Forest sustainability in the state of Florida, USA

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1. Introduction

The combustion of wood for energy purpose is not considered to contribute to the augmentation of greenhouse gases concentration in the atmosphere, as long as the CO2 emissions released during the combustion of wood are balanced by the growth of new trees. It is therefore essential to investigate if the forests in the region where the wood used for energy purpose are managed in a sustainable way, avoiding resources associated with overexploitation of forests, land use change, depletion of carbon stocks, etc...

In this framework, literature research was carried out to produce a summary of forest management in Florida, including general condition, management and sustainability assessment.

2. Florida forests overview

2.1. Location and distribution

Florida is located in the south-eastern region of the USA and covers a total surface area of 170 304 km². The State of Florida has 67 counties (Figure 1).

Floridian forest is part of the large forest area of the East coast of the USA. Nowadays, the extent of forests in Florida is 7.05 million ha[1] and covers about 50% of the State's land area. Most of those forests are located in the northern part of the State.

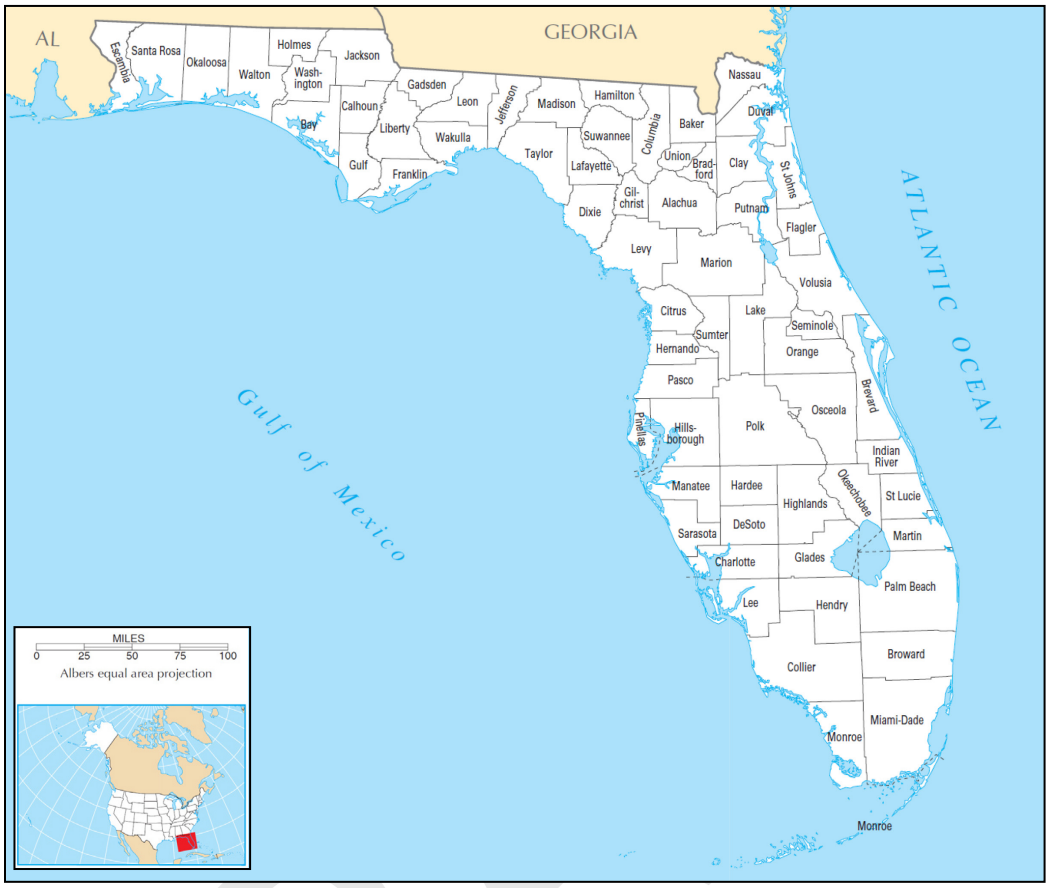
In 2011, 18 of the 67 counties were ≥ 75% forested. There were 14 counties <25 percent forested, all in the southern half of the State. The percentage of forest in each county is shown on the Figure 2.

Figure 3 shows forest and other land cover classes. Pine forests are largely dominant in the North, while South Florida forests are predominantly associated with wetlands (including mangrove, cypress, and other types of forested wetlands).

The percentage of total land cover area for each land cover type (forest and non-forest) in Florida is given on the Figure 4.

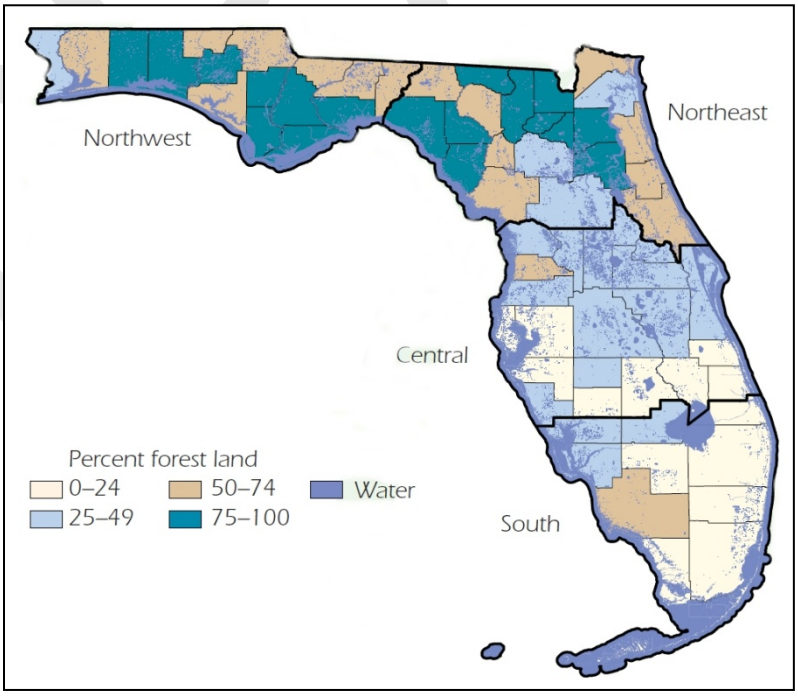
[1] Source : situation as per 2012 Forest Inventory and Analysis, USDA – Forest service

Figure 1: General maps of Florida and counties distribution



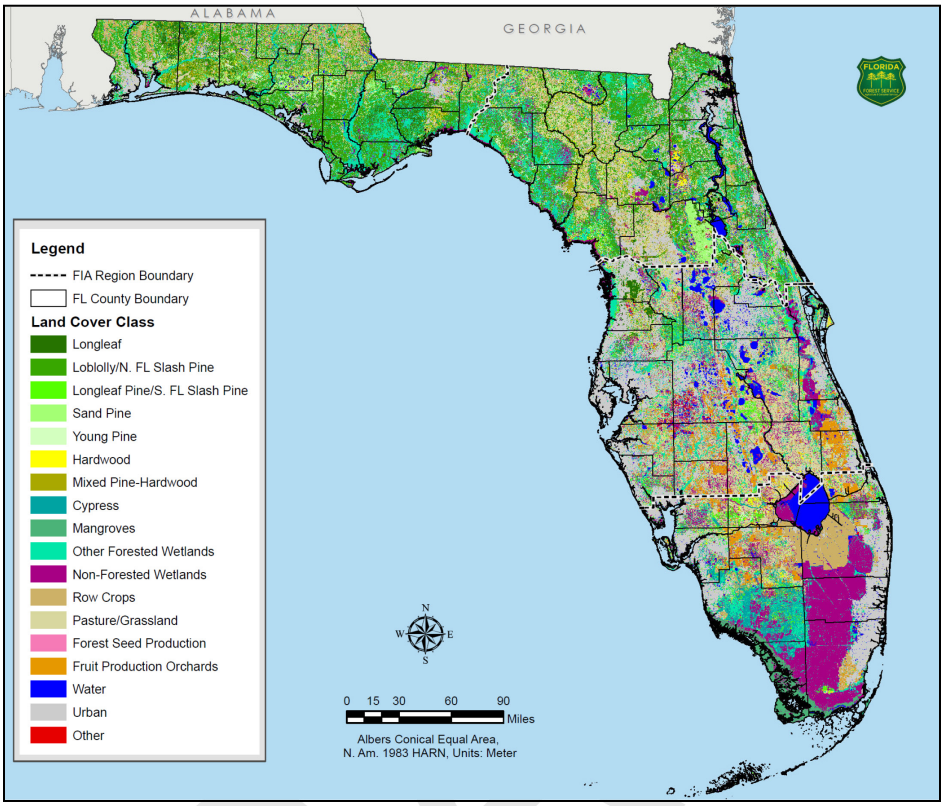
Source: nationalatlas.gov

Figure 2: Percentage of forest cover by county in Florida (2011)



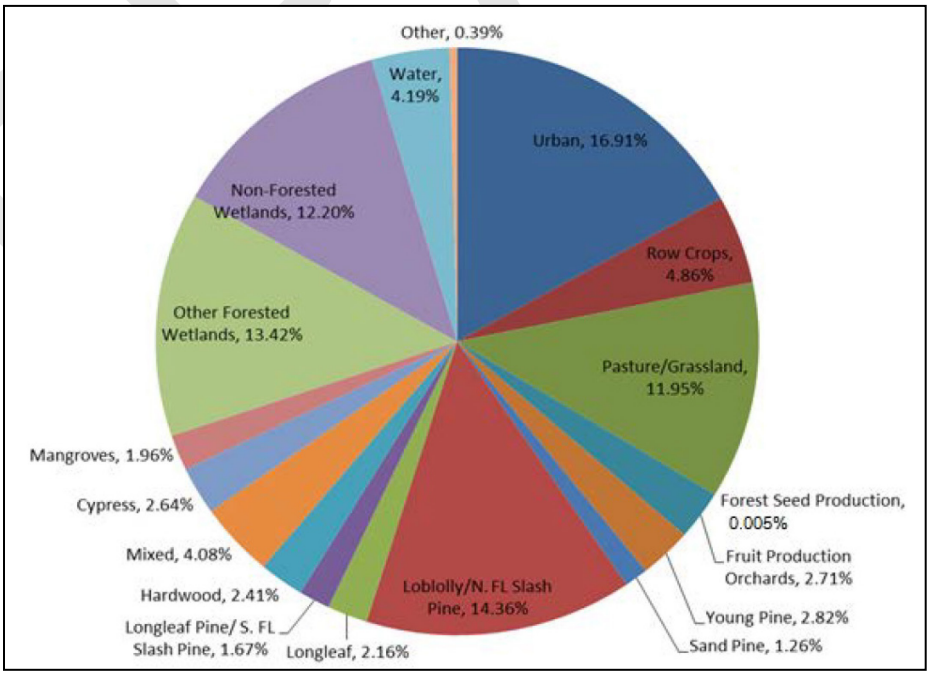
Source: Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

Figure 3: Forest land cover map (2013)



Source: CSFIAS - Florida Forest Service (Aug-2013)

Figure 4: Percentage of area for each land cover type (2013)



Source: CSFIAS - Florida Forest Service (Aug-2013)

2.1. Ecological zones of Florida

Florida is includes the 3 following ecoregions[2]:

A. South-eastern Plains (n°65 on Figure 5)

These irregular plains have a mosaic of cropland, pasture, woodland, and forest. Natural vegetation is mostly oak-hickory-pine and Southern mixed forest. The Cretaceous or Tertiary-age sands, silts, and clays of the region contrast geologically to the older igneous and metamorphic rocks of the Piedmont, and the older limestone, chert, and shale found in the Interior Plateau. Streams in this area are relatively low-gradient and sandy-bottomed.

B. Southern coastal plain (n°75 on Figure 5)

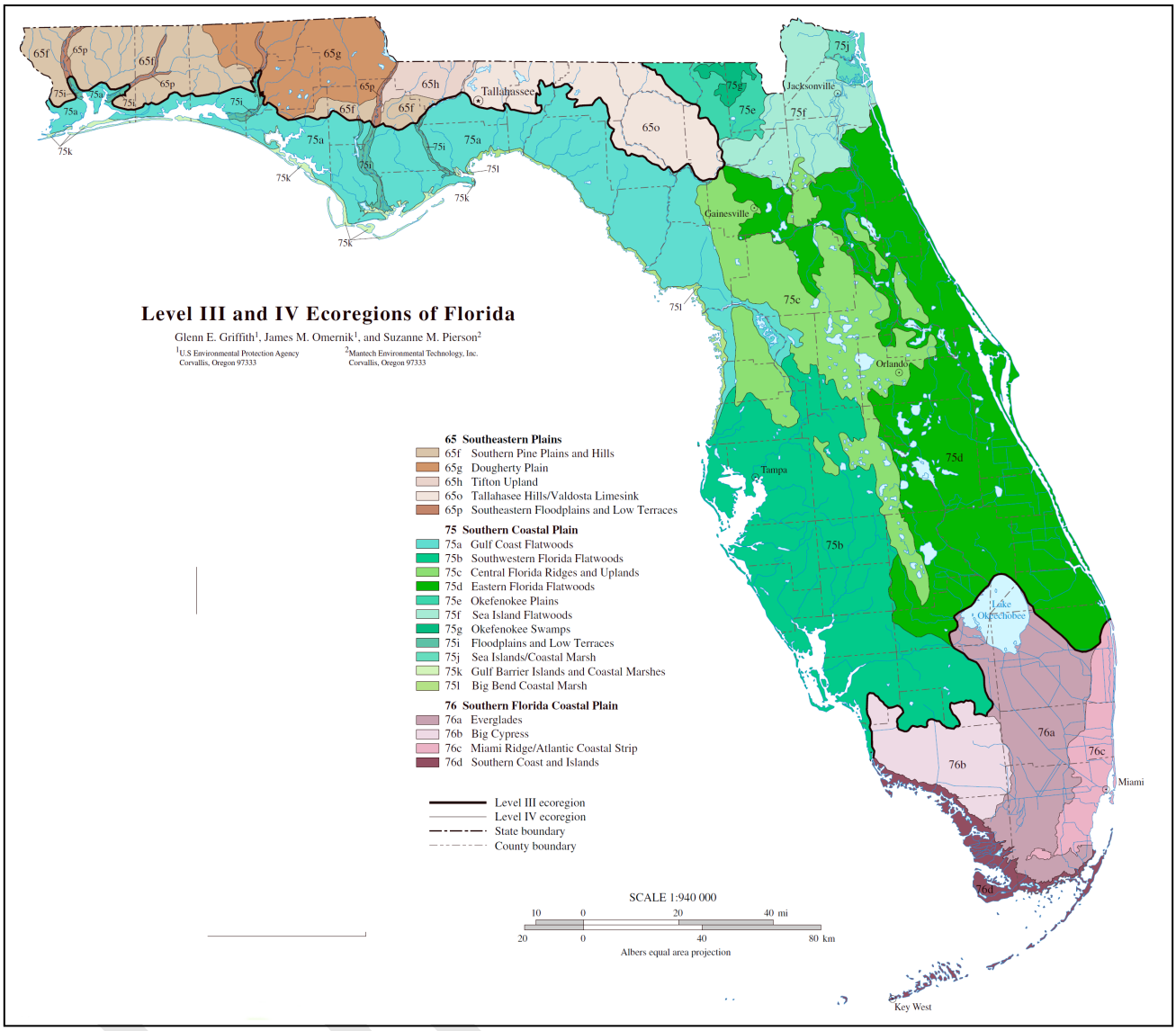
The Southern Coastal Plain consists of mostly flat plains with numerous swamps, marshes and lakes. This ecoregion is warmer, more heterogeneous, and has a longer growing season and coarser textured soils than the Middle Atlantic Coastal Plain. Once covered by a forest of beech, sweetgum, southern magnolia, slash pine, loblolly pine, white oak, and laurel oak, land cover in the region is now mostly longleaf-slash pine forest, oak-gum-cypress forest in some low lying areas, pasture for beef cattle, and urban development.

C. Southern Florida coastal plain (n°76 on Figure 5)

The frost free climate of the Southern Florida Coastal Plain makes it distinct from other ecoregions in the conterminous United States. This region is characterized by flat plains with wet soils, marshland and swamp land cover with everglades and palmetto prairie vegetation types. Although portions of this region are in parks, game refuges, and Indian reservations, a large part of the region has undergone extensive hydrological and biological alteration. Forest extent in this ecozone is extremely limited.

[2] Source: Level III Ecoregions of Florida - National Health and Environmental Effects Research Laboratory – US Environmental Protection Agency (http://www.hort.purdue.edu/newcrop/cropmap/ecoreg/descript.html)

Figure 5: Ecological zones of Florida (Level III & IV)



Source: Environmental Protection Agency – Western Ecology Division
(http://www.epa.gov/wed/pages/ecoregions/fl_eco.htm#Ecoregions denote)

The highest point in Florida is Britton Hill located in the Florida Panhandle with 105 meter above the sea level.

The climate in Florida is subtropical (hot and humid), but with occasional cooling in the winter. Depending on the place, the typical high temperatures recorded in July are in the range 32°C to 33°C while the typical low temperatures recorded in January are in the range 4°C to 18°C[3].

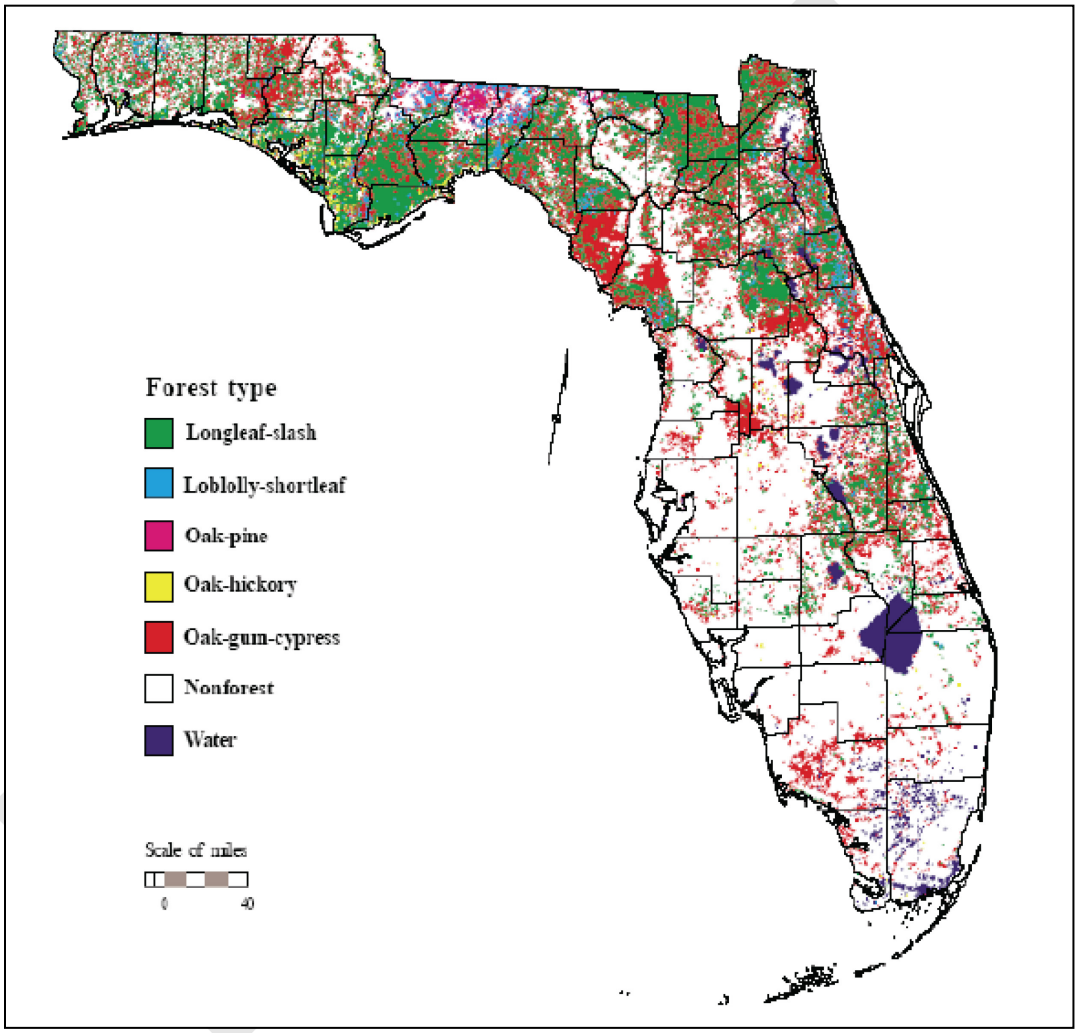
Depending on the place, the average precipitations generally range from 1 100 to 1 800 mm per year[4].

[3] Source : http://www.ustravelweather.com/florida/
[4] Source : http://average-rainfall.weatherdb.com/d/d/Florida

2.2. *Forest species*

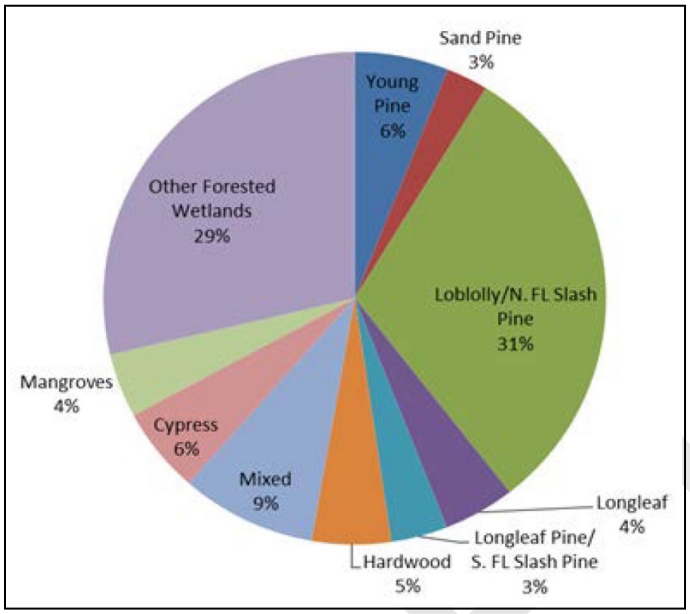
The main forest species found in Florida are: several species of pine (longleaf, slash, loblolly and shortleaf pine), oak, hickory, cypress and liquidambar (sweetgum). The forest-type distribution is given on the Figure 6. Figure 7 shows the percentage of each forest class represented in Florida. The forest-type breakdown shows 38% hardwood (including forested wetlands and mangroves), 53% softwood (pine and cypress) and 9% mixed hardwood-softwood by acreage.

Figure 6 : Forest type distribution in Florida



Source: Florida's forest resources: action plan for 2006-2010

Figure 7: Percentage of area for each forest land cover type



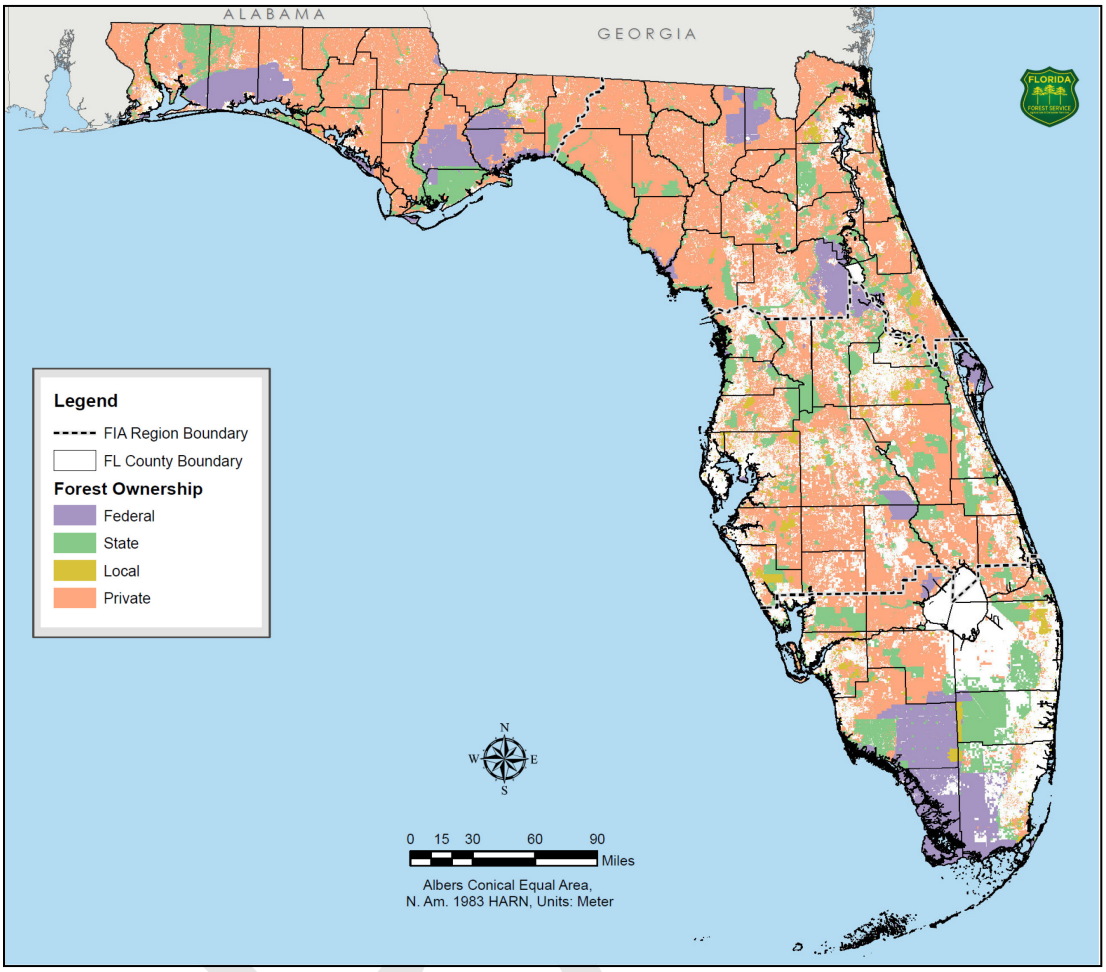
Source: CSFIAS - Florida Forest Service (Aug-2013)

According to the USDA (Forest inventory & Analysis Factsheet - 2011), altogether, hardwood forest-type groups accounted for 51% of Florida's timberland (or 3.27 million ha) in 2011. Softwood forest types occupy 45% (or 2.90 million ha) of timberland, and non-stocked areas make up the remaining 4% (or 0.27 million ha). The longleaf-slash pine forest-type group predominates with 2.25 million ha of the timberland. The oak-gum-cypress type group is second with 1.26 million ha, and oak-hickory type group is third with 1.13 million ha. Next is loblolly-shortleaf pine type group with 0.65 million ha of the timberland, closely followed by area of oak-pine mix.

2.3. Forest ownership

Forest ownership in Florida is given on the following figure:

Figure 8: Florida forest ownership map



Source: CSFIAS - Florida Forest Service (Aug-2013)

Florida forests are predominantly in private ownership. About 63% of forest area statewide is privately owned (and most private forestland is under non-industrial, non-corporate ownership). Federal and state governments own 17% each of Florida's forests, while local and municipal governments own a total of 3%[5]. Private ownership is proportionately greater in North Florida, reaching as much as 76% of all forestland in Northeast Florida. Private ownership in South Florida is lower (27% of forestland), due to the large areas of Big Cypress National Preserve and the Everglades National Park that contribute to the federal government's majority share of ownership.

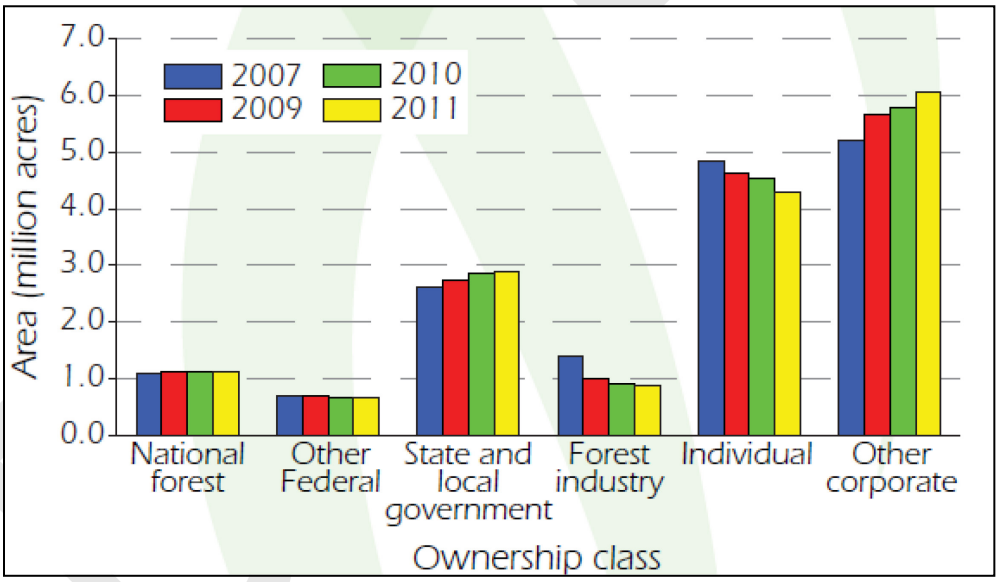
The private forest ownership in Florida shows a clear difference between north and south. The primary timber producing region of the State is in the north, and this is where corporate landowners have significant holdings. In Northwest Florida, Timber Investment Management Organizations (TIMOs) represent just over 10% of all private forestland ownership and own a significant fraction of Northeast Florida forests. Likewise, corporate Timber Real Estate Investment Trusts (REITs) own more than 10% of Northeast Florida private holdings. Throughout the state, the largest share of forestland is held by non-corporate owners of Non-Industrial Private Forest (NIPF).

[5] Source: Comprehensive Statewide Forest Inventory Analysis Study (CSFIAS) – Bulleted Summary (Aug-2013) – Florida Department of Agriculture and Consumer Services – Florida Forest Service (http://freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Forest-Inventory)

Federal forest ownership in North Florida is mostly National Forests although the Department of Defense has large holdings in the West. Federal ownership in Central Florida is limited, but in South Florida however, nearly all of the federal lands are within the Department of Interior holdings, representing 44% of all federal forest acreage statewide. While more than a dozen state agencies own forestland in Florida, the five Water Management Districts and three land managing agencies own the vast majority: Florida Forest Service, Fish and Wildlife Conservation Commission and Division of Recreation and Parks. Local governments typically own only a minor share of forests throughout the state. In most cases, county governments own a greater share of forestland than do municipal governments.

According to the USDA (Forest inventory & Analysis Factsheet - 2011), non industrial private forest (NIPF) owners hold 65% of the State's timberland. This area increased slightly to 4.19 million ha in 2011 from 4.07 million ha in 2007. However, within the NIPF group, area under individual ownership continued to trend rapidly downwards, from 1.96 million ha in 2007 to 1.74 million ha in 2011 (Figure 9). In contrast, timberland under non industrial corporate ownership continued to trend rapidly upwards from 2.11 million ha to 2.45 million ha. Public ownerships has slightly increased while ownership by forest industry has slightly decreased.

Figure 9: Area (million acres) of timberland by ownership class and year (2007-2011)



Source: Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

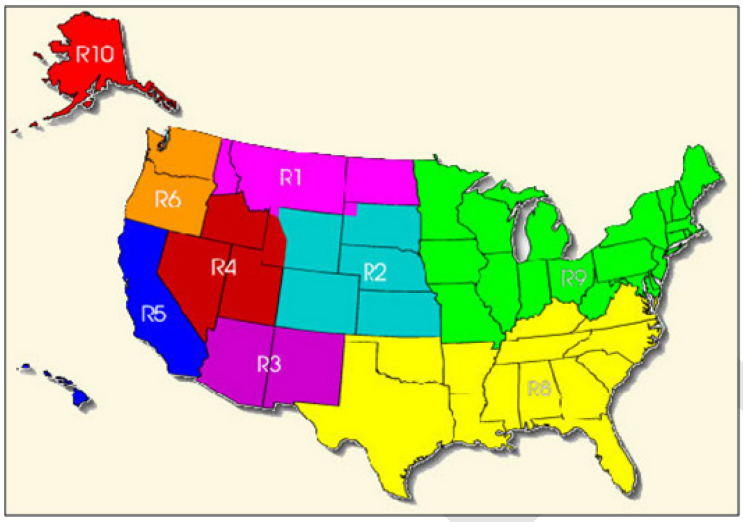
2.4. Competent authorities

Forest management in the United States of America, at the federal level is under the authority of the US Department of Agriculture and more specifically it's agency of the US Forest Service whose mission is to: *"Sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generation"* [6]

[6] Source : http://www.fs.usda.gov/

Forest management on the territory of the United States is shared in 10 different parts belonging to regional divisions of the Forest Service. As shown on the figure below, Florida and other States like Alabama and Georgia belongs to the R8 region: Southern Region.

Figure 10: Regional areas of the Forest Service



Source : http://www.fs.fed.us/

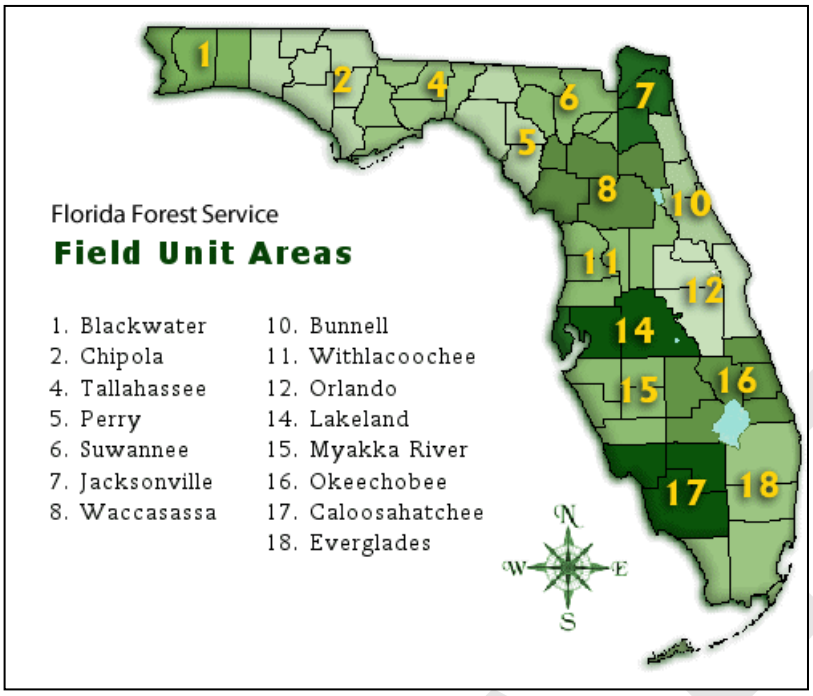
The authority responsible for forest management in Florida is organized in two levels: federal and state. The Forest Service – an agency of the Department of Agriculture – is responsible at federal level for the coordination of forest policies and the management of federal forests. At state level, the Florida Forest Service (a division of the Florida Department of Agriculture and Consumer Services) is in charge of forest management. Its mission is to protect Florida and its people against the dangers of wildfire, and to manage the forest resources through a stewardship ethic to assure they are available for future generations. Their core program areas are:

- wildfire prevention, suppression and training,
- state land management (including timber, recreation and wildlife habitat),
- services to landowners with technical assistance

The Florida Forest Service (FFS) employs more than 1 250 member of staff.

The Florida Forest Service's forestry programs are implemented by its Field Operations staff within 18 field units across the state (Figure 11).

Figure 11: Field unit areas in Florida



Source: Florida Department of Agriculture and Consumer Services – Florida Forest Service (http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Field-Operations)

2.5. Overview of wood-related industry

The wood-related industry involves more than 130 000 jobs and generates an annual turnover of 20.8 billion dollars. Timber production ranks 4th in the State's manufacturing economy.

The forest products industry is very diverse, with many different types of interlinked businesses: private and industrial landowners; manufacturing operations for pulp/paper, lumber, plywood, other milled wood products, wood preservative treating and wood chemical products; forestry service businesses such as loggers, management consultants and operatives, trucking firms, tree trimming/removal services, and forest tree nurseries.

The Figure 12 and Table 1 give the main figures about the wood-related industry, their distribution amongst the State and the location of the primary wood-using mills in Florida economy[7].

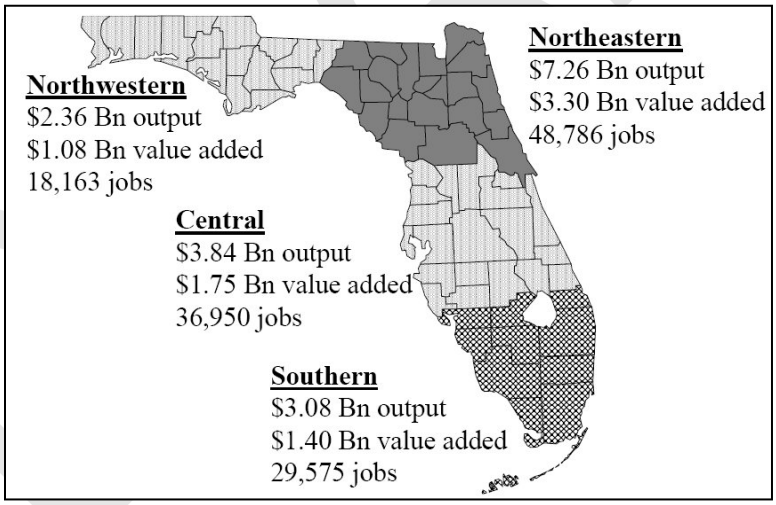
[7] Economic Impacts of the Forest Industry in Florida, 2003 - Final Report to the Florida Forestry Association (revised January 2005) – (http://edis.ifas.ufl.edu/fe538)

Table 1 : Total economic impacts of the forest industry in Florida by group and sector in 2003

Industry Sector	Output Impact ($Mn)	Employment Impact (Jobs)	Value Added Impact ($Mnl)
Forestry & Forest Products	8,835	48,930	2,709
Forestry & Natural Resources	1,646	24,834	835
Logging	722	5,082	364
Forest nurseries and timber tracts	406	1,165	185
Agriculture and forestry support activities	449	17,534	244
Forest Products Manufacturing	7,189	24,096	1,875
Pulp mills	2,181	4,916	502
Paper and paperboard mills	1,781	4,197	594
Wood preservation	931	2,816	131
Sawmills	955	5,271	229
Veneer and plywood manufacturing	388	2,394	117
Other miscellaneous chemical product manuf.	255	828	65
Miscellaneous wood product manufacturing	86	706	28
Millwork- including flooring	10	125	5
Reconstituted wood product manufacturing	6	23	2
Other Industry Sectors	7,699	84,545	4,814
Total	16,534	133,475	7,523

Source: Hodges *et al.*, 2005

Figure 12 : Economic impacts of the forest industry in Florida regions



Source: Hodges *et al.*, 2005

In the *Comprehensive Statewide Forest Inventory Analysis Study*[8], primary wood-using mills were identified, located, and their operational status confirmed. 65 wood-using mills in the state are made up mostly of sawmills, mulch, chip-and-saw and pulp mills (Table 2).

[8] CSFIAS – Bulleted Summary (Aug-2013) – Florida Department of Agriculture and Consumer Services – Florida Forest Service (http://freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Forest-Inventory)

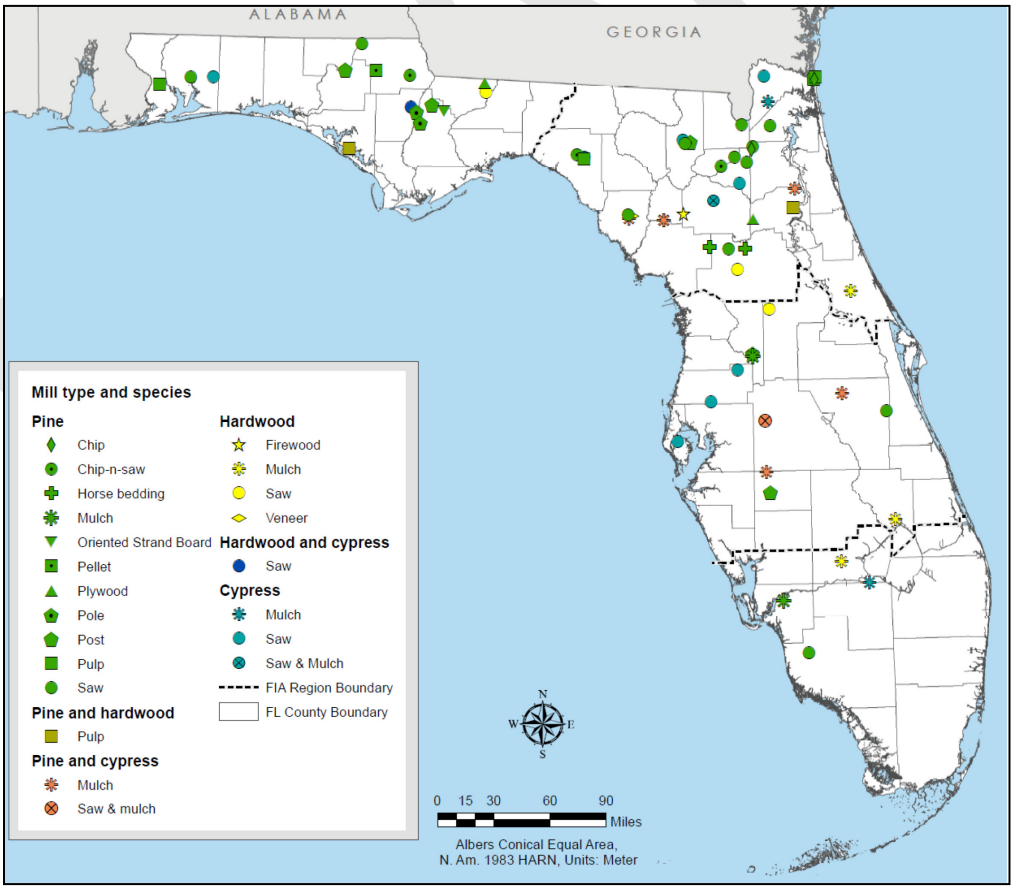
Table 2 : Primary wood using mills in Florida

Mill type	Number of mills
Saw	21
Mulch	13
Pulp, Pulp and Paper	6
Chip-n-saw	4
Post	3
Saw and Mulch	3
Chip	2
Horse bedding	2
Plywood	2
Pole	2
Firewood	1
Oriented Strand Board	1
Pellet	1
Pole and Saw	1
Post and Treating	1
Saw and Post	1
Veneer	1
Total	65

Source: CSFIAS - Florida Forest Service (Aug-2013)

Figure 13 shows the location and type of primary mills within the state.

Figure 13 : Location of primary wood using mills in Florida



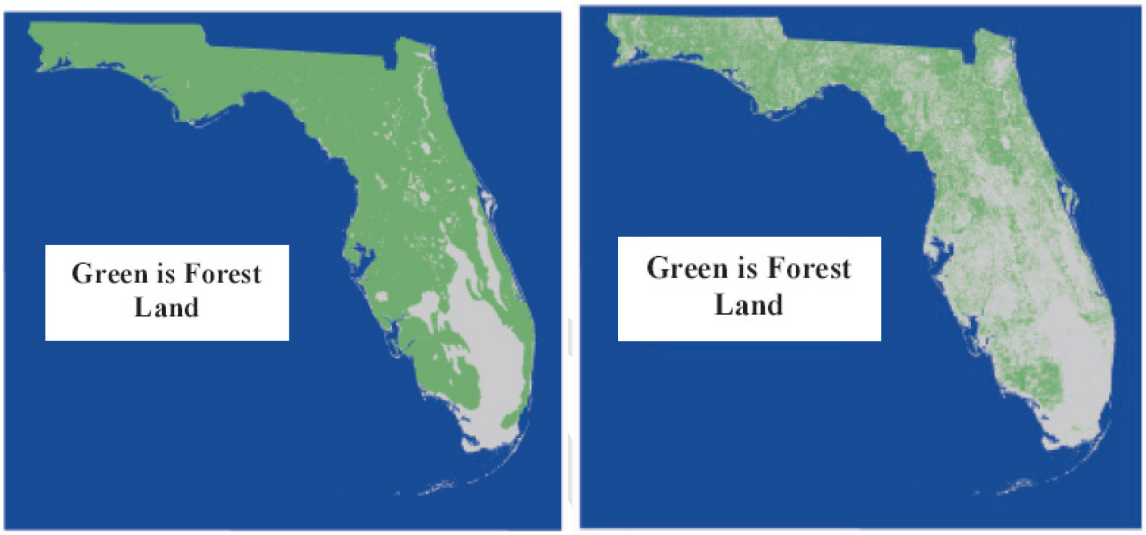
Source: CSFIAS - Florida Forest Service (Aug-2013)

3. Sustainability of Florida forest

3.1. Evolution of forest area and risk of conversion

At the State level, the forested area has dramatically decreased over last century (Figure 14). Forest acreage has dropped steadily since the 1930s, totalling a loss of an estimated 2.89 million hectares, or 30%, between 2030 and 2005 (9.72 to 6.83 million hectares). Floridian forests still decrease by 32 000 hectares each year and it's expected that by 2030, 809 thousand hectares of forest will be lost (Florida's forest resources: action plan for 2006-2010).

Figure 14 : Anticipated losses of forest in Florida between 2005 and 2030



Source: Florida's forest resources: action plan for 2006-2010

There is an ongoing assessment of Florida's forest resources by the US Forest Service's Forest Inventory and Analysis (FIA) program. This program, which is based on field plots, has characterized the forests of Florida and is able to show the changes in forest resources on a continuous basis.

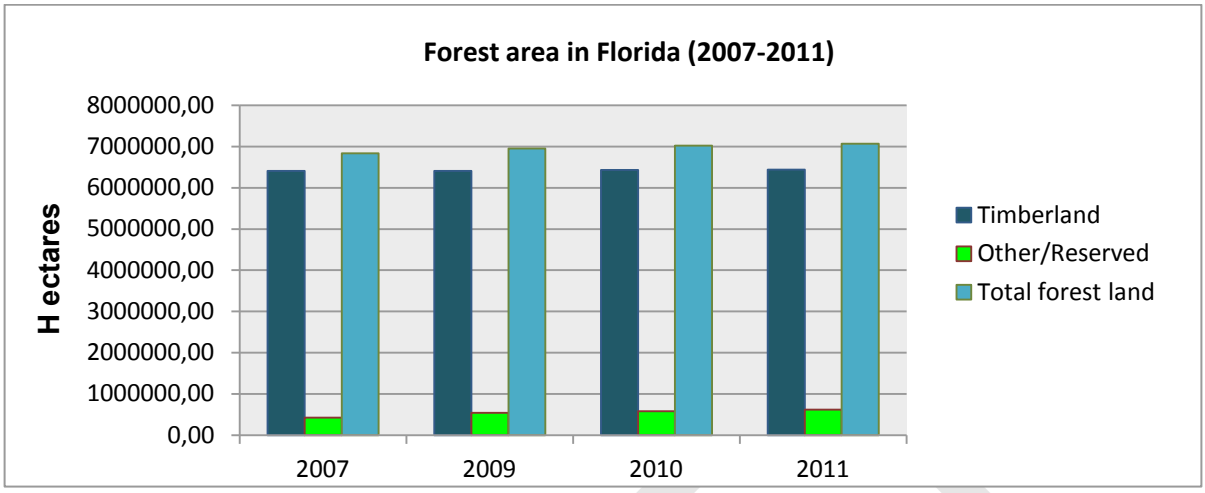
Despite this dramatic decrease in forest surface since 1930 and on the long term, the most recent trend shows a slight increase: according to the USDA (Forest inventory & Analysis Factsheet - 2011), forest area in Florida was 7.06 million ha in 2011 compared to 6.84 million ha in 2007 Table 3 & Figure 15).

Table 3 : Area (million ha) by land class and year (2007-2011)

Land class/year	2007	2009	2010	2011
Timberland	6.411	6.405	6.433	6.441
Other/Reserved	0.427	0.545	0.585	0.625
Total forest land	**6.838**	**6.950**	**7.018**	**7.066**
Nonforest land	7.074	7.038	6.998	6.965
Total land area	13.912	13.989	14.016	14.031
Percent land area forested	49.15%	49.69%	50.07%	50.36%

Source: Adapted from Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

Figure 15: Evolution of forest area in Florida (2007-2011)



Source: Adapted from Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

As can be seen on Table 4, the forest area in Florida has slightly increased (7.6%) between 2004 and 2012 (i.e. about 0.9% increase yearly on average). In 2012, about 89% percent of the total forested land is used for commercial timber production. The remaining forested area is reserved forest land or other type of forested land out of production (this is the difference between forest land and timberland as on Figure 15).

Table 4 : Evolution from forested area (2004-2012) and timberland (1970-2012) in Florida

Year	Forestland (ha)	Change (ha)	Change %	Timberland (ha)	Change (ha)	Change %
1970	-	-	-	6 568 707	-	-
1980	-	-	-	6 339 073	-229 634	-3.50%
1987	-	-	-	6 064 100	-274 973	-4.34%
1995	-	-	-	5 930 204	-133 896	-2.21%
2004	6 558 063	-	-	6 207 044	276 840	4.67%
2007	6 838 037	279 974	4.27%	6 317 027	109 983	1.77%
2009	6 950 493	112 456	1.64%	6 302 253	-14 774	-0.23%
2010	7 018 175	67 682	0.97%	6 315 621	13 368	0.21%
2011	7 066 207	48 032	0.68%	6 311 519	-4 102	-0.06%
2012	7 055 974	-10 233	-0.14%	6 273 692	-37 827	-0.60%

Source: adapted from US Forest service, FIA Program (http://apps.fs.fed.us/fido/standardrpt.html)

The yearly data of the Forestry Inventory and Analysis (FIA) makes possible to further investigate the recent trends of the forest areas in Florida, through the evolution of forest area by county (see annex 1). Depending on the county, the situation is very different, with increases in some counties and decreases in other.

The FSC risk assessment platform www.globalforestregistry.org considers the USA are at unspecified risk in terms of conversion of forest to other land uses, because the following criterion is not verified in the country:

- There is no net loss and no significant rate of loss (> 0.5% per year) of natural forests and other naturally wooded ecosystems such as savannahs taking place in the eco-region in question

Indeed, even though at the national level, forested area in the USA increase by 0.1% yearly on average, there are important regional variations and forest extent is are known to be decreasing in different parts of the country. Hence the Global Forest Registry recommends performing an analysis at the state level.

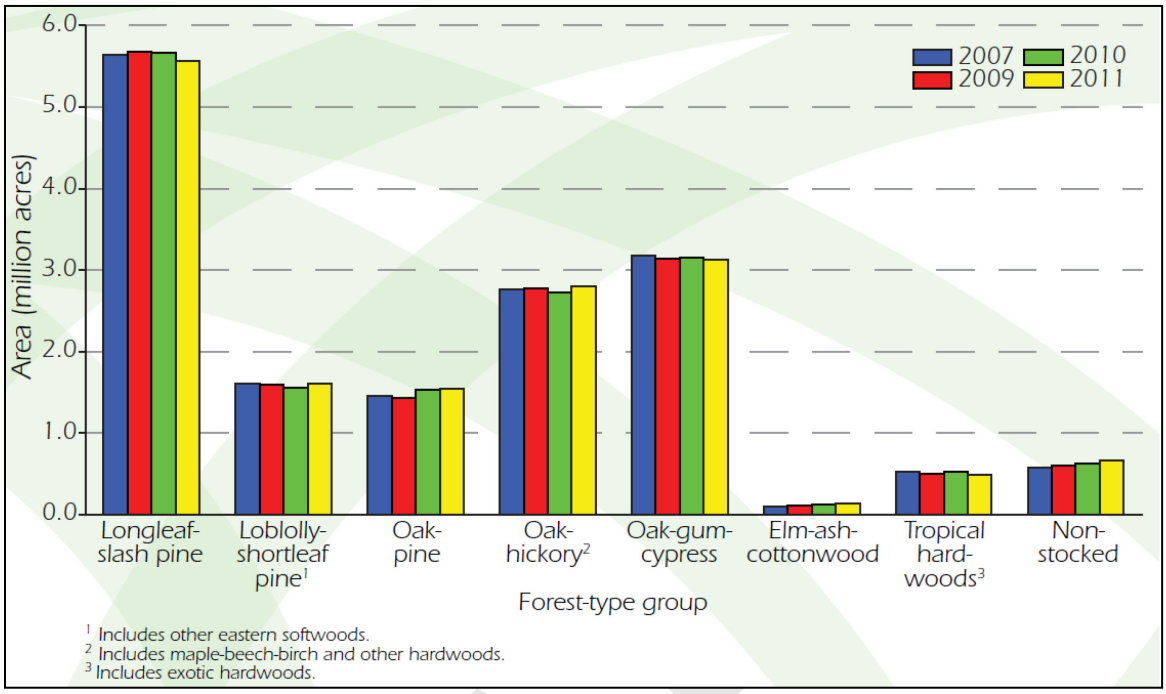
For example, in the Everglades (located in Southern Florida) the Global Forest Registry reports the recent loss of natural forests to be larger than 3% annually. With only about 243000 ha of natural forest area left, this region shall be classified as "unspecified risk" for conversion.

Because of that, and despite the positive recent trend in the evolution of forest areas in Florida, we can't exclude locally a risk of conversion and recommend an analysis at a finer level.

At the county level annex 2 makes possible to identify counties where the average annual losses of forest were in excess of 0.5% (which is the threshold the Global Forest Registry refers to in its risk assessment). There are 15 counties where the 0.5% threshold was exceeded as yearly average in the period 2004-2012 (out of the 67 counties in Florida).

Between 2007 and 2011 (Figure 16), the order of forest-type prevalence was unchanged and changes in area of type groups were minimal. However, the area of the longleaf-slash pine forest-type group has begun to decline, driven especially by declines in the slash pine component. Over the same period, there was an increase in non-stocked area, which could reflect fewer acres being replanted following slash pine harvest.

Figure 16: Area (acres) of timberland by forest-type group and year (2007-2011)



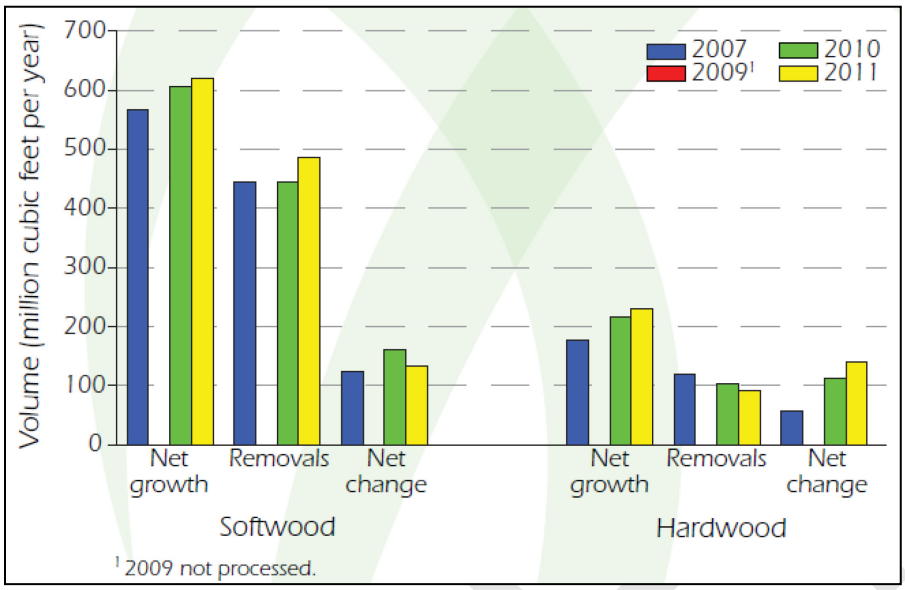
Source: Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

3.2. Living wood volumes and removals

According to the USDA (Forest inventory & Analysis Factsheet - 2011), net growth of softwoods in Florida increased to 17563 million m³ in 2011 from 16062 million m³ in 2007 (Figure 17). Softwood removals increased as well, to 13786 million m³ from 12577 million m³ in 2007. The softwood growth to removals relationship for 2011 yielded a positive annual net increase of 3791 million m³ in the softwood resource statewide, similar to that reported in 2007.

Net growth of all-live hardwoods on Florida's timberland continued to increase as well. Hardwood net growth increased substantially from 2007 to 2011, averaging 6515 million m³ annually in 2011 compared to 4991 million m³ in 2007. Simultaneously, hardwood removals continued to decrease, to 2573 million m³ from 3383 in 2007. The combination of increasing net growth and decreasing removals for hardwoods in 2011 has resulted in a large positive net rate of change of approximately 3941 million m³; more than double that recorded for 2007.

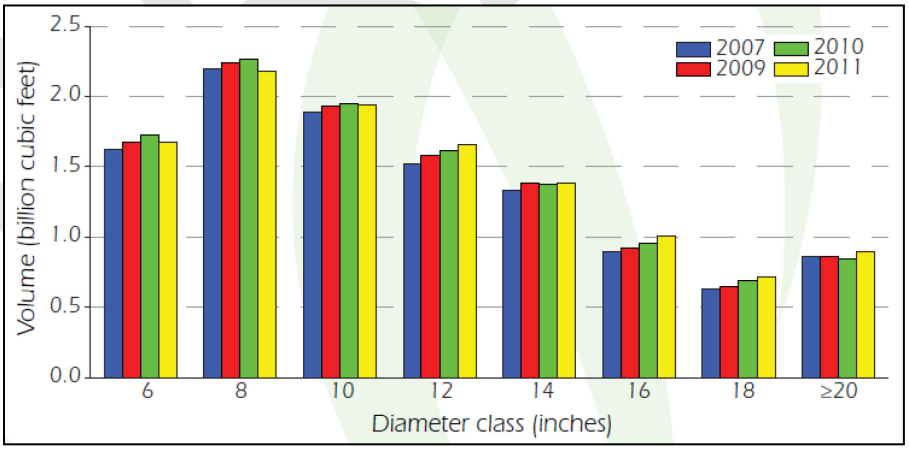
Figure 17: All-live volume of net growth and removals on timberland by broad species group and year (2007-2011)



Source: Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

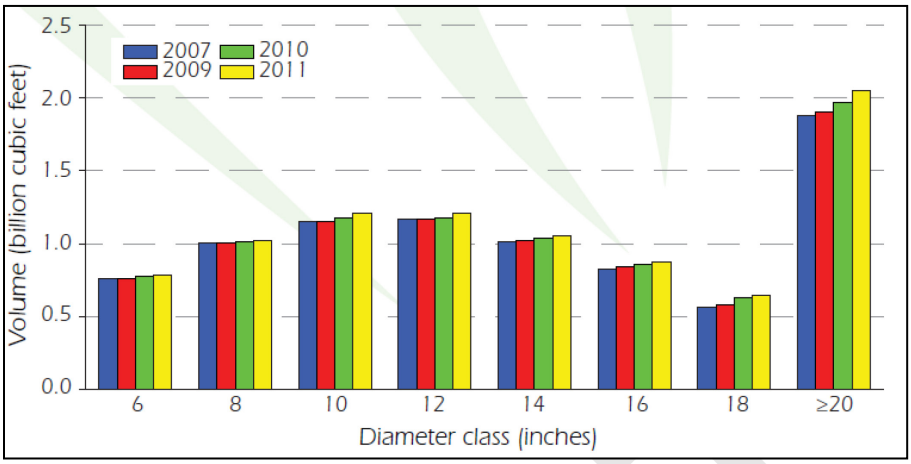
The graphs below (Figure 18 and Figure 19).below show volumes for softwood and hardwood all-live volume on timberland by diameter class and year. Harvested softwood increased in the large diameter categories and decreased in the small diameter categories, which reflects an increased maturity of the forests (consistent with the augmentation of the volume of living biomass). For softwood, the distribution by diameter categories is fairly stable, with a proportionate augmentation of harvested volumes throughout all categories.

Figure 18: Softwood all-live volume on timberland by diameter class and year (2007-2011)



Source: Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

Figure 19: Hardwood all-live volume on timberland by diameter class and year (2007-2011)



Source: Forest inventory & Analysis Factsheet (Florida, 2011 – USDA)

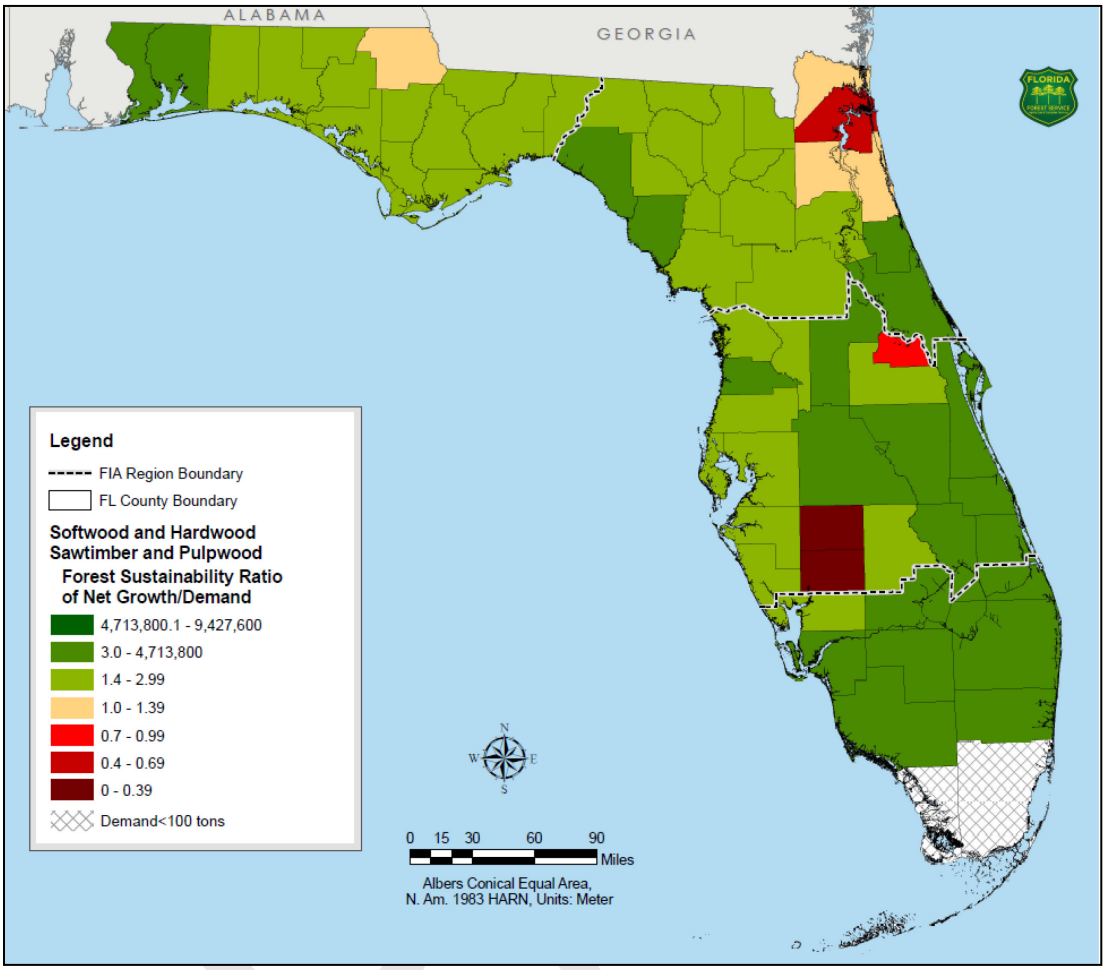
In the *Comprehensive Statewide Forest Inventory Analysis Study*[9],*a* forest sustainability index is defined as the ratio of net timber growth to timber removals, where a value > 1 indicates that there is more growth than removal. A value < 1 indicates that there is more removal than growth. Counties where timber demand for product is low (< 100 tons per year) are shown in a crosshatch pattern.

Florida's forests overall are sustainable across species and timber products with a statewide sustainability index of 2.1.

depicts the sustainability index for all softwood and hardwood products.

[9] CSFIAS – Bulleted Summary (Aug-2013) – Florida Department of Agriculture and Consumer Services – Florida Forest Service (http://freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Forest-Inventory)

Figure 20: Forest sustainability index –sawtimber and pulpwood



Source: CSFIAS - Florida Forest Service (Aug-2013)

3.3. Protection of ecosystems and biodiversity

The area of conservation land in Florida varies for each county (with a minimum of 1% for Hardee to a maximum of 95% for Monroe).

As shown on Table 5 , the conservation land in Florida covers 3713064 ha, which is about 26.4% of the state area. This includes federal, state and local non-submerged lands. Figure 21 shows an overview of all protected land in Florida. Those protected areas are either public (federal, state, county or local) and private lands. Figure 22 shows the national parks in Florida.

Table 5 : Land under conservation status in Florida (as of 2011)

	Status 1	Status 2	Status 3	Total
Acres	1982938	1875503	5316740	9175181
Ha	802467	758989	215147	3713064
Percentage of state area	5.71%	5.40%	15.31%	26.43%

Source: USGS Gap analysis http://gapanalysis.usgs.gov/

Status 1: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.

Status 2: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.

Status 3: Area having permanent protection from conversion of natural land cover for the majority of area. Subject to extractive uses of either broad, low-intensity type (eg. Logging) or localized intense type (eg. Mining). Confers protection to federally listed endangered and threatened species throughout the area.

Note that different figures exist in terms of total conservation area in the State, depending on the categories of protection that are taken into account (particularly in the status 3 as defined above). For example, data shown on Table 6 from Florida Natural Areas Inventory (February 2013) refer to a total area under conservation status of about 29% of total State area.

Table 6 : Land under conservation status in Florida

(including Less-than-fee conservation lands)

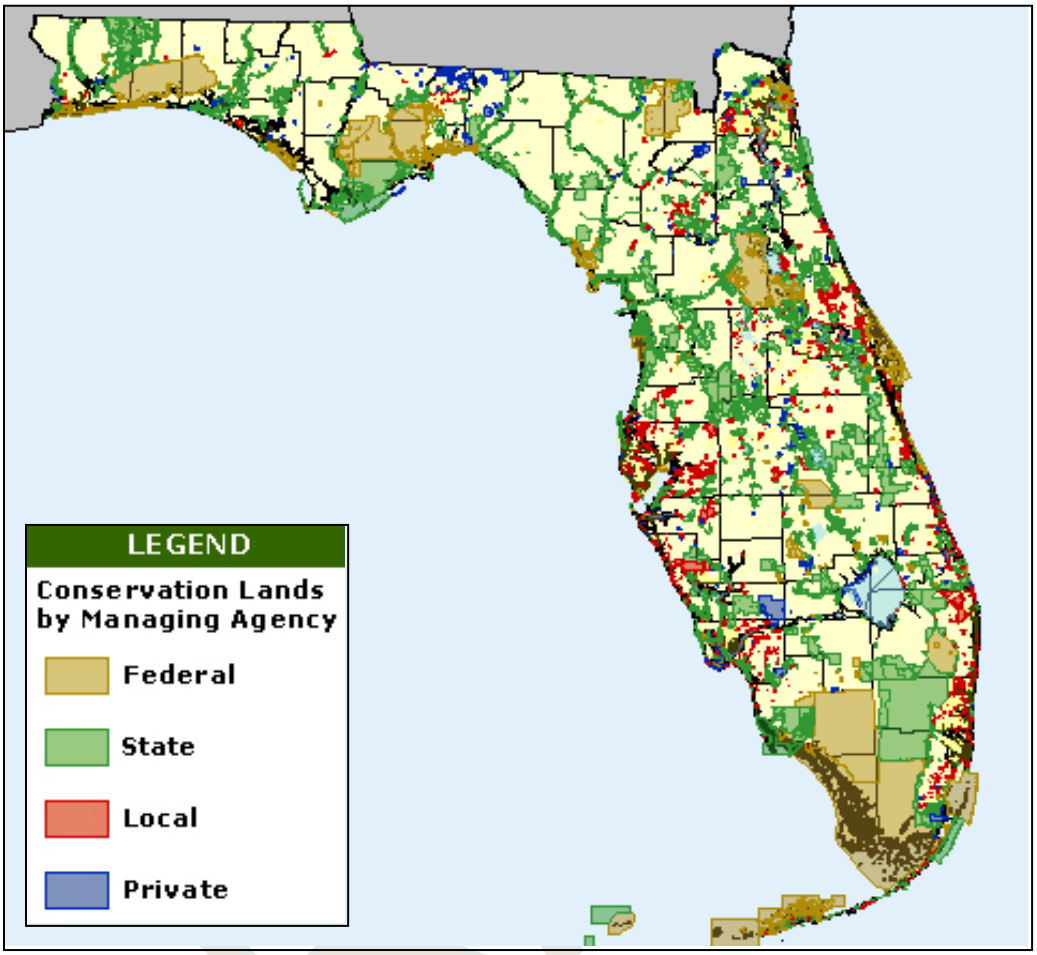
	Fee simple		Less-than-fee	
	Acres[10]	ha	Acres[11]	ha
FEDERAL CONSERVATION LANDS				
USDA Forest Service	1185102	479594	1696	686
USDI Fish and Wildlife Service	504224	204052	2402	972
USDI National Park Service	1683886	681444	1337	541
US Dept. of Defense	664239	268808	0	0
US Other	4829	1954	0	0
TOTAL FEDERALLY MANAGED non-submerged lands	**4042280**	**1635853**	**5435**	**2199**
STATE CONSERVATION LANDS				
DACS Florida Forest Service	1058994	428560	5042	2040
DEP Division of Recreation and Parks (state parks)	598117	242049	0	0
DEP Office of Greenways and Trails	74262	30053	0	0
DEP Office of Coastal and Aquatic Managed Areas	49485	20026	0	0
DEP Division of State Lands	0	0	102699	41561
DEP Northwest District	0	0	13169	5329
DEP Bureau of Mine Reclamation	5710	2311	14601	5909
Fish and Wildlife Conservation Commission	1423409	576033	43375	17553
Babcock Ranch (managed by Babcock Ranch Management, LLC)	73239	29639	0	0
Dept. of Corrections (managed by P.R.I.D.E.)	18200	7365	0	0
Dept. of Military Affairs	73076	29573	0	0
Dept. of Management Services	83	34	0	0
State Universities	14307	5790	66	27
Water Management Districts	1468168	594147	406317	164431
Undesignated State Lands	4627	1872	0	0
TOTAL STATE MANAGED non-submerged lands	**4861677**	**1967451**	**585269**	**236850**
LOCAL (COUNTY & MUNICIPAL) CONSERVATION LANDS	**478852**	**193785**	7531	3048
TOTAL STATE, FEDERAL, AND LOCAL non-submerged lands	**9382809**	**3797088**	**598235**	**242097**
Private Conservation Lands	129885	52563	61784	25003
Private Mitigation Banks	30152	12202	0	0
LAND AREA OF STATE OF FLORIDA	34721280	14051204	34721280	14051204
% OF FLORIDA IN FEDERALLY MANAGED CONSERVATION LANDS	**11.6%**		**0.02%**	
% OF FLORIDA IN STATE-MANAGED CONSERVATION LANDS	**14.0%**		**1.7%**	
% OF FLORIDA IN LOCALLY MANAGED CONSERVATION LANDS	**1.4%**		**0.02%**	
TOTAL OF FEDERALLY, STATE AND LOCALLY MANAGED CONSERVATION LANDS	**27.0%**		**1.7%**	

Source: Adapted from Florida Natural Areas Inventory – February 2013 (http://www.fnai.org/conservationlands.cfm)

[10] Acreages are counted once under the primary managing agency even though there may be several owners and/or managers. For this reason, total acres for some agencies may be higher than the acres to which they hold title and others may be lower. Acreages listed include terrestrial wetlands such as the Everglades but exclude 3,691,155 acres of submerged marine, lake, or river bottom (such as state aquatic preserves or Florida Bay) that are part of certain managed areas.

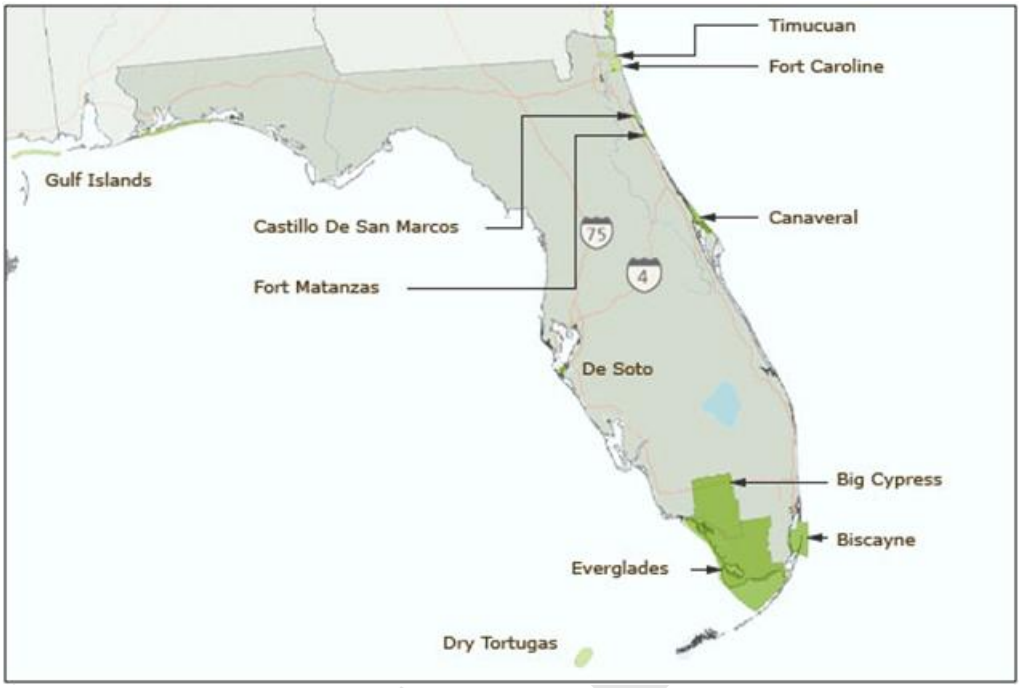
[11] Numbers include a total of 660,019 acres less-than-fee properties (6.5% of total conservation lands). Represents the less-than-fee lands included in the FNAI conservation lands database as of 1 February 2013. All properties are owned by either private individuals or private foundations or corporations. Lands are classified by the agency or organization that monitors the easement on the property. The same agency or organization usually holds title to the easement, but there are a few exceptions.

Figure 21 : Conservation lands in Florida



Source : Florida Natural Areas Inventory (http://www.fnai.org/conservationlands.cfm)

Figure 22 : National parks in Florida



Source: http://home.nps.gov/state/fl/

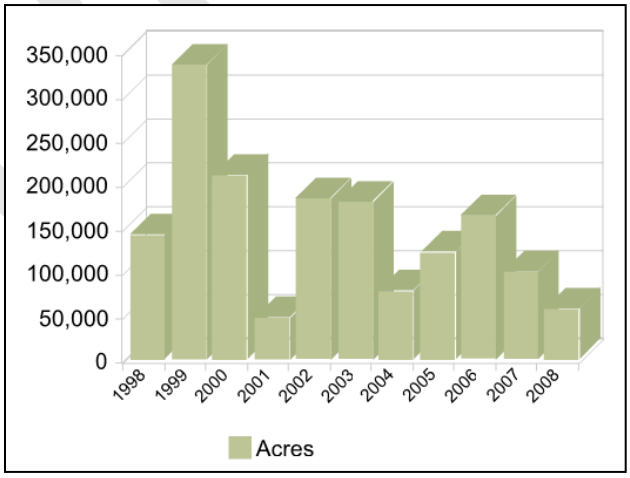
Table 7 and Figure 23 and show that the new surfaces put into conservation decreased significantly after 2000.

Table 7 : New land under conservation status per year in Florida (1998-2008)

Years	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Acres	142575	336039	210076	47966	183575	180756	77494	122736	163010	99190	57193	1620610
ha	57698	135990	85015	19411	74290	73149	31361	49669	65968	40141	23145	655838

Source: http://www.conservationalmanac.org

Figure 23 : New land under conservation status per year in Florida (1998-2008)



Source: http://www.conservationalmanac.org

A number of conservation schemes have been introduced recently to increase the conservation land in Florida. The most important programmes are described hereunder[12]:

- **Florida Forever:** Florida Forever addresses a wide range of conservation objectives including the restoration of damaged environmental systems, water resource development and supply, increased public access, public lands management and maintenance, and increased protection of land via conservation easements. Like P2000[13], Florida Forever was funded at $300 million annually using the state documentary stamp tax revenue. Although the Florida Forever program was authorized through 2020 at $300 million a year the funding was interrupted due to declines in state revenues and shifts in priorities related to economic recovery. Florida Forever has not received funding in 2011 or 2012. A citizen petition drive is underway to place a constitutional amendment on the 2014 ballot to dedicated $500 million per year for 20 years for Florida Forever.

- **Enable Local Financing:** Statewide dedicated funding has spurred many local governments to adopt long-range strategic visions of their conservation needs as well as create their own local sources of revenues in order to maximize the use of state funding. Local governments have the authority to issue bonds, dedicate sales and use taxes as well as property taxes for the purpose of buying land for open space, parks, and recreation.

- **Conservation Tax Credits:** Florida voters approved (2008) a Constitutional Amendment. The amendment provides a property tax exemption for land that is permanently set aside for conservation purposes and allows land that is being used for conservation purposes, but which hasn't been permanently set aside, to be taxed according to its conservation use.

- **State Incentive for Local Land Conservation:** The Florida Communities Trust (FCT) grants are prioritized based on how well the grant will advance a local growth management plan. This has spurred communities to adopt long-range visions of their conservation needs.

3.4. Protection of water

In the US, the Clean Water Act (CWA) was introduced in 1972 to regulate the discharge of pollutants in water. In this framework, forestry operations are considered as nonpoint sources and, hence, are generally exempted for permit under CWA as long as Best Management Practices (BMP) are developed and implemented. It is the responsibility of states to develop, implement and assess the Best Management Practices, under the control and funding of the federal Environmental Protection Agency (EPA). Even though the impact on water is the core of the BMP, many states have gone further and used the BMP as a tool for other management purposes (soil, landscape, wildlife etc...).

Florida's Silviculture Best Management Practices Program is one of the South's first quasi-regulatory environmental protection programs addressing forestry activities. The program was established in the mid-seventies in response to mandates given each state under the 1972 Federal Clean Water Act.

[12] http://www.conservationalmanac.org/secure/almanac/southeast/ga/programs.html#top

[13] The Preservation 2000 (P2000) Program, created in 1990 and expenditures concluded in 2001.

The Florida Forest Service has served as lead agency in the development, implementation, and monitoring of Silviculture BMP's statewide.

The topics covered by the BMP:

- Public lands, wetlands,
- Canals, sinkholes, stream crossing,
- Forest roads,
- Timber harvesting,
- Site preparation and planting,
- Fireline construction,
- Pesticide and fertilizer application,
- Waste disposal,
- Wet weather operations,
- Emergency operations.

BMP's protect the natural water resources from degradation and sedimentation that can sometimes occur because of erosion during and immediately after forest operations. Silviculture BMP's maintain shelter and food for aquatic organisms and wildlife species.

The use of BMP's during normal ongoing forestry operations exempt landowners from the costly process of acquiring permits; however, a permit is required for culvert placement, road construction when crossing streams and wetlands.

Silviculture BMP's are required in all forestry operations adjacent to waterbodies and wetlands by federal, state and local authorities through reference or regulatory statute.

In Southeast USA, there are specific arrangements for the site preparation before establishing pine plantations on wetlands[14]. Such operations are not exempt of permitting on wetlands and a specific permit under CWA section 404 has to be obtained. This makes possible for the administration to better control the mechanical works in sensitive environment.

Florida's first Silviculture BMP Manual[15] was published in 1979, providing written forest management guidelines for landowners.

Since 1981 the Florida Forest Service has monitored BMP implementation by conducting a biennial Compliance Survey. Like BMPs in general, the Survey has traditionally been heavily oriented toward forestry activities involving intensive pine management, near streams and lakes.

The revised Survey was first used in 1995 and includes significant procedural changes such as a numerical scoring system for determining BMP compliance, special criteria for identifying a significant risk to water quality, and an expansion of the Survey into all Florida counties. The Survey has determined a statewide, long-term average of 94% compliance with silviculture BMPs.

[14] http://water.epa.gov/lawsregs/guidance/wetlands/silv2.cfm
[15] http://freshfromflorida.s3.amazonaws.com/silvicultural_bmp_manual.pdf (revised 2008)

In addition, a BMP Effectiveness Study was completed using the Survey as a measure of BMP compliance and using stream bio-assessment techniques to measure water quality. The study concluded that where silviculture BMPs were properly applied water quality, aquatic habitat and overall stream ecosystem health were protected.

The 2011 Survey[16] showed a high implementation rate with silviculture BMPs in Florida (98.7%). Despite this rate for 2011, one BMP category in this Survey showed a slight decrease in compliance – specifically, Timber Harvesting. Educational outreach programs and workshops for silviculture BMPs during the next two years will focus on special management zones, wetlands, forest roads, stream crossings, timber harvesting, and waste disposal prior to the next survey in 2013.

3.5. Protection of soils

The protection of soil, including soil erosion, soil fertility, soil compaction and soil contamination, is addressed in the Best Management Practice applicable to forestry in Florida. Among these topics, soil erosion is the main point addressed in the BMP.

As described under section 3.4, it appears from the BMP Implementation and Compliance Survey (latest report dated 2011) that the BMP are generally well implemented in the State of Florida.

The choice of harvesting method and type of equipment should be influenced by soil fertility, stability, compactability, and erodability. Post-harvesting site treatments, choice of species to plant, and regeneration method should also be influenced by the soil properties of the site.

Despite some search about this topic, we are not aware of any monitoring programme at the State level exists in order to assess the soils condition (erosion, compaction, fertility) as well as its their evolution over time.

3.6. Protection of carbon stocks

In forest land the carbon stocks mainly includes:

- living above ground and below ground woody biomass,
- soil organic carbon and, in particular, peat in specific areas.

Between 2004 and 2012, we have seen in the section 3.1 an increase of about 7.6% of the forest area. We have seen in section 3.2 that the volume of standing trees has been consistently increasing as well for the period 2007-2011. In this context, the sequestrated carbon stock in living biomass has increased.

This observation is verified by the 2004-2012 data from the US Forest service (FIA Program), as shown in the Table 8, where only a slight decrease is noticed regarding the soil organic carbon for the period 2011-2012.

[16] http://freshfromflorida.s3.amazonaws.com/2011_BMP_survey_report.pdf

Table 8 : Carbon stocks evolution in forestland – (Florida 2004-2012)

Year	Carbon in litter in forest area (tons)	Soil organic carbon (tons)	Belowground carbon in live trees (at least 1 inch d.b.h./d.r.c.) (tons)	aboveground carbon in live trees (at least 1 inch d.b.h./d.r.c.) (tons)
2004	51 661 214	673 210 795	49 526 016	230 752 738
2007	54 211 761	709 287 436	51 579 349	240 333 840
2009	55 238 716	724 200 460	52 890 665	246 271 734
2010	56 182 095	731 680 244	53 860 193	250 930 765
2011	56 796 300	733 520 341	54 383 054	253 663 538
2012	57 216 576	732 500 863	55 506 133	258 865 001

Source: adapted from US Forest service, FIA Program (http://apps.fs.fed.us/fido/standardrpt.html)

3.7. Protection of air quality

The main impact of forestry on air quality relates to the use of fire. Using fire under controlled conditions is common practice Florida forestry ("prescribed fire"). In an average year, the Florida Forest Service will issue 120,000 authorizations allowing people and agencies to use fire their land. An average of about 0.8 million ha is treated with prescribed fire each year[17].

Prescribed fire is one of the most versatile and cost effective tools land managers use. Prescribed fire can have different objectives:

- Reduce hazardous fuel buildups, thus providing increased protection to people, their homes and the forest,
- Site Preparation (certain pathogens that reduce growth in pines and other species, can be controlled or eliminated by the use of prescribed burning),
- Disease control in young pines, improving habitat for wildlife,
- Wildlife management ,
- Range management,
- Preservation of endangered plant and animal species,
- Maintenance of fire dependent ecosystems.

The BMP describes appropriate use of fire and prevention of wildfires, including appropriate implementation of firebreaks.

The Florida Forest Service recognizes the need for certain Fire Management Services which in many cases can only be performed by an experienced forestry technician.

It is the policy of the Florida Forest Service to encourage maximum prescribed burning consistent with good forest management practices utilizing the Florida Forest Service's personnel and equipment while complementing activities of the private sector.

[17] http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Wildfire/Prescribed-Fire

The Florida Division of Forestry administers Florida's outdoor burning and forest fire laws. In many areas more stringent local laws are enforced. In some counties or cities, no outdoor burning is allowed at all.

Agricultural, silvicultural, landclearing, pile and acreage burning all require a burning authorization from the Florida Forest Service.

3.8. Illegal logging

The FSC risk assessment platform www.globalforestregistry.org considers the USA are at low risk in terms of illegal logging, because the following criteria are all verified:

1.1 Evidence of enforcement of logging related laws in the district [18]
1.2 There is evidence in the district demonstrating the legality of harvests and wood purchases that includes robust and effective system for granting licenses and harvest permits [19]
1.3 There is little or no evidence or reporting of illegal harvesting in the district of origin[20]
1.4 There is a low perception of corruption related to the granting or issuing of harvesting permits and other areas of law enforcement related to harvesting and wood trade[21]

3.9. Civil rights and traditional rights

The FSC risk assessment platform www.globalforestregistry.org considers the USA are at low risk in terms of violation of civil and traditional rights, because the following criteria are all verified:

- There is no UN Security Council ban on timber exports from the country concerned
- The country or district is not designated a source of conflict timber (e.g. USAID Type 1 conflict)
- There is no evidence of child labor or violation of ILO Fundamental Principles and Rights at work taking place in forest areas in the district concerned
- There are recognized and equitable processes in place to resolve conflicts of substantial magnitude pertaining to traditional rights including use rights, cultural interests or traditional cultural identity in the district concerned
- There is no evidence of violation of the ILO Convention 169 on Indigenous and Tribal Peoples taking place in the forest areas in the district concerned

3.10. Forest certification

The main certification schemes used in the United States are:

[18] www.illegal-logging.info ; www.eia-international.org ; http://www.ahec-europe.org/
[19] www.illegal-logging.info ; www.eia-international.org ; http://www.ahec-europe.org/
[20] www.illegal-logging.info ; www.eia-international.org ; http://www.ahec-europe.org/
[21] http://www.transparency.org/cpi2012/results

- the SFI (Sustainable Forestry Initiative[22]), which is endorsed by PEFC (Programme for the Endorsement of Forest Certification),
- ATFS (American Tree Farm System[23]), which is specifically suitable for small private owners.
- the FSC (Forest Stewardship Council[24]),

The certified forest area under each of those schemes as for 2011 is presented in the table hereafter.

Table 9: Certified forest land in Florida (2011)

	SFI	FSC	ATFS	Total certified
Acres certified	1 121 313	120	1 032 594	2 154 027
Ha certified	453 779	49	417 876	87 1704
Percentage forests	6.9%	0.0007%	6.4%	13.3%

Source: http://www.southernforests.org/resources/publications/SGSF%20Forest%20Certification%20Report%20r1.pdf

4. Conclusions

Forest area in Florida is 7.05 million ha and covers about 50% of the State's land area, most of which being located in the northern part of the State. About 63% of forest area statewide is privately owned

At the State level, the forested area has dramatically decreased over last century. Forest acreage has dropped steadily since the 1930s, totalling a loss of an estimated 2.89 million hectares, or 30%, by 2005. Due to high pressure of urbanization, it is anticipated that the decrease of forest land will go on in the next decades. Nevertheless, the most recent figures show a slight increase of forest land between 2004 and 2012 (7.6%, i.e. about 0.9% increase yearly on average), most of which appears to be related to new reserved areas, as the surface dedicated to forestry exploitation (timberland) has remained rather stable during the same period (slight increase of about 1.1%). The evolution of forest land and timber land is very different from on one state to another and it is recommended to refer to annexe 1 and 2 to find out the risks of conversion on county basis.

The forest-type breakdown shows 38% hardwood (including forested wetlands and mangroves), 53% softwood (pine and cypress) and 9% mixed hardwood-softwood by acreage.

The estimated volume of standing trees has been consistently increasing for the studied period of 2007-2011. The annual removals (harvested volume and other losses) have been increasing consistently, but don't exceed the annual growth for the same period. Florida's forests feature an increased level of maturity, reflected by a sustainability index (ratio of net timber growth to timber removals) of 2.1. Because of the increase of the volume of standing trees, the carbon stock associated to living woody biomass is growing.

[22] http://www.sfiprogram.org
[23] https://www.treefarmsystem.org
[24] https://us.fsc.org

Florida has various types of conservation lands dedicated to the protection of biodiversity and ecosystems, including State parks, National parks, private reserves... The extent of the protected areas is rather important (about 27%). The new surfaces put into conservation decreased significantly between 2000 and 2008 but a number of conservation schemes have been introduced recently to increase the conservation land in Florida.

Florida has developed Best Management Practices (BMP) for forestry to comply with the Clean Water Act. Those BMP address both water and soil conservation. The Florida Forest Service is in charge of implementing and assessing the BMP. The most recent survey shows a high level of compliance and implementation of the BMP in the actual forestry operations.

The FSC risk assessment platform www.globalforestregistry.org considers the USA are at low risk in terms of violation of illegal logging and in terms of violation of traditional and civil rights.

The forest certification systems are little developed in Florida, with about of 13% of forest certified under 3 systems SFI, ATFS and FSC.

ANNEX 1:

Forest area in Florida by county (forest area in ha) from 2004 to 2012

County	2004	2007	2009	2010	2011	2012
Alachua (1)	131575	129392	127710	130425	126961	123931
Baker (3)	102861	115757	117779	120211	121930	121282
Bay (5)	143205	139869	141414	141370	141948	145142
Bradford (7)	62420	62089	62074	61683	61157	60751
Brevard (9)	66695	84718	90422	95215	91449	92438
Broward (11)	3282	6769	17052	16903	17126	16966
Calhoun (13)	134471	135459	135766	136248	133810	132775
Charlotte (15)	61916	78493	79293	76772	77506	74696
Citrus (17)	94527	91516	85650	85852	83912	82367
Clay (19)	120065	116855	118411	117408	117531	116612
Collier (21)	216649	319227	373793	386700	400060	400837
Columbia (23)	156601	157763	155243	155266	154109	153946
Dade (25)	15117	23403	38858	54717	64211	64108
Desoto (27)	23654	23867	26442	29605	28205	30194
Dixie (29)	150758	148946	149322	148858	148689	149972
Duval (31)	98979	101785	101104	96311	93828	94262
Escambia (33)	103201	91234	91196	91104	89999	88771
Flagler (35)	90219	91711	89701	89490	91947	91581
Franklin (37)	140167	132111	132339	131258	130864	132614
Gadsden (39)	98466	92989	94834	92410	92066	92489
Gilchrist (41)	53555	54259	54014	53846	53857	52291
Glades (43)	39779	68313	69400	76717	82858	87655
Gulf (45)	112408	121023	123666	123300	121194	117929
Hamilton (47)	91938	98319	97868	97350	99882	97253
Hardee (49)	45187	47308	46906	46774	46366	46075
Hendry (51)	35353	52418	53130	54917	55322	54095
Hernando (53)	73191	78094	79797	79505	78676	76369
Highlands (55)	59357	46329	50924	53943	53447	52409
Hillsborough (57)	42333	48929	55844	58388	62987	60742
Holmes (59)	95087	94453	90897	91675	92099	91180
Indian River (61)	16635	16759	18531	20577	20456	17742
Jackson (63)	161116	154471	154955	150533	152702	154593
Jefferson (65)	128057	111803	112571	113620	112654	115301
Lafayette (67)	114635	116933	118035	119126	119140	118595
Lake (69)	116737	112032	108340	104260	101843	103592
Lee (71)	71042	83397	79207	81868	85065	84782
Leon (73)	101440	122170	128785	129106	129451	130527
Levy (75)	197591	194043	197114	196618	196360	195628
Liberty (77)	206574	206897	203635	203437	203481	199407
Madison (79)	125067	134697	134302	136525	136031	137157
Manatee (81)	33176	34504	36089	36512	41796	41576
Marion (83)	223644	224246	223331	221099	219548	223447
Martin (85)	28808	30412	32142	33075	31814	29286
Miami-Dade (86)	--	--	--	--	--	--
Monroe (87)	14921	22432	29339	28725	36571	43074
Nassau (89)	118777	119176	118931	123042	118963	117926

County	2004	2007	2009	2010	2011	2012
Okaloosa (91)	197220	189331	184743	186893	191777	191472
Okeechobee (93)	23880	22601	24374	27552	27334	26911
Orange (95)	66649	68685	69681	71965	72805	70628
Osceola (97)	87913	97395	100251	105513	102489	101441
Palm Beach (99)	23509	45967	51630	53200	54379	51978
Pasco (101)	76248	79979	78336	80657	79924	80088
Pinellas (103)	8110	6889	6876	6861	6509	6392
Polk (105)	121428	131003	139966	143578	145558	151899
Putnam (107)	171217	159188	154213	153393	155610	151764
St.Johns (109)	100681	101791	99925	96943	96777	99491
St. Lucie (111)	14534	12961	15625	15632	21218	20926
Santa Rosa (113)	190179	202482	201338	202287	202454	203186
Sarasota (115)	35922	35593	40653	42977	44726	44068
Seminole (117)	22052	27097	25158	24645	26973	26741
Sumter (119)	55063	59488	56772	56063	54125	52308
Suwannee (121)	94321	99155	100038	98194	101093	98865
Taylor (123)	232984	245133	242835	247716	249572	251851
Union (125)	55022	56575	56278	55726	56460	55781
Volusia (127)	179681	184209	186078	184870	183239	183754
Wakulla (129)	134524	133847	128704	130909	130087	128941
Walton (131)	223353	223332	223007	222809	225205	224380
Washington (133)	122337	117967	117859	117449	118021	118743
Total	**6558063**	**6838037**	**6950493**	**7018175**	**7066207**	**7055974**

ANNEX 2 :

Loss and gain of forestland (in %) by county between 2004 and 2012

County	Total change (%) 2004-2012	Yearly average (%) 2004-2012
Pinellas (103)	-21.18%	-2.65%
Escambia (33)	-13.98%	-1.75%
Citrus (17)	-12.86%	-1.61%
Highlands (55)	-11.71%	-1.46%
Putnam (107)	-11.36%	-1.42%
Lake (69)	-11.26%	-1.41%
Jefferson (65)	-9.96%	-1.25%
Gadsden (39)	-6.07%	-0.76%
Alachua (1)	-5.81%	-0.73%
Franklin (37)	-5.39%	-0.67%
Sumter (119)	-5.00%	-0.63%
Duval (31)	-4.77%	-0.60%
Wakulla (129)	-4.15%	-0.52%
Holmes (59)	-4.11%	-0.51%
Jackson (63)	-4.05%	-0.51%
Liberty (77)	-3.47%	-0.43%
Washington (133)	-2.94%	-0.37%
Okaloosa (91)	-2.91%	-0.36%
Clay (19)	-2.88%	-0.36%
Bradford (7)	-2.67%	-0.33%
Gilchrist (41)	-2.36%	-0.30%

County	Total change (%) 2004-2012	Yearly average (%) 2004-2012
Columbia (23)	-1.70%	-0.21%
Calhoun (13)	-1.26%	-0.16%
St.Johns (109)	-1.18%	-0.15%
Levy (75)	-0.99%	-0.12%
Nassau (89)	-0.72%	-0.09%
Dixie (29)	-0.52%	-0.07%
Marion (83)	-0.09%	-0.01%
Walton (131)	0.46%	0.06%
Bay (5)	1.35%	0.17%
Union (125)	1.38%	0.17%
Flagler (35)	1.51%	0.19%
Martin (85)	1.66%	0.21%
Hardee (49)	1.97%	0.25%
Volusia (127)	2.27%	0.28%
Lafayette (67)	3.45%	0.43%
Hernando (53)	4.34%	0.54%
Suwannee (121)	4.82%	0.60%
Gulf (45)	4.91%	0.61%
Pasco (101)	5.04%	0.63%
Hamilton (47)	5.78%	0.72%
Orange (95)	5.97%	0.75%
Indian River (61)	6.65%	0.83%
Santa Rosa (113)	6.84%	0.85%
Taylor (123)	8.10%	1.01%
Madison (79)	9.67%	1.21%
Okeechobee (93)	12.69%	1.59%
Osceola (97)	15.39%	1.92%
Baker (3)	17.91%	2.24%
Lee (71)	19.34%	2.42%
Charlotte (15)	20.64%	2.58%
Seminole (117)	21.26%	2.66%
Sarasota (115)	22.68%	2.83%
Polk (105)	25.09%	3.14%
Manatee (81)	25.32%	3.16%
Desoto (27)	27.65%	3.46%
Leon (73)	28.67%	3.58%
Brevard (9)	38.60%	4.82%
Hillsborough (57)	43.49%	5.44%
St. Lucie (111)	43.98%	5.50%
Hendry (51)	53.01%	6.63%
Collier (21)	85.02%	10.63%
Glades (43)	120.35%	15.04%
Palm Beach (99)	121.10%	15.14%
Monroe (87)	188.68%	23.59%
Dade (25)	324.08%	40.51%
Broward (11)	416.94%	52.12%
Miami-Dade (86)	-	-
Total:	7.59%	0.95%

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