FLORIDA
LAND USE, COVER AND FORMS CLASSIFICATION SYSTEM

HANDBOOK
JANUARY 1999
DEPARTMENT OF TRANSPORTATION
SURVEYING AND MAPPING
GEOGRAPHIC MAPPING SECTION

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Third Edition

Responsible Office:
Surveying & Mapping Office

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ABOUT THIS EDITION:

This is an updated FLORIDA LAND USE, COVER AND FORMS CLASSIFICATION SYSTEM. The September 1985 version is almost intact as it was except for a few added classifications. We would like to thank the Florida Department of Environmental Protection for their input in adding some "Wetland Classes." We left most all the Introduction as it was in the Second Edition.

PURPOSE:

In the years since the original edition of the LAND USE, COVER AND FORMS CLASSIFICATION SYSTEM was initiated, the Geographic Mapping Section has evolved simultaneously with the expanding technologies of remote sensing and digital mapping systems. The section now routinely employs more sophisticated, state-of-the-art forms of aerial photography, Landsat MultiSpectral Scanner (MSS) data and Landsat Thematic Mapper (TM) data. Additionally, most image data reduced from remotely sensed images and all non-image data is stored in a computer-supported geographic information system.

The increased use of these resources has led to very precise classification of land use, cover and forms and a flexible means of capturing not only image data but also auxiliary non-image data in a comprehensive land use/cover/forms data base. As a result of these increased capabilities, the mission of the Thematic Mapping Section has expanded greatly, necessitating a new edition of the FLORIDA LAND USE, COVER AND FORM CLASSIFICATION SYSTEM.

In 1971, the Geographic Mapping Section was established within the Topographic Bureau, now the Surveying and Mapping Office, of the Florida Department of Transportation. Our mission then, as it is now, was to assist upon request other state agencies in their mapping activities. Although our primary responsibility is to the Department of Transportation, the section will intermittently serve the needs of other Governmental Agencies.

A committee representing eight state agencies was formed in 1973 to improve land resources data coordination within the various state agencies by reducing duplication of effort and increasing the value of data for serving multiple purposes.

The committee's objective was to establish a uniform land classification system that would satisfy a wide variety of users. It was determined that the system must be compatible with classification activities at the national level while permitting flexibility for regional and local agencies. After a general evaluation of the current classification systems then in use, it was agreed that the United States Geological Survey report, "A Land-Use Classification System for Use With Remote-Sensor Data," commonly known as U.S.G.S. Circular 671, would be the basis for the committee's work.

A system was designed primarily to meet needs of state agencies, local governments and private enterprise, and to allow user flexibility in modifying the classifications to meet individual needs without seriously impairing the exchange of data. The result of the committee's work was the publication of the FLORIDA LAND USE AND COVER CLASSIFICATION SYSTEM in 1976. This publication encompassed complete sub-categorization of Levels I and II of the classification system, but left the sub-categorization of Level III to the discretion of individual organizations.

However, after the publication of the original classification system, requests for specific identification became more demanding, especially in land cover. In response, land use and vegetation categories were adopted from suggestions furnished primarily by D.O.T. environmentalists, reflecting various users' needs and interests, and incorporated into Levels III and IV. Therefore, in subsequent revisions of the system categorization, Level III was revised to meet the needs of the Department of Transportation and other state agencies requesting Department land use and land cover maps. The resulting classification scheme was not a fixed system but remained a system which was flexible to specific user requirements. (An in-depth discussion of the level structure and guidelines for sub-categorization may be found in the U.S. Geological Survey paper, authored by James R. Anderson et al in 1976, entitled: "A Land-Use/Land Cover Classification System for Use with Remote Sensing Data," U.S.G.S. Professional Paper 964).

Accompanying this report is a section on mapping physiographic features previously not associated with land use inventory. Soil, drainage and geological features affect land use in many respects and, therefore, must be considered by planners in making

decisions regarding land use in an area.
This new edition of the classification system includes in-depth definitions of classes falling in Levels I, II and, where needed, III. Also included is a complete hierarchical listing of all classes in Levels I through IV. Users familiar with the past edition will note that Levels III and IV have been greatly expanded. In many instances the text was reformatted and expanded in order to appeal to a wider audience and new sections were added relating the objectives and capabilities of the Geographic Mapping Section to potential users of our products and services.

While this classification scheme is a direct result of requests from data users and expanded capabilities, the elements of the scheme do not represent every user need since there are limitations in every system. Yet, the structure of the system remains flexible enough to meet new classification requirements as they arise. It is felt that this type of information has proven useful and will continue to be an effective part of the inventory system.

This manual was written to serve as a companion document to land use maps compiled by the Florida Department of Transportation Geographic Mapping Section of the State Surveying and Mapping Office. Its primary purpose is to clarify, in some detail, the land use/cover/forms annotations assigned to the various polygons which make up a land use map. It is hoped that through reading and understanding this manual the users of the products and services provided by the Geographic Mapping Section will come to understand and appreciate the logic, techniques and philosophies employed by image analysts during map compilation.

However, by no means was it intended that this manual serve as a guide to image interpretation. Such an objective is beyond the scope of this publication. We would like the reader to be aware that many texts of this nature have been published which cover not only a broad variety of land uses and cover types but also many which address specialized uses and resources (see Appendix F).

Additionally, it is hoped that this effort will serve as a model for other state agencies to follow in their activities in land use mapping. When this practice is adopted, exchange and adaptation of land use data will be greatly facilitated, particularly when handled in a form compatible with computer-based geographic information systems.

Third Edition, January, 1999

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PROCEDURE:

(1) THE GEOGRAPHIC MAPPING SECTION

Before expanding upon the Land Use, Cover and Forms Classification System, it may prove beneficial to the reader if the purpose and objective of the Geographic Mapping Section of Florida's Department of Transportation Surveying and Mapping Office are briefly described. The section is divided into three subsections: Photo Interpretation, Florida Landsat Data Analysis System and County Mapping.

The primary task of the Photo Interpretation subsection is to reduce the large volume of data captured by aerial photographs into a meaningful, easily understood format. This is accomplished by delineating homogeneous polygons on the imagery which correspond with identifiable land features, covers and uses. The majority of interpretation is facilitated by medium-scale (1:25,000) panchromatic black and white aerial photography. However, the Geographic Mapping Section has received an increasing number of project requests which require the use of either natural color or false color infrared, large-scale imagery for special purpose studies. The type and scale of imagery employed are dependent upon the level of interpretation being executed.

The Florida Landsat Data Analysis System subsection processes both Multispectral Scanner (MSS) and Thematic Mapper (TM) satellite images gathered by the Landsat program. Image analysis is facilitated by the image processing software whose major function, among others, is to extract land classifications from the data. While not as detailed nor quite analogous to aerial photograph interpretation, the Landsat Data Analysis System provides useful information for county and state wide mapping projects. Both the Photo Interpretation and the Florida Landsat Data Analysis System subsections break out homogeneous land uses and covers which correspond to the classes defined in this document.

After the images have been reduced to a number of homogeneous polygons which exhibit a meaningful correlation with recognizable ground features, the data extracted from images is entered into a Geographic Information System facility. The Geographic Information System is a computer-based mapping facility which enables the Geographic Mapping Section to record both image and non-image geographic information in a digital format. The System supports a large number of registered mapping levels or planes, each of

which may be assigned a specific map feature (i.e., vegetative, topographic, demographic, etc. data). Once the polygons and their descriptive information have been entered, the data may be retrieved in the form of a map (along with nongraphic data reports) in either the conventional paper form or as a video terminal display. This type of facility differs from the common map drafting facility in that the map product may be directly linked and correlated with a land use/cover data base. This allows one to conduct quantitative analysis with the "map", something which could not have been easily accomplished in the past.

The last subsection, County Mapping, is involved with the compilation and updating of Florida's county road maps. This subsection differs from the previous two subsections' objectives in that it concerns itself only with the State's road transportation system and gross geographic features. It is similar to the Photo Interpretation Subsection in that it employs aerial photography (generally medium-scale, black and white) and computer graphics to produce a map.

The Geographic Mapping Section's primary function is to reduce and store voluminous image data in manageable form which may be used by a wide variety of users. The Section has the capability to tailor its services to meet the needs of a wide variety of clients. However, it is primarily an image interpretation facility and participates in field data retrieval only on a limited basis although it has the capacity to manage land use data gathered from a wide variety of outside sources.

(2) GENERAL DESCRIPTION OF THE FLORIDA LAND USE, COVER AND FORMS CLASSIFICATION SYSTEM

This land use, vegetation cover and land form classification system is arranged in hierarchical levels with each level containing land information of increasing specificity. The various categories and subcategories listed and defined herein reflect the types of data and information which can be extracted from aerial photography of various types (panchromatic, natural color or false color infrared) and scales (large, medium and small) and from the current generation of airborne and satellite multispectral imaging systems. Color, shade, shape, size, texture, shadows, context and, in the case of non-photographic imagery, multispectral and multitemporal characteristics are some of the features used to implement land use/cover classification. In some cases, it may be necessary to substantiate the image analysis with supporting, non-image

data to insure the accuracy of the final map product or to incorporate additional information in the image-attribute data base.

(a) LEVEL I

This class of data is very general in nature. It can be obtained from remote sensing satellite imagery with supplemental information. Level I would normally be used for very large areas, statewide or larger, mapped typically at a scale of 1:1,000,000 or 1:500,000. At these scales, one inch equals 16 miles (one centimeter per ten kilometers) and one inch equals eight miles (one centimeter per five kilometers) respectively.

(b) LEVEL II

This class of data is more specific than Level I. Level II data is normally obtained from high altitude imagery (40,000 to 60,000 feet) supplemented by satellite imagery and other materials, such as topographic maps. Mapping typically might be at a scale of 1:100,000 or one inch equals 8,333 feet (one centimeter per one kilometer).

(c) LEVEL III

This class of data is usually obtained from medium altitude photography flown between 10,000 and 40,000 feet. The mapping scale typically is 1:24,000 or one inch equals 2,000 feet (one centimeter per 0.24 kilometer).

(d) LEVEL IV

This more specific class of data is obtained from low altitude photography flown below 10,000 feet. In comparison with the above-mentioned levels, Level IV typically might be mapped at a scale of 1:6,000 or one inch equals 500 feet (one centimeter per 0.06 kilometer).

It is important for the reader to realize that as the scale of the imagery increases, not only will the image analyst be able to make more specific assignments of ground features to particular land use/cover classes, but the increased scale will allow for the break out of smaller features. At Levels III and IV, relatively small ground areas form a significant portion of an image. For certain classes of ground cover this may

present difficulties. For example, on 1":500' images, groups of three or four oak trees are easily delineated. While in and of themselves they do not form a forest, that particular polygon will still be assigned to the Upland Forest class. An even more extreme case is the delineation of just a few hundred square feet of herbaceous ground cover. While such an area clearly cannot support cattle, it is still assigned to the Rangeland classification. While this shortcoming of the classification system does not cause any real conceptual problems, we feel that the reader should be advised of these facts.

(3) SCOPE AND USE OF THE SYSTEM

The Florida Land Use, Cover and Land Form Classification System was an important step toward the development of a geographic data based information system. It serves to reduce a large amount of primary data (such as remote sensing imagery or field survey records) to a more understandable, smaller amount of secondary data (such as a land use map). The system also provides a useful structure of land concepts of properties. Yet, it does not collect or analyze information or offer conclusions.

The definitions which follow will provide understanding of what is included in each category at Levels I, II, III and, in some cases Level IV. All Level IV classes are listed in Appendix A. The definitions are largely based on U.S.G.S. publications referenced in this report. In most cases the scientific names of plant species mentioned in this manual will not appear in the text. Rather, a listing of the common names of major plant species used herein and their corresponding genus and species names will be listed in Appendix D. Appendix A is a complete, hierarchical listing of all land use and cover classes, Levels I - IV, currently employed by the Thematic Mapping Section.

(4) CLASS DEFINITIONS

(a) 100 URBAN AND BUILT-UP

Urban and built-up land consists of areas of intensive use with much of the land occupied by man-made structures. Included in this category are cities, towns, villages, strip developments along highways such areas as those occupied by malls, shopping centers, industrial and commercial complexes and institutions that may, in some instances, are isolated from urban areas. This definition is for topographic and descriptive purposes and differs from the AASHTO (American Association of State Highway officials) definition.

As urban expansion progresses, small blocks of land of less intensive or nonconforming use may become isolated in the midst of built-up regions. Such occurrences will generally be incorporated into this land use category. However, agricultural, forest or water areas fringing upon urban and built-up areas will not be included in the Urban and Built-Up class except where they are an integral component of low-density urban development.

The Urban and Built-Up category takes precedence over other categories when the criteria for more than one land use/cover class are met. For example, residential areas that have sufficient tree canopy cover to satisfy the Upland Forest (class 420) criteria will still be classified as Residential in the Urban or Built-Up category.

Lastly, any land use classification that is confirmed as abandoned or not in use will be preceded, in the numerical identifier, by a zero "0"; i.e., 0175.

110 - 130 Residential

Residential land uses range from high-density urban housing developments to low-density rural areas characterized by a relatively small number of homes per acre. The variation extends from the multi-family apartment complexes generally located in larger urban centers to those single-family houses sometimes having lot sizes of more than one acre.

Areas of low intensity residential land use (generally less than one dwelling unit per five acres), such as

farmsteads, will be incorporated in other categories to which they relate. However, rural residential and recreational type subdivisions will be included in the Residential category since this land is almost entirely committed to residential use even though it may include forest or range types.

In most instances the boundary will be clear when new housing developments abut clearly defined agricultural areas. Conversely, the residential boundary may be vague and difficult to discern when residential development is sporadic and occurs in smaller isolated units developed over an extended period of time in areas with mixed or less intensive land uses. A careful evaluation of density and overall relationship of these areas to the total urban complex must be made.

Other land use categories may embrace areas that meet the Residential category requirement. Often such residential sections are an integral component of the category with which they are associated and should be included within that category. For example, in the Institutional category residential units may be found on military bases in the form of barracks, apartments, dormitories or homes and on college and university campuses in the form of apartments and dormitories in close proximity to instructional buildings. Agricultural field operations and resort facilities commonly provide temporary lodging for their employees and these areas should be classified under Agriculture and Commercial and Services respectively.

110 Residential, Low Density <Less than two dwelling units per acre>

111 Fixed Single Family Units

112 Mobile Home Units

113 Mixed Units <Fixed and mobile home units> *Note

116 Low Density with Golf Courses and Small Bodies of Water

119 Low Density Under Construction

120 Residential, Medium Density <Two-five dwelling units per acre>

121 Fixed Single Family Units

122 Mobile Home Units

123 Mixed Units <Fixed and mobile home units>*Note

126 Medium Density with Golf Courses and Small Bodies of Water

129 Medium Density Under Construction

130 Residential, High Density

131 Fixed Single Family Units <Six or more dwelling units per acre>

132 Mobile Home Units <Six or more dwellings units per acre>

133 Multiple Dwelling Units, Low Rise <Two stories or less>

134 Multiple Dwelling Units, High Rise <Three stories or more>

135 Mixed Units <Fixed and mobile home units>*Note

136 Multiple-High Density Units: One, Two, or Three Stories with Golf Courses and Small Bodies of Water

139 High Density Under Construction

140 Commercial and Services

Commercial areas are predominantly associated with the distribution of products and services. This category is composed of a large number of individual types of commercial land uses which often occur in complex mixtures.

The Commercial and Services category includes all secondary structures associated with an enterprise in addition to the main building and integral areas assigned to support the base unit. Included are sheds, warehouses, office buildings, driveways, parking lots and landscaped areas.

Other types of Commercial areas include shopping

centers and commercial strip developments. These areas have distinctive patterns which are readily identifiable on aerial photographs. Frequently, individual houses and other classes of urban land use may be found within commercial areas. Such uses normally are not delineated unless they can be plotted into polygons of at least one acre size at Level III. Otherwise, the Mixed category should be used.

Commercial use which cannot be easily identified on aerial photography is the commercial resort. These businesses cater to vacationing patrons and often contain associated recreational facilities such as swimming pools and ball courts.

141 Retail Sales and Services

The area of Retail Sales and Services is primarily devoted to the sale of products and services. This category is comprised of elements of central business districts, shopping centers and office buildings including associated structures, driveways and parking lots and all other facilities.

142 Wholesale Sales and Services <Excluding warehouses associated with industrial use>

This category is reserved for those land uses associated with the storage and wholesale distribution of products and materials. The primary structures associated with this category are identified by such characteristics as size, shape and adjacent features. Normally these structures are large capacity and of boxlike shape designed to hold large quantities of products. Included in this category are open storage areas that may be interpreted on imagery as being used for wholesale sales and services.

143 Professional Services

Typical examples of this land use category include law offices, consulting firms, architectural firms, medical offices and dental offices. This category is unique in that it often occurs in former residential areas whose structures have been renovated for these and other professional service uses. Increased parking facilities and other physical evidence, in addition to supporting non-photographic data, are used to identify this class.

144 Cultural and Entertainment

This category includes both indoor and open air theaters (such as motion picture theaters and those for live theatrical performances) and museums. Recreational facilities such as skating rinks and tennis courts are not included in this category.

145 Tourist Services

This category includes all primary and secondary facilities that can be identified as supporting over-night tourist/travel lodging.

146 Oil and Gas Storage <except those areas associated with industrial use or manufacturing>

This category identifies storage facilities used in the retail and wholesale sales of these specific products. The Port Everglades facility in Fort Lauderdale would be a typical example.

147 Mixed Commercial and Services

148 Cemeteries

149 Commercial and Services Under Construction

150 Industrial

The Industrial category embraces those land uses where manufacturing, assembly or processing of materials and products are accomplished. Industrial areas include a wide array of industry types ranging from light manufacturing and industrial parks to heavy manufacturing plants. Also included are those facilities for administration and research, assembly, storage and warehousing, shipping and associated parking lots and grounds.

Typical examples of industrial types found in Florida are pulp and lumber mills, oil refineries with tank farms, chemical plants and brick making plants. Stockpiles of raw materials, large power sources and solid waste product disposal areas are visible industrial features and are easily identified on conventional aerial photography.

151 Food Processing

Citrus processing plants, sugar refineries and seafood packaging plants are typical examples of this category.

152 Timber Processing

Plywood mills, pulp and woodchip plants and saw mills are the prime components of this category.

153 Mineral Processing

Refining of basic earth materials such as kaolin, phosphates and heavy metals (i.e., Titanium and Zircon concentrates) is accomplished in Florida and the facilities for processing these materials are located near the mining operations.

154 Oil and Gas Processing

This category includes the production of jet fuel, asphalt and liquid gases as well as the classic petroleum product and gasoline. Also included in this category are the facilities for processing and recycling used petroleum products.

155 Other Light Industrial

Steel fabrication, small boat manufacturing, electronic manufacturing and assembly plants are typical examples of light industrial enterprises.

156 Other Heavy Industrial

Major ship repair, ship building and large lumber mills can be placed in this category. In some instances mineral extraction can also be assigned here if the facility is processing a final and finished product.

159 Industrial Under Construction

160 Extractive

Extractive areas encompass both surface and subsurface mining operations. Included are sand, gravel and clay pits, phosphate mines, limestone quarries plus oil and gas wells. Industrial complexes where the extracted material is refined, packaged or further processed, are

also included in this category. The recognizable impacts of these activities on the landscape will vary from the unmistakable giant pit mines covering vast acreage to oil wells which cover only a few square feet. Obviously, consistent identification of all these diverse extractive uses with their varied degrees of photographic expression can be difficult using remote sensing data alone.

Flooded pits and quarries, which may be part of a mining operation, will be included in this category. The presence of water bodies does not necessarily imply inactive or unused extractive areas; ponds or lakes are often an integral part of an extractive operation.

Abandoned or inactive mining operations are a part of the extractive category until natural revegetation occurs. Areas of tailings and abandoned pits and quarries may remain recognizable for a long time. These areas may be barren for decades after deposition. During the interval from discontinued use until vegetation occurs, the parcel will be retained in the Extractive category.

161 Strip Mines

The mining method used in this category is easily identified by its land scarring, either in the pit form or in long trenches, with tailings along the trenching operation.

162 Sand and Gravel Pits

The category of sand and gravel pits will be relatively small in area size when compared to the category of strip mining operations. These pits are used primarily to support construction activities.

163 Rock Quarries

This category identifies the excavation of building materials and can be found, in part, in the St. Augustine, Brooksville and Ft. Myers areas. Equipment used in this category is a major identifying feature.

164 Oil and Gas Fields

These are petroleum products sources and are found in the Sunnyland and Jay areas. No processing facilities

are found near these fields. The primary distinguishing feature will be the well head pads, flow control facilities and storage tank facilities.

165 Reclaimed Land

In Florida, this category primarily identifies phosphate mining sites that have been or are being restored to approximate a natural state or converted into recreational facilities.

166 Holding Ponds

Man-made ponds and lakes often form an integral part of the extractive process and may be found in the immediate vicinity of mining operations.

170 Institutional

Educational, religious, health and military facilities are typical components of this category. Included within a particular institutional unit are all buildings, grounds and parking lots that compose the facility. Those areas not specifically related to the purposes of the institution should be excluded. For example, agriculture areas not specifically associated with correctional, educational or religious institutions are placed in the appropriate Agricultural categories.

Educational institutions encompass all levels of public and private schools, colleges, universities, training centers, etc. The entire areas enclosing buildings, campus open space, dormitories, recreational facilities and parking lots are included in this category when they are identifiable.

Military facilities are characterized by a wide variety of features including training camps, missile sites, etc. Administration, storage, repair, security and other functional military buildings plus the practice ranges, storage areas, equipment storage lots and buffer zones compose the institutional military facilities. Auxiliary land uses, particularly residential, commercial and other supporting uses located on a military base, are included in the Institutional category.

171 Educational Facilities

This category includes all supporting facilities including parking lots, stadiums, and all buildings and any other features that can be related to the facility.

172 Religious

All buildings that can be related to this category are included. Many religious facilities support schools and day care centers which reside within their property.

173 Military

All buildings and grounds that compose these facilities are included in this category along with auxiliary land uses - particularly residential services and other supporting land uses.

174 Medical and Health care

All buildings and grounds that compose Medical facilities are included.

175 Governmental

All buildings and facilities which are identifiable as non-military governmental are included in this class. In many cases supplemental data is employed to identify this category.

176 Correctional

Normally, these are confined facilities enclosed within multiple fence structures. All structures and grounds known to be associated with this category are included. Identification of correctional facilities is accomplished through either the interpretation process or as the result of supporting supplemental data.

177 Other Institutional

This category is reserved for facilities which are unique in structure and location. In many cases, supplemental data is required for their correct identification; e.g., Elks Club, Masonic lodge, V.F.W., etc.

178 Commercial Child Care

This category includes all privately owned and operated child day care facilities not associated with religious or other institutions.

179 Institutional Under Construction

180 Recreational

Recreational areas are those areas whose physical structure indicates that active user-oriented recreation is or could be occurring within the given physical area. This category would include golf courses, parks, swimming beaches and shores, marinas, fairgrounds, etc. (Note: Swimming beaches are identifiable by such features as bath houses, picnic areas, service stands and large parking lots adjacent to the beach areas.) In order to make this recreational determination, supplemental information may often be required.

181 Swimming Beach

182 Golf Courses

183 Race Tracks <horse, dog, car, motorcycle>

184 Marinas and Fish Camps

185 Parks and Zoos

186 Community Recreational Facilities

187 Stadiums <Those facilities not associated with high schools, colleges, or universities>

188 Historical Sites <Prehistoric or historic>

189 Other Recreational <Riding stables, go-cart tracks, skeet ranges, etc.>

190 Open Land

This category includes undeveloped land within urban areas and inactive land with street patterns but without structures. Open Land normally does not exhibit any structures or any indication of intended use. Often, urban inactive land may be in a transitional state and ultimately will be developed

into one of the typical urban land uses although at the time of the inventory, the intended use may be impossible to determine from aerial photo interpretation alone.

191 Undeveloped Land within urban areas

192 Inactive Land with street patterns but without structures

193 Urban Land in transition without positive indicators of intended activity

194 Other Open Land

*Note Mixed

This category is used where no single use predominates. When more than one-third intermixture of another use or uses occurs, the specific classification is changed to Mixed. But, where the sum of the intermixture is less than one-third, it is mapped as the dominant land use.

Mixed category includes developments along transportation routes and in cities, towns and built-up areas where separate land uses cannot be individually mapped. Residential, commercial, industrial and, occasionally, other land uses will be included.

An analogous set of criteria is used to define Mixed Land Cover types in the following categories. In each case, an intermixture of more than one-third by plant species or species groups warrants the assignment of the given area into a Mixed class. Specific cases will be addressed in detail as they arise.

(b) 200 AGRICULTURE

In a broad sense, agricultural lands may be defined as those lands which are cultivated to produce food crops and livestock. The sub-categories of Agriculture are as follows: Cropland, Pastureland, Orchards, Groves (except Citrus), Vineyards, Nurseries, Ornamental Horticulture Areas, Citrus Groves, Confined Feeding Operations, Specialty Farms and Other Agriculture.

210 Cropland and Pastureland

This includes agricultural land which is managed for the production of row or field crops and improved, unimproved and woodland pastures.

Cropland and Pastureland include:

1. Cropland harvested or land from which crops are harvested other than tree and bush crops and horticultural crops

2. Lands on which crops and pasture grasses are grown in rotation with one another

3. Pastureland used more or less permanently for livestock grazing

Numerous variables must be recognized in identifying crop and pasture uses of land in different parts of Florida. Field size and shape are highly variable depending upon topographic conditions as well as soil types, size of farms, kind of crops and pastures, capital investments, labor availability and other conditions.

In Florida, supplemental irrigation of cropland and pastureland by use of overhead rotary sprinklers can be detected from photography where distinctive circular patterns are created. Drainage or water control on land used for cropland and pastureland sometimes creates a recognizable pattern that may be helpful in identifying this type of land use from photography.

The duration of crop growth in the field may be rather limited. A false impression of non-agricultural use in a field may result if the conditions of temporary inactivity are not recognized. However, this can be

substantiated by field checking areas which are in question.

Pastures may be drained and/or irrigated lands. Where the management objective is to establish or maintain stands of grasses, such as bahia, pangola or bermuda grass, either alone or in mixtures with white clover or other legumes, land is categorized as pastureland regardless of treatments. Much of the "permanent" pastures occur on land which usually is not tilled or used as cropland. Topographically rough land, stream floodplains, wooded areas and wetlands often may be used for pasture more or less permanently.

211 Improved Pastures

This category in most cases is composed of land which has been cleared, tilled, reseeded with specific grass types and periodically improved with brush control and fertilizer application. Water ponds, troughs, feed bunkers and, in some cases, cow trails are evident.

212 Unimproved Pastures

This category includes cleared land with major stands of trees and brush where native grasses have been allowed to develop. Normally, this land will not be managed with brush control and/or fertilizer application.

213 Woodland Pastures

These areas of forest lands are used as pastures. Strong evidence of cattle activity, such as trails to feed bunkers, salt licks and watering areas is required. In some cases, detection of cattle in the area will be the clue used to identify this category. When supplemental data is available, this will be used along with verification during field checks.

214 Row Crops

Corn, tomatoes, potatoes and beans are typical row crops found in Florida. Rows remain well defined even after crops have been harvested.

215 Field Crops

Wheat, oats, hay and grasses are the primary types

identified as field crops. Some problems may occur in identification of field crops and field checks are necessary in many cases, especially when crop growth is in the early stages.

If specific crop type can be determined from aerial photography, Level IV classification will be used; e.g., 2141- Corn.

220 Tree Crops

Orchards and groves generally occur in areas possessing a specific combination of soil qualities and climatology factors. Water bodies, which moderate the effects of short duration temperature fluctuations, often are in close proximity to this type of agriculture. Site selection for air drainage on sloping land may also be important.

221 Citrus Groves <Orange, grapefruit, tangerines, etc.>

222 Fruit Orchards <Peaches are an example of a crop type which is typical for this category>

223 Other Groves <Pecan, avocado, coconut, mango, etc.>

224 Abandoned Groves

If specific crop type can be determined from aerial photography, Level IV classification will be used; e.g., 2231 - Pecan Grove.

230 Feeding Operations

Feeding operations are specialized livestock production enterprises which include beef cattle feedlots, dairy operations with confined feeding, large poultry farms and swine feedlots. These operations have large animal populations restricted to relatively small areas. This restriction results in a concentration of waste material that is an environmental concern. The attendant waste disposal problems justify a separate category for these relatively small areas. Some operations are located near urban areas to take advantage of the proximity to transportation facilities and processing plants.

231 Cattle Feeding Operations

232 Poultry Feeding Operations

233 Swine Feeding Operations

240 Nurseries and Vineyards

This category is composed of nurseries, floricultural areas and seed-and-sod areas used perennially and generally not rotated with other uses.

241 Tree Nurseries

Areas in this category are not associated with the timber industry; trees primarily are ornamentals.

242 Sod Farms

This category is unique, requiring the crop to be in harvest stages for detection. Supplemental data can be used for the identification of this specific category.

243 Ornamentals

This category is defined as plants or shrubs grown for decorative effects.

244 Vineyards

This category is defined as land devoted to cultivating grape vines.

245 Floriculture

This category is defined as the cultivation of flowers and decorative flowering plants.

246 Timber Nursery

Areas in this category are associated with the timber industry. Tree seedlings (primarily pine) are grown for forestation of timber sites.

250 Specialty Farms

Specialty Farms includes a variety of special or unique farming activities such as thoroughbred horse farms,

dog kennels and aquiculture.

251 Horse Farms

This category defines farms which breed and train horses for sport uses in racing, riding and harness racing.

252 Dairies

This is a commercial establishment which processes and distributes milk and dairy products.

253 Kennels

In this category, specific uses of dogs are not defined. In most cases it will require ground "truthing" by visiting each site.

254 Aquiculture

The definition of this category is the culture of marine or aquatic plant and animal species under either natural or artificial conditions for human and domestic animal consumption.

260 Other Open Lands <Rural>

This category includes those agricultural lands whose intended usage cannot be determined.

261 Fallow Crop Land

Harvested agricultural land not currently in crop production.

(c) 300 RANGELAND

Historically, rangeland has been defined as land where the potential natural vegetation is predominantly grasses, grasslike plants, forbs or shrubs and is capable of being grazed. Management practices may include brush control, regulation of grazing intensity and season of use. If revegetated to improve the forage cover, it is managed like native vegetation. Generally, this land is not fertilized, cultivated or irrigated.

The definition of Rangeland used in the CONSERVATION NEEDS INVENTORY by the U. S. Departments of Agriculture and Interior is used in this classification scheme and describes the natural potential (climax) plant cover as being composed of principally native grasses, forbs and shrubs valuable for forage. This category includes Grassland, Shrub and Brushland and mixed Rangeland. In some cases, it is necessary to deviate from this definition of rangeland. When large-scale imagery is employed in a landuse/cover inventory, small areas of herbaceous or shrubland become evident and significant. Although these small areas cannot support cattle, they are never-the-less included in this category. However, such areas may be used extensively as wildlife forage areas.

310 Herbaceous (Dry Prairie)

This category includes upland prairie grasses which occur on non-hydric soils but may be occasionally inundated by water. These grasslands are generally treeless with a variety of vegetation types dominated by grasses, sedges, rushes and other herbs including wire grasses with some saw palmetto present.

320 Shrub and Brushland

This category includes saw palmettos, gallberry, wax myrtle, coastal scrub and other shrubs and brush. Generally, saw palmetto is the most prevalent plant cover intermixed with a wide variety of other woody scrub plant species as well as various types of short herbs and grasses. Coastal scrub vegetation would include pioneer herbs and shrubs composed of such typical plants as sea purslane, sea grapes and sea oats without any one of these types being dominant.

321 Palmetto Prairies

These are areas in which saw palmetto is the most dominant vegetation. Common associates of saw palmetto in this cover type are fetterbush, tar flower, gallberry, wire grass and brown grasses. This cover type is usually found on seldom flooded dry sand areas. These treeless areas are often similar to the pine flatwoods but without the presence of pine trees.

322 Coastal Scrub

This scrub category represents a wide variety of species found in the coastal zone. A few of the more common components are saw palmetto, sand live oak, myrtle oak, yaupon, railroad vine, bay bean, sea oats, sea purslane, sea grape, Spanish bayonet and prickly pear. This cover type is generally found in dune and white sand areas.

329 Other Shrubs and Brush

This category includes other shrubs and brush cover types not previously mentioned.

330 Mixed Rangeland

When more than one-third intermixture of either grassland or shrub-brushland range species occurs, the specific classification is changed to Mixed Rangeland. Where the intermixture is less than one-third, it is classified as the dominant type of rangeland, whether Grassland or Shrub and Brushland categories.

(d) 400 UPLAND FORESTS

This category of land cover is reserved for those upland areas which support a tree canopy closure of ten (10) percent or more. The Upland Forests include both the xeric (drysite) and mesic (moderately moist site) forest communities. Wetland, or hydric, forest communities fall under the broad wetland category. Also included in the Upland Forest category are areas in which timber harvesting has occurred but which exhibit no evidence of being developed for other intended uses (clear-cuts in an area in which rotation forest management is practiced is a prime example of such a case).

Florida's forests serve as a vital resource from not only a commercial view point, but also from an aesthetic and recreational view point. In Florida, slightly less than 50 percent of the land base (17 million acres) is identified by the United States Forest Service as forest land. Approximately 40 percent of this is commercial timber land. A very significant portion of this land is allocated to pine plantation monoculture. Based on the 1980 Forest Service inventory, there are approximately six and one-half million acres of pure natural and planted longleaf and slash pine stands in Florida. There are also many stands of pure hardwood species groups occurring in Florida. However, the majority of forest lands occurs as mixed communities of tree species and species groups. For purposes of classification, a given forest stand is assigned to a particular species or species group only if 66 percent or more of the total canopy can be assigned as such. Otherwise, the mixed categories (434 and 438) are used. Note here that the classification of forests is based upon the species composition of the tree canopy as viewed and interpreted from aerial imagery.

410 Upland Coniferous Forests

Any natural forest stand whose canopy is at least 66 percent dominated by Coniferous species is classified as a Coniferous Forest. However, pine plantation monocultures will fall under the Tree Plantation category (the 440 class). The similar morphology of the pine species occurring in Florida makes them difficult to distinguish from one another on aerial

photographs.

411 Pine Flatwoods

These forests are quite common throughout much of Northern and Central Florida. Originally, longleaf pines were common on drier sites while slash pines, which are less fire-resistant, were confined to moister sites; wildfire being the contributing factor in this distribution. However, fire control and artificial reforestation have extended the range of slash pine into former longleaf sites. The pine flatwoods class is dominated by either slash pine, longleaf pine or both and less frequently pond pine. The common flatwoods understory species include saw palmetto, wax myrtle, gallberry and a wide variety of herbs and brush.

412 Longleaf Pine - Xeric Oak

This forest type is dominated by longleaf pine trees and can be distinguished from longleaf dominated Pine Flatwoods by the presence of a mid-story canopy of blue-jack oak, turkey oak, sand post oak and other dry-site tolerant oaks and hardwoods. This forest community is characteristic of the deep, infertile sand-soils of the sandhill provinces. The often poor and irregular stocking of this pine community, revealing its oak mid-story, is a distinguishing feature.

413 Sand Pine

This pine community grows on deep, infertile deposits of marine sands and clays. There are two varieties of sand pines, both occurring in Florida. The Ocala variety of the Peninsula also naturally occurs in South Florida growing in densely-stocked, pure, even-aged stands. The Choctawhatchee variety of western panhandle Florida commonly occurs in uneven-aged stands invading oak communities. A root disease complex gives many sand pine stands a disheveled appearance. Its dark crown coloration distinguishes it from other southern pines.

414 Pine - Mesic Oak

On moister sites, slash, longleaf and loblolly pine grow in strong association with a wide variety of mesic oaks and other hardwood species. Southern red oak,

water oak, white oak and laurel oak in addition to hickories, sweetgum and dogwood commonly grow along side these pine species under mesic conditions. Gallberry, wax myrtle and saw palmetto are among the common understory species.

415 Mixed Pine

This category is a mixture of sand pine and slash pine with a wide variety of hardwoods. This mixture is found to be most common from Ocala and throughout the Western Panhandle.

419 Other Pines

This category is reserved for other forest communities dominated by upland conifers not previously mentioned.

420 Upland Hardwood Forests

This classification of upland forest lands has a crown canopy with at least a 66 percent dominance by hardwood tree species. This class, like the Upland Conifer class, is reserved for naturally generated stands. Hardwood plantations, where they occur, fall under the 440 class.

421 Xeric Oak

This forest community is similar to and occupies the same sites as the Longleaf Pine - Xeric Oak community except that the pines, if present, are not the dominant species. In many cases longleaf pine may have been present in significant numbers prior to harvesting but were never regenerated. Species common to this class include sand live oak, bluejack oak, turkey oak and sand post oak.

422 Brazilian Pepper

This exotic, pestilent tree species is found on peninsular Florida from the Tampa Bay area southward. Commonly found on disturbed sites, this native of Brazil is also an aggressive invader of Florida's plant communities. Communities of these small, shrub-like trees are often established along borrow-pits, levees, dikes and in old disturbed fields.

423 Oak - Pine - Hickory

This is a mixed forest community in which no single species is consistently dominant. However, this is a predominantly hardwood forest type in which various southern pines are major associate species. Major component species of this community may include southern red oak, post oak, chestnut oak, black oak, live oak, loblolly pine, shortleaf pine, slash pine, mockernut hickory and pignut hickory in addition to numerous minor associate species. Composition will vary throughout Florida.

424 Melaleuca

This exotic tree species occurs in almost pure stands. It is an aggressive competitor, invading and often taking over a site, forming a dense, impenetrable stand. Melaleuca generally is an indicator of a disturbed site.

425 Temperate Hardwood

This forest cover type is often referred to as either low or temperate hammock. Common components of this community may include, depending upon the location, a wide variety of oaks, red bay, sweetbay, magnolia, sweetgum, sugarberry, hickories, cabbage palm, hollies and cedar. Various pines are minor associates.

426 Tropical Hardwoods

This forest cover type is also referred to as tropical hammock. The common components of this community typically include some combination of gumbo limbo, mastic, stoppers, wild lime, strangler fig, lancewood, poison wood, sea grape, marlberry and wild tamarind.

427 Live Oak

Often referred to as upland temperate hammock, this forest community is one in which live oak is either pure or predominant. The principal associates of this cover type include sweetgum, magnolia, holly and laurel oak. This community is common along the upper banks of Florida's lakes and streams.

428 Cabbage Palm

This forest community is pure or predominantly cabbage palm and is found on sandy type soils. Associates

include a wide variety of large and small hardwoods. In South Florida, cabbage palm may be strongly associated with slash and/or longleaf pine.

429 Wax Myrtle - Willow

These tree species are common on upland sites both separately and in association with one another. On moist sites willow will predominate while on drier sites wax myrtle will be the favored species. Note that willow is also found extensively in hydric communities and, where this is the case, the appropriate wetlands classification should be used. On upland sites, the 429 class is used where myrtle and/or willow are pure or predominant. This will usually be on disturbed sites and on the fringes of other forest communities.

430 Upland Hardwood Forests Continued

431 Beech - Magnolia

Beech is the indicator species of this forest type although it may not be the most abundant. Southern magnolia and a great variety of other moist site hardwoods occur in this forest community with common associates including sweetgum, blackgum, yellow poplar, southern red oak, white oak, white ash and hickories.

432 Sand Live Oak

Sand live oak predominates in this cover type. Associates are cabbage palm, southern red cedar and southern magnolia with smaller quantities of chapman oak, myrtle oak, red maple, red bay and holly. This cover type is generally found on old coastal dune and white sand areas.

433 Western Everglades Hardwoods

Large expanses of the western Everglades support communities of a great variety of hardwoods which must withstand periodic water inundation. Although these sites are excessively moist, the behavior of their water tables precludes their classification as wetlands. This is borne out by their species composition. Common species include red maple, bays,

willow, sweet bay magnolia, a variety of oaks and scattered cypress. This category of forest cover may be considered as a wetland-upland transitional community.

434 Hardwood - Conifer Mixed

This class is reserved for those forested areas in which neither upland conifers nor hardwoods achieve a 66 percent crown canopy dominance.

435 Dead Trees

Standing dead trees (either conifer or hardwood), sometimes called snags, occur in areas which have been burned or have experienced a change in the water table or some other site disturbance. Snags are an important habitat for some cavity nesting birds.

436 Upland Scrub, Pine and Hardwoods

This scrub category represents a conglomeration of species found in the upland area. These areas have no one predominant species and are usually a disturbed site which has regenerated naturally.

437 Australian Pine

Contrary to its name, this species is actually a hardwood. Its name is derived from its needle-like leaves and its characteristic cone shaped crown structure. Australian pine was introduced to South Florida from Australia and is colonizing northward to the Tampa Bay area. It is common on disturbed sites, forming dense thickets, and is frequently planted as wind breaks and soil stabilizers and can be found in some wetland areas.

438 Mixed Hardwoods

This is a hardwood community in which no single species or species group appears to achieve a 66 percent dominance of the canopy. This class of hardwoods includes any combination of large and small hardwood tree species none of which can be identified as dominating the canopy.

439 Other Hardwoods

This class is reserved for hardwood cover types which have not been previously mentioned.

440 Tree Plantations

Florida is part of one of the most productive timber producing regions of the world due, in large part to the monoculture management practices prescribed by its private and industrial professional foresters as well as a climate that is conducive to the rapid growth of southern yellow pine of several species. Therefore, large parcels of land are devoted to tree plantations.

441 Coniferous Plantations

These are almost exclusively pine forests artificially generated by planting seedling stock or seeds. These stands are characterized by high numbers of trees per acre and their uniform appearance. Although row patterns often stand out, this is not always the case, especially where stands are as a result of aerial seeding. When established on hydric soils this can be a wetland cover.

4411 Sand Pine Plantations

Most southern pines appear to be similar to one another except for sand pine, which has a distinctively darker canopy coloration.

4412 Christmas Tree Plantations

Cedars and a variety of pines are grown in Florida for the Christmas tree trade. They are characterized by relatively wide, even spacing with trees of uniform size with shapely crown structures.

442 Hardwood Plantations

These are hardwood forests generated by planting seedling stock or seeds. These would also appear to be uniform and a row pattern would be evident. Melaleuca and eucalyptus plantations are found in South Florida.

4421 Eucalyptus Plantations

443 Forest Regeneration Areas

These are areas in which it is clearly evident that harvested stands will be reforested through one of the various silvicultural practices prescribed in Florida's forests rather than being allocated for another land use or abandonment. This will be the case for those regions of Florida which are heavily dependent upon the timber industry (i.e., the Taylor, Jefferson and Wakulla County area). Signs to look for are windrows (lines of piled up slash and debris) and other evidence of site preparation.

444 Experimental Tree Plots

Experimental tree plots include areas devoted to testing the growth response of different tree species to various experimental silvicultural prescriptions or for assessing the characteristics of trees through forest genetics trials.

445 Seed Plantations

These are low density areas of large trees whose sole purpose is to produce seeds for seedling production in forest regeneration. These areas are usually near work stations or seedling nurseries. The understory of these plantations is kept mowed and park-like. Trees are in neat rows.

(e) 500 WATER

The delineation of water areas depends upon the scale and resolution characteristics of the remote sensor imagery used for interpretation. One definition of water bodies, provided by the Bureau of Census, includes all areas within the land mass of the United States that are predominantly or persistently water covered provided that, if linear, they are at least 1/8 mile (660 feet or 200 meters) wide or, if extended, cover at least 40 acres (16 hectares). When defining water bodies at Level III, linear water bodies less than 1/8 mile wide and extensive water bodies less than 40 acres in size are classified. In some instances, water bodies of one acre will be identified and plotted. Those portions of a water body having emergent vegetation or observable submerged vegetation are placed in the Wetlands category (600).

510 Streams and Waterways

This category includes rivers, creeks, canals and other linear water bodies. Where the water course is interrupted by a control structure, the impounded water area will be placed in the Reservoirs category (530).

The boundary between streams and lakes, reservoirs or the ocean is the straight line across the mouth of the stream unless the mouth is more than one mile (1.85 kilometers) wide. In that case, the rule given under Bays and Estuaries (540) is followed.

520 Lakes

The Lakes category includes extensive inland water bodies, excluding reservoirs. Islands within lakes that are too small to delineate will be included in the water area. The delineation of a lake will be based on the size of the water body at the time the remote sensor data was acquired.

521 Lakes larger than 500 acres (202 hectares).

522 Lakes larger than 100 acres (40 hectares) but less than 500 acres.

523 Lakes larger than 10 acres (4 hectares) but less than 100 acres.

524 Lakes less than 10 acres (4 hectares) which are dominant features.

530 Reservoirs

Reservoirs are artificial impoundments of water. They are used for irrigation, flood control, municipal and rural water supplies, recreation and hydro-electric power generation. Dams, levees, other water control structures or the excavation itself usually will be evident to aid in the identification.

531 Reservoirs larger than 500 acres (202 hectares).

532 Reservoirs larger than 100 acres (40 hectares) but less than 500 acres.

533 Reservoirs larger than 10 acres (4 hectares) but less than 100 acres.

534 Reservoirs less than 10 acres (4 hectares) which are dominant features.

540 Bays and Estuaries

Bays and estuaries are inlets or arms of the sea that extend into the land and, as such, are properly classified in this system only when they are included within the land mass of Florida. In order that this land mass be commensurate with the area the United States Government uses in compiling census statistics, the convention employed by the Bureau of Census in setting the outer limits of the United States has been followed. Where bays and estuaries are between one and ten nautical miles (1.85 and 18.5 kilometers) in width, the outer limit of the United States will be a straight line connecting the headlands except where the indentation of the embayment is so shallow that the water area would be less than the area of a semicircle drawn with this straight line as the diameter. In that event, the coastline itself would form the outer limit of the United States.

Embayments less than one nautical mile in width are classed as streams and canals (510). Embayments or portions of embayments more than 10 nautical miles in width are not considered included within the limits of the United States.

541 Embayments opening directly into the Gulf of Mexico or the Atlantic Ocean.

542 Embayments not opening directly into the Gulf of Mexico or the Atlantic Ocean.

550 Major Springs

The natural phenomena known as springs can easily be identified as points of origin of a water source welling from the ground. In many instances, major springs, such as Silver Springs and Homosassa Springs, can readily be identified by the associated recreational-commercial enterprises in the adjacent areas.

560 Slough Waters

Sloughs are channels of slow moving water in the coastal marshland. The term also refers to "backwater sloughs," those narrow, often stagnant bodies of water found near inland rivers.

570 Major Bodies of Water

571 Atlantic Ocean

572 Gulf of Mexico

(f) 600 WETLANDS

For the purpose of discussion in this manual, Wetlands are those areas where the water table is at, near or above the land surface for a significant portion of most years. The hydrologic regime is such that aquatic or hydrophytic vegetation usually is established, although alluvial and tidal flats may be non-vegetated. Wetlands are frequently associated with topographic low lying areas. Examples of Wetlands include marshes, mudflats, emergent vegetation areas and swamps. Shallow water areas with submerged aquatic vegetation are usually, but not always, classed as water and not included in the Wetlands category.

Extensive parts of some river flood plains qualify as Wetlands. These do not include agriculture land where seasonal wetness or short-term flooding may provide an important component of the total annual soil moisture necessary for crop production. But uncultivated wetlands yielding products such as wood or which are grazed by livestock are retained in the Wetlands category.

Wetlands drained for any purpose belong to other land use categories whether they be Agriculture, Rangeland, Forested Uplands or Urban and Built-up. When the drainage is discontinued and such use ceases, classification reverts to Wetlands after characteristic vegetation is re-established. Wetlands managed for wildlife purposes may show short-term changes in vegetation type and wetness condition as different management practices are prescribed but they are properly classified as Wetlands.

The user of this manual should be aware of the fact that the above definition of a Wetland is tailored to the limitations imposed upon image analysis which must classify wetlands according to evidence recorded by remotely sensed images. On-site field verification may prove capable of better defining a specific site about its classification as a wetland. A more detailed definition of a wetland is provided in Florida Statue 373.019(17) and is more appropriate for use in conjunction with on-site field study.

610 Wetland Hardwood Forests

Wetland Hardwood Forests are those Wetland areas which meet the crown closure requirements for forestland as outlined under the Upland Forest Classification (400) <minimum 10 percent closure>. To be included in the Wetland Hardwood Forest category, the stand must be 66 percent or more dominated by wetland hardwood species, either salt or freshwater.

611 Bay Swamps

This category is composed of dominant trees such as loblolly bay, sweetbay magnolia, swamp bay, with slash pine and loblolly pine as an associated component at times. Large gallberry, fetterbush, wax myrtle and titi are included in the understory vegetation.

612 Mangrove Swamps

This coastal hardwood community is composed of red and/or black mangrove which is pure or predominant. The major associates include white mangrove, buttonwood, cabbage palm and sea grape.

613 Gum Swamps

This forest community is composed of swamp tupelo (blackgum) or water tupelo (tupelogum), or Ogeechee tupelo which is pure or predominant. Associate species may include bald cypress and a great variety of wet site tolerant hardwood species widely variant in composition.

614 Titi Swamps

This community is composed of often extremely dense stands of black titi and cyrilla which are either the pure or predominant species. Major associated species include bays, cypress, tupelos and a great variety of wetland hardwoods. At times titi can dominate non-wetland sites in the absence of a natural fire regime.

615 Stream and Lake Swamps (Bottomland)

This community, often referred to as bottomland or stream hardwoods, is usually found on but not restricted to river, creek and lake flood plain or overflow areas. This category has a wide variety of predominantly hardwood species of which some of the more common components include red maple, river birch,

water oak, sweetgum, willows, tupelos, water hickory, bays, and water ash and buttonbush. Associated species include cypress, slash pine, loblolly pine and spruce pine.

616 Inland Ponds and Sloughs

These communities are associated with depressions and drainage areas that are not associated with streams or lakes. One or a combination of the following species will generally be predominant: Pond cypress, swamp tupelo, water tupelo, titi or willows, Carolina ash and pond apple.

617 Mixed Wetland Hardwoods

This category is reserved for those wetland hardwood communities which are composed of a large variety of hardwood species tolerant of hydric conditions yet exhibit an ill defined mixture of species.

618 Willow and Elderberry

In this community willow is pure or predominant species. In some areas of Florida such as in Paynes Prairie State Preserve elderberry is the primary associate species.

619 Exotic Wetland Hardwoods

This category is a wetland with a dominant exotic species such as Brazilian pepper, melaleuca, or other exotic species.

620 Wetland Coniferous Forests

Wetland Coniferous Forests are wetlands which meet the crown closure requirements for coniferous forests (see 400 and 410) and are the result of natural generation. These communities are commonly found in the interior wetlands in such as places as river flood plains, bogs, bayheads and sloughs.

621 Cypress

This community is composed of pond cypress or bald cypress which is either pure or predominant. In the case of pond cypress, common associates are swamp tupelo, slash pine and black titi. In the case of bald

cypress, common associates are water tupelo, swamp cottonwood, red maple, American elm, pumpkin ash, Carolina ash, overcup oak and water hickory. Bald cypress may be associated with laurel oak, sweetgum and sweetbay on less moist sites. Note that some authorities do not distinguish between the two varieties of cypress.

622 Pond Pine

This category is composed of pond pine which is either pure or predominant on hydric soils. Its major associate is titi. Minor associates include sweetbay, loblolly bay, red bay and swamp tupelo.

623 Atlantic White Cedar

In this community, Atlantic White Cedar is the indicator species although it may not always be the most abundant. Its common associates include slash pine, cypress, swamp tupelo, sweetbay, red bay, loblolly bay, black titi and red maple.

624 Cypress - Pine - Cabbage Palm

This community includes cypress, pine and/or cabbage palm in combinations in which no species achieves dominance. Although not strictly a wetlands community, it forms a transition between moist upland and hydric sites.

625 Hydric Pine Flatwoods

Forest with a sparse to moderate canopy of Slash pine. The understory is grasses, wiregrass, forbs, and at times with sparse saw palmetto.

626 Hydric Pine Savanna

This community is an open forest with a sparse canopy of longleaf and/or slash pines with a ground cover of grasses, forbs, and wetland shrubs.

627 Slash Pine Swamp Forest

This community is a typically a domed swamp or strand dominated by slash pine, also pond cypress, swamp black gum, loblolly bay, sweet bay, and swamp bay. This is usually a depression feature in the landscape.

630 Wetland Forested Mixed

This category includes mixed wetlands forest communities in which neither hardwoods or conifers achieve a 66 percent dominance of the crown canopy composition.

631 Wetland Scrub

This community is associated with topographic depressions and poorly drained soil. Associated species include pond cypress, swamp tupelo, willows, and other low scrub with no dominate species. The Loxahatchee Slough area is an example of this classification.

640 Vegetated Non-Forested Wetlands

Vegetated Non-forested Wetlands include marshes and seasonably flooded basins and meadows. These communities are usually confined to relatively level, low-lying areas. This category does not include areas which have a tree cover which meets the crown closure threshold for the forested categories When the forest crown cover is less than the threshold for wetland forest or is non-woody, it will be included in this category. Sawgrass and cattail are the predominant species in freshwater marshes while spartina and needlerush are the predominant species in the saltwater marsh communities.

641 Freshwater Marshes

The communities included in this category are characterized by having one or more of the following species predominate:

Sawgrass	-	Cladium jamaicensis
Cattail	-	Typha domingenis Typha latifolia
	-	Typha angustifolia
Arrowhead	-	Sagittaria sp.
Maidencane	-	Panicum hemitomon
Buttonbush	-	Cephalanthus occidentalis
Cordgrass	-	Spartina bakeri
Giant Cutgrass	-	Zizaniopsis miliacea
Switchgrass	-	Panicum virgatum

Bulrush	-	Scirpus americanus
		Scirpus validus
		Scirpus robustus
Needlerush	-	Juncus effusus
Common Reed	-	Phragmites communnis
		Phragmites australis
Arrowroot	-	Thalia dealbata
		Thalia geniuclata

If the community is 66 percent or more dominated by a single species by cover, one of the following Level IV classifications will be employed.

6411 Sawgrass

6412 Cattail

6413 Spike Rush

6414 Maidencane

6415 Dog fennel and low marsh grasses

6416 Arrowroot

6417 Freshwater Marsh with shrubs, brush, and vines

6418 Giant Cutgrass

642 Saltwater Marshes

The communities included in this category will be predominated by one or more of the following species:

Cordgrasses	-	Spartina alterniflora
		Spartina cynosuroides
		Spartina patens
		Spartina spartinae
Needlerush	-	Juncus roemerianus
Seashore Saltgrass	-	Distichlis spicata
Saltwort	-	Batis maritima
Glassworts	-	Salicornia sp.
Fringerush	-	Finbristylis castanea
Salt Dropseed	-	Sporobolus virginicus
Seaside Daisy	-	Borrichia frutescens
Salt Jointgrass	-	Paspalum vaginatum

If the community is 66 percent or more dominated by a single species by cover, one of the following Level IV

classifications will be employed.

6421 Cordgrass

6422 Needlerush

643 Wet Prairies

This classification is composed predominately of grassy vegetation on hydric soils and is usually distinguished from marshes by having less water and shorter herbage. These communities will be predominated by one or more of the following species:

Sawgrass	-	Cladium jamaicensis
Maidencane	-	Panicum hemitomon
Cordgrasses	-	Spartina bakeri Spartina patens
Spike Rushes	-	Eleocharis sp.
Beach Rushes	-	Rhynchospora sp.
St. Johns Wort	-	Hypericum sp.
Spiderlily	-	Hymenocallis palmeri
Swamplily	-	Crinum Americanum
Yellow-eyed Grass	-	Xeric ambigua
Whitetop Sedge	-	Dichromena colorata

644 Emergent Aquatic Vegetation

This category of wetland plant species includes both floating vegetation and vegetation which is found either partially or completely above the surface of water.

6441 Water Lettuce - Pistia stratiotes

6442 Spatterdock - Nuphar sp.

6443 Water Hyacinth - Eichhornia sp.

6444 Duck Weed - Lemna sp.

6445 Water Lily - Nymphaeacea

645 Submergent Aquatic Vegetation

This category of wetland vegetation is composed of those aquatic species or communities found growing completely below the surface of the water.

6451 Hydrilla - Hydrilla verticillata
646 Treeless Hydric Savanna

This category is typically dominated by wiregrass or cutthroat grass along with wetland plant associates. This is a treeless variant of class 626.

650 Non-Vegetated

Non-vegetated wetlands are those hydric surfaces on which vegetation is found lacking due to the erosional effects of wind and water transporting the surface material so rapidly that the establishment of plant communities is hindered or the fluctuation of the water surface level is such that vegetation cannot become established. Additionally, submerged or saturated materials often develop toxic conditions of extreme acidity. Tidal flats, shorelines and intermittent ponds are the main components of this category.

651 Tidal Flats

This category is composed of that portion of the shore environment protected from wave action, as in the case of estuaries, comprised primarily of muds transported by tidal channels. An important characteristic of the tidal flat environment is its alternating tidal cycle of submergence and exposure to the atmosphere.

652 Shorelines

This category is normally defined as the interface between the land mass and a water body. Shorelines are formed primarily by physical or biological agents resulting in environments such as coral reefs and barrier beaches. The shore is defined as the zone extending from the low tide mark to the farthest point inland to which wave action transports beach materials.

653 Intermittent Ponds

This category of wetland is defined as a waterbody which exists for only a portion of the year. It may be referred to as a seasonal waterbody. Its existence relies upon water received directly from precipitation, runoff or spring flow.

654 Oyster Bars

(g) 700 BARREN LAND

Barren Land has very little or no vegetation and limited potential to support vegetative communities. In general, it is an area of bare soil or rock. Vegetation, when present, is very sparse and scrubby. However, caution should be exercised since barren land may temporarily exist due to human activity. Generally, such land is incorporated in another landuse/cover category. For example, vast areas of agricultural land are temporarily void of vegetation cover due to tillage practices, and areas of extractive and industrial land use have dump sites for tailings and waste materials. Barren Land categories include beaches exhibiting little or no evidence of human encroachment, sand other than beaches, exposed rock and disturbed lands.

710 Beaches Other Than Swimming Beaches

Beaches are constantly affected by wave and tidal action. The fine clays and silts are washed away leaving sand. However, in protected bay and marsh areas, fine soil particles from surface drainage may settle out. The beach areas also are subject to water and wind erosion. Differing beach dimensions are due to factors such as tides, soil material size, water level and wave energy all of which vary. When a stable surface is observed inland, as another land use occurs and the erosion effects of water and wind decrease, the beach category is terminated.

720 Sand Other Than Beaches

Sand Other Than Beaches is usually in reference to dune sands. These are of aeolian origin and composed of sand grains downwind from a natural source of sand. Dune sizes vary greatly with diameters ranging from a few feet to more than several hundred feet. Their heights also vary and their shapes display considerable variety. When the dunes are the major feature, shore and strand lines, coastal plains, river flood plains and deltas are secondary. This category is not restricted to dune sands as bare sands exist in other forms.

730 Exposed Rock

Exposed Rock areas consist of exposed bedrock and other accumulations of rock materials lacking vegetative cover. Exposed bedrock, when weathered, may be lacking vegetation due to the fine soil materials being removed by the actions of wind and water.

731 Exposed Rock with Marsh Grasses

740 Disturbed Lands

Disturbed Lands are those areas which have been changed due primarily to human activities other than mining. In Florida, these areas may be rather extensive and often appear outside of urban areas.

741 Rural land in transition without positive indicators of intended activity

742 Borrow Areas

743 Spoil Areas

744 Fill Areas <Highways-Railways>

745 Burned Areas

This category includes those barren lands which are a result of fire due to either natural ignition or through purposeful or negligent human activity.

746 Abandoned Railways

747 Dikes and Levees

(h) 800 TRANSPORTATION, COMMUNICATION AND UTILITIES

810 Transportation
Transportation facilities are used for the movement of people and goods; therefore, they are major influences on land and many land use boundaries are outlined by them.

Highways are easily identifiable on medium altitude photography. Highways include areas used for interchanges, limited access rights-of-way and service facilities. The center median, pavement and sizable buffer zone should be included even if exact boundaries cannot be detected.

The Transportation category encompasses rail-oriented facilities including stations, round-houses, repair and switching yards and related areas. Airport facilities include runways, intervening land, terminals, service buildings, navigational aids, fuel storage, parking lots and a limited buffer zone and fall within the Transportation category.

Transportation areas also embrace ports, docks, shipyards, dry docks, locks and water course control structures designed for transportation purposes. The docks and ports include buildings, piers, parking lots and adjacent water utilized by ships in the loading and unloading of cargo or passengers. Locks, in addition to the actual structures, include the control buildings, power supply buildings, docks and surrounding supporting land use (i.e., parking lots and green areas).

811 Airports

812 Railroads

813 Bus and Truck Terminals

814 Roads and Highways

815 Port Facilities

816 Canals and Locks

817 Oil, Water or Gas Long Distance Transmission Lines

818 Auto Parking Facilities <When not directly related

to other land use>

819 Transportation Facilities Under Construction

820 Communications

Airwave communications, radar and television antennas with associated structures are typical major types of communication facilities that will be identified in this category. When stations are associated with a commercial or governmental facility, they will be included in either of those specific categories when located within their bounds and will not be listed as separate elements (i.e., not listed as 820).

821 Transmission Towers <Microwave towers are typical in this category>

822 Communication Facilities <Includes transmitter stations, telephone exchanges, antenna farms, etc.>

829 Communication Facilities Under Construction

830 Utilities

Utilities usually include power generating facilities and water treatment plants including their related facilities such as transmission lines for electric generation plants and aeration fields for sewage treatment sites. Small facilities or those associated with an industrial, commercial or extractive land use are included within these larger respective categories.

831 Electric Power Facilities

This category includes hydropower, thermal, nuclear, gas turbine plants, transformer yards, sub-stations, etc.

832 Electrical Power Transmission Lines

833 Water Supply Plants <Including pumping stations>

This category includes treatment plants, settling basins, water storage towers and well fields.

834 Sewage Treatment

This category is composed of all related facilities

such as aeration fields, digesters, etc.

835 Solid Waste Disposal

This category is composed of controlled and managed solid waste fields, non-permitted solid waste disposal sites, etc.

839 Utilities Under Construction

(I) 900 SPECIAL CLASSIFICATIONS

This category is used primarily for specific topics to be addressed for a specific user requirement of those land uses and land cover which requires identification at Level III or IV. For example:

910 Vegetative

911 Sea Grass

9111 Sea Grass, Sparse - Medium

9112 Sea Grass, Dense

9113 Sea Grass, Patchy

(5) DESCRIPTIONS AND DEFINITIONS OF GEOLOGIC FEATURES

The geologic studies undertaken by the Department of Transportation are intended to aid those involved in the development of plans for the improvement of transportation facilities and in the study of hydrologic conditions, depicting those areas considered geologically unstable with respect to sinkhole development. Since nearly two-thirds of Florida is subject to some degree of sinkhole activity, a cautious concern should accompany the construction of any transportation facility. In these studies, former as well as existing sinkholes are noted in the study area from viewing past and recent photography to avoid construction over presently stable sinkholes which may have become filled by natural and/or human activities. Features such as springs are also shown and evaluated with regard to their influence.

The greatest value of such studies is considered to be depiction of those areas where it is felt, based on our analysis, there exists a high likelihood of future sinkhole activity. This determination begins with the delineation of marked geologic features referred to as fracture traces (less than one mile in length) or lineaments (greater than one mile in length). For simplicity, the term lineaments is considered to include fracture traces.

These linear features are the surface expression of subsurface geologic phenomena such as fracture zones, bedding planes, joints, faults, variation in rock types and texture and variation in primary porosity. Lineaments are expressed on the surface as aligned surface sags and

depressions, gaps in ridges, soil tonal change revealing variations of soil moisture, aligned springs, seeps and perched surface ponds, alignments in vegetation, vegetation type and height changes, straight stream and valley segments, abrupt changes in valley alignment and gully development.

Ground water plays a significant role in the development of sinkholes. As in the case of any other liquid, water chooses to travel along the path of least resistance. For ground water, this path is generally along crevices formed in the limestone and expressed as lineaments. Much of this water, having filtrated through the organic soil covered surface, contains substantial quantities of carbonic acid. This acidified water, although dilute, exists in large enough quantities to cause further chemical as well as physical deterioration of the limestone through which it passes. Therefore, along each of the lineaments shown from the aerial photography, significant amounts of subsurface erosion are occurring.

The areas of most concern are where several lineaments intersect. It is felt that in these locations the underlying limestone is undergoing the greatest amount of deterioration and is the most susceptible to sinkhole collapse.

Although the aforementioned geologic indicators suggest sinkhole activity will occur, it may take the activities of man to trigger the final mechanism for collapse. In a general state of equilibrium, the surface layer forming the roof of a subsurface cavity may be of sufficient strength to withstand collapse or the ground water contained within the cavity may supply the upward pressure necessary to equalize the downward pressure of the surface.

Human activities alter this equilibrium in several ways. The over pumping of ground water causes a dewatering and a subsequent decrease in the upward pressure previously supplied by ground water. A localized increase in ground water recharge, as from urban runoff into a recharge basin, may cause increased physical and chemical deterioration of the subsurface and further collapse. Construction activities create an increase in weight on the thin surface layer over a subsurface cavity. This increased weight might be greater than the surface is capable of enduring resulting in a collapse. These are but a few of the ways in which man might aggravate a delicate, natural equilibrium.

Not only should these areas of lineament intersection be avoided due to the possible resultant damage to any facilities constructed over or near them, they also should be viewed as the possible means by which contaminated forms of urban runoff may enter directly into the underground water supply.

The findings of these geologic studies provide some knowledge of the subsurface conditions in an area but are not intended to be the sole factor in determining the limitations on any activities such as construction. They should be used primarily as an indicator of specific areas worthy of subsequent detailed engineering and hydrologic study.

Urbanization masks many of the lineaments and recent sinkholes. Therefore, photography dated prior to many of these activities is used when available.

(6) DESCRIPTIONS AND DEFINITIONS OF SOILS CLASSIFICATION

Soils investigations are directed at identifying the existing soils conditions of an area. The primary concern is delineation of those soils considered unsuitable for construction purposes.

The materials classification used in the soils investigations is based primarily on the AASHTO and Unified Soil Classifications. Some modification or simplification of the classifications have been undertaken to better suit the needs of those persons for whom the soils studies are being conducted.

Distinctions of various soil types recognized under the classification are made by observation of surface soil parameters such as soil tones resulting from moisture and organic content, vegetation and the reflectance characteristics of the soil.

The clean sand (R) classification is composed of fine to medium grained, poorly graded (mixed size), well to very well drained sands containing no organic materials. This material occurs most commonly along the many miles of Florida's coastline. Many of the ancient marine terraces and existing beach ridges are also quite often composed of such material.

A sand (S) classification has been designed to include fairly clean (small amounts of primarily inorganic

substances with some organics), fine to medium grained, poorly to well drained sands. This category is by far the most common soil in Florida, being found throughout the State. These two classifications, Clean Sand (R) and Sand (S) generally are good with respect to construction activities. However, these same soils are somewhat limited in their ability to nurture agricultural growth (citrus, vegetables, etc.).

An impure sand or organic sand (T) classification refers to fine to medium grained, poor to fairly well drained sands. Appreciable amounts of organic material are found intermixed in this type of soil. The most common occurrence of this type is in heavily vegetated areas of the State. Along the edge of many lakes and streams a thin layer of this soil may be found.

In the past, there has been no attempt to distinguish between the various types of clays which may be encountered in Florida. Both inorganic and organic clays are considered in this clay (C) classification. Dependent upon the amount of sand associated with clays, this soil type may be of value as a construction material.

A silty sand (F) classification has been established to include the poorly graded sand and silt mixtures found in many areas of Florida. This soil is for the most part fairly well drained but is quite easily eroded. Wind-blown and flood deposits quite often consist of this material.

Organic deposits are distinguished between peat and muck. Peat deposits, (P) classification, consists of more than 50 percent organic material, either slightly or non-decayed. Humus, grass, leaves and branches may comprise the organic portion of such material. Many of the original plant parts are identifiable and these soils possess drainage qualities. Muck (M) classification, as referred to here, consists of a mixture of sand, clay and organic materials. Approximately 20 to 50 percent of the soil is of an organic nature. Muck shows a greater amount of plasticity and decomposition than peat. The original plant parts composing this material cannot be identified due to the advanced stage of decomposition. Found extensively in certain areas of the state, both of these organic soils are very compressible and have undesirable construction characteristics. However, for agricultural purposes, these soils are in great demand. The features identifying these soils are color, odor, sponginess and fibrous texture.

Areas where the soils have been altered by man to the degree where they cannot readily be identified are classified as Disturbed or Mixed Soils (H). Areas to which this classification has been applied are airport sites, commercial and residential development sites and occasionally areas being used intensively for agriculture. Throughout the State, there are many areas where rock outcrops occur, primarily in the form of limestone (LS). Where appropriate, a limestone or dolomite (DM) classification will be identified.

Any special denotation required to depict fully the existing conditions of an area will be added to the soils map legend when appropriate. Materials such as muck, peat and clay, due to their physical and chemical characteristics, are generally unsuitable as materials on which to build structures of considerable significance. These materials, although often undesirable from an engineering standpoint, frequently possess a great potential for agriculture. The various classifications of sand, (R), (S) and (T), based on the grain composition and associated drainage characteristics, generally are considered best from a construction viewpoint because of good natural drainage and both physical and chemical stability. Subsurface soils will be indicated by superposition. This information is gained from soil samples and a working knowledge of the pedologic conditions of the area. Various combinations of soils also may be indicated when appropriate.

Due to the rapid urbanization occurring in many areas of Florida, much of the natural surface cover has been altered making accurate interpretations difficult. To overcome this problem, photography dated prior to significant urban as well as agricultural development is obtained.

Soils investigations give the requestor of information a basic knowledge of the soil conditions existing in the study area. From the information presented, a more detailed engineering study of the soils may be warranted.

(7) DESCRIPTIONS AND DEFINITIONS OF DRAINAGE FEATURES MAPPING

Drainage studies are designed to show simply and directly the predominant drainage features found in a given study area. Most of the drainage features are obvious due to the presence of flowing or standing water. The occurrence of wetlands vegetation or soils conducive to poor drainage conditions are natural indicators of drainage features.

Four classifications have been established to indicate the types of drainage: 1) Channelized Flow, 2) Unchannelized Flow, 3) Intermittent Pond and 4) Waterbody. Channelized flow is the linear movement of water in a defined pattern within either a natural or man-made channel. Roadway drainage generally is considered in this class. The unchannelized flow classification is applied to that type of drainage which would occur under conditions of excessive rainfall and/or is not confined to a well-defined channel. An example of such a condition would be sheetflow descending a hill. A river-swamp condition also might be classified as unchannelized flow. The waterbodies classification refers to those water systems which are non-flowing and contain some water throughout the year. An intermittent waterbody is an area which might be slightly depressed topographically and is felt to have potential for retention of some water even if only following periods of excessive rainfall. The only evidence of existence of an intermittent waterbody may be the wetland vegetation or soil materials often associated with areas subject to periodic inundation. An example of such a waterbody would be a watertable lake subject to appreciable fluctuations as watertable (upper surface of the zone of saturation for underground water) conditions vary. Retention basins, which might contain water only after periods of excessive runoff, are another type of intermittent waterbody.

When possible, the direction of flow will be indicated on the drainage maps either from actual observation on the aerial photography or from U.S.G.S. topographic quadrangle maps. The most recent photography available is used during these studies in order to show effectively any recent alterations in drainage conditions due to changes in land use.

Such studies are intended to aid in the planning and development of engineering and scientific projects by presenting an overview of the drainage conditions to be expected. Notation of any conditions which have potential of being detrimental, particularly to man-made facilities, is included. Fluvial systems which might be altered severely by construction activities will be noted when environmental and/or hydrologic conditions warrant.

APPENDICES

(8) APPENDIX A

LAND USE AND COVER CLASSIFICATIONS LISTING OF LEVELS 1 - IV

This classification listing (Levels I-IV) reflects the detailed identification possible in depicting the land use, land cover and land forms. With the employment of color or false color infrared aerial photography, a higher degree of accuracy, precision and detail can be realized. The recommended scale is 1:12,000 to 1:10,000 or larger for both the aerial photography and the graphics product (i.e., the maps). Once again, the listing presented herein is not a fixed categorization but rather an open-end system which may be expanded as the need arises.

(a) HIERARCHICAL LIST OF LAND USE AND COVER CLASSIFICATIONS LEVELS I - IV

100 URBAN AND BUILT-UP

110 Residential, Low Density <Less than two dwelling units per acre>

111 Fixed Single Family Units
1111 Single Story Units
1112 Two or More Story Units

112 Mobile Home Units
1121 Single Wide Units
1122 Double Wide Units
1123 Mixed Widths Units

113 Mixed Units <Fixed and mobile home units>

116 Low Density with Golf Courses and Small Bodies of Water

119 Low Density Under Construction

120 Residential, Medium Density <Two-five dwelling units per acre>

121 Fixed Single Family Units
1211 Single Story Units
1212 Two or More Story Units

122 Mobile Home Units
1221 Single Wide Units

1222 Double Wide Units
1223 Mixed Widths Units

123 Mixed Units <Fixed and mobile home units>

126 Medium Density with Golf Courses and Small Bodies of Water

129 Medium Density Under Construction

130 Residential, High Density

131 Fixed Single Family Units <Six or more dwelling units per acre>
1311 Single Story Units
1312 Two or More Story Units

132 Mobile Home Units <Six or more dwelling units per acre>
1321 Single Wide Units
1322 Double Wide Units
1323 Mixed Widths Units

133 Multiple Dwelling Units, Low Rise <Two stories or less>
1331 Duplex Units
1332 Triplex Units
1333 Quadruplex Units
1334 Apartment Units
1335 Townhouse Units
1336 Patio Houses

134 Multiple Dwelling Units, High Rise <Three stories or more>
1341 Apartment Units
1342 Townhouse Units
1343 Condominium Units
1344 Mixed Units

135 Mixed Units <Fixed and mobile home units>

136 Multiple-High Density Units: One, Two, or Three Stories with Golf Courses and Small Bodies of Water

139 High Density Under Construction

140 Commercial and Services
141 Retail Sales and Services
1411 Shopping Centers (Plazas, Malls)

1412 Service Stations
1413 Banking Facilities
1414 Convenience Stores
1415 Restaurants
1416 Builder's Supply
1417 Petroleum (Fuels)
1418 Mixed

142 Wholesale Sales and Services <Excluding warehouses associated with industrial use>
1421 Warehouses
1422 Mini-Warehouses
1423 Junk Yards
1424 Farmers Markets
1425 Other

143 Professional Services

144 Cultural and Entertainment
1441 Theaters
1442 Museums
1443 Open Air Theaters
1444 Amphitheaters
1445 Amusement Parks
1446 Art Galleries
1447 Libraries
1448 Other

145 Tourist Services
1451 Hotels
1452 Motels
1453 Travel Trailer Parks
1454 Campgrounds - Define
1455 Other

146 Oil and Gas Storage <Except those areas associated with industrial use or manufacturing>
1461 Crude Oil
1462 High Octane Fuels
1463 Liquified Gases
1464 Petroleum Fuels
1465 Motor Lubricants

147 Mixed Commercial and Services

148 Cemeteries

149 Commercial and Services Under Construction

150 Industrial

151 Food Processing
- 1511 Citrus
- 1512 Sugar
- 1513 Seafood
- 1514 Meat Packaging Facilities
- 1515 Poultry and Eggs
- 1516 Grains and Legumes

152 Timber Processing
- 1521 Sawmills
- 1522 Plywood and Veneer Mills
- 1523 Pulp and Paper Mills
- 1524 Pole Peeler and Treatment Plants
- 1525 Wood Distillation
- 1526 Log Home Prefabrication
- 1527 Woodyards

153 Mineral Processing
- 1531 Clays
- 1532 Phosphate
- 1533 Limerock
- 1534 Magnesia
- 1535 Heavy Minerals

154 Oil and Gas Processing
- 1541 Gasoline
- 1542 Jet Fuel
- 1543 Fuel Oil
- 1544 Liquified Gases
- 1545 Asphalt

155 Other Light Industrial
- 1551 Boat Building and Repair
- 1552 Electronics Industry
- 1553 Furniture Manufacturers
- 1554 Aircraft Building and Repair
- 1555 Container Manufacturers (Cans, bottles, etc.)
- 1556 Mobile Home Manufacturers

156 Other Heavy Industrial
- 1561 Ship Building and Repair
- 1562 Pre-stressed Concrete Plants
- 1563 Metal Fabrication Plants
- 1564 Cement Plants

159 Industrial Under Construction

160 Extractive

161 Strip Mines
- 1611 Clays
- 1612 Peat
- 1613 Heavy Minerals

162 Sand and Gravel Pits

163 Rock Quarries
- 1631 Limerock
- 1632 Dolomite
- 1633 Phosphate
- 1634 Heavy Minerals

164 Oil and Gas Fields
- 1641 Crude Oil
- 1642 Natural Gas

165 Reclaimed Land

166 Holding Ponds

170 Institutional

171 Educational Facilities
- 1711 Universities or Colleges
- 1712 Vocational Schools
- 1713 High Schools
- 1714 Middle Schools
- 1715 Elementary Schools

172 Religious
- 1721 Parochial Schools
- 1722 Churches/Synagogues Only

173 Military
- 1731 Air Force Installation
- 1732 Army Installations
- 1733 Navy Installations
- 1734 Marines Installations
- 1735 Coast Guard Installations
- 1736 National Guard Installations

174 Medical and Health Care
- 1741 Hospitals
- 1742 Nursing Homes and/or Convalescent Centers
- 1743 Clinics

175 Governmental
1751 City Halls
1752 Courthouses
1753 Police Stations
1754 Fire Stations
1755 Office Buildings
1756 Maintenance Yards
1757 Post Offices
1758 Other

176 Correctional
1761 State Prisons
1762 Federal Prisons
1763 Juvenile Centers
1764 Road Prisons
1765 Municipal Prisons

177 Other Institutional

178 Commercial Child Care

179 Institutional Under Construction

180 Recreational

181 Swimming Beach

182 Golf Courses

183 Race Tracks
1831 Automobile Tracks
1832 Horse Tracks
1833 Dog Tracks

184 Marinas and Fish Camps
1841 Marinas (Basins)
1842 Fish Camps

185 Parks and Zoos
1851 City Parks
1852 Zoos

186 Community Recreational Facilities
1861 Baseball
1862 Basketball
1863 Football/Soccer
1864 Tennis

187 Stadiums <Those facilities not associated with

high schools, colleges or universities>

188 Historical Sites
1881 Prehistoric
1882 Historic

189 Other Recreational
1891 Riding Stables
1892 Go-Cart Tracks
1893 Skeet Ranges
1894 Rifle and/or Pistol Ranges
1895 Golf Driving Ranges
1896 Other

190 Open Land

191 Undeveloped Land within Urban Areas

192 Inactive Land with street pattern but without structures

193 Urban Land in transition without positive indicators of intended activity

194 Other Open Land

(b) 200 AGRICULTURE

210 Cropland and Pastureland

211 Improved Pastures

212 Unimproved Pastures

213 Woodland Pastures

214 Row Crops
2141 Corn
2142 Tomatoes
2143 Potatoes
2144 Beans
2145 Peanuts
2146 Soybeans
2147 Strawberries
2148 Tobacco

215 Field Crops
2151 Wheat
2152 Oats

2153 Hay
2154 Watermelons
2155 Grasses
2156 Sugar Cane

220 Tree Crops

221 Citrus Groves
2211 Oranges
2212 Grapefruits
2213 Tangerines

222 Fruit Orchards
2221 Peaches
2222 Mangos
2223 Avocados

223 Other Groves
2231 Pecans

224 Abandoned Groves

230 Feeding Operations

231 Cattle Feeding Operations

232 Poultry Feeding Operations

233 Swine Feeding Operations

240 Nurseries and Vineyards

241 Tree Nurseries
2411 Pot Nurseries
2412 Field Nurseries
242 Sod Farms

243 Ornamentals

244 Vineyards

245 Floriculture

246 Timber Nurseries

250 Specialty Farms

251 Horse Farms

252 Dairies

253 Kennels

254 Aquaculture

259 Other

260 Other Open Lands <Rural>

261 Fallow Crop Land

(c) 300 RANGELAND

310 Herbaceous (Dry Prairie)

320 Shrub and Brushland

Level IV classification further subdivides Level III classifications on the basis of ground cover classes(other than grasses).

3201 Class 1 - less than 25% ground cover (excluding grasses)
3202 Class 2 - 26 to 50% ground cover
3203 Class 3 - 51 to 75% ground cover
3204 Class 4 - greater than 75% ground cover

321 Palmetto Prairies

322 Coastal Scrub

329 Other Shrubs and Brush
330 Mixed Rangeland

(d) 400 UPLAND FORESTS

Level IV classification further subdivides Level III classifications on the basis of tree crown closure classes.

4001 Class 1 - 10 to 30% crown closure
4002 Class 2 - 31 to 50% crown closure
4003 Class 3 - 51 to 70% crown closure
4004 Class 4 - greater than 70% crown closure

410 Upland Coniferous Forests

411 Pine Flatwoods

412 Longleaf Pine - Xeric Oak

413 Sand Pine

414 Pine - Mesic Oak

415 Mixed Pine

419 Other Pines

420 Upland Hardwood Forests

421 Xeric Oak

422 Brazilian Pepper

423 Oak - Pine - Hickory

424 Melaleuca

425 Temperate Hardwoods

426 Tropical Hardwoods

427 Live Oak

428 Cabbage Palm

429 Wax Myrtle - Willow

430 Upland Hardwood Forests, Continued
431 Beech - Magnolia

432 Sand Live Oak

433 Western Everglades Hardwoods

434 Hardwood - Coniferous Mixed

435 Dead Trees

436 Upland Scrub, Pine and Hardwoods

437 Australian Pines

438 Mixed Hardwoods

439 Other Hardwoods

440 Tree Plantations

441 Coniferous Plantations
4411 Sand Pine Plantations
4412 Christmas Tree Plantations

442 Hardwood Plantations
4421 Eucalyptus Plantations

443 Forest Regeneration Areas

444 Experimental Tree Plots

445 Seed Plantations

(e) 500 WATER

510 Streams and Waterways

520 Lakes

521 Lakes larger than 500 acres (202 hectares)

522 Lakes larger than 100 acres (40 hectares)

523 Lakes larger than 10 acres (4 hectares) but less than 100 acres

524 Lakes less than 10 acres (4 hectares) which are dominant features.

530 Reservoirs

531 Reservoirs larger than 500 acres (202 hectares)

532 Reservoirs larger than 100 acres (40 hectares) but less than 500 acres

533 Reservoirs larger than 10 acres (4 hectares) but less than 100 acres

534 Reservoirs less than 10 acres (4 hectares) which are dominant features

540 Bays and Estuaries

541 Embayments opening directly into the Gulf of Mexico or the Atlantic Ocean

542 Embayments not opening directly into the Gulf of Mexico or the Atlantic Ocean

550 Major Springs

560 Slough Waters

570 Major Bodies of Water

571 Atlantic Ocean

572 Gulf of Mexico

(f) 600 WETLANDS

610 Wetland Hardwood Forests

Level IV classification further subdivides Level III classifications on the basis of tree crown closure classes.

6101 Class 1 - 10 to 30% crown closure
6102 Class 2 - 31 to 50% crown closure
6103 Class 3 - 51 to 70% crown closure
6104 Class 4 - greater than 70% crown closure

611 Bay Swamps

612 Mangrove Swamps

613 Gum Swamps

614 Titi Swamps

615 Streams and Lake Swamps (Bottomland)

616 Inland Ponds and Sloughs

617 Mixed Wetland Hardwoods

618 Willow and Elderberry

619 Exotic Wetland Hardwoods

620 Wetland Coniferous Forests

Level IV classification further subdivides Level III classifications on the basis of tree crown closure classes

6201 Class 1 - 10 to 30% crown closure
6202 Class 2 - 31 to 50% crown closure
6203 Class 3 - 51 to 70% crown closure
6204 Class 4 - greater than 70% crown closure

621 Cypress

622 Pond Pine

623 Atlantic White Cedar

624 Cypress - Pine - Cabbage Palm

625 Hydric Pine Flatwoods

626 Hydric Pine Savanna

627 Slash Pine Swamp Forest

630 Wetland Forested Mixed

631 Wetland Shrub

640 Vegetated Non-Forested Wetlands

641 Freshwater Marshes

646 Treeless Hydric Savanna

650 Non-Vegetated

651 Tidal Flats

652 Shorelines
653 Intermittent Ponds

654 Oyster Bars

(g) 700 BARREN LAND

710 Beaches Other Than Swimming Beaches

720 Sand Other Than Beaches

730 Exposed Rock

731 Exposed Rock with Marsh Grasses

740 Disturbed Land

741 Rural land in transition without positive indicators of intended activity

742 Borrow Areas

743 Spoil Areas

744 Fill Areas <Highways-Railways>

745 Burned Areas

746 Abandoned Railways

747 Dikes and Levees

(h) 800 TRANSPORTATION, COMMUNICATION AND UTILITIES

810 Transportation

811 Airports
- 8111 Commercial
- 8112 General Aviation
- 8113 Private
- 8114 Abandoned

812 Railroads
- 8121 Holding and Trans-shipment Yards
- 8122 Repair Facilities
- 8123 Associated Buildings

813 Bus and Truck Terminals
- 8131 Bus (Commercial)
- 8132 Bus (Government, schools, city service)
- 8133 Truck Terminals

814 Roads and Highways
- 8141 Limited Access (Interstate system)
- 8142 Divided Highways (Federal-State)
- 8143 Two-Lane Highways (State)
- 8144 County Maintained
- 8145 Graded and Drained
- 8146 Primitive/Trails

815 Port Facilities
- 8151 Wharves
- 8152 Piers
- 8153 Terminals (Cargo)
- 8154 Terminals (Passenger)
- 8155 Repair Facilities
- 8156 Shipyards (Building-Fabrication)
- 8157 Ship Chandlers
- 8158 Port Administration and Port Services
- 8159 Facilities Under Construction

816 Canals and Locks
- 8161 Locks
- 8162 Power Supply Buildings

817 Oil, Water or Gas Long Distance Transmission Lines
- 8171 Pipe Lines
- 8172 Pump Stations

818 Auto Parking Facilities <When not directly related to other land use>

819 Transportation Facilities Under Construction
- 8191 Highways
- 8192 Railroads
- 8193 Airports
- 8194 Port Facilities
- 8195 Pipe Lines

820 Communications

821 Transmission Towers
- 8211 Microwave
- 8212 Radio/Television
- 8213 Antenna Farms
- 8214 Navigational Systems (i.e., Loran, ILS)

822 Communication Facilities
- 8221 Telephone
- 8222 Radio
- 8223 Television

829 Communication Facilities under Construction

830 Utilities

831 Electric Power Facilities
- 8311 Thermal
- 8312 Gas Turbine
- 8313 Nuclear
- 8314 Hydro
- 8315 Sub-Stations

832 Electrical Power Transmission Lines
- 8321 Trunk
- 8322 Feeder

833 Water Supply Plants
- 8331 Treatment Plants
- 8332 Settling Plants
- 8333 Water Tanks
- 8334 Well Fields
- 8335 Pumping Stations

834 Sewage Treatment
- 8341 Treatment Plants
- 8342 Lift Stations
- 8343 Aeration Fields

835 Solid Waste Disposal

839 Utilities Under Construction

(i) 900 SPECIAL CLASSIFICATIONS

910 Vegetation

911 Sea Grass
- 9111 Sea Grass, Sparse - Medium
- 9112 Sea Grass, Dense
- 9113 Sea Grass, Patchy
- 6411 Sawgrass
- 6412 Cattail
- 6413 Spike Rush
- 6414 Maidencane
- 6415 Dog fennel and low marsh grasses
- 6416 Arrowroot
- 6417 Freshwater Marsh with shrubs, brushes, and vines
- 6418 Giant Cutgrass

642 Saltwater Marshes
- 6421 Cordgrass
- 6422 Needlerush

643 Wet Prairies

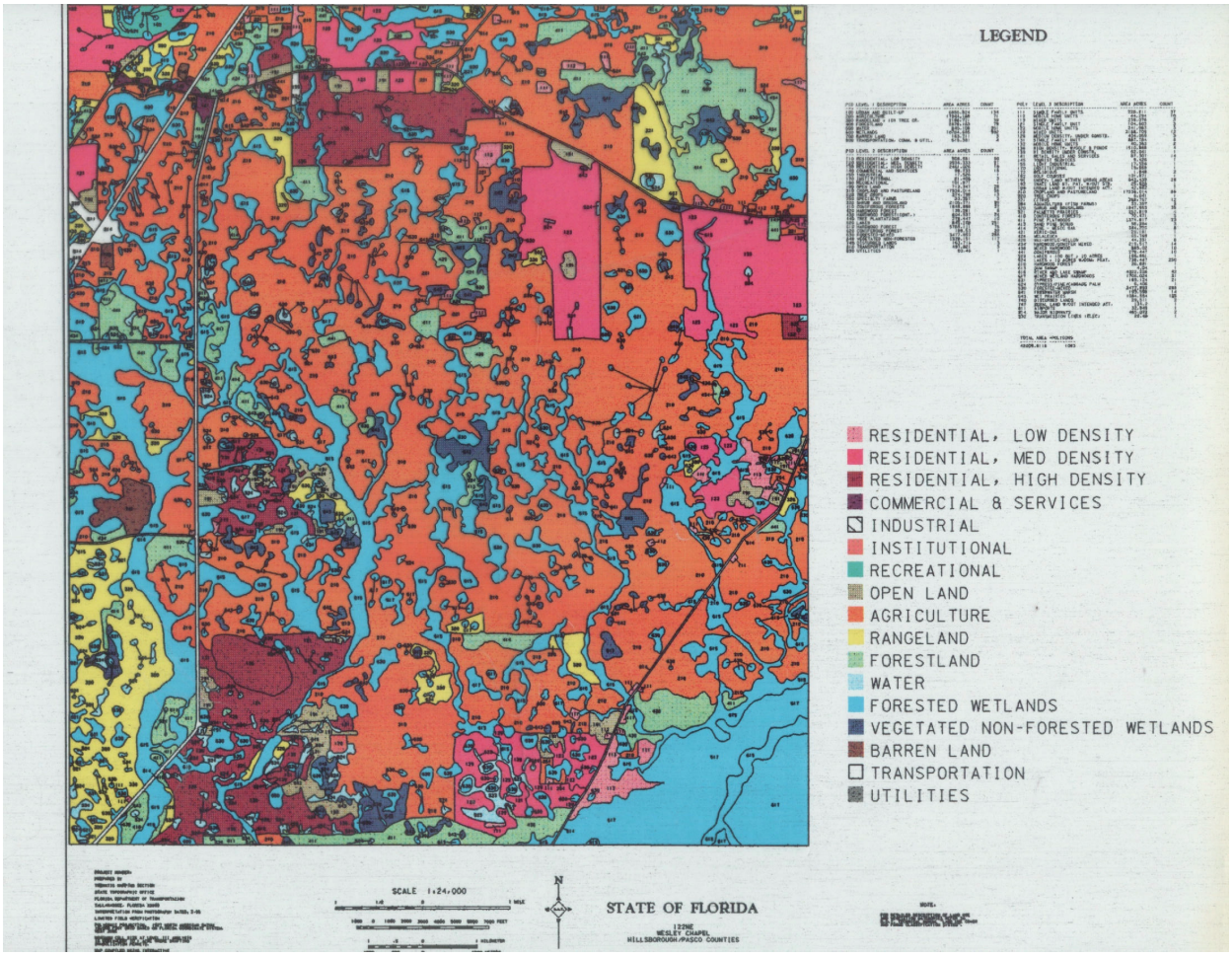
644 Emergent Aquatic Vegetation
- 6441 Water Lettuce
- 6442 Spatterdock
- 6443 Water Hyacinth
- 6444 Duckweed
- 6445 Water Lily

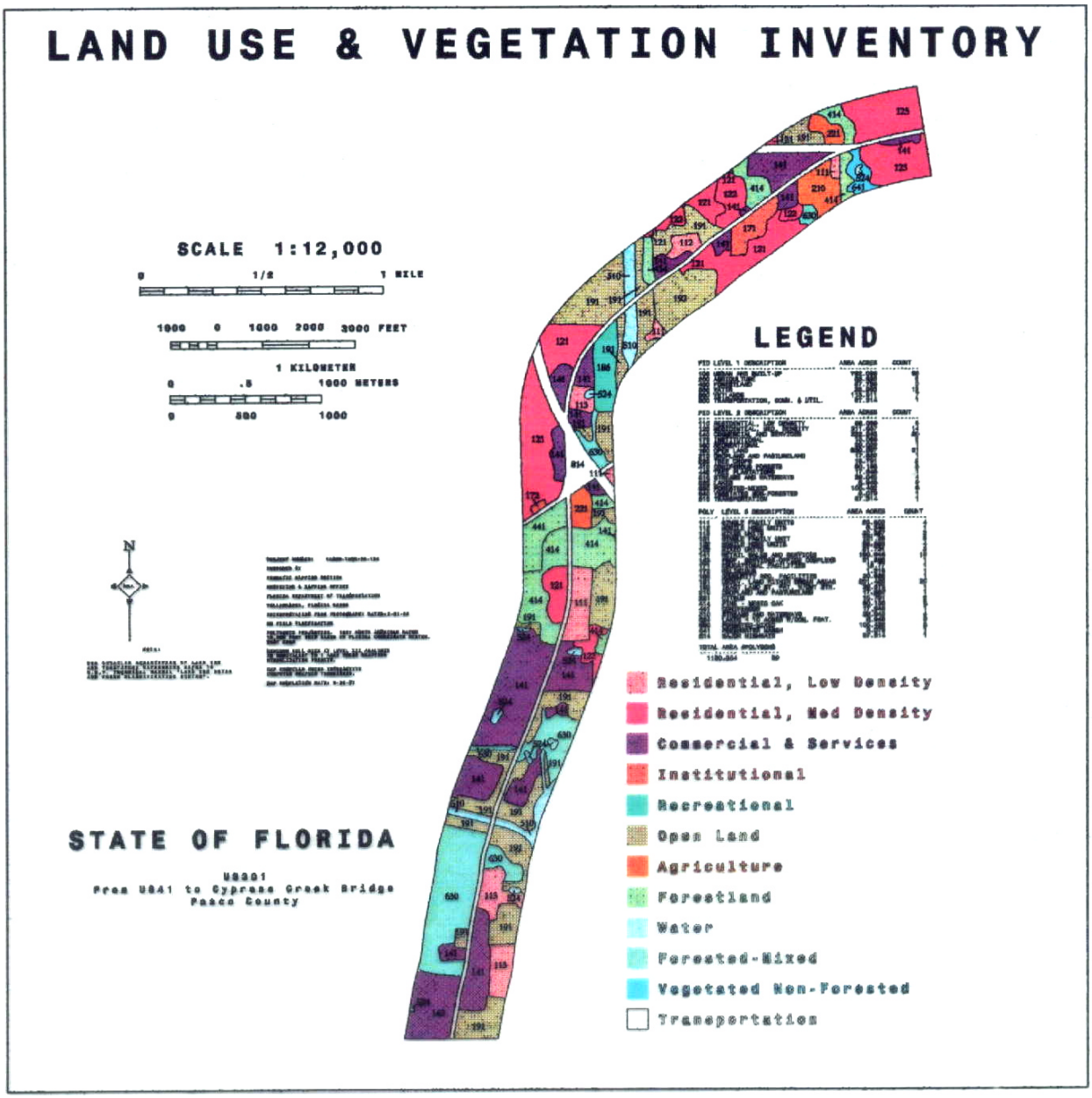
645 Submergent Aquatic Vegetation
- 6451 Hydrilla

(9) APPENDIX B

EXAMPLES OF LAND USE AND VEGETATION INVENTORY MAPS

LAND USE & VEGETATION INVENTORY




LAND USE & VEGETATION INVENTORY
SCALE 1:12,000
0 1/2 1 MILE
1000 0 1000 2000 3000 FEET
1 KILOMETER
0 .5 1000 METERS
0 500 1000
N
LEGEND
Residential, Low Density
Residential, Med Density
Commercial & Services
Institutional
Recreational
Open Land
Agriculture
Forestland
Water
Forested-Mixed
Vegetated Non-Forested
Transportation
STATE OF FLORIDA
US301
From US41 to Cypress Creek Bridge
Pasco County

(10) APPENDIX C

EXAMPLES OF GEOLOGIC FEATURES, SOILS AND DRAINAGE MAPS

GEOLOGICAL FEATURES MAP

PROJECT NUMBER: 99900-1733
PREPARED BY
REMOTE SENSING CENTER
STATE TOPOGRAPHIC BUREAU
FLORIDA DEPARTMENT OF TRANSPORTATION
TALLAHASSEE, FLORIDA 32304
INTERPRETATION FROM PHOTOGRAPHY DATED: MARCH 1949
MAP COMPLETION DATE: DECEMBER 1984

LINEAMENTS

SINKHOLES

SCALE 1:24,000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

1000 500 0 1000 METERS

N

STATE OF FLORIDA

TALLAHASSEE MUNICIPAL AIRPORT

SOILS MAP

PROJECT NUMBER: 99900-1733
PREPARED BY
REMOTE SENSING CENTER
STATE TOPOGRAPHIC BUREAU
FLORIDA DEPARTMENT OF TRANSPORTATION
TALLAHASSEE, FLORIDA 32304
INTERPRETATION FROM PHOTOGRAPHY DATED: MARCH 1949
MAP COMPLETION DATE: DECEMBER 1984

LEGEND

W CLEAN SAND	- CLEAN, FINE TO MEDIUM GRAINED, POORLY GRADED, WELL TO VERY WELL DRAINED.
S SAND	- FAIRLY CLEAN, MEDIUM TO FINE GRAINED, WELL TO POORLY DRAINED.
I IMPURE SAND	- MEDIUM TO FINE GRAINED, FAIR TO POORLY DRAINED, APPRECIABLE AMOUNTS OF ORGANIC MATERIAL.
C CLAY	
F SILTY SAND	- FAIRLY WELL DRAINED, EASILY ERODED.
P PEAT	- PRIMARILY ORGANICS.
M MUCK	- MIXTURE OF SAND, CLAY AND ORGANICS, PLASTIC.
H DISTURBED OR MIXED SOILS.	
LS LIMESTONE	
G GRAVEL	- POORLY GRADED, VERY WELL DRAINED.
W WATER	

NOTE: SUPERPOSITION OF LETTERS IMPLIES VERTICAL LAYERING.
EXAMPLE: SF/C DEPICTS SAND AND SILTY SAND OVER CLAY.

SCALE 1:24,000

1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER
1000 500 0 1000 METERS

N

STATE OF FLORIDA

TALLAHASSEE MUNICIPAL AIRPORT
198

DRAINAGE MAP

PROJECT NUMBER: 99900-1733
PREPARED BY
REMOTE SENSING CENTER
STATE TOPOGRAPHIC BUREAU
FLORIDA DEPARTMENT OF TRANSPORTATION
TALLAHASSEE, FLORIDA 32304

INTERPRETATION FROM PHOTOGRAPHY DATED: MARCH 1984

MAP COMPLETION DATE: JANUARY 1985

SCALE 1:24,000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

1000 500 0 1000 METERS

N

STATE OF FLORIDA

TALLAHASSEE MUNICIPAL AIRPORT
198

CHANNELIZED FLOW

UNCHANNELIZED FLOW

INTERMITTENT POND

WATER BODY

(11) APPENDIX D

COMMON AND SCIENTIFIC NAMES OF MAJOR PLANT SPECIES

Species marked with an asterisk (*) are introduced species.

CONIFEROPHYTA (GYMNOSPERMS)

CONIFERALES

Pinaceae	
Pinus Palustris	Long leaf pine
Pinus echinata	Short leaf pine
Pinus taeda	Loblolly pine
Pinus elliottii var. eliottii	Slash pine
Pinus serotina	Pond pine
Pinus glabra	Spruce pine
Pinus clausa var. clausa	Ocala sand pine
Pinus clausa var. immuginata	Choctwahatchee sand pine
Taxodiaceae	
Taxodium distichum var. distichum	Bald cypress
Taxodium distichum var. nutans	Pond cypress
Cupressaceae	
Chamaecyparis thyoides	Atlantic white cedar
Juniperus silicicola	Southern red cedar

ANTHOPHYTA (ANGIOSPERMS)

MONOCOTS (LILIOPSIDA)

Arecaceae (palmae)	
Sabal palmetto	Cabbage palmetto
Serona repens	Saw palmetto
Salicaceae	
Populus deltoides	Eastern cottonwood
Salix nigra	Black willow
Salix longipes	Coastal plain willow
Sambucus canadensis	Elderberry
Myricaceae	
Myrica cerifera	Wax myrtle
Juglandaceae	
Jublans nigra	Black walnut
Carya glabra	Pignut hickory
Carya illinoensis	Pecan hickory

Carya tomentosa	Mockernut hickory
Carya aquatica	Water hickory
Betulaceae	
Betula nigra	River birch
Carpinus caroliniana	Blue beech
Ostrya virginiana	Hophornbean
Fagaceae	
Fagus grandifolia	American beech
Castanea pumila var. ashei	Ashe Chinkapin
Quercus alba	White oak
Quercus chapmanii	Chapman oak
Quercus durandii	Bluff oak
Quercus falcata	Southern red oak
Quercus incana	Bluejack oak
Quercus laevis	Turkey oak
Quercus laurifolia	Laurel oak
Quercus michauxii	Swamp chestnut oak
Quercus stellata var. margaretta	Sand post oak
Quercus virginiana var. virginiana	Live oak
Quercus virginiana var. geminata	Sand live oak
Ulmaceae	
Celtis laevigata	Sugarberry
Ulmus alata	Winged elm
Ulmus americana var. floridana	Florida elm
Moraceae	
Morus rubra	Red mulberry
Magnoliaceae	
Liriodendron tulipifera	Yellow poplar
Magnolia grandiflora	Evergreen magnolia
Magnolia virginiana	Sweetbay magnolia
Lauraceae	
Cinnamonum camphora*	Camphor tree
Persea americana*	Avocado
Persea borbonia var. borbonia	Redbay
Persea borbonia var. pubescens	Swampbay
Hamamelidaceae	
Liquidambar styracifua	Sweetgum
Platanaceae	
Platanus occidentalis	Sycamore
Rosaceae	

Crataegus sp.	Hawthorn
Prunus angustifolia	Chickasaw plum
Prunus caroliniana	Carolina laurelcherry
Prunus serotina	Black cherry
Fabaceae	
Cercis canadensis	Redbud
Robinia pseudoacacia	Black locust
Albizia julibrissin*	Mimosa tree
Euphorbiaceae	
Aleurites fordii*	Tung-oil tree
Sapium sebiferum*	Chinese tallow tree
Anacardiaceae	
Schinus terebinthifolius*	Brazilian pepper
Cyrillaceae	
Cyrilla racemiflora	Swamp titi
Aquifoliaceae	
Ilex ambigua	Carolina holly
Ilex cassine	Dahoon holly
Ilex glabra	Gallberry
Ilex coriacea	Giant gallberry
Ilex myrtifolia	Myrtle leafed holly
Ilex opaca	American holly
Ilex vomitoria	Yaupon
Aceraceae	
Acer barbatum	Florida sugar maple
Acer negundo	Boxelder
Acer rubrum	Red maple
Acer saccharinum	Silver maple
Hippocastanaceae	
Aesculus pavia	Red buckeye
Tiliaceae	
Tilia caroliniana	Carolina basswood
Nyssaceae	
Nyssa sylvatica var. biflora	Swamp tupelo
Nyssa aquatica	Water tupelo
Theaceae	
Gordonia lasianthus	Loblolly bay
Cornaceae	
Cornus florida	Flowering dogwood
Cornus stricta	Swamp dogwood

Ericaceae	
Vaccinium arboreum	Tree sparkleberry
Lyonia ferruginea	Stagger-bush
Lyonia lucida	Fetter-bush
Ebenaceae	
Diospyros virginiana	Persimmon
Oleaceae	
Chionanthus virginicus	Fringetree
Fraxinus americana	White ash
Fraxinus caroliniana	Carolina (Pop) ash
Caprifoliaceae	
Viburnum scabrellum	Viburnum
Viburnum obovatum	Water Viburnum
Viburnum nudum	Possum-haw Viburnum
Viburnum rufidulum	Rusty black-haw
Myrtaceae	
Eucalyptus sp.*	Eucalyptus
Melaleuca quinquenervia*	Melaleuca
Rhizophoraceae	
Rhizophora mangle	Mangrove
Combretaceae	
Conocarpus erecta	Button-mangrove
Laguncularia racemosa	White-mangrove
Verbenaceae	
Avicennia nitida	Black-mangrove
Buseraceae	
Bursera simaruba	Gumbo-limbo
Myrsinaceae	
Ardisia escallonioies	Marlberry
Myrtaceae	
Eugenia sp.	Stoppers
Rutaceae	
Zanthorylum fagara	Wild lime
Polygonaceae	
Coccoloba uvifera	Seagrape

(12) APPENDIX E

ENGLISH TO METRIC CONVERSIONS

Linear

1 centimeter (cm)	=	10 millimeters (mm)
1 meter (m)	=	10 centimeters
1 meter	=	3.2808 feet (ft)
	=	39.37 inches (in)
1 kilometer (km)	=	1000 meters
1 kilometer	=	0.62137 miles
l mile	=	5280 feet
1 inch	=	25.400 millimeters
1 foot	=	304.80 millimeters

Area

1 square meter	=	10.76 square feet
1 square kilometer	=	247.1 acres
1 hectare	=	2.471 acres

(13) APPENDIX F

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Throughout this manual appear excerpts, citations and references from the sources listed below. Rather than footnoting or citing each of the above, a complete reference listing is given below. Also included are a number of source materials not used in the production of this manual but which may be of interest and utility to users of this manual.

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