Landscape units of Puerto Rico: Influence of climate, substrate, and topography

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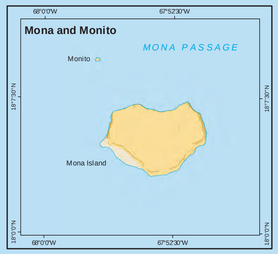
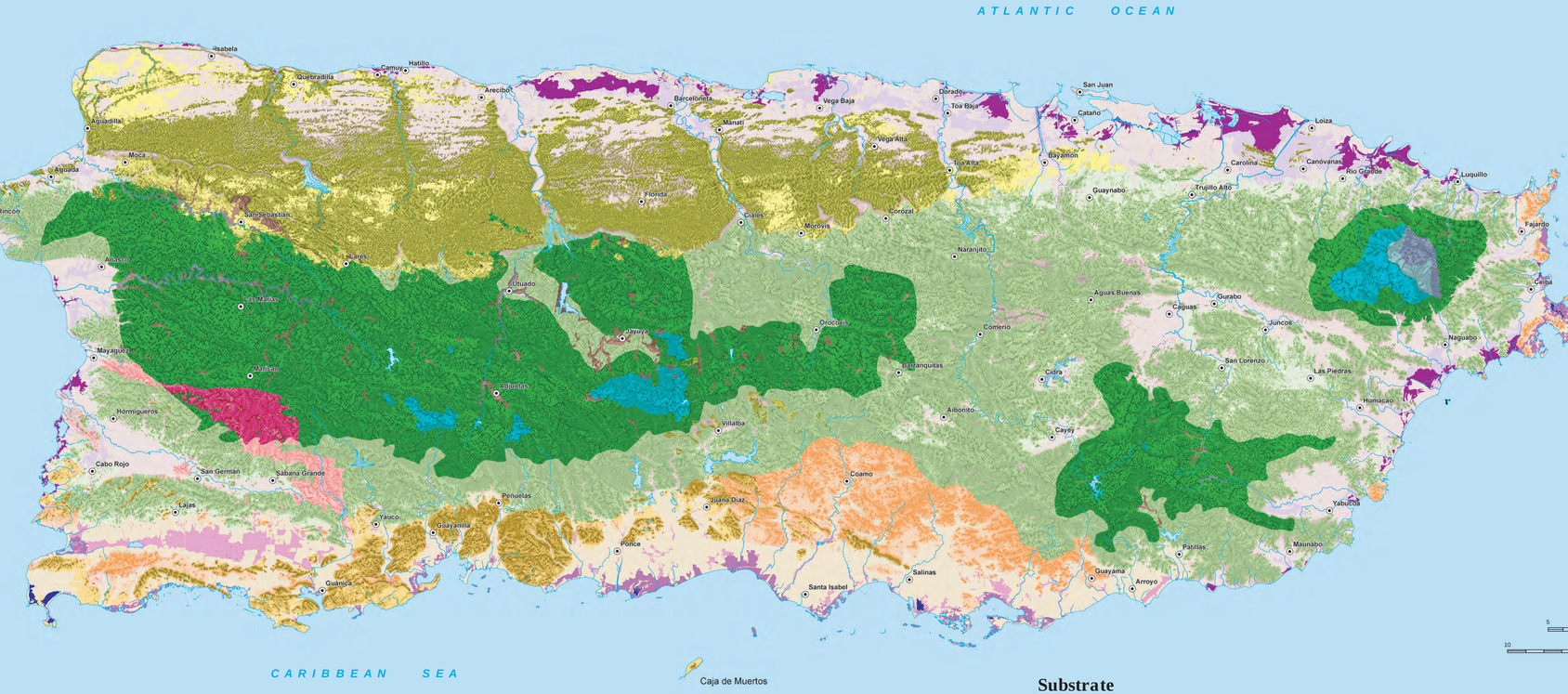
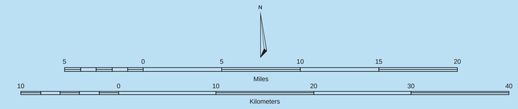
Desecheo







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

Substrate

Climate (Holdridge lifezones)	Limestone	Alluvial and unconsolidated quaternary	Ultramafic igneous	Volcanic and volcaniclastic
Subtropical dry forest	Ridge, Upper slope, Lower slope, Plain	Ridge, Upper slope, Lower slope, Plain	Ridge, Upper slope, Lower slope, Plain	Ridge, Upper slope, Lower slope, Plain
Subtropical moist forest	Ridge, Upper slope, Lower slope, Plain	Ridge, Upper slope, Lower slope, Plain		Ridge, Upper slope, Lower slope, Plain
Subtropical wet forest		Ridge, Upper slope, Lower slope, Plain	Ridge, Upper slope, Lower slope, Plain	Ridge, Upper slope, Lower slope, Plain
Subtropical rain forest				Ridge, Upper slope, Lower slope, Plain
Lower montane wet forest				Ridge, Upper slope, Lower slope, Plain
Lower montane rain forest				Ridge, Upper slope, Lower slope, Plain

Wetlands and depressions
- Moist saline
- Moist non-saline
- Dry saline
- Dry non-saline

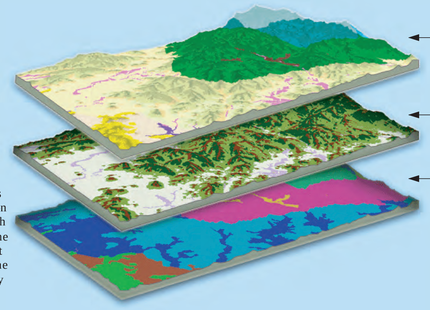
Lakes/Reservoirs
Rivers/Streams
Urban centers

Map description

The landscape units map of Puerto Rico represents climatic, substrate, and topographic variation by integrating six climatic zones (Ewel and Whitmore 1973), six distinct substrates (Bawiec 2001, USGS 2005), five topographic positions or landforms (Martinuzzi et al. 2007), and prominent lakes and rivers (USGS 2005). Substrates were a simplified set of Bawiec's (2001) twelve geologic terrane units and include cretaceous and tertiary limestone deposits, alluvium and other unconsolidated quaternary deposits, intrusive and extrusive volcanic formations and volcaniclastic sedimentary deposits (reworked sediments of volcanic origin – may or may not be calcareous), and ultramafic serpentine and amphibolite formations (low quartz content – typically high pH). We also deliniated saline and nonsaline wetlands (USGS 2005). The resulting map displays a set of 57 landscape units for the islands. The map builds on earlier work by Figueroa (1996) mapping geoclimatic variation in Puerto Rico and was developed for the purpose of understanding and modeling variation in vegetation. Natural variation in vegetation has a hierarchy of environmental controls, including climate, geochemical substrates, topography, and disturbance. Geospatial information on these controls is useful for modeling potential variation in vegetation cover and associated ecosystem properties.

- ? Climatic controls include the range, mean, and variability of air temperatures and precipitation regulated by latitudinal gradients, global atmospheric patterns, orographic patterns, and feedbacks with landcover (Chapin et al. 2005).
- ? Substrate characteristics (geochemistry) include soil pH, nutrient availability, and texture, which strongly affect plant species composition (Gould et al. 2006). Geochemistry is related to exposed bedrock, quaternary deposits, land use history, and biological processes.
- ? Topography affects plant species composition by influencing soil moisture, development, texture, and chemistry (Birkeland 1984). Slope position is also related to disturbance and particular landforms may be more or less influenced by flooding, storms, landslides, fire, or human development.

The most abundant landforms in Puerto Rico are the moist and wet slopes on volcanic substrates of the Central and Luquillo Mountains, which include 40% of the area. Moist and wet slopes on limestone substrates make up 10% of the area. Dry hills and slopes make up 6% of the area, with 30% of these on limestone and the remaining 70% on volcanic and ultramafic serpentine substrates. Nearly 12% of the landscape is made up of ridges and 90% of these are in the moist and wet climatic regions. Moist plains include 16% of the area and dry plains include 8% of the area. Wetlands and depressions, not including open water bodies, make up 5% of the area. Nearly 70% of these are in moist climatic regions and just under 30% in dry climatic regions.



Landscape units
This datest is the result of the integration of geospatial data on landforms and geoclimate regions of Puerto Rico. We derived 57 classes including water and four types of wetlands.

Slope positions
The landforms dataset includes five slope positions modeled using elevation and topography (Martinuzzi et al. 2007).

Climate and substrate
Sixteen geoclimatic regions integrate climate and geologic information using Holdridge's lifezones (Ewel and Whitmore 1973) and the USGS (Bawiec 2001) geology of Puerto Rico.

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Additional data sources
Climate (Holdridge lifezones): Modified from Ewel and Whitmore (1973).

Geology: The geology dataset was derived and generalized from the Geologic Terranes of Puerto Rico by Bawiec (2001).

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.

Landforms: Gould, W.A.; Martinuzzi, S.; Jiménez, M.E.; Edwards, B.R.; Ramos-González, O.M. 2008. Topographic units of Puerto Rico. Scale 1: 260 000. IITF-RMAP-04. Rio Piedras, PR: US Department of Agriculture Forest Service, International Institute of Tropical Forestry.

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
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