Information System (GIS) data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, or incomplete while being created or revised. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. This information was released on the indicated date. The Forest Service reserves the right to correct, update, modify, or replace GIS

- Land use**
- Developed surface
 - Urban
 - Suburban
 - Rural
- Administrative**
- Urban centers
- Hydrography**
- Lakes/Reservoirs
 - Rivers/Streams

References
 Gould, W.A.; Alarcón, C.; Fovold, B.; Jiménez, M.E.; Martinuzzi, S.; Potts, G.; Quiñones, M.; Solórzano, M.; Ventosa, E. 2008. The Puerto Rico Gap Analysis Project. Volume 1: Land cover, vertebrate species distributions, and land stewardship. Gen. Tech. Rep. IITF-GTR-39. Río Piedras, PR: U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry.

Martinuzzi, S.; Gould, W.A.; Ramos-González, O.M. 2007. Land development, land use, and urban sprawl in Puerto Rico: integrating remote sensing and population census data. *Landscape and Urban Planning*, 79: 288-297.

Additional data sources
 Census data: U.S. Census Bureau, 2000. <http://www.census.gov/>

Elevation data: The elevation data were derived from the USGS National Elevation Dataset (NED) digital elevation model (DEM). This data set is a raster product assembled by the U.S. Geological Survey (USGS). The NED is designed to provide national elevation data in a seamless form with a consistent datum, elevation unit, and projection. Data corrections are made in the NED assembly process to minimize, but not eliminate artifacts, perform edge matching, and fill silver areas of missing data. NED has a resolution of one arc-second (approximately 30 meters) for the contiguous United States, Hawaii, and Puerto Rico and a resolution of two arc-seconds for Alaska. The hillshade was calculated using ArcGIS 9.1 and spatial analyst extension.

Hydrography data set: The hydrography dataset was derived and generalized from The National Hydrography Dataset (NHD). The NHD was originated by the U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency, USDA Forest Service, and other Federal, State and local partners. 2005, Reston, Virginia. This data set is presented as vector digital data generally developed at 1:24 000/1:12 000 scale.

Urban centers: This data set was developed by the GIS and Remote Sensing Lab of the International Institute of Tropical Forestry using visual interpretation of existing maps. Each point in the data set represents the approximate urban center for each municipality.

Suggested citation
 Martinuzzi, S.; Gould, W.A.; Ramos González, O.M.; Quiñones, M.; Jiménez, M.E. 2008. Urban and rural land use in Puerto Rico. Scale 1: 260 000. IITF-RMAP-01. Río Piedras, PR: US Department of Agriculture Forest Service, International Institute of Tropical Forestry.

Acknowledgements
 This research was supported by the United States Geological Survey Biological Resources Division National Gap Program cooperative agreement No. 01HQPG0031 (01-IA-11201-002), the Puerto Rico GAP Analysis Program (PRGAP), the IITF GIS and Remote Sensing Laboratory and the USDA Forest Service International Institute of Tropical Forestry. Special thanks to reviewers for critical reviews of the map. This research was conducted in collaboration with the University of Puerto Rico.

Publication date: November 2008