

Florida Land Cover Classification System*

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ABSTRACT

The *Florida Comprehensive Wildlife Conservation Strategy* (Strategy) has taken a habitat-based approach to assess the needs and status of wildlife in Florida. However, a single, comprehensive land cover classification is needed to meet the priorities and goals of the Strategy. The feasibility and applicability of classification schemas used within Florida, other states, and nationally was investigated to determine if a currently developed classification could be serve as a model for a classification that could be used to meet the needs of the Strategy. It was determined that a schema that incorporated classifications currently used by the Florida Fish and Wildlife Conservation Commission (FWC), Florida Natural Areas Inventory (FNAI), and Florida's water management districts (WMD) would be the most feasible and produce the most usable land cover dataset. Based on these classifications, a "straw-man" classification was presented to a group of experts in Florida's natural communities, as well as experts in image processing and classification who have been involved in classification of Florida habitats. Meetings with these experts were held and the proposed classification was revised and modified to incorporate, to the greatest extent possible, the currently used classifications and class definitions into a new classification schema. The resultant classification scheme is hierarchical and extensible and can be cross-walked among the currently used and maintained classifications. The ability to cross-walk this classification with other currently used schemas will allow the incorporation of other classification efforts and facilitate collaboration between entities producing land cover datasets. This will

ultimately result in more accurate and reliable land cover classification that will benefit and add value to all currently maintained land cover classification projects, as well as meet the needs of the Strategy.

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INTRODUCTION

The *Florida Comprehensive Wildlife Conservation Strategy* (Strategy) has taken a habitat-based approach to assess the status and needs of more than 900 species, however, a single comprehensive land cover (i.e., habitat) classification system is not currently available. During the development of the Strategy it became apparent that a single classification system that incorporates the level of detail and flexibility needed by the Florida Fish and Wildlife Conservation Commissions (FWC) and its conservation partners is needed for terrestrial species habitat assessment and modeling necessary to meet the goals of the Strategy. Currently, FWC and its conservation partners use different classification schemas that contain vegetative classes that were developed independently and do not correspond with each other due to differences in scale, detail, and class definitions.

In addition to the number of land cover classifications within the state of Florida, there are a variety of other classification schemas that are being developed by other states or by Federal agencies and their partners. Of the later, the most notable initiatives are Natureserves' Terrestrial Ecological System Classification (Comer et al. 2003) and the National Vegetation Classification Standard (NVCS) that was developed by the USGS-NPS and its partners (Anderson et al. 1998, Grossman et. al. 1998). The NVCS classification was adopted as the Federal Geographic Data Committee's standard for vegetation classifications in the U.S. (FGDC 1997). Subsequently, an updated NVCS was developed and this classification is the currently adopted standard (FGDC 2008).

Many other state initiatives to develop their own individualized classification systems are based on these standards.

This project proposed to use available classifications to develop a schema that was extensible and could be modified to meet the needs of FWC and its partners. The current Strategy recognizes 45 habitat types of which 22 are classified as terrestrial or wetland types. Habitats types were developed from a hybridization of classification systems from FWC (Gilbert and Stys 2004, Stys et al. 2004), Florida Natural Areas Inventory (FNAI 1990), and Florida Department of Transportation (FDOT 1999) that the 5 Water Management Districts (WMD) use as a basis for their classifications. However, the Strategy also recognizes the shortcomings of this classification system and a more robust vegetation classification system that will adequately account for the wide-ranging habitat needs of species that use habitats at different spatial and temporal scales has been recommended for inclusion in the revision of the Strategy. The Strategy also identifies as a “Priority Data Gap” the need for data layers that reflect the true spatial extent and/or configuration for some habitats and other habitats that should be revised (Florida Fish and Wildlife Conservation Commission 2005, p. 48). Results from this project will facilitate the creation of these data layers to address this data gap and produce a habitat classification system with well-defined habitat classes that are unique to the state of Florida but can also be incorporated with schemas in neighboring states, as well as regionally. A common habitat classification will allow for easier integration of species-specific research projects initiated by the implementation of the Strategy to keep common species common.

The objectives of this work were to identify current and potential conservation partners and stakeholders and design and develop, with these conservation partners, a standardized, hierarchical, and consistently defined land cover classification system containing systematic and strict class boundary definitions. The ultimate goal of this project was to produce a land cover classification system that meets the needs of FWC and its conservation partners but is also flexible and extensible to incorporate future changes and additions. Ideally this classification system will incorporate the land cover classification systems currently being used and developed throughout Florida that will facilitate the exchange of data produced for different purposes that can be used by all parties to meet the needs for implementation of the Strategy, as well as other needs related to the conservation of fish and wildlife and their habitats in Florida. It is important to note that this project is limited to developing a classification system for terrestrial, wetland, and inland aquatic (i.e. non-marine) habitats and does not attempt to develop a classification system for marine habitats. However, other initiatives are currently underway to develop a classification system for marine habitats that will likely need to be reconciled with this classification for habitats that are transitional between the marine and non-marine classification systems.

METHODS

I identified and reviewed existing land cover classification systems that were developed or being used within Florida and in other states. To assess different classification schemas, I considered and used the specifications and requirements identified by the

USGS–NPS Vegetation Characterization Program

(<http://biology.usgs.gov/npsveg/nvcs.html>):

- The system must be based on a sound scientific approach that is a logical progression from historical methods
- The approach must be repeatable and based on standard field and data analysis methods
- The system must classify existing biological associations that repeat across the landscape
- The classification units must be ecologically meaningful.
- The classification must be mappable from imagery.
- The classification system must be hierarchically organized such that it can be applied at multiple scales.
- The system must identify classification units that are appropriately scaled to meet objectives for biodiversity conservation, as well as resource and ecosystem management needs.
- The system must be flexible and open ended such that it will allow for additions, modifications and continuous refinement.
- The system must be well documented.
- The system should be able to be cross-walked between other frequently used systems.

Concurrent with the assessment of existing classification systems, I identified and contacted individuals that were involved with existing land cover and land use

classifications within Florida. While consulting with experts using other classifications within Florida, I used the FWC classification (Gilbert and Stys 2003), a draft update to FNAI's Natural Communities Classification (FNAI 1990), and the Florida Land Use, Cover and Forms Classification System (FLUCCS; FDOT 1999) to develop a "straw-man" classification to serve as a starting point for the development of a new classification schema.

The "straw-man" classification that was presented to classification experts who attended the first meeting held in Ocala, Florida (2-3 June 2009). I revised the classification and assigned definitions to each class based on feedback from experts and held a follow-up meeting in Ocala, Florida (24-25 September 2009). Based on feedback received at these meetings and comments from other experts that could not attend either of the classification meetings a new habitat classification schema was developed that incorporates the classes found in the FNAI, FWC, and FLUCCS schemas, as well as modifications of WMD modifications to FLUCCS.

I distributed for review versions of the draft classification hierarchy and definitions after modifications were made based on comments from experts and suggestions and advice provided at the classification meetings. The results of feedback and reviews are presented in this report.

RESULTS

Based on the specifications and requirements identified by the USGS–NPS Vegetation Characterization Program, research into other classification schemas used throughout the

U.S., and advice by classification experts, it became apparent that the most feasible classification would incorporate the most widely used classifications currently used within Florida. The FNAI, FWC, and FLUCCS/WMD classifications are the most widely used large scale land cover classifications that can be applied statewide and were used to develop this new schema that incorporates the classes of each system.

Classification Scheme

The classification hierarchy and numbering system (Appendix A) was modeled after the FLUCCS system (FDOT 1999). Although the numbering system does not match the FLUCCS numbering system it is arranged in hierarchical levels with each level containing land cover information of increasing specificity. All terrestrial natural communities identified by FNAI's Guide to the Natural Communities of Florida (FNAI 2009) are represented in the classification. Despite a few upper level classes in the FLUCCS classification that are not represented (e.g. rangeland) most classes and subclasses are incorporated into the classification, as well as the FLUCCS classes added or modified by the various WMD's. All classes from FWC's land cover classification (Gilbert and Stys 2003, Stys et al. 2004) are also included in the classification system.

The highest level of differentiation among habitat classes is by Upland, Wetland, or Exotic categories. Wetland classes are further divided into subclasses that follows those identified by Cowardin et al. (1979) and that have been adopted as a standard by the FGDC (2009) and include palustrine (Class 2000), riverine (Class 3000), lacustrine (Class 4000), estuarine (Class 5000), and marine (Class 6000). Uplands are those

terrestrial habitats (Class 1000) that do not meet the definition of wetland or deep-water habitats while the exotic category (Class 7000) contains habitat classes that are dominated by introduced, non-native species. Within each of these classes a cultural subclass is used to identify those habitat classes that are influenced by human disturbance (i.e. developed or human-impact) or maintained in a "non-natural" state. Cultural classes were adopted from a classification completed by the New York Natural Heritage Program (NYNHP, Edinger et al. 2002).

Generally, the numbering system used accommodated the number of subclasses in each class; however, due to the number of subclasses, it was necessary to split the Marsh class into two classes (2120 and 2130). No other classes were required to be split. Once all classes were identified and assigned a hierarchical number, a crosswalk of all classes used was completed (Appendix B).

Class Definitions

Existing class definitions were adopted from currently used classifications systems when possible. Capsule descriptions from FNAI's Guide to Natural Communities of Florida (FNAI 1990, 2010) were used and readers are encouraged to read the full class descriptions available on their website (www.fnai.org). Class descriptions from FWC (Gilbert and Stys 2003), SJWMD (SJWMD 2004), SFWMD (SFWMD 2004), FLUCCS (FDOT 1999) and NYNHP (Edinger et al. 2002) were used in their entirety, in part, or modified to meet the needs of this classification. The source for each definition is noted parenthetically after the definition. No source is noted if no definition was available for

adoption and the class definition was independently developed specifically for this classification. The class definitions are as follows:

Uplands

1000 Terrestrial

The terrestrial system consists of upland habitats that have well-drained soils that are dry to mesic (never hydric), and vegetative cover that is never predominantly hydrophytic, even if the soil surface is occasionally or seasonally flooded or saturated. This is a broadly defined system that includes everything except aquatic, wetland, and exotic communities.

1100 Hardwood Forested Uplands

Mesic or xeric forest dominated mainly by hardwood trees. (FNAI)

1110 Upland Hardwood Forest

Upland with sand/clay and/or calcareous substrate; mesic; Panhandle to central peninsula; rare or no fire; closed deciduous or mixed deciduous/evergreen canopy; American beech, southern magnolia, hackberry, swamp chestnut oak, white oak, horse sugar, flowering dogwood, and mixed hardwoods. (FNAI)

1111 Dry Upland Hardwood Forest

Occur on dry slopes or along upper slopes with sand/clay substrate; mesic; temperate; rare fire; closed canopy; laurel oak and/or live oak and/or pignut hickory, southern magnolia, shortleaf pine, loblolly pine, and/or mixed hardwoods. (FNAI)

1112 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. (FLUCCS)

1120 Mesic Hammock

Flatland with sand/organic soil; mesic; primarily central peninsula; occasional or rare fire; live oak, cabbage palm, southern magnolia, pignut hickory, saw palmetto. (FNAI)

1121 Evergreen Levee Hammock

Occurs on high levees within floodplains; eastern panhandle and northern peninsula, particularly on the Suwannee River; rare fire; live oak and/or water oak dominant. (FNAI)

1122 Prairie Mesic Hammock

Isolated stands within a matrix of pyrogenic vegetation; occasional fire; live oak, cabbage palm, saw palmetto. (FNAI)

1123 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. (FLUCCS)

1124 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 alongside these pine species under mesic conditions. Gallberry, wax myrtle and saw palmetto are among the common understory species. (FLUCCS)

1125 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. (FLUCCS)

1130 Rockland Hammock

Flatland with limestone substrate; mesic; southern peninsula and Keys; rare or no fire; closed canopy of evergreen mixed tropical hardwoods; gumbo limbo, pigeon plum, stoppers. (FNAI)

1131 Thorn Scrub

Found along ecotones or within openings in rockland hammock; low-statured; dominated by spiny species; saffron plum, blackbead, hog plum, buttonwood, plus other common rockland hammock species. (FNAI)

1140 Slope Forest

Steep slope on bluff or in sheltered ravine within the Apalachicola drainage; sand/clay substrate; mesic-hydric; central panhandle; rare or no fire; closed canopy of mainly deciduous species; American beech, Florida maple, white oak, Ashe's magnolia, southern magnolia, spruce pine, Shumard's oak. (FNAI)

1150 Xeric Hammock

Upland with deep sand substrate; xeric; primarily eastern Panhandle to central peninsula; rare or no fire; closed canopy of evergreen hardwoods; sand live oak, saw palmetto. (FNAI)

1200 High Pine and Scrub

Hills with mesic or xeric woodlands or shrublands; canopy, if present, open and consisting of pine or a mixture of pine and deciduous hardwoods. (FNAI)

1210 Scrub

Upland with deep sand substrate; xeric; statewide except extreme southern peninsula and Keys, mainly coastal in Panhandle; occasional or rare fire; open or dense shrubs with or without pine canopy; sand pine and/or scrub oaks and/or Florida rosemary. (FNAI)

1211 Oak Scrub

Oak scrub is a xeric hardwood community typically consisting of clumped patches of low growing oaks interspersed with bare areas of white sand. This community occurs on areas of deep, well-washed, sterile sands, and it is the same understory complex of scrubby oaks and other ground cover species that occurs in the sand pine scrub community. Dominated by scrubby oaks; myrtle oak, Chapman's oak, sand live oak. (FWC)

1212 Rosemary Scrub

Found on the driest ridge crests, particularly at the southern end of the Lake Wales Ridge and on Panhandle barrier islands; occasional or rare fire (10-40 years); dominated by Florida rosemary with large areas of bare sand visible between the shrubs. (FNAI)

1213 Sand Pine Scrub

Found on ridges throughout the state; rare fire (20-80 years); canopy of sand pine and an understory of the three shrubby oaks, myrtle oak, Chapman's oak, sand live oak, or less commonly, Florida rosemary. (FNAI)

1214 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. (FLUCCS)

1220 Upland Mixed Woodland

Upland with loamy soils; mesic-xeric; central panhandle to extreme northern central peninsula; occasional fire (variable but as little as two up to 20 year interval); open to partially closed canopy over an open understory of mixed herbs and scattered shrubs; mixture of southern red oak, mockernut hickory, and longleaf or shortleaf pine with other mixed hardwoods; wiregrass infrequent. (FNAI)

1230 Upland Coniferous

Upland with sand/clay substrate; mesic-xeric; longleaf pine and/or loblolly pine and/or shortleaf pine. (FNAI)

1231 Upland Pine

Upland with sand/clay substrate; mesic-xeric; panhandle to extreme northern central peninsula; frequent fire (1-3 years); widely spaced canopy of pine over primarily herbaceous understory; longleaf pine and/or loblolly pine and/or shortleaf pine, southern red oak, wiregrass. (FNAI)

1240 Sandhill

Upland with deep sand substrate; xeric; panhandle to central peninsula; frequent fire (1-3 years); open canopy of longleaf pine and/or turkey oak with wiregrass understory. (FNAI)

1300 Pine Flatwoods and Dry Prairie

Mesic pine woodland or mesic shrubland on flat sandy or limestone substrates, often with a hard pan that impedes drainage (FNAI)

1310 Dry Flatwoods

Non-hydric flatwoods.

1311 Mesic Flatwoods

Flatland with sand substrate; mesic; statewide except extreme southern peninsula and Keys; frequent fire (2-4 years); open pine canopy with a layer of low shrubs and herbs; longleaf pine and/or slash pine, saw palmetto, gallberry, dwarf live oak, wiregrass. (FNAI)

1312 Scrubby Flatwoods

Flatland with sand substrate; xeric-mesic; statewide except extreme southern peninsula and Keys; occasional fire (5-15 years); widely scattered pine canopy over saw palmetto and scrub oaks; longleaf pine, sand live oak, myrtle oak, Chapman's oak, saw palmetto, wiregrass. (FNAI)

1320 Pine Rockland

Flatland with exposed limestone substrate; mesic-xeric; southern peninsula and Keys; frequent to occasional fire (3-7 years); open pine canopy with mixed shrubs and herbs in understory; south Florida slash pine, palms, mixed tropical and temperate shrubs, grasses, and herbs (FNAI).

1330 Dry Prairie

Flatland with sand soils over an organic or clay hardpan; mesic-xeric; central peninsula; annual or frequent fire (1-2 years); treeless with a low cover of shrubs and herbs; wiregrass, dwarf live oak, stunted saw palmetto, bottlebrush threawn, broomsedge bluestem. (FNAI)

1340 Palmetto Prairie

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. (FLUCCS)

1400 Mixed Hardwood-Coniferous

Mix of hardwood and coniferous trees where neither is dominant.

1410 Successional hardwood forest

Hardwood forests where pines are encroaching.

1500 Shrub and Brushland

This association includes a variety of situations where natural upland community types have been recently disturbed through clear-cutting commercial pinelands, land clearing, or fire, and are recovering through natural successional processes. This type could be characterized as an early condition of old-field succession, and various shrubs, tree saplings, and lesser amounts of grasses and herbs dominate the community. Common species include wax myrtle, saltbush, sumac, elderberry, saw palmetto, blackberry, gallberry, fetterbush, staggerbush, broomsedge, dog fennel, together with oak, pine and other tree seedlings or saplings. (FWC)

1510 Other Shrubs and Brush

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

1600 Coastal Uplands

Mesic or xeric communities restricted to barrier islands and near shore; woody or herbaceous vegetation; other communities may also occur in coastal environments. (FNAI)

1610 Beach Dune

Active coastal dune with sand substrate; xeric; statewide; rare or no fire; marine influence; open herbaceous vegetation with no canopy; sea oats, railroad vine, bitter panicum, and/or mixed salt-spray tolerant grasses and herbs. (FNAI)

1620 Coastal Berm

Old bar or storm debris with sand/shell substrate; xeric-mesic; southern peninsula and Keys; rare or no fire; marine influence; variable vegetation structure; mixed tropical herbs, shrubs, and trees. (FNAI)

1630 Coastal Grassland

Coastal flatland behind dunes with stable sand substrate; mesic-hydric; statewide excluding Keys; occasional fire; marine influence; herbaceous vegetation with no canopy; salt-tolerant grasses and herbs; sea oats, bitter panicum, camphorweed, hairawn muhly, Gulf bluestem. (FNAI)

1640 Coastal Strand

Stabilized coastal dune with sand substrate; xeric; peninsula; rare fire; marine influence; primarily dense shrubs; saw palmetto in temperate coastal strand or seagrape and/or saw palmetto in tropical coastal strand. (FNAI)

1650 Maritime Hammock

Stabilized coastal dune with sand substrate; xeric-mesic; statewide but rare in panhandle and Keys; rare or no fire; marine influence; evergreen closed canopy; live oak, cabbage palm, red bay, red cedar in temperate maritime hammock; gumbo limbo, seagrape, and white or Spanish stopper in tropical maritime hammock. (FNAI)

1660 Shell Mound

Small hill of shells deposited by Native Americans; mesic-xeric; statewide; rare or no fire; marine influence; closed canopy of mixed hardwoods; soapberry, snowberry, white stopper. (FNAI)

1670 Sand Beach (Dry)

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. (FLUCCS)

1700 Barren, Sinkhole, and Outcrop Communities

Small extent communities in karst features or on exposed limestone. (FNAI)

1710 Sinkhole

Karst feature with steep walls; mesic-hydric; statewide; variable vegetation structure. (FNAI)

1720 Upland Glade

Upland with thin clay soils over limestone outcrops; hydric-xeric; central panhandle only; sparse mixed grasses and herbs with occasional stunted trees and shrubs that are concentrated around the edge; black bogrush, poverty dropseed, diamond flowers, hairawn muhly, Boykin's polygala, red cedar. (FNAI)

1730 Limestone Outcrop

Exposed limestone; mesic-hydric; statewide; often with mosses, liverworts, and a diversity of rare ferns. (FNAI)

1740 Keys Cactus Barren

Small openings on flatland with exposed limestone; xeric; restricted to Keys; marine influence; open, herbaceous vegetation with some cacti, agave, and stunted trees; three-spined pricklypear, erect pricklypear, barbed wire cactus, Yucatan fly mallow, Florida Keys indigo, skyblue clustervine, dwarf bindweed. (FNAI)

1750 Bare Soil

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. (FLUCCS)

1760 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. (FLUCCS)

1761 Exposed Rock w/ Marsh Grasses

Mix of exposed rock with various marsh grasses

1800 Cultural - Terrestrial

Includes communities that are both created and maintained by human activities, or are modified by human influence to such a degree that the physical conformation of the substrate, or the biological composition of the resident community is substantially different from the character of the substrate or community as it existed prior to human influence. (NYNHP)

1810 Mowed Grass

These are non-urban upland communities where the predominant vegetative cover is very low growing grasses and forbs. This very early successional category includes all sites with herbaceous vegetation during the time period between bare ground, and the shrub and brush stage. It also includes areas that may be maintained in this stage through periodic mowing, such as along dikes or levees.

1811 Vegetative Berm

1812 Highway Rights of Way

1820 Urban

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, be isolated from urban areas. (FLUCCS)

1821 Low Intensity Urban

Less than two dwelling units per acre. Areas of low intensity residential land use (generally less than one dwelling unit per five acres), such as farmsteads, will be incorporated into the rural structures category. (FLUCCS in part)

18211 Urban Open Land

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. (FLUCCS)

182111 Urban Open Forested

Urban open but with scattered to dense hardwoods. May be mix of hardwood and conifer but largely succeeded to hardwood. Differs from Successional Hardwood Forest in that ground typically appears disturbed or improved.

182112 Urban Open Pine

Urban Open but with scattered to dense pines. Ground typically appears disturbed or improved.

18212 Residential, Low density

Structures within low intensity urban areas.

18213 Grass

Mowed lawn in low density residential areas. Includes recreational or unpaved airport runways in which the groundcover is dominated by clipped grasses and there is less than 30% cover of trees. Ornamental and/or native shrubs may be present, usually with less than 50% cover. The groundcover is maintained by mowing. (FLUCCS)

- 182131 Parks and Zoos
- 182132 Golf courses
- 182133 Ball fields
- 182134 Cemeteries
- 182135 Community recreational facilities

18214 Trees

Trees within low density residential areas. May include native and/or ornamental trees.

1822 High Intensity Urban

Residential density > 2 dwelling/acre, commercial, industrial, and institutional (FLUCCS)

18221 Residential, Med. Density - 2-5 Dwelling Units/ac

Rural and recreational types of subdivisions will be included in the Residential category since this land is almost entirely committed to residential use even though forest or open areas may be present also. (SJRWMD)

18222 Residential, High Density > 5 Dwelling Units/ac

Unvegetated areas such as roads, residential and commercial buildings, parking lots, etc. (FWC)

18223 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. (FLUCCS)

18224 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. (FLUCCS)

18225 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. (FLUCCS)

1830 Rural

1831 Rural Open

Herbaceous or shrubby vegetated areas in a rural setting. Ground typically appears improved or disturbed to some degree.

18311 Rural Open Forested

Rural Open but with scattered to dense hardwoods. May be mix of hardwood and conifer but largely succeeded to hardwood. Differs from Successional Hardwood Forest in that ground typically appears disturbed or improved.

183111 Oak - Cabbage Palm Forests

This class is characterized by a closed canopy of hardwood species, primarily Live Oak and Cabbage Palm, that are naturally protected from fire by its position on the landscape. This community has been heavily impacted by human activity, primarily clearing for agriculture and urbanization. Soils and understory vegetation, which are often the only shaded habitat in a landscape of prairie, pasture, pineland or marsh, are often trampled and compacted by cattle. The canopy closure must be 25% or more with at least 67% or more dominance by the combination of Live Oak and Cabbage Palm for inclusion in this class. (SFWMD)

18312 Rural Open Pine

Rural Open but with scattered to dense pines.

1832 Rural Structures

Structures located in rural setting including barns, residencies, and other out-buildings including yards and maintained areas surrounding structures.

1833 Agriculture

Lands that are cultivated to produce food crops and livestock. (FLUCCS)

18331 Cropland/Pasture

Agricultural land which is managed for the production of row or field crops and improved, unimproved and woodland pastures. (FLUCCS)

183311 Row Crops

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

1833111 Irrigated Row Crops

Row crops that show photographic evidence of irrigation primarily from center pivot irrigation however agricultural lands that utilize other irrigation methods (eg. water reel) also fall into this class.

183312 Field Crops

Wheat, oats, hay, sugarcane, and grasses are the primary types identified as field crops. (FLUCCS)

1833121 Sugarcane

183313 Improved Pasture

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. (FLUCCS)

183314 Unimproved/Woodland Pasture

Includes cleared or forest 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. (FLUCCS)

183315 Other Open Lands – Rural

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

1833151 Fallow Cropland

18332 Orchards/Groves

This class is for active tree cropping operations that produce fruit, nuts, or other resources not including wood products. (SJRWMD)

183321 Citrus

Agricultural lands planted to groves of citrus (e.g., oranges, grapefruit, lemons). (FWC)

183322 Fruit Orchards

Peaches are an example of a crop type which is typical for this category. (FLUCCS)

183323 Pecan

Actively managed pecan orchards

183324 Fallow Orchards

Groves or orchards that are no longer being actively managed as tree crops and are essentially out of production. Examples include citrus and pecans. (SJRWMD)

18333 Tree Plantations

183331 Hardwood Plantations

Hardwood plantations that are artificially generated by planting seedling stock or seeds.

183332 Coniferous Plantations

Pine plantations that are artificially generated by planting seedling stock or seeds. (SJRWMD)

1833321 Wet Coniferous Plantations

Pine plantations that are artificially generated by planting seedling stock or seeds; seasonally inundated.

18334 Vineyard and Nurseries

Includes tree nurseries, sod farms, and three classes of ornamentals. Miscellaneous uses that would belong include vineyards and nurseries other than for trees. (SJRWMD)

183341 Tree Nurseries

Nurseries that grow trees for transfer to other destinations. There may be other products grown at the facility, such as flowers and ornamentals, but they are not the predominant use. Trees may be grown in-ground or in containers. (SJRWMD)

183342 Sod Farms

Sod (turf) farms. They are usually large, intensively managed areas of short, uniform turf. The crop requires extensive fertilization and machinery, reflected in buildings, tanks, and storage areas. (SJRWMD)

183343 Ornamentals

Facilities that raise ornamental plants for off-site use. It does not include ornamental trees, which are classed in Tree nurseries. (SJRWMD)

183344 Vineyards

Lands devoted to cultivating grape vines. (FLUCCS)

183345 Floriculture

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

18335 Other Agriculture

183351 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. (FLUCCS)

183352 Specialty Farms

Includes a variety of special or unique farming activities such as thoroughbred horse farms and dog kennels. (FLUCCS)

1840 Transportation

Transportation facilities are used for the movement of people and goods. Highways include areas used for interchanges, limited access rights-of-way and service facilities. 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). (FLUCCS)

1841 Roads

1842 Rails

1850 Communication

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. (FLUCCS)

1860 Utilities

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. (FLUCCS)

1870 Extractive

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. (FLUCCS)

1871 Strip Mines

1872 Sand and Gravel Pits

1873 Rock Quarries

1874 Oil and Gas Fields

1875 Reclaimed Lands

1876 Abandoned Mining Lands

1877 Spoil Area

1880 Bare Soil/Clear Cut

Areas of bare soil representing recent timber cutting operations, areas devoid of vegetation because of recent fires, natural areas of exposed bare soil (e.g., sandy areas within xeric communities), or bare soil exposed due to vegetation removal for unknown reasons. (FWC)

Wetlands

2000 Palustrine

The palustrine system consists of non-tidal, perennial wetlands characterized by emergent vegetation. The system includes wetlands permanently saturated by seepage, permanently flooded wetlands, and wetlands that are seasonally or intermittently flooded (these may be seasonally dry) if the vegetative cover is predominantly hydrophytic and soils are hydric. Wetland communities are distinguished by their plant composition (hydrophytes), substrate (hydric soils), and hydrologic regime (frequency of flooding) (Cowardin 1979).

2100 Freshwater Non-Forested Wetlands

Herbaceous or shrubby palustrine communities in floodplains or depressions; canopy trees, if present, very sparse and often stunted. (FNAI)

2110 Prairies and Bogs

Short hydroperiod; dominated by grasses, sedges, and/or titi. (FNAI)

2111 Wet Prairie

Flatland or slope with sand or clayey sand substrate; usually saturated but only occasionally inundated; statewide excluding extreme southern peninsula; frequent fire (2-3 years); treeless, dense herbaceous community with few shrubs; wiregrass, blue maidencane, cutthroat grass, wiry beaksedges, flattened pipewort, toothache grass, pitcherplants, coastalplain yellow-eyed grass. (FNAI)

21111 Wiregrass Savanna

Drier form of wet prairie; often dominated mainly by dense wiregrass with hydrophytic herbs common. (FNAI)

21112 Cutthroat Seep

Eastern and western edges of the Lake Wales Ridge in central Florida; dominated by the endemic cutthroat grass. (FNAI)

21113 Calcareous Wet Prairie

Found in central and south-central peninsula on calcareous soils; Gulf hairawn muhly typically dominant with other calcium-loving species. (FNAI)

21114 Pitcherplant Prairie

Found only in the Panhandle on wetter soils; dense stands of tall pitcherplants. (FNAI)

2112 Mixed Scrub-Shrub Wetland

Wetlands areas that are dominated by woody vegetation less than 20 feet in height. This can occur in many situations, but in most cases involves transitional or disturbed communities on drier sites. Persistent examples of shrub wetlands include shrub bogs and willow swamps. (SJRWMD)

21121 Shrub Bog

Wetland on organic soil over sand; soil often saturated and mucky, occasionally shallowly inundated; Panhandle to north peninsula; occasional fire (10-20 years); dense stand of shrubs, trees absent or sparse, sphagnum moss common; titi, black titi, fetterbush, large gallberry, laurel greenbrier, pond pine or slash pine. (FNAI)

2113 Marl Prairie

Flatland with marl over limestone substrate; seasonally inundated (<4 months); southern peninsula; frequent to occasional fire (2-10 years depending on density of herbs); purple muhly, sawgrass (stunted), spreading beaksedge, black bogrush, Florida little bluestem, and/or mixed grasses, sometimes with dwarf cypress. (FNAI)

2114 Seepage Slope

On or at base of slope with loamy sand substrate; maintained by downslope seepage, usually saturated but rarely inundated; Panhandle and northern peninsula; frequent fire (1-3 years); dense herbaceous community; wiregrass, wiry beaksedges, flattened pipewort, toothache grass, pitcherplants. (FNAI)

2120 Marshes

Long hydroperiod; dominated by grasses, sedges, broadleaf emergents, floating aquatics, or shrubs. (FNAI)

2121 Isolated Freshwater Marsh

21211 Depression Marsh

Small, isolated, often rounded depression in sand substrate with peat accumulating toward center; surrounded by fire-maintained community; seasonally inundated; still

water; statewide excluding Keys; frequent or occasional fire; largely herbaceous; maidencane, sawgrass, pickerelweed, longleaf threeawn, sand cordgrass, and peelbark St. John's wort. (FNAI)

21212 Basin Marsh

Basin with peat or sand substrate; seasonally inundated; statewide; occasional fire; largely herbaceous; maidencane, sawgrass, bulltongue arrowhead, pickerelweed, Baker's cordgrass, white water lily. (FNAI)

2122 Coastal Interdunal Swale

Linear wetlands between dunes on sandy barrier islands; inundated by local rainfall events; Panhandle to central peninsula; herbaceous or shrubby; sawgrass, hairawn muhly, broomsedge, seashore paspalum, Baker's cordgrass, saltmeadow cordgrass, wax myrtle, coastalplain willow. (FNAI)

2123 Floodplain Marsh

Floodplain with organic/sand/alluvial substrate; seasonally inundated; Panhandle to central peninsula; frequent or occasional fire (ca. 3 years, much less frequent in freshwater tidal marshes); treeless herbaceous community with few shrubs; sawgrass, maidencane, sand cordgrass, and/or mixed emergents. (FNAI)

21231 Freshwater Tidal Marsh

River mouth wetland on organic/alluvial substrates; receives pulses of freshwater in response to tides; sawgrass, giant cutgrass. (FNAI)

2124 Slough Marsh

Broad, shallow channel with sand/peat substrate; seasonally inundated; intermittently flowing water; central to southern peninsula (3-10 years); frequent or occasional fire; sawgrass, maidencane, pickerelweed, and/or mixed emergents. (FNAI)

2125 Glades Marsh

Broad, shallow channel with peat/marl substrate directly overlying limestone; seasonally inundated; slow flowing water; south of Lake Okeechobee in central and southern peninsula; frequent to occasional fire (3-10 years); sawgrass, spikerush, maidencane, beaksedges, mixed emergents. (FNAI)

21251 Keys Freshwater Marsh

Limestone depression; restricted to Florida Keys; may be saline during dry season; sawgrass. (FNAI)

2130 Marshes (Continued)

Freshwater marshes classified on dominant hydrophytic vegetation.

- 2131 Sawgrass
- 2132 Cattail
- 2133 Spike Rush
- 2134 Maidencane
- 2135 Dog Fennel and Low Marsh Grasses
- 2136 Arrowroot
- 2137 Giant Cutgrass
- 2138 Buttonbush
- 2139 Other spp.

2140 Floating/Emergent Aquatic Vegetation

Includes both floating vegetation and vegetation which is found either partially or completely above the surface of water. (FLUCCS)

2141 Slough

Broad, shallow channel with peat; inundated except during droughts; flowing water; statewide excluding Keys; rare fire; sparsely canopied or with emergent or floating plants; alligator flag, American white waterlily. (FNAI)

21411 Pond Apple Slough

Canopied sloughs dominated by pond apple, often with abundant epiphytes. (FNAI)

Additional Floating/Emergent Aquatic Classes are differentiated by dominant vegetation.

- 2142 Water Lettuce
- 2143 Spatterdock
- 2144 Water Hyacinth
- 2145 Duck Weed
- 2146 Water Lily
- 2147 Other spp.

2150 Submergent Aquatic Vegetation

Composed of those aquatic species or communities found growing completely below the surface of the water. (FLUCCS)

2200 Freshwater Forested Wetlands

Floodplain or depression wetlands dominated by hydrophytic trees. (FNAI)

2210 Cypress/Tupelo (including mixed Cypress/Tupelo)

Dominated entirely by cypress or tupelo, or these species important in the canopy; long hydroperiod. (FNAI)

2211 Cypress

Dominated entirely by cypress, or these species important in the canopy; long hydroperiod. (FNAI)

2212 Tupelo

Dominated entirely by tupelo, or these species important in the canopy; long hydroperiod. (FNAI)

2213 Isolated Freshwater Swamp

22131 Dome Swamp

Small or large and shallow isolated depression in sand/marl/limestone substrate with peat accumulating toward center; occurring within a fire-maintained community; seasonally inundated; still water; statewide excluding Keys; occasional or rare fire; forested, canopy often tallest in center; pond cypress, swamp tupelo. (FNAI)

221311 Stringer Swamp

Narrow linear swamps; occur within a pyrogenic community along intermittent streams that only flow during heavy rainfall; Panhandle; dominated by pond cypress. (FNAI)

221312 Gum Pond

Underlain by a clay lens; generally, occurs in upland pine; mainly Panhandle; longer hydroperiod and lower fire frequency than cypress-dominated dome swamps; dominated by swamp tupelo. (FNAI)

22132 Basin Swamp

Typically, large basin wetland with peat substrate; seasonally inundated; still water or with water output; Panhandle to central peninsula; occasional or rare fire; forest of cypress/tupelo/mixed hardwoods; pond cypress, swamp tupelo. (FNAI)

2214 Strand Swamp

Broad, shallow channel with peat over mineral substrate; situated in limestone troughs; seasonally inundated; slow flowing water; vicinity of Lake Okeechobee southward in the central and southern peninsula; occasional or rare fire; closed canopy of cypress and mixed hardwoods; cypress, pond apple, strangler fig, willow, abundant epiphytes. (FNAI)

2215 Floodplain Swamp

Along or near rivers and streams with organic/alluvial substrate; usually inundated; Panhandle to central peninsula; rare or no fire; closed canopy dominated by cypress, tupelo, and/or black gum. (FNAI)

22151 Freshwater Tidal Swamp

Floodplain swamp a river mouth where occasional saltwater intrusion significantly affects vegetation composition; receives pulses of freshwater in response to tides; cypress absent or infrequent; closed/open canopy of swamp tupelo, pumpkin ash, sweetbay. (FNAI)

2220 Other Coniferous Wetlands

Coniferous forested wetlands that are not dominated by cypress, tupelo, or a mix of cypress/tupelo.

2221 Wet Flatwoods

Flatland with sand substrate; seasonally inundated; statewide except extreme southern peninsula and Keys; frequent fire (2-4 years for grassy wet flatwoods, 5-10 years for shrubby wet flatwoods); closed to open pine canopy with grassy or shrubby understory; slash pine, pond pine, large gallberry, fetterbush, sweetbay, cabbage palm, wiregrass, toothache grass. (FNAI)

22211 Hydric Pine Flatwoods

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. (FLUCCS)

222111 Cutthroat Grass Flatwoods

Located on and near the Lake Wales Ridge; frequent fire (2-4 years); widely scattered pines over cutthroat grass and/or other hydrophytic herbs. (FNAI)

222112 Cabbage Palm Flatwoods

Located on shelly sand or where limestone is near the surface; pine canopy over cabbage palm understory. (FNAI)

22212 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. (FLUCCS)

2222 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. (FLUCCS)

2223 Atlantic White Cedar

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. (FLUCCS)

2224 Slash Pine Swamp Forest

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. (FLUCCS)

2230 Other Hardwood Wetlands

Dominated by a mix of hydrophytic hardwood trees; cypress or tupelo may be occasional or infrequent in the canopy; short hydroperiod (FNAI)

2231 Baygall

Slope or depression wetland with peat substrate; usually saturated and occasionally inundated; statewide excluding Keys; rare or no fire; closed canopy of evergreen trees; loblolly bay, sweetbay, swamp bay, titi, fetterbush. (FNAI)

22311 Bay Swamp

Large or small peat filled depression; mainly eastern Panhandle to central peninsula; forested; dominated by bay species. (FNAI)

22312 South Florida Bayhead

Found on tree islands in glades marsh on peat substrate; south of Lake Okeechobee in central and southern peninsula; open or closed canopy; swamp bay, sweetbay, dahoon, coastalplain willow, and/or coco plum. (FNAI)

2232 Hydric Hammock

Lowland with sand/clay/organic soil over limestone or with high shell content; mesic-hydric; primarily eastern Panhandle and central peninsula; occasional to rare fire; diamond-leaved oak, live oak, cabbage palm, red cedar, and mixed hardwoods. (FNAI)

22321 Coastal Hydric Hammock

Occurring adjacent to coastal marshes; central Panhandle to central peninsula; species composition limited by occasional salt water intrusion; cabbage palm, red cedar, and live oak. (FNAI)

22322 Prairie Hydric Hammock

Isolated stands of hydric hammock within a pyrogenic community, usually floodplain marsh; shelly sand soils; central and southern peninsula; occasional fire; cabbage palm, live oak, red cedar. (FNAI)

22323 Cabbage Palm Hammock

Cabbage palms can be dominant in a variety of different wetlands landscapes, including hammocks, which are elevated above deeper wetlands and forested depressions, which are lower than surrounding uplands. Although this class is termed a "hammock", it is used for any forested (over 25% canopy closure) wetland community in which cabbage palms are the most dominant tree species. (SJRWMD)

2233 Mixed Wetland Hardwoods

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. (FLUCCS)

22331 Bottomland Forest

Flatland with sand/clay/organic substrate; usually connected or adjacent to a riverine community; occasionally inundated; Panhandle to central peninsula; rare or no fire; closed canopy of mixed hardwoods; tuliptree, sweetbay, water oak, sweetgum, diamond-leaved oak, red maple, loblolly pine, spruce pine, Atlantic white cedar. (FNAI)

22332 Alluvial Forest

Floodplain with alluvial substrate of sand, silt, clay or organic soil; inundated yearly during growing season; influenced by disturbance from ongoing floodplain processes (deposition of point bars, creation of “ridge and swale” topography); Panhandle to central peninsula; rare or no fire; closed canopy of mainly deciduous trees; water hickory, overcup oak, diamond-leaved oak, green ash, American elm, water locust, river birch.

2234 Titi Swamp

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. (FLUCCS)

2240 Mixed Hardwood-Coniferous Swamps

Includes mixed wetlands forest communities in which neither hardwoods nor conifers achieve a 66 percent dominance of the crown canopy composition. (FLUCCS)

2241 Cypress/Hardwood Swamps

Mix of cypress and hardwood species where neither cypress nor hardwoods are dominant.

2242 Cypress/Pine/Cabbage Palm

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. (FLUCCS)

2300 Non-vegetated Wetland

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. Intermittent ponds are the main components of this category. (FLUCCS)

2400 Cultural-Palustrine

Communities that are both created and maintained by human activities or are modified by human influence to such a degree that the physical conformation of the substrate, the hydrology, or the biological composition of the resident community is substantially different from the character of the substrate, hydrology, or community as it existed prior to human influence. (NYNHP)

2410 Impounded Marsh

Impounded marsh: a marsh (with less than 50% cover of trees) in which the water levels have been artificially manipulated or modified., (NYNHP)

2420 Impounded Swamp

Impounded swamp: a swamp (with at least 50% cover of trees) where the water levels have been artificially manipulated or modified (NYNHP)

2430 Grazed Wetlands

Wetlands that are used as pasture for livestock during all or a portion of the year.

2440 Clearcut Wetland

Wetlands where merchantable trees have been removed. Clearcut cypress is an example of this class.

3000 Lacustrine

Wetlands and deepwater habitats (1) situated in a topographic depression or dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30% areal coverage; and (3) whose total area exceeds 8 hectares (20 acres); or area less than 8 hectares if the boundary is active wave-formed or bedrock or if

water depth in the deepest part of the basin exceeds 2 m (6.6 ft) at low water. Ocean-derived salinities are always less than .5 ppt. (Cowardin et al. 1979).

3100 Natural Lakes and Ponds

Includes inland lakes and ponds in which the trophic state, morphometry, and water chemistry have not been substantially modified by human activities, or the native biota are dominant. (NYNHP)

3110 Limnetic

All deepwater habitats within the Lacustrine System; many small Lacustrine Systems have no Limnetic Subsystem. (Cowardin et al. 1979)

3111 Clastic Upland Lake

Generally irregular basin in clay uplands; predominantly with inflows, frequently without surface outflow; clay or organic substrate; colored, acidic, soft water with low mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic. (FNAI)

3112 Coastal Dune Lake

Basin or lagoon influenced by recent coastal processes; predominantly sand substrate with some organic matter; salinity variable among and within lakes, and subject to saltwater intrusion and storm surges; slightly acidic, hard water with high mineral content (sodium, chloride). (FNAI)

3113 Flatwoods/Prairie/Marsh Lake

Shallow basin in flatlands with high water table; frequently with a broad littoral zone; still water or flow-through; sand or peat substrate; variable water chemistry, but characteristically colored to clear, acidic to slightly alkaline, soft to moderately hard water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic. Marsh lakes are generally shallow, open water area within wide expanses of freshwater marsh; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic. (FNAI)

3114 River Floodplain Lake/Swamp Lake

Meander scar, backwater, or larger flow-through body within major river floodplains; sand, alluvial or organic substrate; colored, alkaline or slightly acidic, hard or moderately

hard water with high mineral content (sulfate, sodium, chloride, calcium, magnesium); mesotrophic to eutrophic. Swamp lakes are generally shallow, open water area within basin swamps; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic. (FNAI)

3115 Sinkhole Lake

Typically, deep, funnel-shaped depression in limestone base; occurs in most physiographic regions; predominantly without surface inflows/outflows, but frequently with connection to the aquifer; clear, alkaline, hard water with high mineral content (calcium, bicarbonate, magnesium). (FNAI)

3116 Coastal Rockland Lake

Shallow basin influence by recent coastal processes; predominantly barren oolitic or Miami limestone substrate; salinity variable among and within lakes, and subject to saltwater intrusion, storm surges and evaporation (because of shallowness); slightly alkaline, hard water with high mineral content (sodium, chloride). (FNAI)

3117 Sandhill Lake

Generally rounded solution depression in deep sandy uplands or sandy uplands shallowly underlain by limestone; predominantly without surface inflows/outflows; typically, sand substrate with organic accumulations toward middle; clear, acidic moderately soft water with varying mineral content; ultra-oligotrophic to mesotrophic. (FNAI)

3120 Littoral

All wetland habitats in the Lacustrine System. Extends from the shoreward boundary of the system to a depth of 2 m (6.6 feet) below low water or to the maximum extent of non-persistent emergents, if these grow at depths greater than 2 m. (Cowardin et al. 1979)

3200 Cultural-Lacustrine

Communities that are either created, and maintained by human activities, or are modified by human influence to such a degree that the trophic state, morphometry, water chemistry, or biological composition of the resident community are substantially different from the character of the lake community as it existed prior to human influence. (NYNHP)

3210 Artificial/Farm Pond

Aquatic community of a small pond constructed on agricultural or residential property. (NYNHP)

3211 Aquacultural Ponds

Culture of marine or aquatic plant and animal species under either natural or artificial conditions for human and domestic animal consumption. (FLUCCS)

3220 Artificial Impoundment/Reservoir

Aquatic community of an artificial lake created by the impoundment of a river with a dam. Reservoirs are constructed to collect water for municipal and/or agricultural water use, to provide hydroelectric power, and to improve opportunities for recreational activities (e.g. boating, swimming), and development. (NYNHP)

3230 Quarry Pond

Aquatic community of an excavated basin that is created as part of a rock quarrying operation. The sides of the basin are often very steep, thereby eliminating any shallow shoreline habitats. Water levels usually fluctuate. (NYNHP)

3240 Sewage Treatment Pond

Artificial pond constructed for sewage treatment (chemical, and biological decomposition of sewage) prior to release to a stream or aquifer. (NYNHP)

3250 Stormwater Treatment Areas

Impoundments constructed primarily to retain or treat stormwater

3260 Industrial Cooling Pond

Aquatic community of an artificial pond constructed as a holding pond to allow for cooling of high temperature industrial effluents. (NYNHP)

4000 Riverine

All wetlands and deepwater habitats contained within a channel except those wetlands (1) dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) which have habitats with ocean-derived salinities in excess of .5 ppt. (Cowardin et al. 1979)

4100 Natural Rivers and Streams

Streams in which the stream flow, morphometry, and water chemistry have not been substantially modified by human activities, or the native biota are dominant. (NYNHP)

4110 Alluvial Stream

Lower perennial or intermittent/seasonal watercourse characterized by turbid water with suspended silt, clay, sand and small gravel; generally, with a distinct, sediment-derived (alluvial) floodplain and a sandy, elevated natural levee just inland from the bank. (FNAI)

4120 Blackwater Stream

Perennial or intermittent/seasonal watercourse characterized by tea-colored water with a high content of particulate and dissolved organic matter derived from drainage through swamps and marshes; generally lacking an alluvial floodplain. (FNAI)

4130 Spring-run Stream

Perennial watercourse with deep aquifer headwaters and characterized by clear water, circumneutral pH and, frequently, a solid limestone bottom. (FNAI)

4131 Major Spring

Naturally occurring places where water flows from the aquifer to the earth's surface. Generally, only larger, first-magnitude springs are identified.

4140 Seepage Stream

Upper perennial or intermittent/seasonal watercourse characterized by clear to lightly colored water derived from shallow groundwater seepage. (FNAI)

4150 Calcareous Stream

Section of river or stream that typically has a high pH, high carbonate level, and sand bottom with some limestone exposed. Springs and spring runs form low-order tributaries to most of the calcareous streams. As a result, calcareous streams share many characteristics with the Spring and Spring Run habitat.

4160 Tidally-influenced Stream

Section of river that is influenced by tide. Delineation of the tidally-influenced section is uncertain both at the downstream and upstream limits and may be thought of as a transitional zone over which many of the controlling ecological and physical variables fluctuate, such as salinity, tidal rise and fall and freshwater flow conditions.

4170 Riverine Sandbar

4200 Cultural-Riverine

Communities that are either created and maintained by human activities or are modified by human influence to such a degree that stream flow, morphometry, water chemistry, or the biological composition of the resident community are substantially different from the character of the stream community as it existed prior to human influence. (NYNHP)

4210 Canal

Aquatic community of an artificial waterway or modified stream channel constructed for inland navigation, drainage or irrigation of adjacent lands. Water levels either fluctuate in response to variations in precipitation and groundwater levels, or water levels are artificially controlled. (NYNHP)

4220 Ditch/Artificial Intermittent Stream

Aquatic community of an artificial waterway constructed for drainage or irrigation of adjacent lands. Water levels either fluctuate in response to variations in precipitation and groundwater levels, or water levels are artificially controlled. The sides of ditches are often vegetated, with grasses and sedges usually dominant. (NYNHP)

4230 Industrial Effluent Stream

Aquatic community of a stream or a small section of a stream in which the temperature, chemistry, or transparency of the water is significantly modified by discharge of effluent from an industrial, commercial, or sewage treatment plant. (NYNHP)

5000 Estuarine

Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, with ocean-derived water at least occasionally diluted by freshwater runoff from the land. The upstream and landward limit is where ocean-derived salts measure less than .5 ppt during the period of average annual low flow. The seaward limit is (1) an imaginary line closing the mouth of a river, bay, or sound; and (2) the seaward limit of wetland emergents, shrubs, or trees when not included in (1). (Cowardin et al. 1979)

5100 Subtidal

This subsystem includes the area below the lowest tide that is permanently flooded with tidal water. (NYNHP)

5200 Intertidal

Includes the area between the highest tide level and the lowest tide level; the substrate is periodically exposed and flooded by semidiurnal tides (two high tides and two low tides per tidal day). (NYNHP)

5210 Exposed Limestone

Exposed limestone in the intertidal zone that either is barren or supports vegetation.

5211 Vegetated

Exposed limestone found in intertidal zone with vegetation present.

52111 Keys Tidal Rock Barren

Flatland with exposed limestone in supratidal zone; restricted to Keys; no fire; open, mainly herbaceous vegetation of upper tidal marsh species and stunted shrubs and trees; buttonwood, christmasberry, perennial glasswort, saltwort, seashore dropseed, shoregrass. (FNAI)

5212 Non-vegetated

Exposed limestone found in the intertidal zone where vegetation is absent or very sparse.

5220 Tidal Flat

A community of quiet waters, with substrates composed of silt or sand that is rich in organic matter and poorly drained at low tide. The substrate may be covered with algae. (NYNHP)

Subclasses differentiated by substrate type.

5221 Mud

5222 Sand

5230 Oyster Bar

5240 Salt Marsh

Estuarine wetland on muck/sand/or limestone substrate; inundated with saltwater by daily tides; statewide; occasional or rare fire; treeless, dense herb layer with few shrubs; saltmarsh cordgrass, needle rush, saltgrass, saltwort, perennial glasswort, seaside oxeye. (FNAI)

5241 Salt Flat

Salt marsh with much exposed bare soil on slightly higher areas within marsh; high salinity and dry conditions; sparse and stunted cover of succulents and/or shoregrass. (FNAI)

5242 Cordgrass

5243 Needlerush

5250 Mangrove Swamp

Estuarine wetland on muck/sand/or limestone substrate; inundated with saltwater by daily tides; central peninsula and Keys; no fire; dominated by mangrove and mangrove associate species; red mangrove, black mangrove, white mangrove, buttonwood. (FNAI)

5251 Buttonwood Forest

Upper tidal area dominated by buttonwood; often transitional to rockland hammock. (FNAI)

5252 Scrub Mangrove

Areas sparsely vegetated with small, stunted mangroves. Found in extreme south Florida only. (FWC)

5300 Cultural-Estuarine

Communities that are either created and maintained by human activities or are modified by human influence to such a degree that the physical conformation of the substrate, or the biological composition of the resident community is substantially different from the character of the substrate or community as it existed prior to human influence. (NYNHP)

5310 Estuarine Ditch/Channel

Aquatic community of a ditch or narrow channel excavated in an estuarine marsh. (NYNHP)

5320 Estuarine Artificial Impoundment

Marsh community that occurs in a wetland created or modified by a barrier or dam that obstructs the outflow or inflow of water, and which has a biological composition significantly different from the composition of a natural estuarine marsh. (NYNHP)

5330 Aquaculture

6000¹ Marine

Open ocean overlying the continental shelf and coastline exposed to waves and currents of the open ocean shoreward to (1) extreme high water of spring tides; (2) seaward limit of wetland emergents, trees, or shrubs; or (3) the seaward limit of the Estuarine System, other than vegetation. Salinities exceed 30 parts per thousand (ppt). (Cowardin et al. 1979)

6100 Surf Zone

Exotics

7000 Exotic Plants

Upland and wetland areas dominated by non-native trees that were planted or have escaped and invaded native plant communities. These exotics include melaleuca, Australian pine, Brazilian pepper, and eucalyptus. This class includes sites known to be

¹ The classification of marine habitats was beyond the scope of this project. Other initiatives are currently underway to develop a marine habitat classification system that will need to be incorporated into this system.

vegetated by non-native but for which the actual species composition could not be determined. (FWC)

7100 Australian Pine

Australian pine communities where canopy closure is 25% or more with at least 67% dominance by Australian pine trees. Trees average at least 20 feet tall. This class grows in tall, dense monocultures that preclude other vegetation. (SJRWMD)

7200 Melaleuca

Exotic tree species that occurs in almost pure stands. It is an aggressive competitor, invading and often taking over a site, forming a dense and impenetrable stand. The canopy closure must be 25% or more with at least 67% or more dominance. (SJRWMD)

7300 Brazilian Pepper

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. (FLUCCS)

7400 Exotic Wetland Hardwoods

Wetland with a dominant exotic species such as Brazilian pepper, melaleuca, or other exotic species. (FLUCCS). However, dominant species is not specified.

8000 Open Water

9000 Other

9100 Unconsolidated substrate

DISCUSSION AND CONCLUSIONS

Current land cover classifications systems designed for state and regional scales were assessed for their feasibility for use in Florida. Most states, including Florida, have produced land cover maps based on the NVCS system as part of the National Gap

Analysis Program (NBII 2009), while others have developed modified versions of the NVCS, or maintained their historical habitat classifications. One short-coming of many of these classifications is the absence of culturally influenced habitat sites such as agricultural and urban lands that are used by, or impact, fish and wildlife species. The NVCS is also very detailed and, based on my experience and discussions with other users of these data; it is often very difficult to translate this classification into already established classifications. The usability and ability to translate between currently used and maintained classifications in Florida were important considerations when developing this system.

This land cover classification system not only meets the needs of the Strategy but also meets many of the specifications and requirements identified by USGS-NPS Vegetation Characterization Program. The classification is hierarchical, can be applied at various scales, is flexible to allow for changes and refinement, is mappable from imagery, is repeatable across the landscape, and can be cross-walked between other frequently used systems. Currently used land cover classification systems in Florida do not translate (i.e. cross-walk) well with each other. Class and class definitions do not match and many "one to many" and "many to one" relationships develop when translated, which makes these data difficult to use as a unified dataset. A major benefit of this system is that it incorporates these currently used classifications. This facilitates the incorporation and use of other land cover classifications that are produced within Florida because they are mandated by Florida law or for specific purposes. The ability to produce a translatable land cover dataset will allow for collaboration between entities producing

these data. The ability to pool resources or information will ultimately result in more accurate and reliable land cover classification that would benefit and add value to all land cover classifications.

Limitations

No classification can meet the needs of all potential users and specific classifications may need to be developed that can be applied for specific purposes. Although efforts were made to limit errors and inconsistencies in the land cover classification, application of this classification is likely to reveal short-comings within the structure or class definitions. However, the land cover classification is extensible and changes and modifications to the classification schema or class definitions are expected. It is unlikely and not expected, that all classes in this schema will be represented in one dataset. However, it is anticipated that other classified land cover data will translate directly to this schema or the schema can be expanded or modified to incorporate lower level, or more specific, classes.

Despite our attempts to develop a classification that can be useful for a broad range of needs, the habitat classes largely reflect habitat communities. As a consequence, specific vegetative species may be included in <1 classes which may limit its usefulness for this purpose. For example, live oak (*Quercus virginiana*) exists as a component in many forested upland classes, thus cannot be exclusively extracted from the classification.

Future Research

The development of a statewide dataset using the land cover classification system is likely the highest priority for future work as many of the goals and priorities of the Strategy rely on these data. To ensure that the classification remains feasible and usable, the classification should be revisited periodically to incorporate any updates and modifications to the schema or class definitions.

In addition to maintenance of this classification, attempts should be made to cross-walk it to other classifications systems. Although components of other classifications were considered when developing this system it has yet to be compared directly with national classification systems (e.g. NVCS) or land cover classification developed in neighboring states. In addition to incorporating other land cover classifications the feasibility of integrating coastal and marine classification systems such as the Coastal and Marine Ecological Classification Standard (Madden et al. 2009) should be addressed. If other classifications are found to correspond well with this system it may be feasible to incorporate these classifications schemas into this system.

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Appendix A. Land cover classification listing for Levels 1 – 6.

1000 Terrestrial

1100 Hardwood Forested Uplands

- 1110 Upland Hardwood Forest
 - 1111 Dry Upland Hardwood Forest
 - 1112 Mixed Hardwoods

- 1120 Mesic Hammock
 - 1121 Evergreen Levee Hammock
 - 1122 Prairie Mesic Hammock
 - 1123 Live Oak
 - 1124 Pine - Mesic Oak
 - 1125 Cabbage Palm

- 1130 Rockland Hammock
 - 1131 Thorn Scrub

1140 Slope Forest

1150 Xeric Hammock

1200 High Pine and Scrub

- 1210 Scrub
 - 1211 Oak Scrub
 - 1212 Rosemary Scrub
 - 1213 Sand Pine Scrub
 - 1214 Coastal Scrub

1220 Upland Mixed Woodland

- 1230 Upland Coniferous
 - 1231 Upland Pine

1240 Sandhill

1300 Pine Flatwoods and Dry Prairie

- 1310 Dry Flatwoods
 - 1311 Mesic Flatwoods

- 1312 Scrubby Flatwoods
- 1320 Pine Rockland
- 1330 Dry Prairie
- 1340 Palmetto Prairie
- 1400 Mixed Hardwood-Coniferous
 - 1410 Successional hardwood forest
- 1500 Shrub and Brushland
 - 1510 Other Shrubs and Brush
- 1600 Coastal Uplands
 - 1610 Beach Dune
 - 1620 Coastal Berm
 - 1630 Coastal Grassland
 - 1640 Coastal Strand
 - 1650 Maritime Hammock
 - 1660 Shell Mound
 - 1670 Sand Beach (Dry)
- 1700 Barren and Outcrop Communities
 - 1710 Sinkhole
 - 1720 Upland Glade
 - 1730 Limestone Outcrop
 - 1740 Keys Cactus Barren
 - 1750 Bare Soil

- 1760 Exposed Rock
 - 1761 Exposed Rock w/ Marsh Grasses
- 1800 Cultural - Terrestrial
 - 1810 Mowed Grass
 - 1811 Vegetative Berm
 - 1812 Highway Rights of Way
 - 1820 Urban
 - 1821 Low Intensity Urban
 - 18211 Urban Open Land
 - 182111 Urban Open Forested
 - 182112 Urban Open Pine
 - 18212 Low Structure Density
 - 18213 Grass
 - 182131 Parks and Zoos
 - 182132 Golf courses
 - 182133 Ballfields
 - 182134 Cemeteries
 - 182135 Community rec. facilities
 - 18214 Trees
 - 1822 High Intensity Urban
 - 18221 Residential, Med. Density - 2-5 Dwelling Units/AC
 - 18222 Residential, High Density > 5 Dwelling Units/AC
 - 18223 Commercial and Services
 - 18224 Industrial
 - 18225 Institutional
- 1830 Rural
 - 1831 Rural Open
 - 18311 Rural Open Forested
 - 183111 Oak - Cabbage Palm Forests
 - 18312 Rural Open Pine
 - 1832 Rural Structures
 - 1833 Agriculture
 - 18331 Cropland/Pasture
 - 183311 Row Crops
 - 1833111 Irrigated Row Crops

- 183312 Field Crops
 - 1833121 Sugarcane
- 183313 Improved Pasture
- 183314 Unimproved/Woodland Pasture
- 183315 Other Open Lands - Rural
 - 1833151 Fallow Cropland

- 18332 Orchards/Groves
 - 183321 Citrus
 - 183322 Fruit Orchards
 - 183323 Pecan
 - 183324 Fallow Orchards

- 18333 Tree Plantations
 - 183331 Hardwood plantation
 - 183332 Coniferous plantation
 - 1833321 Wet plantation

- 18334 Vineyard and Nurseries
 - 183341 Tree Nurseries
 - 183342 Sod Farms
 - 183343 Ornamentals
 - 183344 Vineyards
 - 183345 Floriculture

- 18335 Other Agriculture
 - 183351 Feeding Operations
 - 183352 Specialty Farms

- 1840 Transportation
 - 1841 Roads
 - 1842 Rails

- 1850 Communication

- 1860 Utilities

- 1870 Extractive
 - 1871 Strip Mines
 - 1872 Sand and Gravel Pits
 - 1873 Rock Quarries
 - 1874 Oil and Gas Fields
 - 1875 Reclaimed Lands

- 1876 Abandoned Mining Lands
- 1877 Spoil Area

- 1880 Bare Soil/Clear Cut

- 2000 Palustrine
 - 2100 Freshwater Non-Forested Wetlands
 - 2110 Prairies and Bogs
 - 2111 Wet Prairie
 - 21111 Wiregrass Savanna
 - 21112 Cutthroat Seep
 - 21113 Calcareous Wet Prairie
 - 21114 Pitcherplant Prairie
 - 2112 Mixed Scrub-Shrub Wetland
 - 21121 Shrub Bog
 - 2113 Marl Prairie
 - 2114 Seepage Slope
 - 2120 Marshes
 - 2121 Isolated Freshwater Marsh
 - 21211 Depression Marsh
 - 21212 Basin Marsh
 - 2122 Coastal Interdunal Swale
 - 2123 Floodplain Marsh
 - 21231 Freshwater Tidal Marsh
 - 2124 Slough Marsh
 - 2125 Glades Marsh
 - 21251 Keys Freshwater Marsh
 - 2130 Marshes (Continued)
 - 2131 Sawgrass
 - 2132 Cattail
 - 2133 Spike Rush
 - 2134 Maidencane
 - 2135 Dog Fennel and Low Marsh Grasses
 - 2136 Arrowroot
 - 2137 Giant Cutgrass
 - 2138 Buttonbush
 - 2139 Other spp.
 - 2140 Floating/Emergent Aquatic Vegetation

- 2141 Slough
 - 21411 Pond Apple Slough
 - 2142 Water Lettuce
 - 2143 Spatterdock
 - 2144 Water Hyacinth
 - 2145 Duck Weed
 - 2146 Water Lily
 - 2147 Other spp.
- 2150 Submergent Aquatic Vegetation
- 2200 Freshwater Forested Wetlands
- 2210 Cypress/Tupelo (Cypress/Tupelo mixed)
 - 2211 Cypress
 - 2212 Tupelo
 - 2213 Isolated Freshwater Swamp
 - 22131 Dome Swamp
 - 221311 Stringer Swamp
 - 221312 Gum Pond
 - 22132 Basin Swamp
 - 2214 Strand Swamp
 - 2215 Floodplain Swamp
 - 22151 Freshwater Tidal Swamp
 - 2220 Other Coniferous Wetlands
 - 2221 Wet Flatwoods
 - 22211 Hydric Pine Flatwoods
 - 222111 Cutthroat Grass Flatwoods
 - 222112 Cabbage Palm Flatwoods
 - 22212 Hydric Pine Savanna
 - 2222 Pond Pine
 - 2223 Atlantic White Cedar
 - 2224 Slash Pine Swamp Forest
 - 2230 Other Hardwood Wetlands
 - 2231 Baygall
 - 22311 Bay Swamp
 - 22312 South Florida Bayhead
 - 2232 Hydric Hammock
 - 22321 Coastal Hydric Hammock
 - 22322 Prairie Hydric Hammock
 - 22323 Cabbage Palm Hammock

- 2233 Mixed Wetland Hardwoods
 - 22331 Bottomland Forest
 - 22332 Alluvial Forest
- 2234 Titi Swamp

- 2240 Mixed Hardwood-Coniferous Swamps
 - 2241 Cypress/Hardwood Swamps
 - 2242 Cypress/Pine/Cabbage Palm

- 2300 Non-vegetated Wetland

- 2400 Cultural - Palustrine
 - 2410 Impounded Marsh
 - 2420 Impounded Swamp
 - 2430 Grazed Wetlands
 - 2440 Clearcut Wetland

- 3000 Lacustrine
 - 3100 Natural Lakes and Ponds
 - 3110 Limnetic
 - 3111 Clastic Upland Lake
 - 3112 Coastal Dune Lake
 - 3113 Flatwoods/Prairie/Marsh Lake
 - 3114 River Floodplain Lake/Swamp Lake
 - 3115 Sinkhole Lake
 - 3116 Coastal Rockland Lake
 - 3117 Sandhill Lake
 - 3120 Littoral
 - 3200 Cultural - Lacustrine
 - 3210 Artificial/Farm Pond
 - 3211 Aquacultural Ponds

- 3220 Artificial Impoundment/Reservoir
- 3230 Quarry Pond
- 3240 Sewage Treatment Pond
- 3250 Stormwater Treatment Areas
- 3260 Industrial Cooling Pond
- 4000 Riverine
 - 4100 Natural Rivers and Streams
 - 4110 Alluvial Stream
 - 4120 Blackwater Stream
 - 4130 Spring Run Stream
 - 4131 Major Springs
 - 4140 Seepage Stream
 - 4150 Calcareous Stream
 - 4160 Tidally-influenced Stream
 - 4170 Riverine Sandbar
 - 4200 Cultural - Riverine
 - 4210 Canal
 - 4220 Ditch/Artificial Intermittent Stream
 - 4230 Industrial Effluent Stream
- 5000 Estuarine
 - 5100 Subtidal
 - 5200 Intertidal

- 5210 Exposed Limestone
 - 5211 Vegetated
 - 52111 Keys Tidal Rock Barren
 - 5212 Non-vegetated

- 5220 Tidal Flat
 - 5221 Mud
 - 5222 Sand

- 5230 Oyster Bar

- 5240 Salt Marsh
 - 5241 Salt Flat
 - 5242 Cordgrass
 - 5243 Needlerush

- 5250 Mangrove Swamp
 - 5251 Buttonwood Forest
 - 5252 Scrub Mangrove

- 5300 Cultural - Estuarine
 - 5310 Estuarine Ditch/Channel
 - 5320 Estuarine Artificial Impoundment
 - 5330 Aquaculture

- 6000 Marine
 - 6100 Surf Zone

- 7000 Exotic Plants
 - 7100 Australian Pine
 - 7200 Melaleuca
 - 7300 Brazilian Pepper
 - 7400 Exotic Wetland Hardwoods

- 8000 Open Water

9000 Other

9100 Unconsolidated Substrate

Appendix B. Crosswalk between frequently used land cover classification systems used in Florida.

Class Name	Class Code	Class			
		SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
Terrestrial	1000	-	-	-	-
Hardwood Forested Uplands	1100	4000	4000	400	8
Upland Hardwood Forest	1110	4200	4200	420, 430, 439	-
Dry Upland Hardwood Forest	1111	-	-	-	-
Mixed Hardwoods	1112	4300	4300	438	-
Mesic Hammock	1120	-	-	425	-
Evergreen Levee Hammock	1121	-	-	-	-
Prairie Mesic Hammock	1122	-	-	-	10
Live Oak	1123	-	4270	427	-
Pine - Mesic Oak	1124	-	4140	414	-
Cabbage Palm	1125	4280	4280	428	-
Rockland Hammock	1130	-	-	426	11
Thorn Scrub	1131	-	-	-	-
Slope Forest	1140	-	-	-	-
Xeric Hammock	1150	-	-	-	-
High Pine and Scrub	1200	-	-	-	-
Scrub	1210	-	-	436	-
Oak Scrub	1211	4210	4210	421	3
Rosemary Scrub	1212	-	-	-	-
Sand Pine Scrub	1213	4130	4130	413	4
Coastal Scrub	1214	-	3220	322	-
Upland Mixed Woodland	1220	4340	4340	415, 434	7
Upland Coniferous	1230	4100	4100	410, 419	-
Upland Pine	1231	-	-	-	-
Sandhill	1240	4120	4120	412	5
Pine Flatwoods and Dry Prairie	1300	4110	4110	411	9
Dry Flatwoods	1310	-	-	-	-
Mesic Flatwoods	1311	-	-	-	-
Scrubby Flatwoods	1312	-	-	-	-
Pine Rockland	1320	-	-	-	-
Dry Prairie	1330	-	-	-	6
Palmetto Prairie	1340	-	3210	321	-
Mixed Hardwood-Coniferous	1400	-	-	-	-
Successional Hardwood Forest	1410	-	-	-	-
Shrub and Brushland	1500	3200	3200	320	28
Other Shrubs and Brush	1510	-	-	329	-

Class Name	Class Code	SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
Coastal Uplands	1600	-	-	-	-
Beach Dune	1610	7200	7200	720	-
Coastal Berm	1620	-	-	-	-
Coastal Grassland	1630	-	-	-	-
Coastal Strand	1640	-	-	-	1
Maritime Hammock	1650	-	-	432	-
Shell Mound	1660	-	-	-	-
Sand Beach (Dry)	1670	7100, 1810	1810	181,710	2
Barren and Outcrop Communities	1700	-	-	-	-
Sinkhole	1710	-	-	-	-
Upland Glade	1720	-	-	-	-
Limestone Outcrop	1730	-	-	-	-
Keys Cactus Barren	1740	-	-	-	-
Bare Soil	1750	7000	7000	700	-
Exposed Rock	1760	-	7300	730	-
Exposed Rock w/ Marsh Grasses	1761	-	-	731	-
Cultural - Terrestrial	1800	1800	1800	180	-
Mowed Grass	1810	-	-	-	29
Vegetative Berm	1811	-	-	-	-
Highway Rights of Way	1812	-	-	-	-
Urban	1820	1000	1000	100	-
Low Intensity Urban	1821	1100	1100	110	42
Urban Open Land	18211	1900	1900	190	-
Urban Open Forested	182111	-	-	-	-
Urban Open Pine	182112	-	-	-	-
Low Structure Density	18212	-	-	-	-
Grass	18213	-	-	-	-
Parks and Zoos	182131	1850	1850	1851, 1852	-
Golf courses	182132	1820	1820	182	-
Ballfields	182133	-	-	-	-
Cemeteries	182134	1480	1480	148	-
Community rec. facilities	182135	1860	-	186	-
Trees	18214	-	-	-	-
High Intensity Urban	1822	-	-	-	-
Residential, Med. Density					
2-5 Dwelling Units/AC	18221	1200	1200	120	-
Residential, High Density					
> 5 Dwelling Units/AC	18222	1300	1300	130	41

Class Name	Class Code	SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
Commercial and Services	18223	1400	1400	140	-
Industrial	18224	1500	1500	150	-
Institutional	18225	1700	1700	170	-
Rural	1830	-	-	-	-
Rural Open	1831	3100, 3300	3100, 3300	310,330	-
Rural Open Forested	18311	-	-	-	-
Oak - Cabbage Palm Forests	183111	-	4271	-	-
Rural Open Pine	18312	-	-	-	-
Rural Structures	1832	-	-	-	-
Agriculture	1833	2000	2000	200	36
Cropland/Pasture	18331	2100	2100	210	35
Row Crops	183311	2140	2140	214	-
Irrigated Row Crops	1833111	2140	2140	214	-
Field Crops	183312	2150	2150	215	-
Sugarcane	1833121	-	2156	2156	33
Improved Pasture	183313	2110	2110	211	31
Unimproved/Woodland Pasture	183314	2120, 2130	2120, 2130	212, 213	32
Other Open Lands - Rural	183315	2600	2600	260	-
Fallow Cropland	1833151	2610	2610	261	-
Orchards/Groves	18332	2200	2200	220, 223	-
Citrus	183321	2210	2210	221	34
Fruit Orchards	183322	-	2220	222	-
Pecan	183323	-	2230	2231	-
Fallow Orchards	183324	2240	3230	224	-
Tree Plantations	18333	4400	4400	440	-
Hardwood Plantations	183331	-	-	-	-
Coniferous Plantations	183332	-	-	-	-
Wet Coniferous Plantations	1833321	-	-	-	-
Vineyard & Nurseries	18334	2400	2400	240	-
Tree Nurseries	183341	2410	2410	241	-
Sod Farms	183342	2420	2420	242	-
Ornamentals	183343	2430	2430	243	-
Vineyards	183344	-	-	244	-
Floriculture	183345	2450	-	245	-
Other Agriculture	18335	-	-	-	-
Feeding Operations	183351	2300	2300	230	-
Specialty Farms	183352	2500	2500	250	-
Transportation	1840	8000, 8100	8000, 8100	800, 810	-

Class Name	Class Code	Class			
		SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
Roads	1841	8140	8140	814	-
Rails	1842	8120	8120	812	-
Communication	1850	8200	8200	820	-
Utilities	1860	8300	8300	830	-
Extractive	1870	1600, 7400	1600, 7400	160, 740	43
Strip Mines	1871	1610	1610	161	-
Sand & Gravel Pits	1872	1620	1620	162	-
Rock Quarries	1873	1630	1630	163	-
Oil & Gas Fields	1874	1640	1640	164	-
Reclaimed Lands	1875	1650	1650	165	-
Abandoned Mining Lands	1876	1670	1670	-	-
Spoil Area	1877	-	-	-	-
Bare Soil/Clear Cut	1880	-	-	-	30
Palustrine	2000	-	-	-	-
Freshwater Non-Forested Wetland	2100	6400	6400	640	12
Prairies and Bogs	2110	-	-	-	-
Wet Prairie	2111	6430	6430	643	-
Wiregrass Savanna	21111	-	-	-	-
Cutthroat Seep	21112	-	-	-	-
Calcareous Wet Prairie	21113	-	-	-	-
Pitcherplant Prairie	21114	-	-	-	-
Mixed Scrub-Shrub Wetland	2112	6460	-	646	15
Shrub Bog	21121	-	-	-	-
Marl Prairie	2113	-	-	-	-
Seepage Slope	2114	-	-	-	-
Marshes	2120	6410	6410	641	-
Isolated Freshwater Marsh	2121	-	-	-	-
Depression Marsh	21211	-	-	-	-
Basin Marsh	21212	-	-	-	-
Coastal Interdunal Swale	2122	-	-	-	-
Floodplain Marsh	2123	-	-	-	-
Freshwater Tidal Marsh	21231	-	-	-	-
Slough Marsh	2124	-	-	-	-
Glades Marsh	2125	-	-	-	-
Keys Freshwater Marsh	21251	-	-	-	-
Marshes (Continued)	2130	-	-	-	-
Sawgrass	2131	-	6411	6411	13
Cattail	2132	-	-	6412	14

Class Name	Class Code	Class			
		SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
Spike Rush	2133	-	-	6413	-
Maidencane	2134	-	-	6414	-
Dog Fennel & Low Marsh Grasses	2135	-	-	6415	-
Arrowroot	2136	-	-	6416	-
Giant Cutgrass	2137	-	-	6418	-
Buttonbush	2138	-	-	-	-
Other spp.	2139	-	-	-	-
Floating/Emergent Aquatic Veg.	2140	6440	6440	644	-
Slough	2141	5600	5600	560	-
Pond Apple Slough	21411	-	-	-	-
Water Lettuce	2142	-	-	6441	-
Spatterdock	2143	-	-	6442	-
Water Hyacinth	2144	-	-	6443	-
Duck Weed	2145	-	-	6444	-
Water Lily	2146	-	-	6445	-
Other spp.	2147	-	-	-	-
Submergent Aquatic Vegetation	2150	-	-	645	-
Freshwater Forested Wetlands	2200	-	-	-	-
Cypress/Tupelo(incl Cy/Tu mixed)	2210	-	6216	-	-
Cypress	2211	6210	6210	621	17
Tupelo	2212	-	-	-	-
Isolated Freshwater Swamp	2213	-	-	-	-
Dome Swamp	22131	-	6215	-	-
Stringer Swamp	221311	-	-	-	-
Gum Pond	221312	-	-	613	-
Basin Swamp	22132	-	-	-	-
Strand Swamp	2214	-	-	-	-
Floodplain Swamp	2215	-	-	-	-
Freshwater Tidal Swamp	22151	-	-	-	-
Other Coniferous Wetlands	2220	-	-	-	-
Wet Flatwoods	2221	-	-	-	-
Hydric Pine Flatwoods	22211	6250	6250	625	-
Cutthroat Grass Flatwoods	222111	-	-	-	-
Cabbage Palm Flatwoods	222112	-	-	-	-
Hydric Pine Savanna	22212	-	6260	626	-
Pond Pine	2222	6220	-	622	-
Atlantic White Cedar	2223	-	-	623	-
Slash Pine Swamp Forest	2224	-	-	627	-

Class Name	Class Code	SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
Other Hardwood Wetlands	2230	6100	6100, 6180	610	-
Baygall	2231	-	-	-	-
Bay Swamp	22311	6110	6110	611	16
South Florida Bayhead	22312	-	6111	-	-
Hydric Hammock	2232	-	-	-	21
Coastal Hydric Hammock	22321	-	-	-	-
Prairie Hydric Hammock	22322	-	-	-	-
Cabbage Palm Hammock	22323	6181	-	-	-
Mixed Wetland Hardwoods	2233	6170	6170	617	-
Bottomland Forest	22331	-	-	615	20
Alluvial Forest	22332	-	-	-	22
Titi Swamp	2234	-	-	614	-
Other Wetland Forested Mixed	2240	6300	6300	630	19
Cypress/Hardwood Swamps	2241	-	-	-	-
Cypress/Pine/Cabbage Palm	2242	-	6240	624	18
Non-vegetated Wetland	2300	6500	6500	650, 653	-
Cultural-Palustrine	2400	-	-	-	-
Impounded Marsh	2410	-	-	-	-
Impounded Swamp	2420	-	-	-	-
Grazed Wetlands	2430	-	-	-	-
Clearcut Wetland	2440	-	-	-	-
Lacustrine	3000	5200	5200	520	-
Natural Lakes and Ponds	3100	-	-	-	-
Limnetic	3110	-	-	-	-
Clastic Upland Lake	3111	-	-	-	-
Coastal Dune Lake	3112	-	-	-	-
Flatwoods/Prairie/Marsh Lake	3113	5250	5250	-	-
River Floodplain Lake/Swamp Lake	3114	-	-	-	-
Sinkhole Lake	3115	-	-	-	-
Coastal Rockland Lake	3116	-	-	-	-
Sandhill Lake	3117	-	-	-	-
Littoral	3120	-	-	-	-
Cultural - Lacustrine	3200	-	-	-	-
Artificial/Farm Pond	3210	-	-	-	-
Aquacultural Ponds	3211	2540	2540	254	-
Artificial Impoundment/Reservoir	3220	5300	5300	530	-
Quarry Pond	3230	1660	1660	166	-
Sewage Treatment Pond	3240	-	-	-	-

Class Name	Class Code	SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
Stormwater Treatment Areas	3250	-	-	-	-
Industrial Cooling Pond	3260	-	-	-	-
Riverine	4000	5100	5100	510	-
Natural Rivers and Streams	4100	-	5160	-	-
Alluvial Stream	4110	-	-	-	-
Blackwater Stream	4120	-	-	-	-
Spring-run Stream	4130	-	-	-	-
Seepage Stream	4140	5500	-	550	-
Calcareous Stream	4150	-	-	-	-
Tidally-influenced Stream	4160	-	-	-	-
Riverine Sandbar	4170	-	-	-	-
Cultural - Riverine	4200	-	-	-	-
Canal	4210	8160	5120	816	-
Ditch/Artificial Intermittent Stream	4220	-	-	-	-
Industrial Effluent Stream	4230	-	-	-	-
Estuarine	5000	5400	5400	540	-
Subtidal	5100	-	-	-	-
Intertidal	5200	-	-	-	-
Exposed Limestone	5210	-	-	-	-
Vegetated	5211	-	-	-	-
Keys Tidal Rock Barren	52111	-	-	-	-
Non-vegetated	5212	-	-	650	-
Tidal Flat	5220	-	6510	651	26
Mud	5221	-	-	-	-
Sand	5222	-	-	-	-
Oyster Bar	5230	-	-	654	-
Salt Marsh	5240	6420	6420	642	23
Salt Flat	5241	-	-	-	-
Cordgrass	5242	-	-	6421	-
Needlerush	5243	-	-	6422	-
Mangrove Swamp	5250	6120	6120	612	24
Buttonwood Forest	5251	-	-	-	-
Scrub Mangrove	5252	-	-	-	25
Cultural - Estuarine	5300	-	-	-	-
Estuarine Ditch/Channel	5310	-	-	-	-
Estuarine Artificial Impoundment	5320	-	-	-	-
Aquaculture	5330	-	-	254	-
Marine	6000	-	-	-	-

Class Name	Class	SJRWMD ^a	SFWMD ^b	FLUCCS ^c	FWC ^d
	Code				
Surf Zone	6100	-	-	-	-
Exotic Plants	7000	-	-	-	37
Australian Pine	7100	4370	4370	437	38
Melaleuca	7200	-	4240	424	39
Brazilian Pepper	7300	-	4220	422	39
Exotic Wetland Hardwoods	7400	-	6190	619	-
Open Water	8000	-	-	-	27
Other	9000	-	-	-	-
Unconsolidated Substrate	9100	-	-	-	-

^a Source: St. John's River Water Management District [SJRWMD]. 2004. Photo Interpretation Key. <http://www.sjrwmd.com/disk6b/lcover_luse/luse2004/PI_Key_lulc2004/keylist.html>. Accessed 21 November 2009.

^b Source: South Florida Water Management District [SFWMD]. 2004. Land Cover Land Use 2004. <http://my.sfwmd.gov/gisapps/sfwmdxwebdc/dataview.asp?query=unq_id=1813>. Accessed 21 November 2009.

^c Source: Florida Department of Transportation, Surveying and Mapping Office. 1999. Florida land use, cover and forms classification system - handbook. Tallahassee, FL, USA.

^d Source: Gilbert, T. and B. Stys. 2004. Descriptions of vegetation and land cover types mapped using Landsat imagery. Florida Fish and Wildlife Conservation Commission. Tallahassee, FL, USA.