

## **ARC LandPro Database**

### **Abstract**

LandPro03 is ARC's current landuse/landcover GIS database for the 13-county Atlanta Region (Cherokee, Clayton, Cobb, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Henry, Rockdale, and the EPA non-attainment counties (1hr standard) of Forsyth, Paulding, and Coweta). LandPro03 was created by on-screen photo-interpretation and digitizing of ortho-rectified aerial photography at a scale of 1:14,000. The primary source for this GIS database was 2003 true color imagery with 2.3-foot pixel resolution, provided by Aerials Express, Inc. Please note that this database is an update of LandPro01 which was an update of LandPro99.

### **Purpose**

This GIS database is a generalized landcover database designed for Regional Planning. Although it has a landuse component which is used for forecasts and modeling at ARC, outside users should be aware that the landcover and landuse delineations are based on photo-interpretation of a 5-acre and 25-acre minimum mapping unit respectively, not parcels. Likewise, LandPro03 should not be taken out of its Regional context, though county-level or municipal-level analysis may be useful for transportation, environmental and landuse planning.

### **Background**

Though the terms are often used interchangeably, landuse and landcover are not synonymous. Landcover generally refers to the natural or cultivated vegetation, rock, or water covering the land, as well as the developed surface which can be identified on aerial photography. Landuse generally refers to the way that humans use or will use the land, regardless of its apparent landcover. Collateral data for the landcover mapping effort included the Aero Surveys of Georgia street atlas, the Georgia Department of Community Affairs (DCA) Community Facilities database and the USGS Digital Raster Graphics (DRGs) of 1:24,000 scale topographic maps. The landuse component of this database was added after the landcover interpretation was completed, and is based primarily on ownership information provided by the 13 counties and the City of Atlanta for larger tracts of undeveloped land that meet the landuse definition of "Extensive Institutional" or "Park Lands" (refer to the Code Descriptions and Discussion section below). Although some of the boundaries of these tracts may align with visible features from the aerial photography, these areas are generally "non-photo-identifiable," thus require other sources for accurate identification.

The minimum mapping unit standard for this database is generally 5 acres, with varying exceptions based on category and context. Some smaller Intensive Institutional (mostly elementary schools), Commercial, Cemeteries, and Reservoirs (impoundments) have been intentionally delineated in some cases throughout the Region. Within the downtown and midtown areas, many small polygons of multi-family residential have been identified and added with this 2003 update through research of mostly web-based resources. Within single-family neighborhoods, differentiation of adjacent residential areas (111-low density, 112-medium density, and 113-high density) is generally 25 acres, and within agricultural areas, delineation of some forested areas (Code 40) is

occasionally larger. 25 acres is also the minimum mapping consideration for the landuse categories of Extensive Institutional (Code 125) and Park Lands (Code 175).

The landuse/cover classification system is adapted from the USGS (Anderson) classification system, incorporating a mix of level I, II and III classes. There are a total of 28 categories in ARC's landuse/cover system (described below), 2 of which are used only for landuse designations: Park Lands (Code 175) and Extensive Institutional (Code 125). The other 26 categories can describe landuse and/or landcover, and in most cases will be the same. The LU code will differ from the LC code only where the Park Lands (Code 175) and Extensive Institutional (Code 125) land holdings have been identified from collateral sources of land ownership.

Although similar to previous eras of ARC landuse/cover databases developed before 1999 (1995, 1990 etc.), "LandPro" differs in many significant ways. Originally, ARC's landuse and landcover database was built from 1975 data compiled by USGS at scales of 1:100,000 and selectively, 1:24,000. The coverage was updated in 1990 using SPOT satellite imagery and low-altitude aerial photography and again in 1995 using 1:24,000 scale panchromatic aerial photography. Unlike these previous 5-year updates, the 1999, 2001 and now 2003 LandPro databases were compiled at a larger scale (1:14,000) and do not directly reflect pre-1999 delineations. In addition, all components of LandPro were produced using digital orthophotos for on-screen photo-interpretation and digitizing, thus eliminating the use of unrectified photography and the need for data transfer and board digitizing. As a result, the positional accuracy of LandPro is much higher than in previous eras.

There have also been some changes to the classification system prior to 1999. Previously, three categories of Forest (41-deciduous, 42-coniferous, and 43-mixed forest) were used; this version does not distinguish between coniferous and deciduous forest, thus Code 40 is used to simply designate Forest. Likewise, two categories of Wetlands (61-forested wetland, and 62-non-forested wetland) were used before; this version does not distinguish between forested and non-forested wetlands, thus Code 60 is used to simply designate Wetlands. With regard to Wetlands, the boundaries themselves are now based on the National Wetlands Inventory (NWI) delineations along with the CIR imagery. Furthermore, Code 51 has been renamed "Rivers" from "Streams and Canals" and represents the Chattahoochee River which has been identified in the landuse/cover database. In addition to these changes, Code 52 has been dropped from the system as there are no known instances of naturally occurring lakes in the Region. Finally, the landuse code for Park Lands has been changed from 173 to 175 so as to minimize confusion with the Parks landcover code, 173.

Due to new technology and the enhancements to this database, direct comparison between LandPro99, LandPro01 and LandPro03 is now possible, with the 1999 database serving as ARC's new baseline. Please note that as a result of the 2003 mapping effort, LandPro01 has been adjusted for better comparison to LandPro03 and is named "LandPro01\_adjusted." Likewise, LandPro99 was previously adjusted when LandPro01 was completed, but was not further adjusted following the 2003 update. Although some adjustments were originally made to the 1995 landuse/cover database for modeling applications, direct comparisons to previous versions of ARC landuse/cover before 1999 should be avoided in most cases.

## **Classification System**

**111: Low Density Single Family Residential** - Areas that have generally been developed for single family residential use, usually with a significant mix of forested or agricultural landcover. These areas often occur on the periphery of urban expansion and are generally characterized by houses on 2 to 5 acre lots. Some examples of this category include rural housing, estates, and linear residential developments along transportation routes.

**112: Medium Density Single Family Residential** - Areas that have predominantly been developed for single family residential use, with or without a significant mix of forested or agricultural landcover. These areas usually occur in urban or suburban zones and are generally characterized by houses on 1/4 to 2 acre lots. This category accounts for the majority of residential landuse in the Region and includes a wide variety of neighborhood types.

**113: High Density Residential** - Areas that have predominantly been developed for concentrated single family residential use. These areas occur almost exclusively in urban neighborhoods with streets on a grid network, and are characterized by houses on lots smaller than 1/4 acre, but may also include mixed residential areas with duplexes and small apartment buildings.

**117: Multifamily Residential** - Residential areas comprised predominantly of apartment, condominium and townhouse complexes where net density generally exceeds eight units per acre. Typical apartment buildings are relatively easy to identify, but some high rise structures may be interpreted as, or combined with, office buildings, though many of these dwellings were identified and delineated in downtown and midtown for the first time with the 2003 update. Likewise, some smaller apartments and townhouses may be interpreted as, or combined with, medium- or high-density single family residential. Housing on military bases, campuses, resorts, agricultural properties and construction work sites is not included in this or other residential categories.

**119: Mobile Home Parks** - Areas that have been developed for single family mobile home use. These residential areas may occur in urban, suburban, or rural zones throughout the Region, with or without a significant mix of forested landcover. Due to their sparse distribution, individual mobile homes are generally mapped with the Forest landcover (Code 40) and Low- or Medium-Density Residential (Codes 111 and 112, respectively).

**12: Commercial and Services** - Areas used predominantly for the sale of products and services, including urban central business districts, shopping centers in suburban and outlying areas, commercial strip developments, junk yards and resorts. The main buildings, secondary structures and areas supporting the basic use are all included: office buildings, warehouses, driveways, sheds, parking lots, landscaped areas, waste disposal areas, etc. Commercial areas may include some non-commercial uses too small to be separated out. Central business districts commonly include some institutions such as churches and schools, and commercial strip developments may include some residential units.

**121: Intensive Institutional** - The built-up portions of institutional land holdings, including all buildings, grounds and parking lots that compose educational, religious, health, correctional and military facilities. Institutions occupying small areas (for example, many churches and some elementary and secondary schools) may be included in other categories, principally residential or commercial.

**125: Extensive Institutional** - Public or private land holdings devoted to educational, religious, health, correctional, or military landuse. This category is one of only two that is used exclusively for landuse classifications, the other being Park Lands (Code 175). As the Metropolitan Planning Organization (MPO) for Atlanta, ARC is required to produce long range population and employment forecasts which are used in transportation modeling. The landuse categories of Extensive Institutional and Park Lands are important to ARC's long range forecasts since large tracts of land controlled by governments and institutions are more likely to be withheld from residential, commercial, or industrial development. Unlike Intensive Institutional (Code 121) which is visible on, and delineated from, the digital aerial photography, Extensive Institutional can only be identified and mapped from collateral data sources. The primary source of this information comes from the GIS Coordinators for each of the 13 counties and the City of Atlanta who reviewed the previous designations and provided updated information and additional GIS or CAD data. Various secondary sources include hardcopy, digital and internet maps and files. Please note, the built-up landcover portion of these various tracts of land are generally identified as Intensive Institutional (Code 121). The Extensive Institutional landuse areas identify the full extent of these tracts which are both built-up and non-built-up, and whose undeveloped area is at least 25 acres in size.

**13: Industrial** - Land associated with light or heavy manufacturing. Light industries, those focused on design, assembly, finishing, processing and packaging of products, can be difficult to identify using aerial photography. Heavy industries, those focused on the use of raw materials, such as timber and steel, are relatively uncommon in the Atlanta Region, but the category may include lumber mills and tank farms, as well as chemical, cement and brick-making plants. For this mapping effort, industrial landcover is more commonly captured with the Industrial and Commercial Complexes category (Code 15) which is described below.

**14: Transportation, Communication and Utilities** - Also referred to as "TCU," this category encompasses various landuse types associated with transportation, communication, and utilities. Much of the automotive transportation is accounted for in other categories, particularly highways and their right-of-ways, which are either absorbed into the context of a more dominant landcover (e.g. residential or commercial), or are covered completely within the Limited Access Highways category (Code 145) described below. Other types of transportation include service and terminal facilities, railways (including MARTA) and their stations, parking lots, roundhouses, repair and switching yards, as well as overland track and spur connections. Airport facilities may include runways, terminals, service buildings, navigation aids, fuel storage, parking lots, and intervening land. Similar to streets and highways, communication and utility networks generally fall below the minimum mapping standards, thus are not separated out of the context of the larger landuse with which they are associated. When practical, areas involved in the processing, treatment and transportation of water, gas, oil, and electricity, such as pumping stations and electric substations have been delineated. Likewise, areas used for airwave communications, such as radio, radar, or television may be mapped in this category.

**145: Limited Access Highways** - This category identifies all highways, or portions of highways that are considered "limited access," their approximate right-of-ways, ramps and interchanges. In addition to the 8 interstate highways in the Region (I-20, I-75, I-85, I-285, I-575, I-595, I-675, and I-985), this category includes the entire extents of the Stone Mountain Freeway, Ronald Reagan Parkway, Freedom Parkway, Arthur Langford Parkway, the Canton Road Connector, and Spur 14 connecting the South Fulton Parkway to I-285. Likewise, portions of the Camp Creek Parkway, Appalachian Highway, Peachtree Industrial Boulevard, and Georgia Highway 316 are also included. Finally, cartographic license was taken with Georgia Highway 400 to extend this designation northward through Forsyth County, slightly beyond where interchanges stop and intersections begin, thus ceasing to actually be limited access highway.

**15: Industrial and Commercial Complexes** - Industrial and commercial areas that typically occur together or in close functional proximity with one another. For this mapping effort, based primarily on the interpretation of aerial photography, industrial areas are more commonly grouped in this category than in the Industrial (Code 13) category. In as much as various functions, such as warehousing, wholesaling and occasionally retailing may be found in the same structures or adjacent structures, this more inclusive category has been used to combine commercial with industrial. Industrial parks are almost always classified in this category.

**17: Other Urban** - Open land in intensive or indeterminate urban uses that do not require or do not have structures. Examples include water control structures and spillways, waste dumps, landfills, golf driving ranges and other recreation areas not identified as parks. This category excludes golf courses, cemeteries and active parks, which are contained in separate categories.

**171: Golf Courses** - The "green space" areas of golf courses, including tees, fairways, greens and intervening land. Forest areas and ponds are often included, but may also be identified separately (Code 40 and 53, respectively) depending on their size. Likewise, other built-up facilities, such as parking lots, clubhouses, pools, courts, etc. may be classified as commercial/services (Code 12).

**172: Cemeteries** - Public and private lands devoted to burial grounds, including primary and secondary buildings and associated infrastructure. Because of their unique photo "signature," many small cemeteries can be identified from the digital imagery at a scale of 1:14,000; many others, however, may be combined with residential, commercial, forest, or agriculture landcover. Forest areas and ponds are often included in this category, but may also be identified separately (Code 40 and 53, respectively) depending on their size.

**173: Parks** - Active recreation areas identified from aerial photography, including baseball and other sports fields, tennis courts, swimming pools, camp grounds, parking lots, structures, drives, and trails. Forest areas and ponds are often included, but may also be identified separately (Code 40 and 53, respectively) depending on their size.

**175: Park Lands** - Local, state, or federal land holdings devoted to preservation, conservation or recreation, as identified from secondary sources. This category is one of only two that is used exclusively for landuse classifications, the other being Extensive Institutional (Code 125). As the Metropolitan Planning Organization (MPO) for Atlanta,

ARC is required to produce long range population and employment forecasts which are used in transportation modeling. The landuse categories of Park Lands and Extensive Institutional are important to ARC's long range forecasts since large tracts of land controlled by governments and institutions are more likely to be withheld from residential, commercial, or industrial development. Unlike Parks (Code 173) which are visible on, and delineated from, the digital aerial photography, Park Lands can only be identified and mapped from collateral data sources. The primary source of this information comes from the GIS Coordinators for each of the 13 counties and the City of Atlanta who reviewed the previous designations and provided updated information and additional GIS or CAD data. Various secondary sources include hardcopy, digital and internet maps and files. Please note, the built-up landcover portion of these various tracts of land are generally identified as Parks (Code 173). The Park Land landuse areas identify the full extent of these tracts which are both built-up and non-built-up, and whose undeveloped area is at least 25 acres in size.

**21: Agriculture-Cropland and Pasture** - Agricultural land regularly used to grow field crops or to pasture animals. Although the 5 acre minimum mapping standard generally applies in identifying these areas and distinguishing them from Forest (Code 40) and Residential-Low Density (Code 111) landcover, for cartographic reasons it was not used in separating out forest in many larger agricultural delineations. Instead, these vast areas of mixed landcover were generalized with a minimum mapping unit of 25 acres.

**22: Agriculture-Orchards, Vineyards and Nurseries** - Agricultural land used to produce fruit, nuts or living plants for sale or for propagation.

**23: Agriculture-Confined Feeding Operations** - Agricultural land used for specialized livestock production enterprises where large animal populations are restricted to small areas. Such land uses include cattle feed lots, dairy operations with little or no pasture, large poultry farms and hog feed lots. Shipping corrals and other temporary holding facilities are generally excluded, as are horse farms and equestrian facilities which have lower animal population densities.

**24: Agriculture-Other** - Agricultural land used for livestock holding, breeding and training areas, including farmsteads and associated infrastructure, such as small farm lanes, roads, ditches, canals and ponds.

**40: Forest** - All forested areas of coniferous and/or deciduous trees. Although the 5 acre minimum mapping standard generally applies with the identification of these areas in an urban context, for cartographic reasons it is not used in a rural context to separate out forest within larger agricultural delineations. Instead, these vast areas of mixed landcover are generalized with a minimum mapping unit of 25 acres.

**51: Rivers** - The Chattahoochee River extending from Buford Dam in Gwinnett and Forsyth counties south to Heard County. Other "linear" water bodies, such as smaller rivers, streams, creeks, and canals fall below the mapping standards used for inclusion in this category.

**53: Reservoirs, Lakes, and Ponds** - Man-made impoundments, often referred to as "lakes" or "ponds," which are persistently covered with water. Please note, as there are no known naturally occurring lakes in the Region, the previous class called Lakes (Code 52) has been dropped from the classification system. For larger reservoirs, the water control structures themselves are often classified in Other Urban (Code 17).

**60: Wetlands** - Forested and/or herbaceous areas where the water table is at, near or above the land surface for a significant part of the growing season in most years. Please note, the expanse of wetlands has been greatly increased with this update over previous versions due to the availability of digital National Wetlands Inventory (NWI) data and color infrared (CIR) imagery. Wetland polygons were delineated at a scale of 1:6,000 using the CIR imagery after all other landcover delineations had been made at 1:14,000, mostly with the true color imagery. The NWI data was used as the primary "backcoverage" in ARC/Info for reference to wetland boundary and classification information. This information was concurrently compared to USGS digital raster graph (DRGs) topographic images which were viewed at the same scale in ArcView for reference to contours, hydrography, and other topographic information. ARC's landcover delineations represent the synthesis of these two older data sources against the 1999 CIR digital imagery using the minimum mapping standards established for the project.

**74: Bare Exposed Rock** - Naturally occurring areas of exposed bedrock with little or no vegetative cover.

**75: Quarries, Gravel Pits, and Strip Mines** - Land which is currently, or was in the past, used to extract rocks and minerals, and has had its vegetation cover removed and not replaced. Pits which have been flooded with water are often included in this category, but may also be identified separately as artificial impoundments (Code 53) depending on their size.

**76: Transitional Areas** - Recently cleared or altered land in transition from one landuse activity, either built-up or non-built-up, to another unknown or undeterminable landuse.