Protected Natural Areas of Puerto Rico

Unted States
Department of Agriculture

Forest Service

Forest Service

INTRNATIONAL INSTITUTION OF IRCHICAL ICRISINY

KEEPING COMMON SPECIES COMMON









rotection of natural areas is essential to conserving biodiversity and maintaining ecosystem services. Benefits and services provided by natural areas are complex, interwoven, life-sustaining, and necessary for a healthy environment and a sustainable future (Daily et al. 1997). They include clean water and air, sustainable wildlife populations and habitats, stable slopes, productive soils, genetic reservoirs, recreational opportunities, and spiritual refugia. These are benefits that cannot be replaced by existing technology (Cohen and Tilman 1996, Daily et al. 1997). To best use our natural heritage, natural lands management and protection designation should be based on sound scientific information provided by research and experience. Social and historical factors, sustainable uses, existing conditions, restoration potential, and future scenarios should be considered to assure continued benefits, a good quality of life, and economic stability for the communities that depend on ecosystem services provided by natural areas.

William A. Gould, Maya Quiñones, Mariano Solórzano, Waldemar Alcobas, and Caryl Alarcón

Protected areas by management

U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry

We portray the protected natural areas designated for natural resource conservation in Puerto Rico, as well as areas with government regulation that have the potential to enhance natural resource conservation. The designation of protected areas can be very dynamic as it is a product of ever-evolving social values. The information shown is a compilation of available geospatial data from various local and federal government agencies and nongovernmental organizations (NGOs). The primary map, "Protected areas by management," shows Puerto Rico's protected natural lands designated for conservation and managed by Puerto Rico Commonwealth agencies, U.S. federal agencies, and NGOs. The areas are identified by a numerical label that matches the area's name on the list below. This map also shows Puerto Rico's marine reserves and marine extensions of terrestrial natural reserves, which are all managed or co-managed by the Puerto Rico Department of Natural and Environmental Resources (DNER). Some or parts of the protected areas are owned by a different agency than the one that manages it, so a supplemental map, "Protected areas by ownership," identifies the protected areas as either parks, reserves, or state forests owned by the DNER or the Puerto Rico National Parks Company, areas owned by other Commonwealth agencies, federally owned land, land owned by NGOs, and unprotected lands. The second supplemental map, "Regulated land," shows areas with some degree of government regulation, including the 2006 Puerto Rico land use plan draft (Junta de Planificación 2006) and additional local and federal laws that potentially provide protection of natural resources. It is important to note that there are areas not portrayed which were historically designated as part of the state forests of Boquerón (6), Ceiba (19), and Piñones (81). We were unable to determine their current status. Additionally, there are areas not included in this map that have been designated by the commonwealth government as special zoning areas, which have some conservation objectives but little enforcement (e.g., a parcel adjacent to the Tres Palmas Marine Reserve (110).

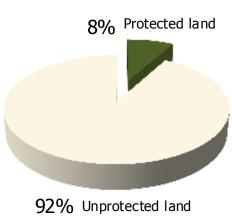
Summary. Currently 8 percent of Puerto Rico's land is designated for conservation. This includes public and private properties classified as state forests, national federal forests, wildlife refuges, natural reserves, natural protected areas, conservation easements, recently acquired lands for conservation, and other lands managed for conservation.

Puerto Rico currently has 116 protected natural areas with 21 marine reserves, of which 16 are marine extensions of terrestrial reserves. Eight of the 95 protected land areas are co-owned by various entities. The Commonwealth of Puerto Rico owns and manages the greatest area of protected lands (58 percent and 57 percent, respectively), followed by the federal government (28 percent in both categories) and NGOs (14 and 15 percent, respectively). However, NGOs manage more individual protected land areas than the federal government (36 vs. 7). Protected areas are concentrated on the high peaks of the Central and Luquillo Mountains, the wetlands of the coastal plains, and the lesser islands and cays of the Puerto Rican Archipelago. These areas are relatively well-protected. Under protected areas include nonwetlands of the coastal plain, the karst limestone hills in northwestern Puerto Rico, and the coastal hills and lower slopes. The coastal hills form an important hydrological and ecological link between the upper mountains, the coastal wetlands, and the near-shore marine areas.

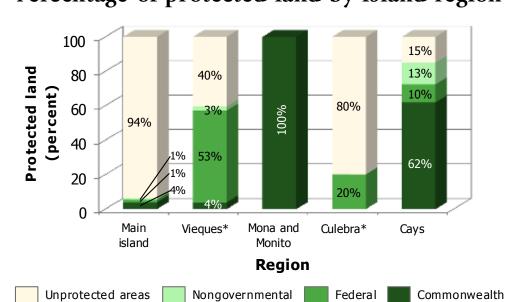
Mechanisms other than official designation as a protected area have been established to promote natural resource conservation, including local and federal laws, zoning regulation, planning, and permit processes for development. The Puerto Rico Land Use Plan, an island-wide regulatory obligation of the Puerto Rico Planning Board (Junta de Planificación 2006), has been in development for years although it is still unfinished and unapproved. Local and federal laws and regulations often protect specific landcover types, species habitats, and terrain not appropriate for development, e.g., flood plains, steep slopes, landslide-prone areas, and critical

habitat. However, these mechanisms and the processes to enforce them do not always work (Fernández-Porto 1994, Lugo 1994, Lugo et al. 2004, Molina 1994). Development pressure, the politicizing of environmental agencies and decisionmaking processes, and the lack of knowledge and appreciation of the services provided by natural areas have historically impaired the ability of these processes to properly protect our land (Lugo 1994).

* Region includes surrounding cays.



Percentage of protected land by island region



Protected Land Management in Puerto Rico

Lands managed by Puerto Rican government agencies (i.e., Department of Natural and Environmental Resources, Land Administration, National Parks Company of Puerto Rico, and University of Puerto Rico) and municipalities.

Lands managed by U.S. federal government agencies (i.e., U.S. Fish and Wildlife Service, U.S. Forest Service, and U.S. National Park Service).

Data sources:

Bathymetry: This data set was created with National Oceanic and Atmospheric Administration nautical chart points compiled by Antonio González of the University of Turabo, Ana G. Méndez System. The Digital Elevation Model (DEM) was created at the International Institute of Tropical Forestry (IITF) Geographical Information Systems (GIS) and Remote Sensing Lab. The points were interpolated to a 30-meter raster file using the Spline interpolation in ArcGIS 9.2, Spatial Analyst extension. A hill shade was calculated from the DEM using ArcGIS 9.2.

Coastline: The coastline data set is mainly based on 2007 digital aerial photographs, with small areas based on 2004 digital aerial photographs, IKONOS and the U.S. Geological Survey (USGS) topographic maps owing to geometric errors or range issues in the 2007 photos. The data set was developed by a collaborative effort between the Conservation Trust of Puerto Rico and the IITF GIS and Remote Sensing Lab.

Hydrography: The hydrography data set was derived and generalized from The National Hydrography Dataset (NHD)

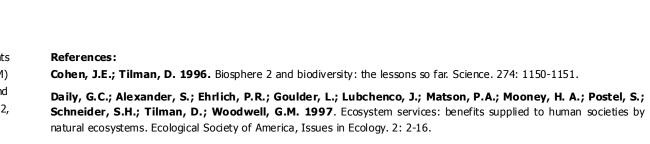
published in 2005, Reston, Virginia. The NHD was originated by the USGS in cooperation with the U.S. Environmental Protection Agency, U.S. Department of Agriculture (USDA) Forest Service, and other federal, state, and local partners. This data set is presented as vector digital data generally developed at 1:24,000/1:12,000 scale. Protected areas: Updated from Gould et al. 2007. Marine reserves were added from data provided by the Department

of Natural and Environmental Resources of Puerto Rico. Some boundaries were updated with more recent data provided by the agency or organization responsible for said areas, whereas other areas that were missing in the original file were added. The coastline of the original data was updated to match a newer coastline based primarily on 2007 digital orthorectified aerial photographs, developed by the IITF GIS and Remote Sensing Lab. These are the most recent available

Topography: The elevation data were derived from the USGS National Elevation Dataset (NED) DEM. This data set is a raster product assembled by the USGS. The NED is designed to provide national elevation data in a seamless form with a consistent datum, elevation unit, and projection. 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 by using ArcGIS 9.2, Spatial Analyst extension.

Urban centers: This data set was developed by the IITF GIS and Remote Sensing Lab using visual interpretation of

existing maps. Each point in the data set represents the approximate urban center for each municipality.



Foundation, among other nonprofit and private organizations).

Lands with no known current legal protection for conservation.

Lands managed by nongovernmental entities (e.g., Casa Pueblo Foundation, Ciudadanos del Karso, Conservation Trust of Puerto Rico, Luis Muñoz Marín

67°50'0"W

15 Caño Martín Peña Natural Reserve

16 Caño Tiburones Natural Reserve

21 Cibuco Swamp Natural Reserve

23 Conservation Easement El Rabanal

24 Conservation Easement El Tambor

25 Conservation Easement Foreman

26 Conservation Easement Montes Oscuros

27 Conservation Easement Palmas del Mar

18 Cartagena Lagoon National Wildlife Refuge

22 Cibuco Swamp Natural Reserve Marine Extent

17 Carite State Forest

19 Ceiba State Forest

67°10'0"W

Bathymetry (meters below sea surface)

20 Cerrillos State Forest

Protected Areas

3 Aguirre State Forest

6 Boquerón State Forest

8 Boquerón Wildlife Refuge

11 Cambalache State Forest

12 Camuy River Caves Park

Administrative

Urban centers

Marine protected areas

1 Adjuntas People's Forest

4 Belvedere Natural Reserve

5 Belvedere Natural Reserve Marine Extent

7 Boquerón State Forest Marine Extent

10 Caja de Muertos Island Natural Reserve

14 Caño La Boquilla Natural Reserve Marine Extent

9 Cabo Rojo National Wildlife Refuge

13 Caño La Boguilla Natural Reserve

2 Aguas Buenas Caverns and Cave Systems Natural Reserve

Puerto Rico Department of Natural and Environmental Resources [DRNA]. 2009. Hoja de nuestro ambiente: Los Manglares. P-037. San Juan, PR. 2 p. Fernández-Porto, J. 1994. El Impacto sobre las comunidades de la administración de los terrenos y otros bienes públicos. Acta Científica. 8(1-2): 37-43. Gould, W.A.; Alarcón, C.; Fevold, B.; Jiménez, M.E.; Martinuzzi, S.; Potts, G.; Solórzano, M.; Ventosa, E.

2007. Puerto Rico Gap Analysis Project-final report. Moscow, ID: U.S. Geological Survey, and Río Piedras, PR: U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry. 159 p. and 8 appendices. Junta de Planificación. 2006. Plan de uso de terrenos de Puerto Rico: borrador preliminar para vistas públicas. San Lugo, A.E. 1994. Terrenos públicos, fragmentación y la biodiversidad de Puerto Rico. Acta Científica. 8(1-2): 31-35.

Acta Científica. 18(1-3): 1940-1148 Molina, M. 1994. Introducción al concepto de los terrenos y bienes públicos, y su marco legal. Acta Científica. 8(1-2):

Suggested citation: Gould, William A.; Quiñones, Maya; Solórzano, Mariano; Alcobas, Waldemar; Alarcón, Caryl.

2011. Protected natural areas of Puerto Rico. 1:240,000. IITF-RMAP-02. Río Piedras, PR: U.S. Department of

Lugo, A.E.; Ramos-Álvarez, A.; Mercado, A.; La Luz Feliciano, D.; Cintrón, G.; Márquez D'Acunti, L.;

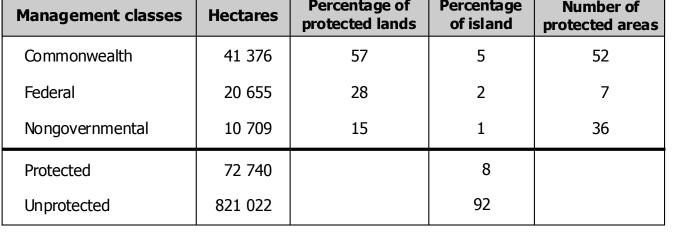
Chaparro, R.; Fernández Porto, J.; Peisch, S.J.; Rivera Santana, J. 2004. Cartilla de la zona marítimo-terrestre.

Agriculture, Forest Service, International Institute of Tropical Forestry. **Acknowledgments:** This research was supported by the USGS Biological Resources Division National Gap Program cooperative agreement 01HQPG0031 (01-IA-111201-002). Special thanks to Brick Fevold and the Conservation Trust of Puerto Rico, the Puerto Rico Department of Natural and Environmental Resources, William Hernández and the Fish and

Wildlife Service, Luis Jorge Herrera and Ciudadanos del Karso, Coralys Ortiz and the Coastal Zone Management Program

of the DNER, and reviewers for information and critical reviews of this map. This research was conducted in

collaboration with the University of Puerto Rico.



28 Cueva del Indio Natural Reserve

30 Culebra National Wildlife Refuge

32 Desecheo National Wildlife Refuge

33 Doña Inés Mendoza Urban Forest

35 El Convento Caves Natural Protected Area

38 Encantado River Natural Protected Area

40 Espíritu Santo River Natural Reserve Marine Extent

39 Espíritu Santo River Natural Reserve

34 El Buey National Wildlife Refuge

36 El Tallonal Natural Reserve

37 El Yunque National Forest

41 Guajataca State Forest

29 Cueva del Indio Natural Reserve Marine Extent

31 Desecheo Island Coastal Waters Natural Marine Reserve

42 Guánica State Forest

46 Guillermeti property

53 José Santiago property

54 Joyuda Lagoon Natural Reserve

43 Guánica State Forest Marine Extent

45 Guaynabo River Natural Protected Area

47 Hacienda Buena Vista Natural Protected Area

51 Jobos Bay Estuary National Research Reserve

55 La Ciénaga Las Cucharillas Natural Reserve

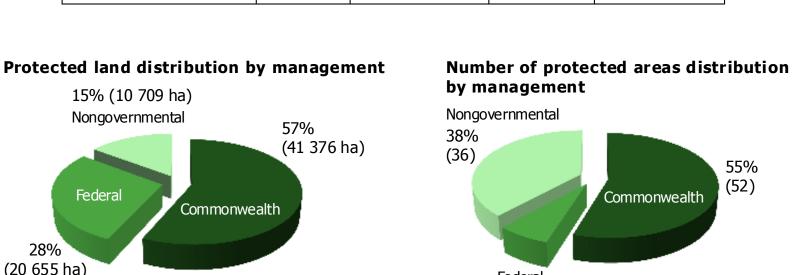
52 Jorge Sotomayor del Toro Natural Protected Area

49 Hacienda La Esperanza Natural Reserve Marine Extent

50 Inés María Mendoza (Punta Yeguas) Nature Reserve

48 Hacienda La Esperanza Natural Reserve

44 Guayama Reef Natural Reserve



The 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 or for which they were created may yield inaccurate or misleading results. This information was released on the indicated date. The data in this research map reflect data available at the moment of publication. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification.

The Forest Service of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research. cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA. Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



56 La Cordillera Reef Natural Reserve

59 La Parguera Natural Reserve Marine Extent

63 Las Cabezas de San Juan Natural Reserve

64 Las Cabezas de San Juan Natural Reserve

66 Las Piedras del Collado Natural Reserve

68 Luis Peña Channel Natural Reserve

58 La Parguera Natural Reserve

60 Lago Guajataca Wildlife Refuge

61 Lago La Plata Wildlife Refuge

62 Lago Luchetti Wildlife Refuge

57 La Olimpia Forest

Marine Extent

67 Los Frailes property

65 Las Mesas Peak

Protected Land Ownership in Puerto Rico Commonwealth forests, parks, and reserves Protected lands for conservation owned by Puerto Rican government agencies (i.e., DNER, National Parks Company of Puerto Rico)

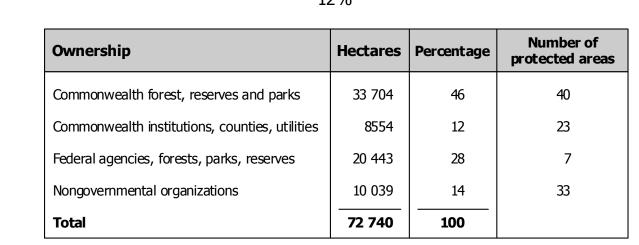
Protected lands for conservation owned by Puerto Rican government institutions, municipalities, and utility companies Federal agencies, forests, parks, and reserves Protected lands for conservation owned by U.S. government federal

Commonwealth institutions, counties, and utilities

Nongovernmental organizations Protected lands for conservation owned by nonprofit and private organizations

Lands with no known current legal protection for conservation

Unprotected areas



Caribbean Sea

82 Pterocarpus Forest of Dorado

85 Punta Ballenas Natural Reserve

86 Punta Cucharas Natural Reserve

90 Punta Petrona Natural Reserve

94 Ratones Cay Natural Reserve

88 Punta Guaniquilla Natural Reserve

83 Pterocarpus Forest Nature Reserve

84 Pterocarpus Swamp Forest and Mandry and

87 Punta Cucharas Natural Reserve Marine Extent

89 Punta Guaniquilla Natural Reserve Marine Extent

91 Punta Petrona Natural Reserve Marine Extent

93 Punta Yeguas Natural Reserve Marine Extent

Regulated land

92 Punta Tuna Natural Mangrove Reserve

Santa Teresa Lakes Natural Reserve

69 Maricao River Natural Protected Area

71 Mata de Plátano Field Station Natural Reserve

72 Medio Mundo y Daguao Natural Protected Area

73 Mona Island and Monito Natural Reserve

74 Mona Island and Monito Natural Reserve

79 Pandura Range Natural Protected Area

80 Paraíso de las Lunas Natural Protected Area

70 Maricao State Forest

Marine Extent

75 Monte Choca State Forest

76 Monte Guilarte State Forest

77 Nuevo Milenio Urban Forest

78 Old San Juan Aqueduct

81 Piñones State Forest

66°10'0"W

Atlantic Ocean

Lakes/reservoirs

95 Recently aquired land in Manatí and

96 Recently aquired land in Piñones by DNER

98 Recently aquired land in the Northeast

Ecological Corridor by DNER

97 Recently aguired land in the Northern Karst

100 San Cristóbal Canyon Natural Protected Area

Guayama by IITF

region by DNER

99 Río Abajo State Forest

101 San Juan Ecological Corridor

103 Seven Seas Natural Reserve

102 San Patricio Urban Forest

104 Shapiro property

105 Sun Bay National Park

Some of Puerto Rico's laws and regulations that impact the conservation of natural resources

The agriculture valleys are areas regulated for the conservation of agriculture activities. Each valley is protected under a specific mandate: Lajas valley, Law number 277 of the year 1999; Coloso valley, Law number 142 of the year 2000; Guanajibo valley, Law number 184 of the year 2002; Cibuco valley, Law number 398 of the year 2004; Yabucoa valley, Law number 49 of the year 2009.

Maritime terrestrial zone _____ The maritime terrestrial zone is that part of the coast designated as public domain. Its use is

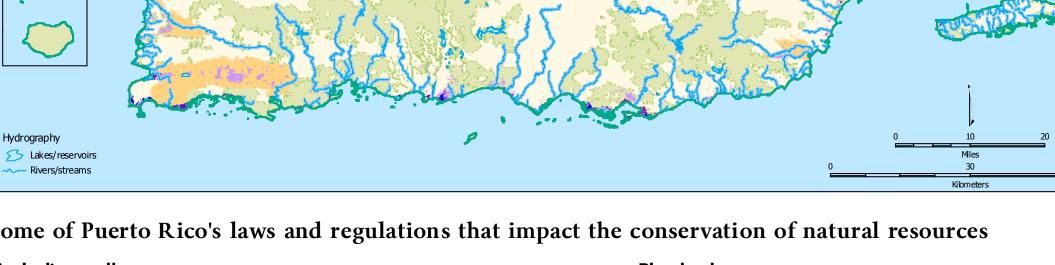
regulated by various laws and regulations, including: "Ley de Muelles y Puertos de Puerto Rico," "Ley de Aguas," "Reglamento para el Aprovechamiento, Vigilancia, Conservación y Administración de las Aquas Territoriales, los Terrenos Sumergidos bajo estas y la Zona Marítimo-Terrestre," "Reglamento de Zonificación de la Zona Costanera y de Acceso a Playas y Costas de Puerto Rico" (Lugo et al. 2004).

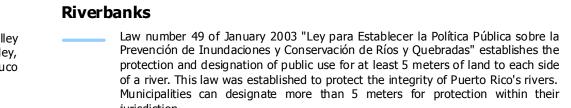
Puerto Rico Land Use Plan 2006 draft

Specially protected rustic terrain Other classifications

The Planning Board of Puerto Rico is required by law to create a land use plan for Puerto Rico. The last finished draft was done in 2006 but was not approved. The Planning Board is currently working on a new version. In the 2006 draft, the category of Specially Protected Land referred to land that because of its location; topography; aesthetic, archaeological, ecological, and agricultural values; and unique natural

resources, among other attributes, should never be used as urban land (Junta de Planificación 2006).





SCALE: 1:240,000

Lambert Comformal Conic Projection

North American Datum of 1983 (NAD 83)

106 Susúa State Forest

113 Vega State Forest

Marine Extent

107 Toro Negro State Forest

111 Tres Picachos State Forest

108 Tortuguero Lagoon Natural Reserve

110 Tres Palmas Natural Marine Reserve

112 University of Puerto Rico Botanical Garden

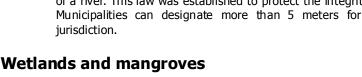
114 Viegues Bioluminescent Bay Natural Reserve

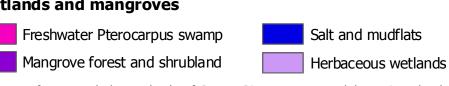
115 Viegues Bioluminescent Bay Natural Reserve

65°20'0"W

109 Tourmaline Reef Natural Reserve

116 Vieques National Wildlife Refuge





Mangrove forests and the wetlands of Puerto Rico are protected by various local and federal laws and regulations to protect the integrity of the coast and other water bodies, including Law number 23 of the 20th of June of 1972 "Ley Orgánica del Departamento de Recursos Naturales y Ambientales," Law number 133 of 1 of June of 1975 "Ley de Bosques," Law 241 of 15 of August of 1999 "Nueva Ley de Vida Silvestre," Law 150 of 4 of August of 1988 "Ley del Programa de Patrimonio Natural," law 314 of 24 December of 1988 "Política Pública sobre Humedales y designación de Caño Tiburones como Reserva Natural," Regulation number 17 "Reglamento de Zonificación de la zona costanera y acceso a las playas y costas de Puerto Rico," and the Federal Clean Water Act (DRNA, 2009).