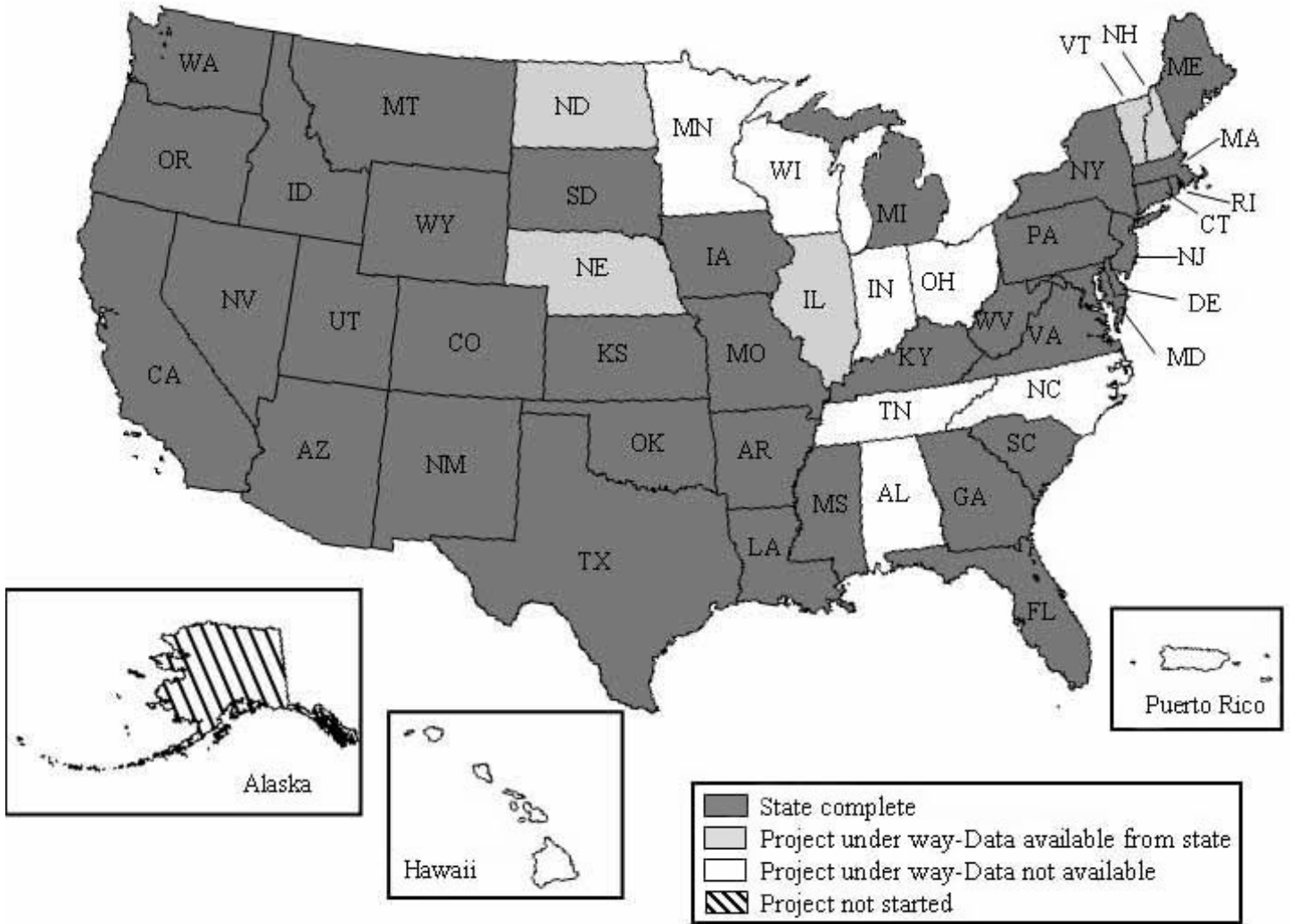


# STATE PROJECT REPORTS

(Status as of April 2005)



All completed products and reports will be available through the GAP web site at <<http://gapanalysis.nbii.gov>>. Drafts and other products may be obtained from the state project PI as noted.

## Alabama

Project under way.

Anticipated completion date: December 2006

### Contacts:

James B. Grand, PI  
Leader, Alabama Cooperative Fish and Wildlife Research Unit  
Auburn University, Auburn  
bgrand@acesag.auburn.edu, 332-884-4796

Amy L. Silvano, Project Coordinator  
Alabama Cooperative Fish and Wildlife Research Unit  
Auburn University, Auburn  
silvaal@auburn.edu, 334-844-9295

**Land cover:** As part of our ongoing partnership with Southeast Regional GAP (SEReGAP), the Alabama Gap Analysis Project (AL-GAP) is responsible for all land cover mapping efforts within the East Gulf Coastal Plain (EGCP). The land cover mapping is being developed in two phases of thematic detail. In the first phase, we are creating a general land cover map in cooperation with EROS Data Center's (EDC) effort to develop a second-generation National Land Cover Data set (NLCD). For the second phase, we will refine the NLCD to create a more detailed vegetation map based on the Terrestrial Ecological Systems, described by NatureServe (Comer et al. 2003, hereafter referred



Figure 1. The East Gulf Coastal Plain.

to as Systems). This Systems map will represent the terrestrial habitat communities and provide a foundation for GAP vertebrate modeling and biodiversity assessments in the EGCP. In fiscal year 2004, the NLCD layer for the EGCP (Figure 1) was completed. In spring 2004 we initiated fieldwork and collected data for over 60 percent of the Systems found within the EGCP. In addition, in January 2005 we began to evaluate methods for developing the Systems level map, which included classification and regression tree analysis (CART), logistic regression, and spatial query analyses. We will continue fieldwork and compilation of training data for the remaining Systems within the EGCP through 2005.

**Animal modeling:** Development of animal models continued in 2004. As part of SEReGAP, we created regional range extents for 257 species of terrestrial vertebrates. In May 2004, we worked with project staff from the North Carolina and Georgia GAP labs to conduct an internal review and finalize range extents for the 608 species proposed for the Southeast Regional Project. In June 2004, we commenced literature reviews for generating unified habitat relationships for the region, and in the winter of 2004-05 we began developing the lists of spatial parameters and habitat relationship models for each species. The habitat modeling will continue throughout 2005 and we anticipate producing preliminary predicted distribution maps by the summer of 2005. We plan to initiate expert review workshops in fall 2005.

**Land stewardship mapping:** Stewardship mapping is also ongoing. Digital boundary files and ownership data have been compiled from various public and private agencies through cooperative arrangements. We will continue updating this layer for the duration of the project and will complete the final map in early 2006 to provide the most up-to-date data for our Gap analysis.

**Analysis:** Not applicable at this time.

**Reporting and data distribution:** Report writing will be ongoing through the duration of the project. Project updates and current information can be found on our web site at <<http://www.auburn.edu/gap>>.

**Other accomplishments and innovations:** AL-GAP has partnered with the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries to develop a map of high-priority terrestrial habitats to be used in support of the state's Comprehensive Wildlife Conservation Strategy. Also in 2004, our graduate research assistant, John Hogland, identified an innovative modeling method to classify longleaf ecosystems using polytomous logistic regression. See his paper, which describes this modeling procedure, in this *Gap Analysis Bulletin*.

### Papers and posters presented in 2004:

Hogland, J. S., and M. D. MacKenzie. Determining the current distributions of critically endangered longleaf ecosystems: A

regional approach using remote sensing techniques. Poster presented at the Integrated Regional Studies for Global Sustainability Conference, Auburn, Alabama, March 22.

———. Determining the current distributions of critically endangered longleaf ecosystems: A regional approach using remote sensing techniques. Poster presented at the 5<sup>th</sup> Longleaf Alliance Regional Conference, Hattiesburg, Mississippi, October 12–15.

———. Identifying longleaf ecosystems using remote sensing and GIS: Management implications. Longleaf Alliance Report No. 8. *In progress*.

———. Using remote sensing techniques to delineate the current distribution of longleaf (*Pinus palustris*) ecosystems across Alabama, west Georgia, and east Mississippi. *Southeastern Biology Bulletin* 51 (2):186.

Kleiner, K. J., M. D. MacKenzie, and A. McKerrow. Mapping riparian wetlands from Landsat ETM+ imagery and DEM derivatives: A comparison of methods. *Southeastern Biology Bulletin* 51(2): 186.

Silvano, A. L., K. J. Kleiner, B. Taylor, E. R. Irwin, M. D. MacKenzie, M. S. Mitchell, and J. B. Grand. Alabama Gap Analysis Project: Managing biological diversity with geographic information systems. Poster presented at the Integrated Regional Studies for Global Sustainability Conference, Auburn, Alabama, March 22.

———. Alabama Gap Analysis Project: Managing biodiversity with geographical information systems. Poster presented at the First Annual GIS Symposium at Troy State University, Dothan, Alabama, May 20–21.

#### Literature Cited:

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. *Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems*. Arlington, Va.: NatureServe.

## Alaska

Not started.

## Arizona

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD. Remapping under way (see Southwest Regional GAP, p. 75).

## Arkansas

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## California

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Colorado

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD. Remapping under way (see Southwest Regional GAP, p. 75).

## Connecticut

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Delaware

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Florida

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Georgia

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Hawaii

Project under way.

Anticipated completion date: November 2005

#### Contact:

Megan Laut  
Hawaii Natural Heritage Program  
Center for Conservation Research and Training  
University of Hawaii  
677 Ala Moana Blvd., Suite 705  
Honolulu, HI 96813  
mlaut@hawaii.edu, 808-587-8591

**Land cover:** Hawaii Gap Analysis Project (HI-GAP) land cover maps by island are in various stages of completion. The land cover map of the Big Island, which constitutes 50 percent of the area of the state of Hawaii, is complete (Figure 1). Drafts of Maui, Molokai, and Lanai are in semifinal stages of completion. Land cover maps of Oahu and Kaua'i are in the initial stages of development.

Over the past year, HI-GAP has developed methods of finalizing the land cover classification for each island, including manual recoding of selected areas, and the use of ancillary data to assist classification of associations characterized by the native leguminaceous tree koa (*Acacia koa*), a tree whose spectral signature is not distinguishable by the Landsat ETM sensors from its surroundings when in an open forest setting. In addition, HI-GAP is investigating the use of topographic normalization to improve classification accuracy of topographically complex areas on Oahu and Kaua'i.

HI-GAP performed a pilot accuracy assessment of an area on the Big Island to assess the cost and feasibility of collecting reference data via helicopter. Based on the results, HI-GAP has decided to explore additional methods of reference data collection for accuracy assessment.

**Animal modeling:** Most of the bird modeling is reliant on land cover completion, so we have almost completed Big Island bird modeling. Modeling for the other islands will be completed as land cover drafts become available. We used Pyle (2002) to identify all birds known to occur in Hawaii and categorized them according to residency status (i.e., resident native, alien introduced, or visitor species). From a total of 313 species and subspecies, we identified 49 resident native birds that represent all major taxon groups for distribution modeling (i.e., 19 seabirds, 7 waterbirds, 21 forest birds, and 2 raptors). We excluded visitor species, as they do not breed in Hawaii and no predictable pattern of distribution could be modeled. We used literature to develop a database of environment response variables (e.g., habitat type and elevation) that the species is expected to occupy. We extracted habitat associations described in the Birds of North America species accounts (see specific accounts for citations). We referenced additional sources therein and recent literature to refine general associations. These habitat associations were cross-walked to HI-GAP land cover types to generate island-specific binary matrices for element modeling.

Previous studies have shown that vegetation variables (e.g., dominance and structure) can be used to reliably predict the distribution of bird species (for example, see Seoane et al. 2004 and references therein). We therefore generated a species-specific binary matrix (element model) of associated land cover types and queried these land cover types in a GIS to produce preliminary species distribution maps. Preliminary distributions for seabird, waterbird, and raptor derived from literature-based element models did not require further model parameterization. However, preliminary forest bird element models, where elements were derived solely from the literature, typically overestimated species distributions. We further parameterized the element models to reflect island and regional differences in bird distributions. Environment variables were derived from survey data conducted between 1985 and 2005.

Species distribution modeling has been initiated for native and nonnative freshwater aquatic species of vertebrates and selected macroinvertebrates.

**Land stewardship mapping:** Stewardship has been completed, using standard GAP classification and a set of Hawaii-specific classifications (Figure 2). For multiple reasons, it was necessary for HI-GAP to develop a set of stewardship values we named Management Intent, which are independent of national GAP stewardship values. First, there are no designated Forest Service or Bureau of Land Management (BLM) lands in Hawaii; second, a number of key properties have no permanent designation for protection; and finally, management activities are focused on restoration, not disturbance, to regulate natural conditions. We used a dichotomous key similar to that developed by national GAP, but with the permanence of protection removed to assign Hawaii Management Intent.

GIS data will be made available on the ARC IMS web site of the Pacific Basin Information Node (PBIN) of the National Biological Information Infrastructure (NBII).

**Analysis:** Analysis is currently scheduled for fiscal year 2005. The gap analysis for our project is anticipated to employ standard gap analysis methods for project completion.

**Reporting and data distribution:** Data are available for both aquatic species survey information mapping and stewardship mapping, and land cover for the Big Island. Contact the Hawaii Natural Heritage Program or the national GAP office for details.

**Other accomplishments and innovations:** HI-GAP is collaborating closely with Hawaii's Comprehensive Wildlife Conservation Strategy. The products from both programs have much in common and they will both benefit from working together.

**Literature Cited:**

Pyle, R. L. 2002. Checklist of the birds of Hawaii—2002. *Elepaio* 62:137–48.

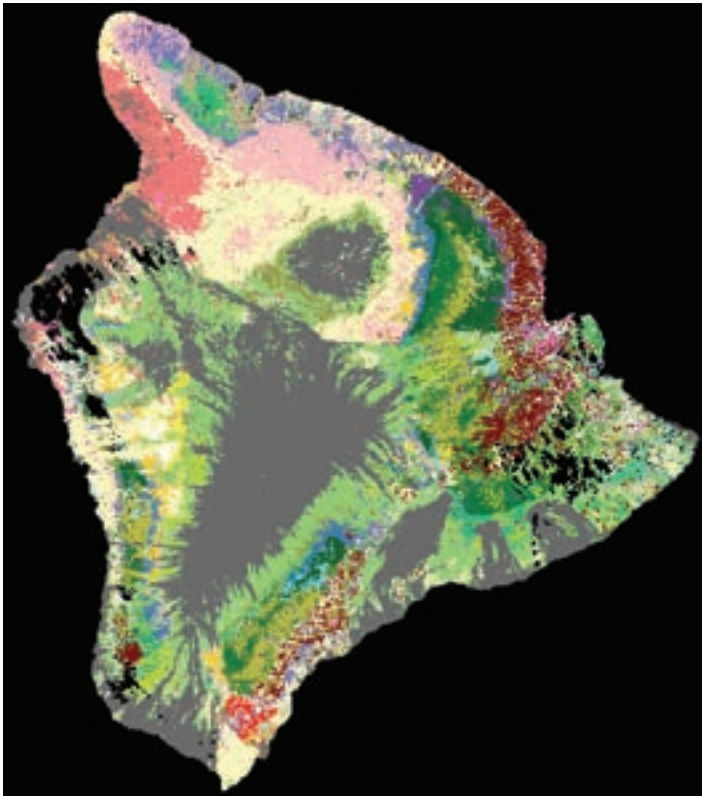


Figure 1. Land cover map for Hawaii Island.

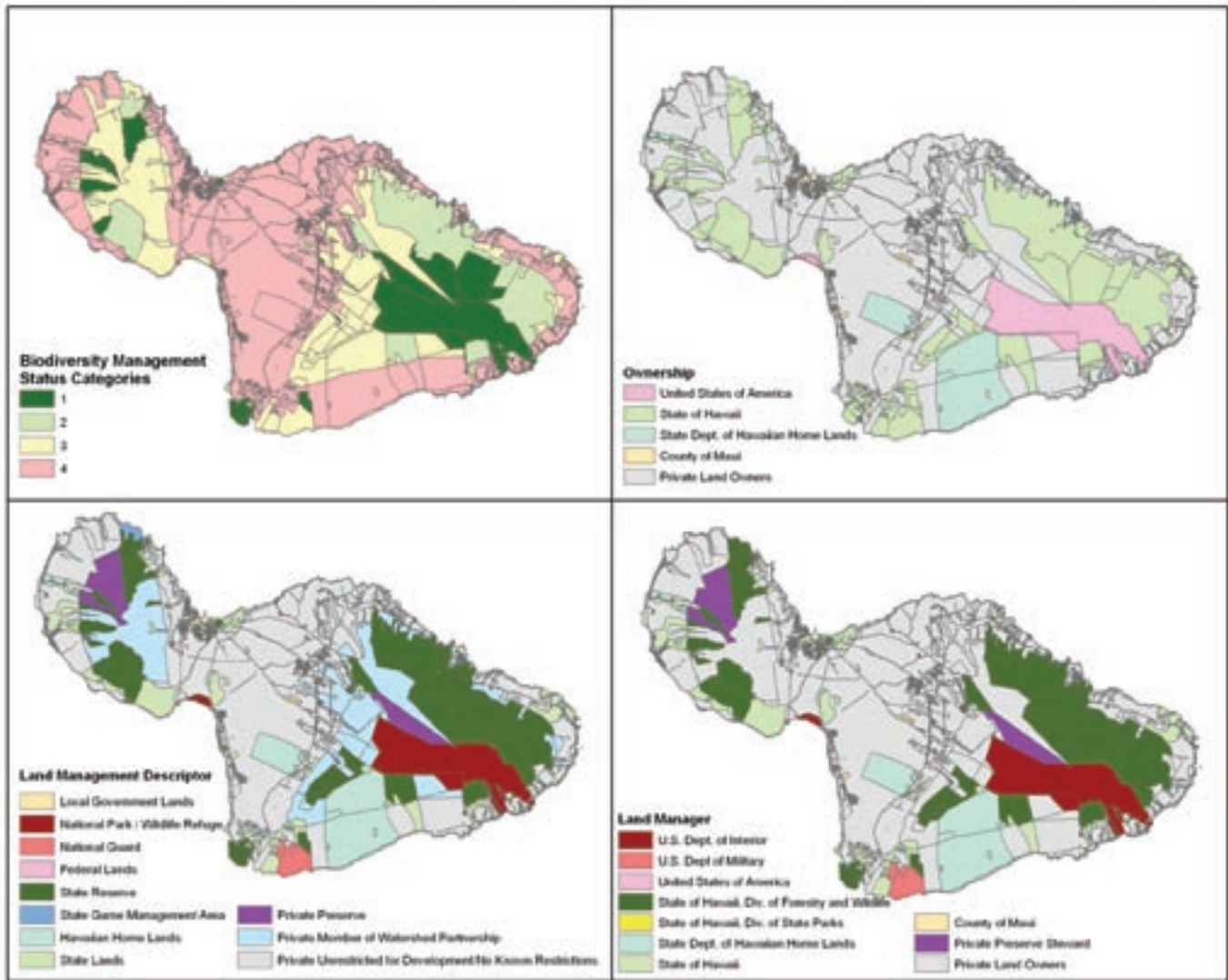


Figure 2. Stewardship maps for Kaua'i Island.

Seoane, J., J. Bustamante, and R. Diaz-Delgado. 2004. Are existing vegetation maps adequate to predict bird distributions? *Ecological Modelling* 175:137-49.

**Land cover:** Complete.

**Animal modeling:** Complete.

**Land stewardship mapping:** Complete.

**Analysis:** Complete.

## Idaho

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Illinois

Draft data available from state <<http://www.inhs.uiuc.edu/cwe/gap/>>. Review under way.

### Contact:

Tari Tweddle  
 GAP Coordinator  
 Illinois Natural History Survey, Champaign  
 tweicher@uiuc.edu, 217-265-0583

Reporting and data distribution: Digital coverages containing all Illinois Gap Analysis Project (IL-GAP) data were submitted to the national GAP office in July 2004. Initial review of the IL-GAP data was completed by the national GAP office in January 2005. The IL-GAP team is now in the process of compiling the final report and completing the necessary revisions to the data deliverables. GIS and data revisions will be submitted for peer review by June 2005. The final report will be submitted no later than December 2005.

## Indiana

Near completion.

Anticipated completion date: September 2005

**Contact:**

Forest Clark

U.S. Fish and Wildlife Service, Bloomington

forest\_clark@fws.gov, 812-334-4261 x206

**Land cover:** The Indiana Land Cover data are complete. We are incorporating these data into our gap analysis of Indiana. The data have also been used by various Indiana GAP partners for diverse projects and provided to numerous organizations upon request.

**Animal modeling:** The Indiana project completed the modeling of 300 vertebrate species. Pangaea Information Technologies, Ltd., was contracted to run the final models in the autumn of 2002. We are incorporating the models into our gap analysis of Indiana.

**Land stewardship mapping:** The Land Stewardship map of Indiana, developed primarily under the aegis of the Indiana Department of Natural Resources, Division of Fish and Wildlife is complete. We are incorporating these data into our gap analysis of Indiana.

**Analysis:** A preliminary gap analysis of Indiana has been run. The initial results have been forwarded to the national GAP office for review. We will work to address the required revisions updated in February 2005 by the national GAP office.

**Reporting and data distribution:** We are continuing the analysis phase of the project and have begun to write the final report. We propose to continue that process through the spring/summer of 2005 and, in cooperation with the national GAP office, to make products available in the fall of 2005.

**Other accomplishments and innovations:** The Indiana Biodiversity Initiative (IBI), which uses Indiana Gap Analysis products extensively to identify landscape-level conservation sites, received a generous grant from the Efroymson Fund of the Central Indiana Community Foundation. The IBI finalized regional assessments, produced the Conservation Tool CD-ROM, and ran workshops distributing the Conservation Tool CD-ROM to county planners, land trusts, state and federal agencies, and private consulting firms in five of the seven modified natural regions of the state.

## Iowa

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Kansas

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Kentucky

Draft data available from state contact. Review under way.

## Louisiana

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Maine

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Maryland

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Massachusetts

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Michigan

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Minnesota

Project under way.

Anticipated completion date: December 2005

**Contact:**

Gary Drotts

Minnesota Department of Natural Resources, Brainerd

gary.drotts@dnr.state.mn.us, 218-828-2314

**Land cover:** Land cover mapping followed the Upper Midwest GAP protocol <<ftp://ftp.umesc.usgs.gov/pub/misc/umgap/98-g001.pdf>>. The state Department of Natural Resources (DNR) completed classification of the entire state and, with the assistance of NatureServe, cross-walked the classification to the National Vegetation Classification System (NVCS).

**Animal modeling:** Hexagon species range maps have been developed for Minnesota and delivered to the U.S. Geological Survey (USGS) Upper Midwest Environmental Sciences Center (UMESC). The animal modeling coordinator for the Minnesota DNR is Jodie Provost (Jodie.provost@dnr.state.mn.us). Vertebrate distribution mapping will be completed in 2005.

**Land stewardship mapping:** Stewardship mapping is completed.

**Analysis:** Gap analysis will be completed in 2005.

**Reporting and data distribution:** Draft stewardship coverage is available from UMESC. Contact Kirk Lohman at 608-783-7550 x58 or klohman@usgs.gov.

## Mississippi

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Missouri

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Montana

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Nebraska

Draft data available from state contact <<http://www.calmit.unl.edu/gap/>>.

Anticipated completion date: June 30, 2005

### Contacts:

Geoffrey M. Henebry, Coordinator  
CALMIT, University of Nebraska-Lincoln  
ghenebry@calmit.unl.edu, 402-472-6158

James W. Merchant, PI  
CALMIT, University of Nebraska-Lincoln  
jmerchant1@unl.edu, 402-472-7531

**Land cover:** The land cover map has been completed.

**Animal modeling:** Animal models have been completed.

**Land stewardship mapping:** Land stewardship mapping has been completed.

**Analysis:** Gap analyses have been completed.

**Reporting and data distribution:** Draft report, species atlases, GIS coverages, and metadata under review by state experts before delivery.

## Nevada

Data on GAP web site (<http://gapanalysis.nbii.gov>) or CD.  
Remapping under way (see Southwest Regional GAP).

## New Hampshire

(See Vermont and New Hampshire.)

## New Jersey

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## New Mexico

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.  
Remapping under way (see Southwest Regional GAP, p. 75).

## New York

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## North Carolina

Draft data available from state contact. Review under way.

Anticipated completion date: August 2005

### Contact:

Alexa McKerrow  
North Carolina State University, Raleigh  
mckerrow@unity.ncsu.edu, 919-513-2853

**Land cover:** Complete.

**Animal modeling:** Complete.

**Land stewardship mapping:** Complete.

**Analysis:** Complete.

**Reporting and data distribution:** The land cover, stewardship, and analysis chapters are complete and in review. The vertebrate modeling chapters are in preparation.

## North Dakota

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Ohio

Project under way.

Anticipated completion date: September 2006

### Contacts:

Land cover, Dr. J. Raul Ramirez  
The Ohio State University Center for Mapping, Columbus

raul@cfm.ohio-state.edu, 614-292-6557

Animal modeling, Troy Wilson  
U.S. Fish and Wildlife Service, Reynoldsburg  
614-469-6923

**Land cover:** The land cover map for Ohio was completed on June 30, 2004, and went through a peer review process. We incorporated the changes that resulted from the peer review process and plan to perform a quality assessment to finish the land cover map by June 2005.

**Animal modeling:** In 2004, we began to develop wildlife habitat models. Currently, approximately 30 percent of the species are complete. We plan to complete model development in 2005, followed by expert review, and begin draft predicted distributions upon completion of the final draft of the land cover map. In addition, the Ohio Department of Natural Resources Division of Wildlife is currently funding a study through Ohio State University that involves a statewide assessment of mammalian diversity in Ohio. We plan to incorporate these efforts to update current hexagon range information in the coming year. Draft predicted species distribution mapping began in June 2005. We anticipate completing all species distributions, along with their review, by December 2005.

**Land stewardship mapping:** The Land Stewardship map was completed and revised in 2004.

**Reporting and data distribution:** The Ohio terrestrial gap analysis and final report will be completed by June 2006.

## Oklahoma

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Oregon

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Pennsylvania

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Puerto Rico

Project underway.

Anticipated completion date: December 2005

**Contact:**

William Gould, PI

Geographic Information Systems and Remote Sensing Laboratory  
USDA Forest Service-International Institute of Tropical Forestry,  
San Juan  
wgould@fs.fed.us, 787-766-5335 x302

**Land cover:** Our land cover layer includes spectral information from eighteen Landsat-7 ETM+ scenes (2000–2003) corrected for atmospheric distortion and cloud and cloud-shadows, and pan-sharpened to a 15-meter resolution. Pixel classification is being performed using ERDAS Imagine 8.7 and incorporates image stratification and unsupervised classification, site visits, and visual interpretation of aerial photography and Ikonos imagery. Final pixel classification will be completed in spring 2005 and will result in a set of 35–40 land cover units. Plant community descriptions are in development and are being organized into a hierarchical legend structure along gradients of climate, substrate, topographic position, and stand age as governed by disturbance and land-use history. These gradients are the key controls on plant community composition and structure in Puerto Rico. Initial pixel classification includes the delineation of urban areas based on spectral response values and visual interpretation and is followed by further classification through an analysis of patterns of development (urban pixels) and population density. From this analysis, we have developed a set of three land-use categories: urban, densely populated rural, and sparsely populated rural (Figure 1).

The developed land cover in Puerto Rico is significant and covers approximately 11 percent of the land surface. We have classified approximately 16 percent of the island as urban, with a high proportion of developed relative to vegetated pixels. The urban use category contains developed areas (Figure 2), urban forest, wetlands, and open space and these are important for both our animal modeling and for understanding the dynamics of land cover change and threats to the sustainability of biodiversity. A second important set of land cover classes are the wetlands and mangroves. We are conducting an analysis of the current and historical aerial extent of mangrove forests and other wetlands relative to the area of coastal plain in Puerto Rico. We will incorporate our land cover map with ancillary GIS layers on surface waterbodies and streams, geology, physiography, landforms, elevation, rainfall, and road networks in order to develop predicted habitat models.

**Animal modeling:** Our Access relational vertebrate database (PRGAP-VERT) contains an expert-reviewed list consisting of 436 vertebrate species known to occur across Puerto Rico or its offshore islands. From this total, we have identified a subset of 176 vertebrate species to initially include in the terrestrial component of the gap analysis of Puerto Rico. This subset of species includes those considered endemic, resident, or breeding migratory, or of special concern due to their establishment through human introductions or range expansion.

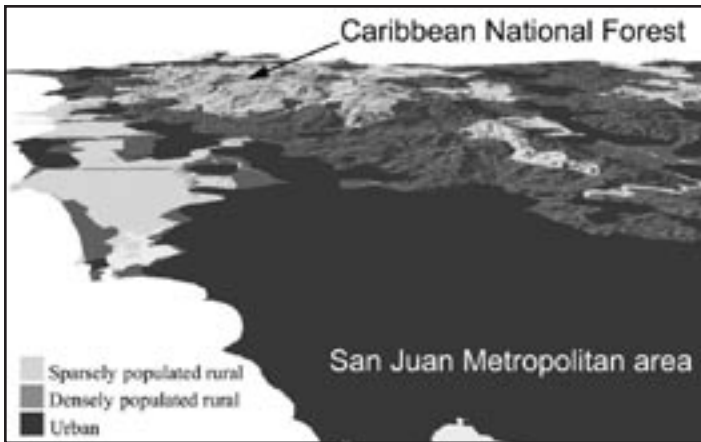


Figure 1. Using a combination of remote sensing and census data, we have developed three land use classes for Puerto Rico: urban, densely populated rural, and sparsely populated rural. In this oblique view of northeastern Puerto Rico looking eastward over the San Juan metropolitan area towards “El Yunque,” the Caribbean National Forest, urban areas in dark gray are more than 20 percent developed within a 1 km<sup>2</sup> area, densely populated rural areas are less than 20 percent developed but with population densities higher than 200 people per km<sup>2</sup>, and sparsely populated areas are less than 20 percent developed and less than 200 people per km<sup>2</sup>.

All 436 species can be related to the Puerto Rico Gap Analysis Project’s (PR-GAP) Vertebrate Occurrence Records (VOR) data set through either of three unique identifiers: NatureServe’s element code, the taxonomic serial number (TSN) of the Information Taxonomic Information System (ITIS), or the element code as maintained by the Puerto Rico Conservation Data Center (PRCDC). PR-GAP’s VOR data set grew from 873 element occurrence records provided by the PRCDC to over 30,000 occurrence records as a result of integrating occurrence information from sources including the USGS Breeding Bird Survey (BBS), Audobon’s Christmas Bird Count (CBC), the Institute of Tropical Ecosystem Studies (ITES), and cooperative efforts by other local agencies, organizations, and individuals. This VOR data set represents a significant resource for biodiversity research and conservation in the Caribbean.

Additionally, we are developing PRGAP-VERT with the understanding that certain aquatic and marine species are important elements of terrestrial landscape biodiversity due to their dependence on land cover types associated with a coastal-marine transition zone. The necessity of incorporating logic and methodology in our habitat modeling of terrestrial landscapes to include Puerto Rico’s proportionately significant coastal-marine habitats identifies the potential importance of conducting a combined aquatic and marine gap analysis for Puerto Rico after the completion of the terrestrial component.

We continue our collaboration with local projects to augment our VOR data set to better support island-wide species range

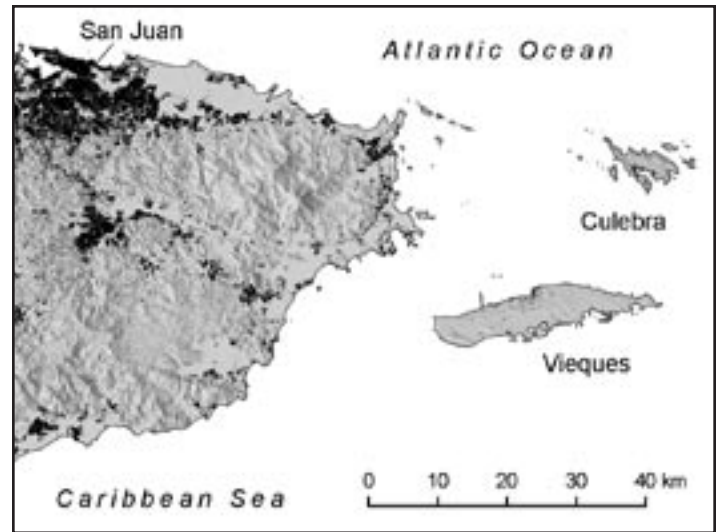


Figure 2. Black areas on map represent urban land cover in eastern Puerto Rico.

mapping efforts. Species range distributions are based on a minimum mapping unit of 24 km<sup>2</sup> represented by a hexagonal grid established by the U.S. Forest Service’s Forest Inventory and Analysis program (FIA) and modified by PR-GAP (Figure 3).

We continue to generate Access vertebrate species account reports, which, as they are completed, are submitted to experts as part of the expert review process. Each report includes the species taxonomy, conservation status, and life-history description, a concise description of the wildlife habitat relationship model (WHRM), and a range map depicting the species range distribution.

**Land stewardship mapping:** The Puerto Rico land stewardship layer began with the acquisition of two GIS layers representing management boundaries for most federal and commonwealth protected areas in Puerto Rico. These layers are managed by the Puerto Rico Planning Board and the executive branch of Puerto Rico’s governing administration. Using these layers as a starting point, we established an itinerary to conduct site visits with all federal and commonwealth management units to acquire additional or updated boundary information and associate management policy documents. This effort has resulted in the development of Puerto Rico’s first comprehensive land stewardship database (PRGAP-LAND) managed in an Access relational database environment. A land stewardship map (Figure 4) is one of the many products being derived from this effort.

Through this process, we are incorporating necessary quality assurance/quality control measures in response to source data set inconsistencies requiring documentation or modification, such as edge-matching with existing political and current coastline boundaries. In addition, vital land-unit management policy (and activity) is either lacking documentation and/or lacks delineation

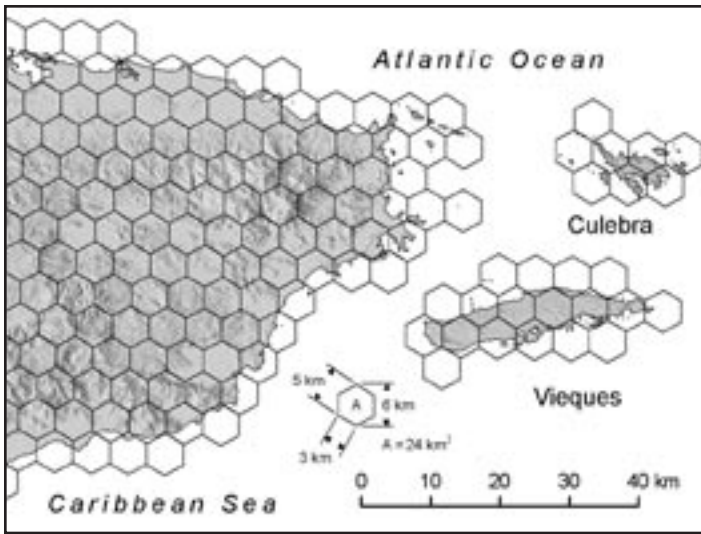


Figure 3. PR-GAP-HEX for eastern Puerto Rico.

of its management-unit boundaries, resulting in the need to create internal boundaries within a particular protected area to accurately reflect current management. Nearly completed, PRGAP-LAND contains text description and coding on land ownership and management classification, GAP management status classification and description, and protected area resources and conservation threats, as well as an annotated bibliography of related studies and publications.

Preliminary assessment of the existing protected areas identifies a total of 725 km<sup>2</sup> (8 percent) of Puerto Rico's 8,959 km<sup>2</sup> area with some level of protected status. Of this total, 60 percent is managed by the commonwealth, 28 percent by U.S. federal agencies, and 12 percent by local private organizations. To be consistent with other state-level projects, we are classifying land-unit management status according to methodology presented in the Gap Analysis Program Handbook. However, our research into the management policy of Puerto Rico's protected areas has identified a need to develop a management status classification scheme unique to Puerto Rico's commonwealth status, one we feel more realistically qualifies each protected area's management in regard to its conservation policy on the protection of biological diversity.

During site visits to protected areas, we interview each land manager directly to better assess the area's management strategies (often undocumented, or if documented, not implemented). To date, 31 of 58 site visits (53 percent) have been conducted, with an expected completion date of May 2005. By managing all this information in an Access relational database, we are able to establish entity relationships between geospatial information contained in our PRGAP-GEOD (PRGAP geodatabase) and tabular data consisting of management policies and activities, biodiversity threats, and



Figure 4. Dark grey areas show protected areas of eastern Puerto Rico.

protected area resources found at each site. As part of this effort, we are generating management area reports, maps, and posters from our information so we can provide these as a service to local area management units and for use as an educational outreach tool.

**Analysis:** Gap analyses will begin in the fall of 2005 following expert review of our final land cover map, vertebrate distribution models, and land stewardship layer and management status classification.

**Reporting and data distribution:** Reporting has been ongoing in the form of presentations and posters, both at the national and the local levels. Efforts this year include the preparation of manuscripts and maps on urban cover, physiography, and landforms of Puerto Rico. In addition, we will soon publish a color brochure describing the project that will be available in both Spanish and English.

**Other accomplishments and innovations:** Accomplishments by PR-GAP include the ongoing development of the PRGAP-VERT and PRGAP-LAND Access relational databases, which, when completed, will be merged into a centralized database model (Figure 5) to serve as an interface tool for exploration of PR-GAP geospatial data; report-based information on species and protected areas; and other maps and documents.

The opportunity to provide comprehensive descriptive information and maps on current land cover and land-use descriptions, species distributions and habitat associations, protected and other areas critical to biological diversity, and land management strategies and conservation threats is unprecedented for Puerto Rico. There are a number of pressing conservation issues in Puerto Rico, as well as the Caribbean, that will

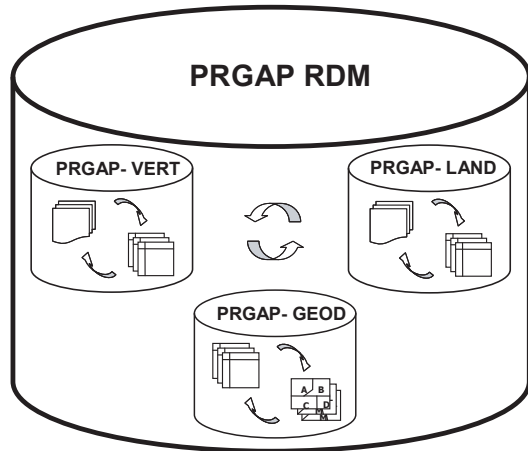


Figure 5. PR-GAP tabular and geospatial relational database model (RDM).

benefit from this gap analysis. These data are providing a good foundation on which to build long-term and comprehensive biodiversity databases for the Caribbean region.

## Rhode Island

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## South Carolina

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## South Dakota

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Tennessee

Draft data available from state. Review under way.

Anticipated completion date: October 2005

**Contact:**

Jeanette Jones  
Tennessee Wildlife Resources Agency, Nashville  
Jeanette.Jones@state.tn.us, 615-781-6534

## Texas

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Utah

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.  
Remapping under way (see Southwest Regional GAP, p. 75).

## Vermont and New Hampshire

Draft data available from state contact. Review under way.

**Contact:**

David E. Capen  
University of Vermont, Burlington  
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## Virginia

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Washington

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## West Virginia

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.

## Wisconsin

Project under way.

Anticipated completion date: September 2005

**Contact:**

Kirk Lohman  
U.S. Geological Survey  
Upper Midwest Environmental Sciences Center, La Crosse  
klohman@usgs.gov, 608-781-6341

**Land cover:** Land cover mapping is completed, and a draft version is available from the USGS Upper Midwest Environmental Sciences Center (UMESC).

**Land stewardship mapping:** The Wisconsin DNR compiled data for state, county, and U.S. Forest Service lands. UMESC acquired coverages of U.S. Department of the Interior lands and compiled the complete stewardship coverage.

**Reporting and data distribution:** Land cover and stewardship coverages are available from UMESC. Contact Kirk Lohman at 608-781-6341 or klohman@usgs.gov.

## Wyoming

Data on GAP web site <<http://gapanalysis.nbii.gov>> or CD.