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Nontimber Values of Louisiana's Timberland

Victor A. Rudis

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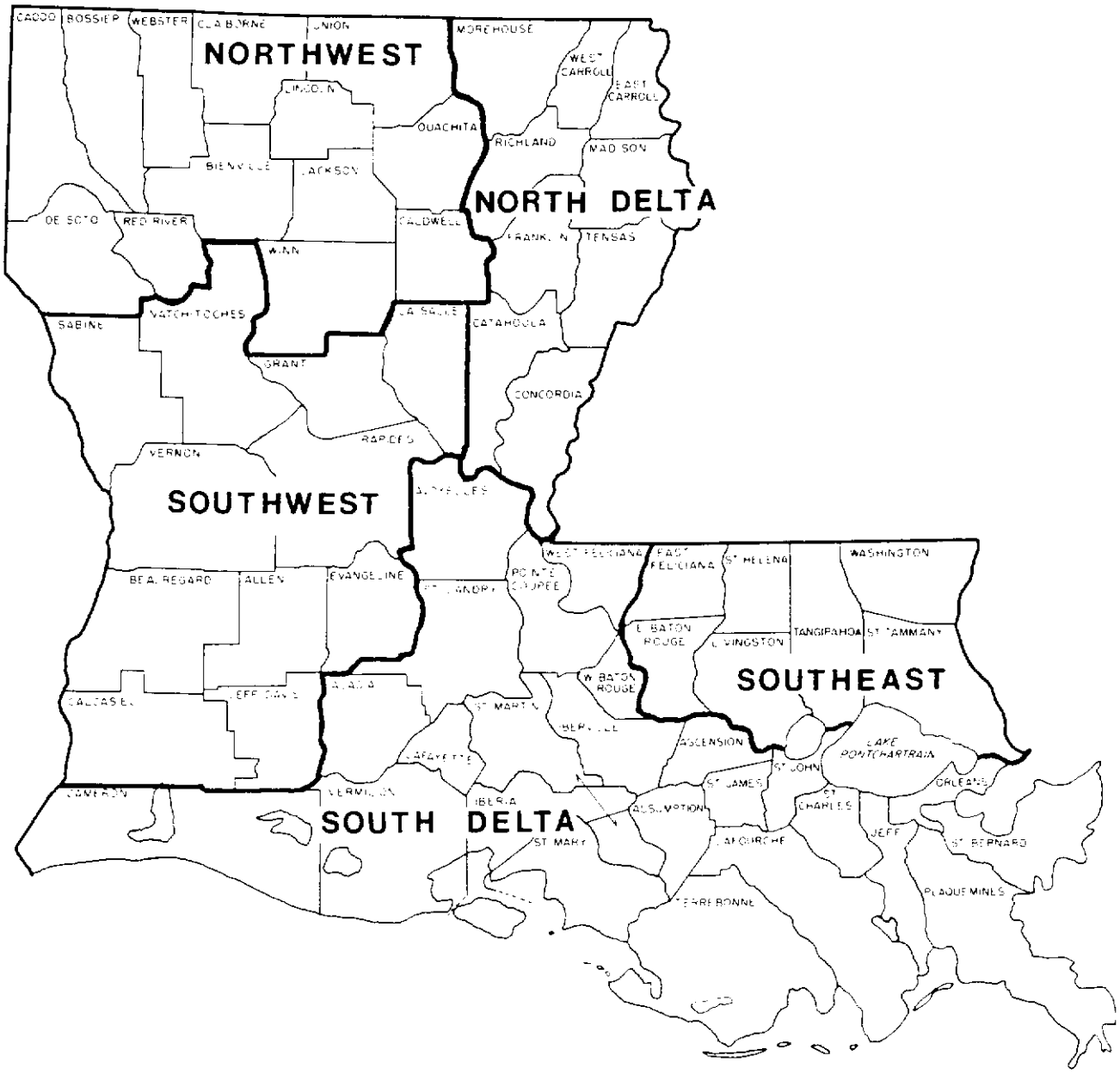

Figure 1.—*Forest survey units of Louisiana.*

Nontimber Values of Louisiana's Timberland

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HIGHLIGHTS

- As a companion publication to the Louisiana timber report (Rosson and others 1988), this document presents information about the other forest values associated with Louisiana's timberland. These "nontimber" values include water quality, soils, livestock potential, wildlife habitat, aesthetics, and dispersed recreation opportunities in timberland areas.

- Approximately 3 percent of the timberland acreage exists along steep slopes (greater than 15 percent slope).

- Forest attributes important to wildlife, such as snags and nut bearing tree species, are abundant at the State level but are distributed unevenly. Large diameter trees are concentrated in hardwood bottoms.

- Timberland with high recreation values is distributed unevenly. Hunting and camping facilities are abundant but there are regional shortages. The diversity of forest types near metropolitan areas is limited.

- Remote stands (i.e., stands distant from roads and part of large forested tracts) and stands with old-growth forest potential represent a minor fraction of the timberland. Timberland with habitats for wildlife that need seclusion and timberland with old-growth and wildlife potential occur mostly in bottomlands along the Mississippi alluvial plain.

- Public agencies have increased their landholdings by 30 percent to 1,330,700 acres since 1974; most of the recent acquisitions have been bottomland hardwood stands. Forest industry landholdings have declined 4 percent to 3,603,100. Other private landholdings declined 8 percent to 8,938,800 acres.

- Timberland acreage has declined chiefly in bottomland hardwoods. In pine types, shifts in stand dominance have favored loblolly and slash over shortleaf and longleaf forest types in sawtimber stands. Sapling-seedling stand increases have occurred only in loblolly pine. Shifts have occurred in hardwood forest types from oak-pine to oak-hickory.

INTRODUCTION

This document presents findings from the fifth periodic forest survey of Louisiana's timberland. Information covers the nontimber values of timberland (water quality maintenance, soil retention, range or livestock potential, wildlife habitat, and recreation opportunities). A companion report, Resource Bulletin SO-130 (Rosson, McWilliams, and Frey 1988), discusses the forest resource in terms of timber values.

The trend data available on nontimber values of timberland are limited, but useful comparisons can be derived from earlier surveys conducted in 1936 (Winters and others 1943), 1954 (U.S. Department of Agriculture 1955), 1964 (Sternitzke 1965), and 1974 (Murphy 1975) and, where noted, studies conducted by other agencies.

While Louisiana's timberland provides important timber value that bolsters the State's economy, not all timberland can be used exclusively to supply wood products. Forest management and planning that consider only timber values overlook hidden expenses in terms of other values foregone. Other land needs may also reduce the availability of forest resources for timber production. Further, some of the other values of timberland, known collectively as nontimber values, contribute to the State's economy. Timberland areas managed for commodities in addition to timber (e.g., livestock) can have greater value than those managed strictly for timber production, particularly when wood market prices are unstable. Noncommodity outputs of timberland (e.g., water quality, aesthetics) are important to the tourism industry, enhance the standard-of-living of local communities, and play a role in attracting and maintaining regional industries, particularly those in the service sector and other industries not tied to timber production.

Other forest values are examined in terms of physical and socioeconomic attributes as well as the more traditional forest survey estimates of area, volume, and stand structure characteristics of timberland. Definition of terms used in the text, estimates of statistical reliability, a species list, species occurrence data, and estimates of relative importance are tabulated in the Appendix.

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BACKGROUND

This report focuses on nontimber values of Louisiana's timberland as recorded in surveys between February 1983 and February 1985. Such surveys, originally mandated by the McSweeney-McNary Act of 1928, provide basic periodic assessments of the Nation's public and private forest resources. More recent legislation, the Forest and Rangeland Renewable Resources Planning Act of 1974 and the Forest and Rangeland Renewable Resources Research Act of 1978, mandated that the Forest Service make and keep current comprehensive assessments of forested areas, thereby broadening the survey to consider nontimber values.

For forest survey purposes, Louisiana is subdivided into five units (fig. 1): North Delta, South Delta, Southwest, Southeast, and Northwest. Within each unit are permanent survey plots that have been distributed systematically throughout the State on a three-mile square grid. In this Statewide survey, 4,471 plots were visited. Of these, 2,365 plots were forested and were sampled for detailed tree and plot-level information. Approximate plot locations are illustrated in figure 2.

The total land base for Louisiana is 28,493,700 acres. Of this, 14,611,000 acres are classified as agriculture, urban, residential, highways and other rights-of-way and small wooded lots or strips too small or narrow t meet forest survey definitions. The remaining 13,882,70 acres are forested, with 10,100 of these acres classed a productive-reserved. Productive-reserved timberlan occurs in Claiborne, Natchitoches, Rapides, Webster and Winn parishes. This leaves 13,872,600 acres o Louisiana land classed as timberland.

WATER AND SOILS

Timberland is important to sustain soil productivit and water quality values in Louisiana. In some areas o the State, forest cover is essential to mitigate soil loss or land with high erosion potential, to reduce streamwate turbidity and temperature changes that harm fish an other aquatic species, and to limit downstream flooding Louisiana's major land resource areas (fig. 3) are re flected in the general physical properties of land in th State. Potential soil erosion rates are highest for th Southern Mississippi Valley Uplands. The Western an Central Coastal Plains have moderate erosion potential while the Western Gulf Coast Flatwoods have lo erosion potential. Potential soil erosion rates are negli gible for the remaining land resource areas.

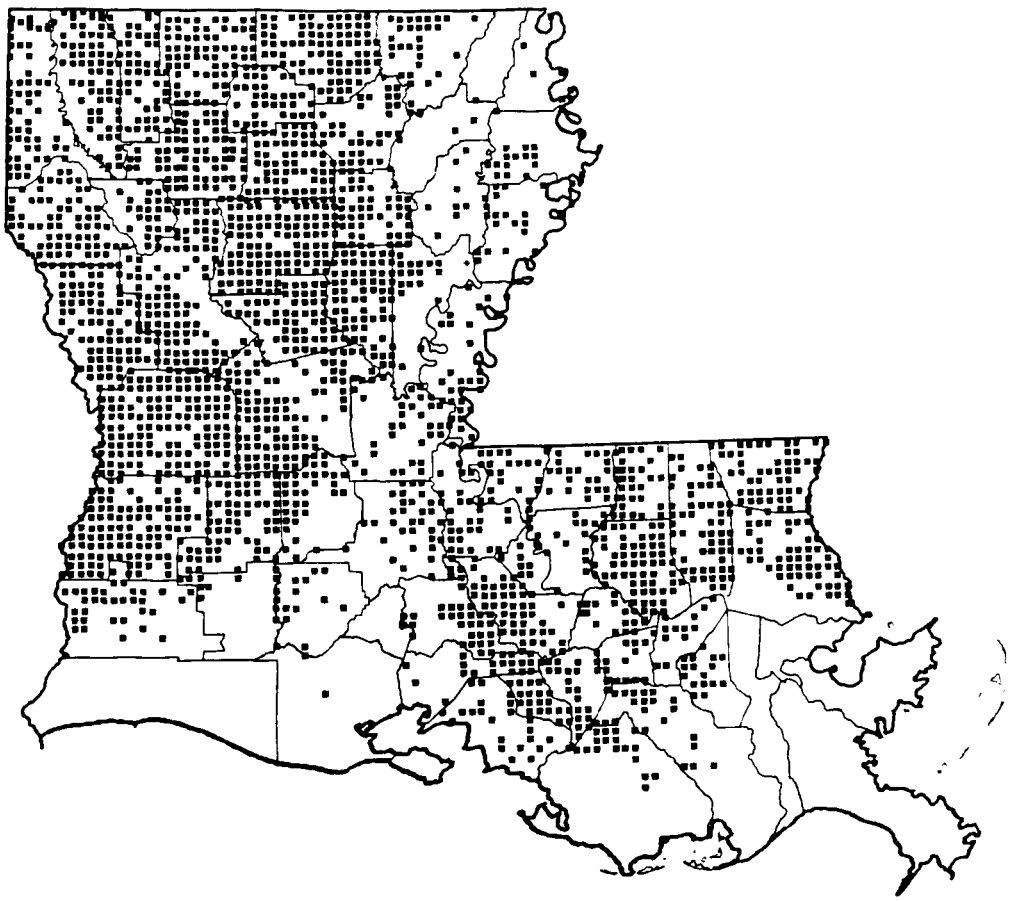

Figure 2.—*Forest plot locations, Louisiana, 1984.*

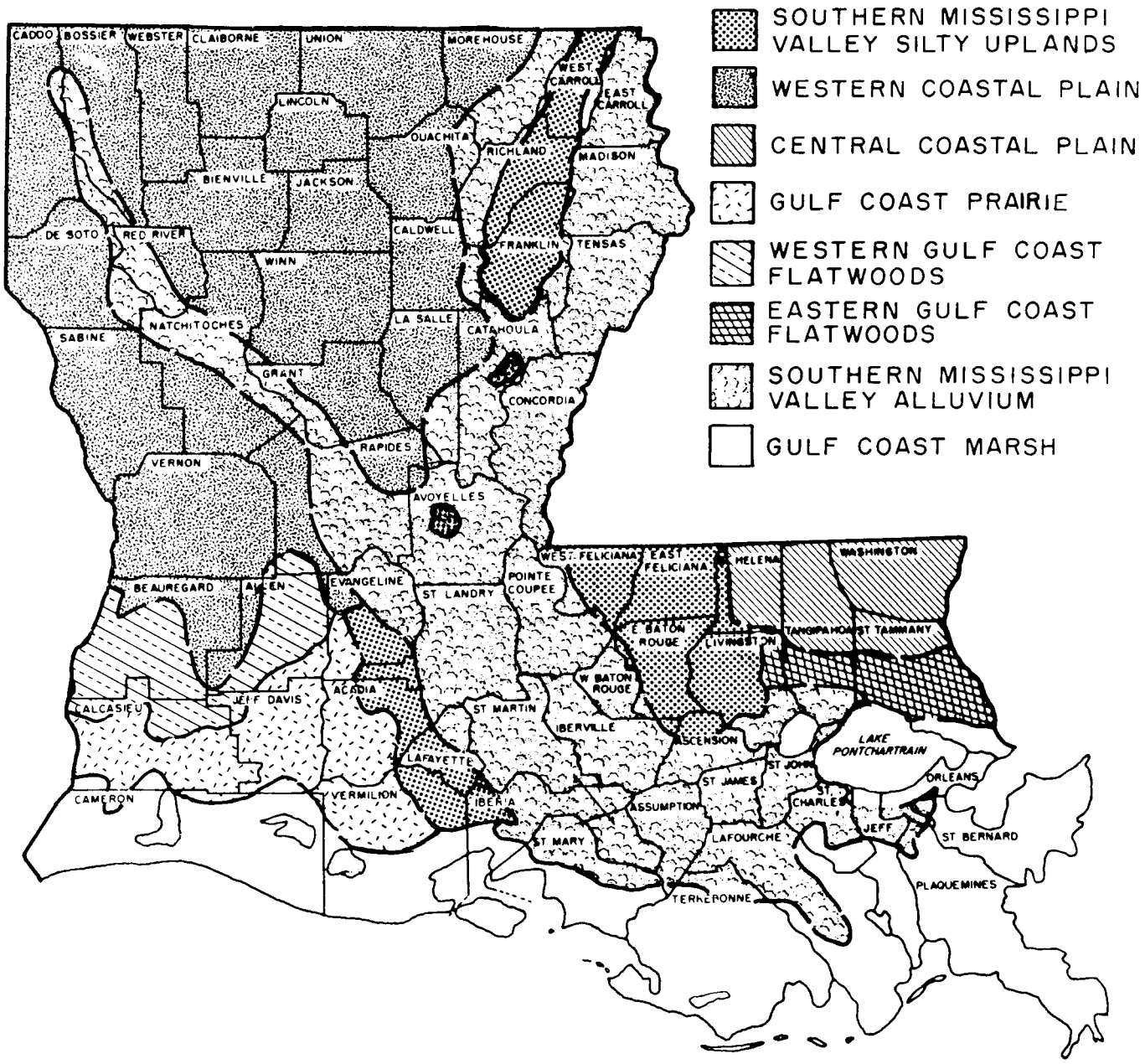

Figure 3.—*Major land resource areas, Louisiana. (SCS, 1984).*

Timberland with steep terrain may be unavailable for timber production because many of the standing trees, along with understory vegetation, are needed to retain soil, reduce surface runoff, and filter water for underground water recharge. Significant topsoil and nutrient losses and damage to streams can occur during the time normally required for natural revegetation of harvested areas. Even moderate erosion on some marginal soils can result in long-term loss of soil productivity (SCS 1984). Intensive site preparation on such fragile soils is not recommended, but clearcutting is possible without significant loss to water quality by using recommended practices such as retention of vegetation strips along catchments, carefully placed skidder roads and landings, and leaving slash onsite (McClurkin and others 1985).

Statewide, forest cover on steep terrain contains only a fraction of the timber. Approximately 3 percent of the State's timberland and growing-stock volume are on slopes greater than 15 percent (table 1). Growing-stock volume in these areas represents 620 million cubic feet, of which softwood saw-log volume accounts for 261 million cubic feet (42 percent). Setting aside these steep areas from timber production could alleviate some of the need to retain nontimber values, thereby freeing other areas for more intensive timber management.

The seven parishes of Caldwell, Catahoula, DeSoto, Rapides, Sabine, Union, and Vernon account for three-fourths of the 68,000 acres of forest land identified by the Soil Conservation Service (SCS) as having erosion problems (SCS 1984). Catahoula Parish has 37 percent of its timberland on slopes greater than 15 percent. The remaining six parishes have between 2 and 7 percent of timberland on slopes exceeding 15 percent.

Cropland areas where soils, terrain, and land use practices combine to create erosion problems have been identified by the Soil Conservation Service (fig. 4). The areas most susceptible to erosion are in the Southeast, Southwest, and North Delta survey units. Conservation measures, such as converting cropland to forest land, leaving residues on the soil surface in the autumn, and planting cover crops for wildlife, can reduce erosion in the problem areas. Erosion control programs in these areas would be far more effective than programs applied to other parts of the State.

RANGE

Farmers have traditionally used forests for grazing and as seasonal shelter for livestock. Many farmers who own timberland also have permitted livestock grazing with little regard for timber production (Byington and others 1983). Transitional timberland areas—those of timberland but adjacent to pastureland—are areas where such practices are common.

Mosher (1984) states that growing timber and livestock together offers potentially more income per acre and helps stabilize income by providing more market production options. This "double-cropping" requires more intensive management, however. Occasional use of timberland by livestock benefits older stands by reducing understory competition and providing organic fertilizer. Monitoring to avoid excessive soil compaction and tree bole damage is needed. Timber harvesting, grazing, and prescribed fires need to be carefully scheduled to permit adequate regeneration. Additional guidelines and procedures for managing southern pine forests for both livestock and timber production have been prepared (see Byrd and others 1984).

The potential for timber production in combination with existing livestock production is greatest in Southwest Louisiana, where more than two-thirds of the farm owners use forested areas for livestock grazing (Byington and others 1983). A detailed survey of the Southwest unit in 1974 indicated that half of the timberland was grazed by livestock (Sternitzke and Pearson 1974). Most woody and non-woody plant utilization on this timberland was light; i.e., less than 3 percent of the plants were grazed. The longleaf-slash forest type was used more often for grazing (73 percent) than loblolly-shortleaf (56 percent), oak-pine (48 percent), oak-hickory (48 percent), or bottomland types of oak-gum-cypress and elm-ash-cottonwood (41 percent.)

Table 1—*Area of timberland and growing-stock volume by slope class, Louisiana, 1984*[1]

Slope class	Area	Volume per acre	Volume		
			Total	Softwood	Hardwood
Percent	*Thousand acres*	*Cubic feet*	*Million cubic feet*		
0-5	10,885.8	1,378	15,003.9	7,766.7	7,237.2
6-10	1,930.3	1,337	2,580.6	1,837.9	742.7
11-15	593.6	1,327	787.5	591.7	195.8
16-20	255.3	1,323	337.8	205.6	132.2
over 20	207.6	1,359	282.2	150.0	132.2
Total	13,872.6	1,369	18,992.0	10,552.0	8,440.0

[1]Rows and columns may not sum to totals due to rounding.

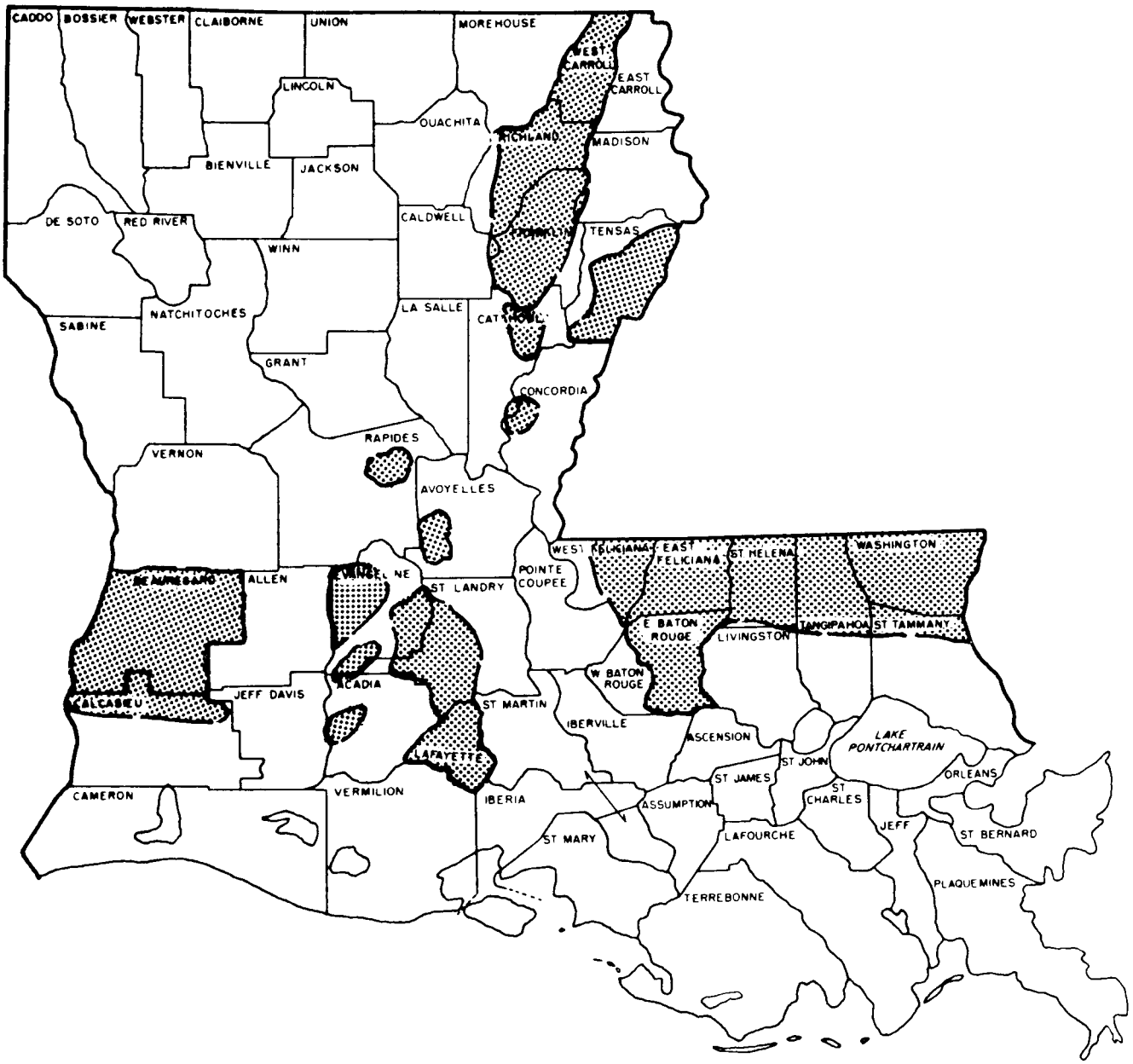

Figure 4.—*Erosion problem areas, Louisiana (SCS, 1984).*

WILDLIFE

Timberland attributes associated with wildlife include the presence of diverse food plants, adequate nesting and foraging areas, and suitable cover from predators. The fruit of oak, hickory, beech, gum, cherry, ash, and other tree and shrub species, are important food sources for many wildlife. Trees that bear nuts (hard mast) are most likely to be critical to several game and non-game wildlife species during the fall and winter months. Many large birds of prey, such as bald eagles and barred owls, and mammals, such as black bears, require large trees for nesting, perching, or dens. Live trees with large, dead sections are also important nesting areas for cavity dwelling birds. Dead and dying trees provide feeding and nesting areas for woodpeckers and nesting areas for other mammals.

Oaks comprise the majority of nut-bearing tree species in Louisiana. Acorns are the most common food source for white-tailed deer, squirrel, and turkey. Production of acorns and other nuts varies by tree species and diameter class. Other factors, such as crown class, are also important to mast production (Goodrum and others 1971). Bluebeech dominates in the 1.0- to 4.9-inch diameter class while water oak dominates in larger diameter classes. Other nut-bearing trees species are

Table 2. —*Number of live trees of nut-bearing species on timberland by species and diameter class, Louisiana, 1984*[1]

Species	All classes	Diameter class (inches at breast height) 1.0-4.9	5.0-10.9	11.0-14.9	15.0-20.9	21.0 and larger
			Thousand trees			
Oaks						
White oak group						
Post	148,179	114,426	25,196	5,586	2,529	441
White	132,565	100,918	23,224	5,377	2,470	576
Overcup	43,852	26,236	9,387	3,668	2,948	1,614
Swamp chestnut	21,689	16,832	2,595	931	803	529
Delta post	686	...	542	65	62	17
Chestnut	541	541	...	...	...	...
Chinkapin	56	...	...	...	36	20
Swamp white	41	...	...	...	23	18
Total	347,609	258,953	60,944	15,627	8,871	3,215
Red oak group						
Water	275,330	220,735	35,520	9,736	5,911	3,428
Southern red	175,308	128,742	34,731	7,925	3,367	542
Willow	96,024	68,632	17,184	5,268	3,137	1,803
Laurel	71,780	57,854	8,964	2,050	2,008	904
Cherrybark	69,020	49,987	12,522	3,265	2,241	1,005
Blackjack[2]	44,881	37,734	6,794	337	...	15
Nuttall	16,666	7,436	4,910	1,807	1,400	1,114
Black	16,358	14,721	1,337	219	68	15
Live[2]	4,301	2,377	1,378	178	214	153
Bluejack[2]	3,760	3,152	574	...	34	...
Shumard	2,280	1,363	579	138	156	44
Pin	137	...	...	120	...	17
Total	775,845	592,733	124,493	31,043	18,536	9,040
All oaks	1,123,454	851,686	185,437	46,670	27,407	12,255
Hickories						
Water	93,507	67,816	17,882	4,696	2,335	777
Pecan	12,742	6,959	4,038	876	633	236
Other	134,695	108,214	19,149	4,803	2,099	431
All hickories	240,944	182,989	41,069	10,375	5,067	1,444
Bluebeech[2]	303,946	276,099	26,056	1,757	34	...
Ironwood[2]	176,134	170,227	5,791	116	...	...
American beech	25,134	14,740	3,975	2,334	2,504	1,581
Chinkapin	8,509	8,509	...	...	...	...
Black walnut	317	...	304	...	...	14
All species	1,878,438	1,504,250	262,632	61,252	35,012	15,294

[1]Rows and columns may not sum to totals due to rounding.
[2]Noncommercial species.

presented by diameter class and detailed species in table 2. Information on the diameter distribution of other mast-bearing tree species (e.g. persimmon, dogwood, cherry) can be found in the timber report (Rosson and others 1988).

A few tree species such as bluebeech produce nuts when small. Most acorns are produced when oaks attain sawtimber size. The distribution of nut-bearing tree species of sawtimber size is presented by species and forest survey unit (table 3). At the State and unit level, water oak is the dominant nut-bearing species, except in the North Delta unit, where overcup oak, willow oak, and water hickory are more frequent. Regionally, more nut-bearing tree species of sawtimber size occur in the Southwest and Northwest survey units.

Most large live trees, those 21 inches or more in diameter, are found in bottomlands (oak-gum-cypres and elm-ash-cottonwood forest types), rather than i pine forest types (longleaf-slash and loblolly-shortlea forest types) (table 4). In pine forest types, large live tree are rare in plantations (16 trees per 100 acres) whe compared with natural pine stands (153 trees per 10 acres). Among owners, forest industries own the leas number of large live trees (182 trees per 100 acres relative to other private individuals (273 trees per 10 acres) and public agencies (367 trees per 100 acres).

The red-cockaded woodpecker, one of the endangere species more extensively studied, depends upon live pin trees in stands averaging 60 years or more, and i relatively pure pine stands with a limited hardwoo understory (Lennartz and others 1983b). Such stand are rare because many pine stands are harvested withi

Table 3. — *Number of live sawtimber trees of nut-bearing species by species and forest survey units, Louisiana, 1984*[1]

Species	Statewide	Forest survey units				
		North Delta	South Delta	Southwest	Southeast	Northwest
	Trees per 1000 acres					
Oaks						
White oak group						
Post	617	192	128	764	342	933
White	607	462	52	722	394	908
Overcup	593	2,372	815	268	143	610
Swamp chestnut	163	58	115	198	358	99
Delta post	10	110	...	...	...	10
Chinkapin	4	...	...	...	32	...
Swamp white	3	...	...	4	...	5
Total	1,997	3,194	1,110	1,956	1,269	2,565
Red oak group						
Water	1,375	1,360	1,441	1,001	2,018	1,462
Southern red	853	359	10	1,158	371	1,300
Willow	736	1,987	199	397	285	1,287
Cherrybark	469	324	275	434	491	632
Laurel	358	114	85	439	1,325	90
Nuttall	311	1,326	844	124	...	123
Live[2]	39	...	189	3	48	...
Blackjack[2]	25	...	...	54	...	26
Shumard	24	...	12	22	...	48
Black	22	88	18	5	14	30
Pin	10	...	20	4	41	...
Bluejack[2]	2	...	...	...	...	8
Total	4,224	5,558	3,093	3,641	4,593	5,006
All oaks	6,221	8,752	4,203	5,597	5,862	7,571
Hickories						
Water	563	1,833	1,117	309	272	369
Pecan	126	600	282	94	...	24
Other	529	193	262	480	493	806
All hickories	1,218	2,626	1,661	883	765	1,199
American beech	463	252	60	747	510	422
Bluebeech[2]	129	...	57	177	424	29
Ironwood[2]	8	...	...	26	...	...
Black walnut	1	...	...	...	...	3
All species	8,040	11,630	5,981	7,430	7,561	9,224

[1]Rows and columns may not sum to totals due to rounding.
[2]Noncommercial species.

Table 4.—*Number of large diameter live trees on timberland by diameter class and forest type, Louisiana, 1984*

Forest type	Diameter class (inches at breast height)					
	Total	21.0–22.9	23.0–24.9	25.0–26.9	27.0–28.9	29.0 and larger
	Trees per 100 acres					
Longleaf-slash	25	9	12	1	...	3
Loblolly-shortleaf	133	73	33	15	6	5
Oak-pine	200	90	54	23	15	19
Oak-hickory	188	70	51	28	15	24
Oak-gum-cypress	477	188	112	62	46	70
Elm-ash-cottonwood	382	159	87	48	32	57
All types	259	109	64	33	21	32

50 years of establishment or hardwood control measures such as periodic low intensity fires have been eliminated. Further, a few studies have suggested that optimum conditions for red-cockaded woodpeckers occur in mature longleaf pine forest stands rather than other pine forest stands (Lennartz and others 1983b, Seagle and others 1987). Thus timber management preferences for other pines in stand regeneration over longleaf is seen as a contributor to the decline in red-cockaded populations.

Individual habitats of active red-cockaded woodpecker colonies have been estimated on Federal lands. Nesting colonies in Louisiana are believed to occur in the Kisatchie National Forest, Fort Polk Military Base, and D'Arbonne National Wildlife Refuge (Lennartz and others 1983a). Together, these areas represent all of the known red-cockaded woodpecker colonies in Louisiana (Gary Lester, Louisiana Natural Heritage Program, Baton Rouge, LA, personal communication). The State's red-cockaded woodpecker nesting habitat was estimated in 1974 at 59,000 acres. For the 1984 survey, the estimate is 79,000 acres — a negligible difference when sampling error is considered.

Black bears in Louisiana currently prevail in small, isolated bottomland hardwood stands (fig. 5). Most of these areas are relatively inaccessible to people and contain large tracts of timberland with suitable food plants and escape cover. Hunting pressure (mainly through poaching) and harrassment by dogs and humans have probably restricted the potential for black bears to increase their range and population numbers (Lauren Hillman, USDA-Forest Service, National Forests in North Carolina, Asheville, NC, personal communication 1986). The fragmentation of hardwood stands and loss of bottomland hardwoods to agricultural uses have also contributed to the restricted area of suitable black bear habitat (Brunett and others 1975).

Other cavity-nesting birds and mammals depend upon snags, i.e., standing dead and dying trees, for shelter or as foraging areas. Because the number, size, and quality of snags needed by cavity-nesters vary by tree species, forest type and other forest conditions, users may wish to obtain more detailed data from the Forest Inventory and Analysis Unit to categorize habitats for individual cavity-nesting species. General information on snags is presented to provide an overview of data available.

Snag data are derived from timber-oriented inventories; some snags can be classed as rotten trees. Most snags are salvable dead or standing nonsalvable dead trees. Rotten trees are live trees of commercial species with reduced timber value primarily due to rot. Salvable dead trees are dead trees of commercial species that still have some merchantable timber volume. In Louisiana's climate, salvable dead trees are almost always standing trees. Standing nonsalvable dead trees are dead trees of any species that remain standing and have decay advanced to the point where there is no merchantable timber volume.

Rotten, salvable, and standing nonsalvable dead trees occur in all size classes, even in small diameter classes. Rotten trees are more commonly found in the hardwood forest types (oak-hickory, oak-gum-cypress, and elm-ash-cottonwood) than in the pine forest types (table 5). Hardwood forest types also contain more of the large diameter class dead trees (table 6). Salvable dead trees of small diameter class are generally more frequent in pine and oak-pine forest types than other forest types (table 7). Standing nonsalvable dead trees are more frequent in hardwood stands, regardless of diameter class (table 8).

Rotten trees are not as frequent on forest industry land (261 trees per 100 acres), as on public (412 trees per 100 acres) or other private timberland (335 trees per 100 acres). Public timberland contains more rotten trees, on average, regardless of forest type. As one might expect, salvable and standing nonsalvable dead trees are less frequent on timberland owned by forest industries (398 trees per 100 acres) than public timberland (513 trees per 100 acres) or other private timberland (565 trees per 100 acres). Other private timberland contains a greater frequency of standing nonsalvable dead trees, regardless of forest type (table 9).

The patterns above are not surprising. Others have noted the reduced number of snags in pine stands (Harlow and Guynn 1983). Common management practices associated with pine timber production, such as clearcutting and short rotations, limit dead and rotten tree retention. Stand conversion from oak-pine and oak-hickory to pine types has the potential for increasing the number of hardwood snags where unwanted rough and rotten hardwoods are killed but allowed to remain standing.

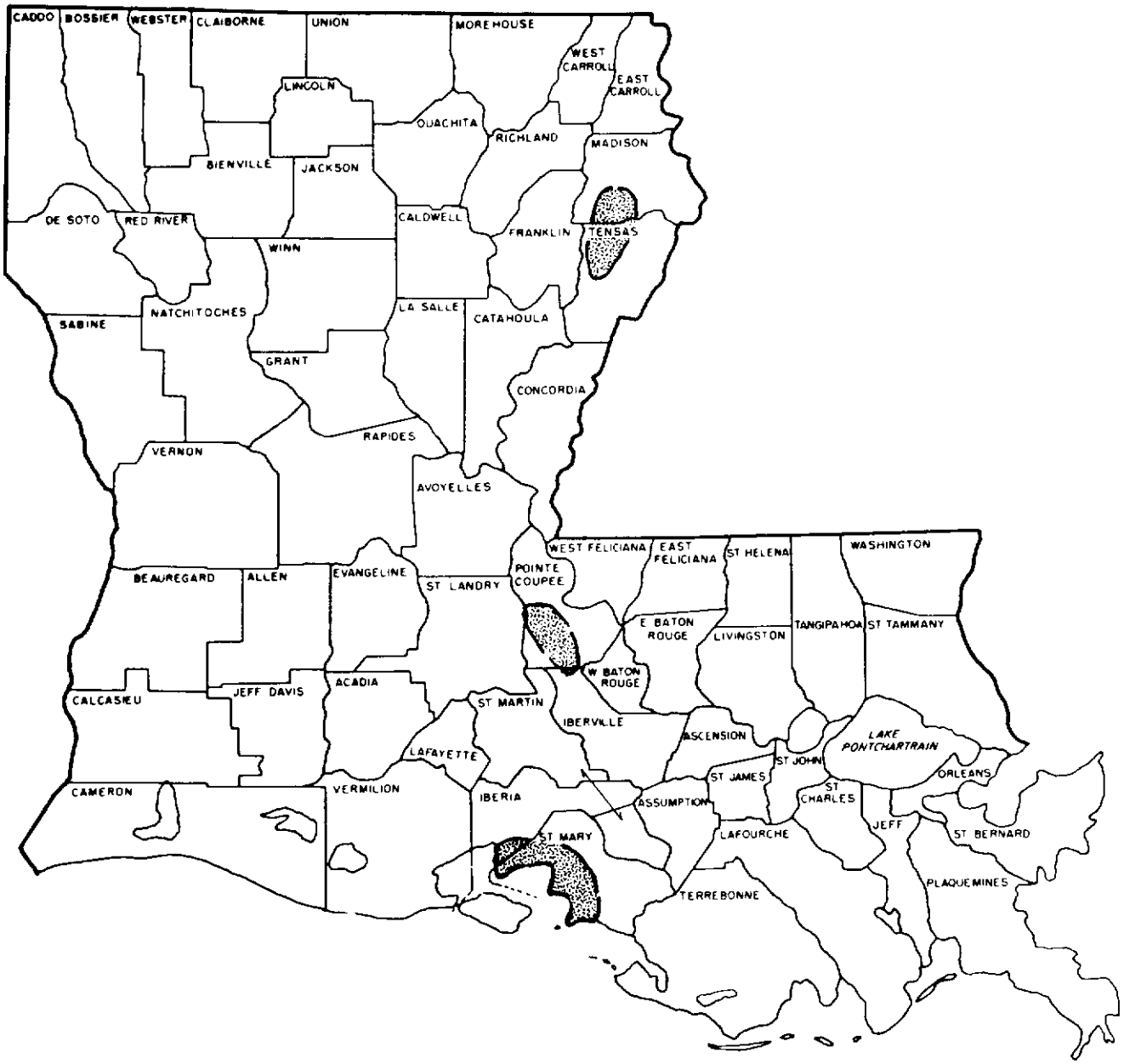

Figure 5.—*Range of black bears in Louisiana (Louisiana Department of Wildlife and Fisheries, 1985).*

Table 5. — *Number of rotten trees on timberland by diameter class and forest type, Louisiana, 1984*

Forest type	Diameter class (inches at breast height)					
	Total	5.0–8.9	9.0–12.9	13.0–16.9	17.0–20.9	21.0 and larger
	Trees per 100 acres					
Longleaf-slash	58	58	...	...	...	...
Loblolly-shortleaf	131	63	30	16	12	10
Oak-pine	202	20	64	54	37	26
Oak-hickory	369	167	73	49	39	41
Oak-gum-cypress	572	199	134	92	62	85
Elm-ash-cottonwood	510	285	87	84	32	22
All forest types	323	122	74	51	35	40

Table 6. — *Number of dead trees on timberland by diameter class and forest type, Louisiana, 1984*

Forest type	Diameter class (inches at breast height)					
	All classes	5.0–8.9	9.0–12.9	13.0–16.9	17.0–20.9	21.0 and larger
	Trees per 100 acres					
Longleaf-slash	465	327	104	27	7	...
Loblolly-shortleaf	435	303	80	36	12	4
Oak-pine	506	294	138	54	14	6
Oak hickory	565	395	94	50	13	13
Oak-gum-cypress	587	317	136	75	31	27
Elm ash cottonwood	534	230	173	67	28	36
All forest types	517	320	112	53	18	14

Table 7. — *Number of salvable dead trees on timberland by diameter class and forest type, Louisiana, 1984*

Forest type	Diameter class (inches at breast height)					
	All classes	5.0–8.9	9.0–12.9	13.0–16.9	17.0–20.9	21.0 and larger
	Trees per 100 acres					
Longleaf-slash	318	255	46	13	5	...
Loblolly-shortleaf	176	142	19	10	3	2
Oak-pine	200	138	30	23	8	1
Oak-hickory	159	124	17	9	7	3
Oak-gum-cypress	77	42	14	11	7	3
Elm-ash-cottonwood	65	...	52	11	...	3
All types	151	110	21	12	6	2

Table 8. — *Number of standing non-salvable dead trees on timberland by diameter class and forest type., Louisiana, 1984*

Forest type	Diameter class (inches at breast height)					
	All classes	5.0–8.9	9.0–12.9	13.0–16.9	17.0 20.9	21.0 and larger
	Trees per 100 acres					
Longleaf-slash	147	72	58	15	2	...
Loblolly-shortleaf	259	162	62	25	8	2
Oak-pine	306	156	108	31	6	5
Oak-hickory	406	272	77	41	6	10
Oak-gum-cypress	510	275	123	65	24	24
Elm-ash-cottonwood	468	230	121	56	28	33
All types	366	210	91	41	13	12

Table 9. —*Number of rotten, salvable dead, and standing non-salvable dead trees 5.0 inches or more in diameter on timberland by forest type and ownership class, Louisiana, 1984*

Forest type and ownership class	Total	Rotten	Salvable dead	Standing non-salvable dead
		Trees per 100 acres		
a. Pine (longleaf-slash and loblolly-shortleaf)				
Public	522	123	160	239
Forest industry	458	116	133	209
Other private	625	117	252	256
All owners	557	117	202	238
b. Upland hardwood (oak-pine and oak hickory)				
Public	1,068	412	343	313
Forest industry	719	300	141	278
Other private	857	272	179	406
All owners	828	291	178	359
c. Bottomland hardwood (oak-gum-cypress and elm-ash-cottonwood)				
Public	1,190	651	60	479
Forest industry	1,111	593	35	483
Other private	1,148	548	85	515
All owners	1,149	566	76	507
d. All forest types				
Public	925	412	155	358
Forest industry	659	261	119	279
Other private	900	335	163	402
All owners	840	323	151	366

RECREATION AND OTHER VALUE INTERACTIONS

The Louisiana landscape is dominated by forests. Lakes, rivers, bayous, and air-conditioned facilities may be the features sought when people plan outings, but Louisiana's humid climate and relatively hot summers make forests a most important year-round focus of outdoor recreation activities.

Unlike many regions with popular recreation areas, Louisiana has few locations with steep topography or rugged terrain (see table 3). However, the relatively flat forested bayous of the Mississippi and Atchafalaya Rivers are some of the prime sightseeing areas that attract tourists to Louisiana. The potential for development of old-growth stands—a rare site in the Midsouth states—is very great. Most of the State's old-growth stands have been cut in the past, but some stands remain relatively undeveloped and have reverted to a semi-wild status. Approximately 1 percent of the timberland (131,000 acres) contains a majority stocking of large-diameter trees (21 inches d.b.h. and larger). Eighty-seven percent of these stands are bottomland hardwood forests; half are in the Delta units. The ivory-billed woodpecker, thought by many to be extinct in the United States, was last reported to be in the old-growth bottomland forests of Louisiana. In the future, selectively managed stands with old growth potential may provide suitable habitat for reintroducing the ivory-billed woodpecker and help retain habitats for other endangered and potentially threatened species dependent on old-growth forests.

Remoteness

Remote timberland areas are limited throughout the Midsouth (Rudis 1986). These areas are important to recreationists because they provide a sense of "wilderness." Black bears and other wildlife in need of seclusion depend upon remote areas as well.

Estimates of remote timberland areas in Louisiana come from two parameters—forest size and distance from roads. Forest size is classified by tract size or area of contiguous forest land. Tracts are not defined by ownership boundaries but by nonforest uses exceeding 120 feet in width. Distance of timberland from roads is determined as the distance from the nearest all-weather road (improved and maintained) or unimproved, truck-operable road. (These parameters can also be used in assessing timber availability. Small tracts may be uneconomical for harvesting. Timberland in remote locations may require helicopters, an intensive road-building effort, or other specialized equipment.)

Timberland in tracts of 2,500 acres or more represents 43 percent of the State's timberland area and 47 percent of its growing-stock volume (table 10). Less than 4 percent of the timberland is fragmented into tracts 50 acres or less (table 10). Most of this timberland is widely dispersed, with the exceptions of southeastern Louisiana

and the predominantly agricultural portion of the State (fig. 6). By forest type, 40 percent of timberland in tracts 2,500 acres or more is oak-gum-cypress, with the remaining 60 percent in loblolly-shortleaf (25 percent), oak-hickory (12 percent), oak-pine (12 percent), longleaf-slash (8 percent), and elm-ash-cottonwood (4 percent) (table 11).

Timberland ½ mile or more from roads represents 2.5 million acres (17 percent statewide), and 4.0 million cubic feet of growing-stock volume (21 percent Statewide). Timberland that is distant from roads and is part of large tracts is found chiefly in the Atchafalaya Basin and in scattered locales throughout the Mississippi River Valley (fig. 6). Most of these areas (77 percent) are in bottomland hardwood forest types, compared with 12 percent in oak-pine and oak-hickory, and 10 percent in pine forest types.

The majority of timberland, 83 percent, is accessible, being within ½ mile of roads. Softwoods comprise the majority of growing stock on accessible timberland; hardwoods represent the majority on less accessible timberland (table 12). Timberland 1 mile or more from roads comprises 9 percent of the total and is found chiefly in the Atchafalaya Basin.

Location

In addition to distance from roads, timberland's recreation value depends on proximity to population centers. Louisiana's population is concentrated in the southeastern part of the State (fig. 7) where 10-year projected population increases also are expected to be greatest (fig. 8). Timberland in or near densely populated and growing metropolitan areas is likely to be valued more for recreation and land development potential than for timber values.

Data aggregated by State planning region suggests a disparity in the variety and amount of acres of timberland available. Pine and upland hardwood forests are common in the northern regions; bottomlands are common in the southern regions (fig. 9). Public timberland acreage is relatively rare in southern regions when compared with northern regions; the proportion per State planning region ranges from 23 percent in Alexandria to 0 percent in Lake Charles. Other ownership classes are presented for comparison (table 13). There are 3.3 acres of timberland for each of the State's inhabitants. By regions, timberland per person ranges from 9.8 acres per person in Alexandria to 0.3 acre per

Table 10.—*Area of timberland and growing-stock volume by size of forest tract, Louisiana, 1984*[1]

Size of forest tract	Area	Volume/acre	Volume		
			Total	Softwood	Hardwood
Acres	*Thousand acres*	*Cubic feet*	*Million cubic feet*		
1-10	125.1	1,123	140.5	64.9	75.6
11-50	381.5	1,074	409.7	198.3	211.4
51-100	402.3	1,068	429.5	209.4	220.1
101-500	1,964.4	1,195	2,347.8	1,322.0	1,025.8
501-2,500	5,026.8	1,336	6,717.1	4,083.6	2,633.5
2,501-5,000	2,965.1	1,486	4,406.7	2,457.8	1,948.9
More than 5,000	3,007.5	1,510	4,540.7	2,216.0	2,324.7
All sizes	13,872.6	1,369	18,992.0	10,552.0	8,440.0

[1]Rows and columns may not sum to totals due to rounding.

Table 11.—*Area of timberland by forest type and size of forest tract, Louisiana, 1984*[1]

Forest type	Size of forest tract (acres)							
	All classes	1-10	11-50	51-100	101-500	501-2,500	2,501-5,000	More than 5,000
	Thousand acres							
Longleaf-slash	933.2	0.0	12.1	12.4	71.2	376.4	195.7	265.4
Loblolly-shortleaf	4,033.2	34.3	109.4	83.8	661.3	1,642.9	887.8	613.8
Oak-pine	1,913.3	0.0	40.8	52.3	259.4	877.9	382.2	300.6
Oak-hickory	2,170.7	18.3	57.7	90.6	359.1	930.1	508.0	206.9
Oak-gum-cypress	4,377.6	58.7	125.8	146.9	542.4	1,141.0	925.0	1,437.7
Elm-ash-cottonwood	412.4	13.8	30.2	11.1	71.0	58.4	58.2	169.6
All types[2]	13,840.2	125.1	376.0	397.1	1,964.4	5,026.7	2,956.9	2,994.0

[1]Rows and columns may not sum to totals due to rounding.
[2]Does not include 32,400 acres of nontyped timberland.

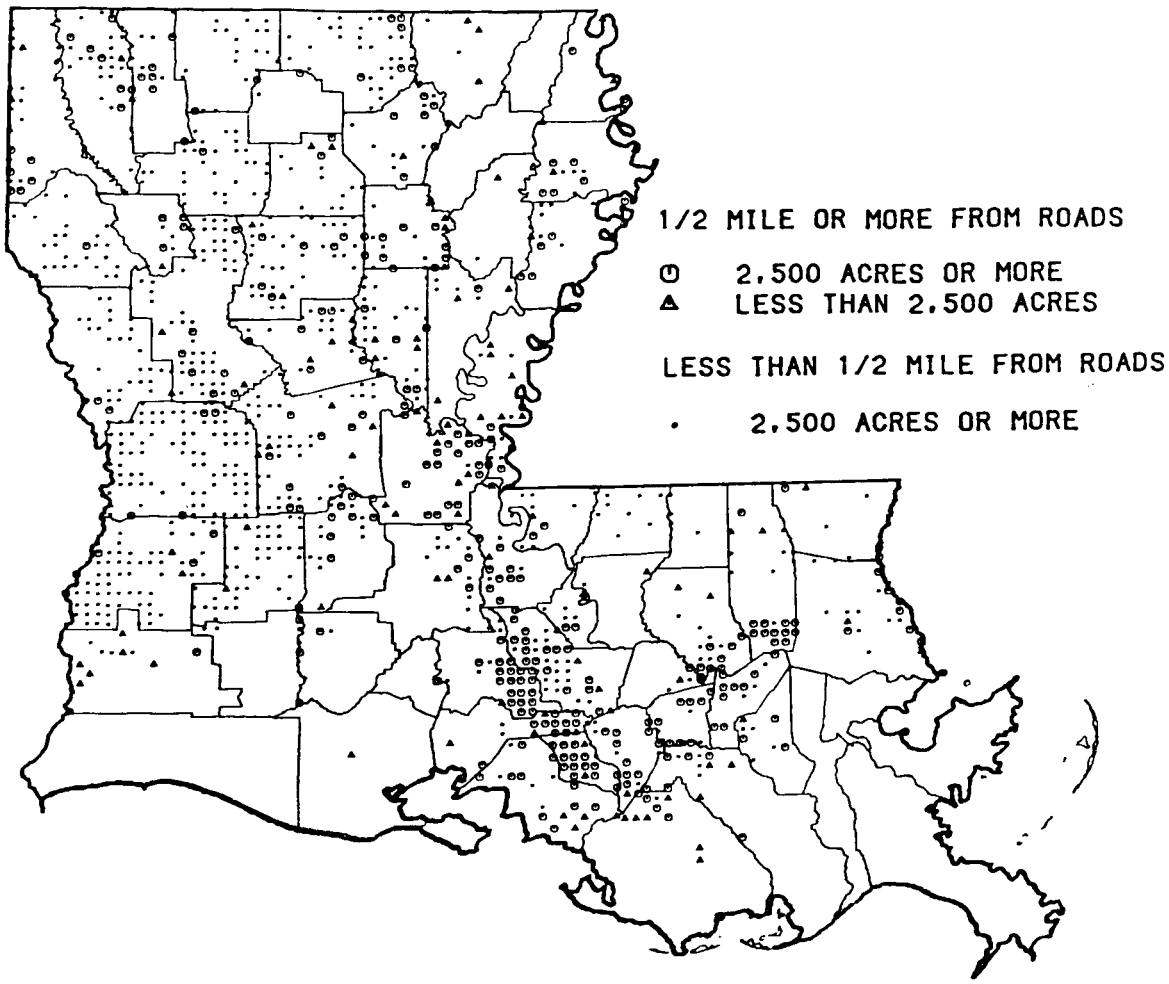

Figure 6.—*Remote timberland by forest size and distance from roads, Louisiana, 1984.*

Table 12.—*Area of timberland and growing-stock volume by distance from roads, Louisiana, 1984*

Distance from roads	Area	Volume/acre	Volume		
			Total	Softwood	Hardwood
	Thousand acres	*Cubic feet*	*Million cubic feet*		
0-649 feet	5,683.8	1,227	6,971.5	4,823.0	2,148.4
650-1,349	3,309.8	1,371	4,537.7	2,631.4	1,906.4
1,350-2,649	2,486.0	1,472	3,658.9	1,635.6	2,023.3
2,650-3,949	784.4	1,672	1,311.6	513.9	797.7
3,950-5,249	404.8	1,636	662.3	269.5	392.7
5,250-<3 miles	846.1	1,584	1,340.6	499.2	841.4
3 miles or more	357.8	1,424	509.4	179.3	330.1
Total	13,872.6	1,369	18,992.0	10,552.0	8,440.0

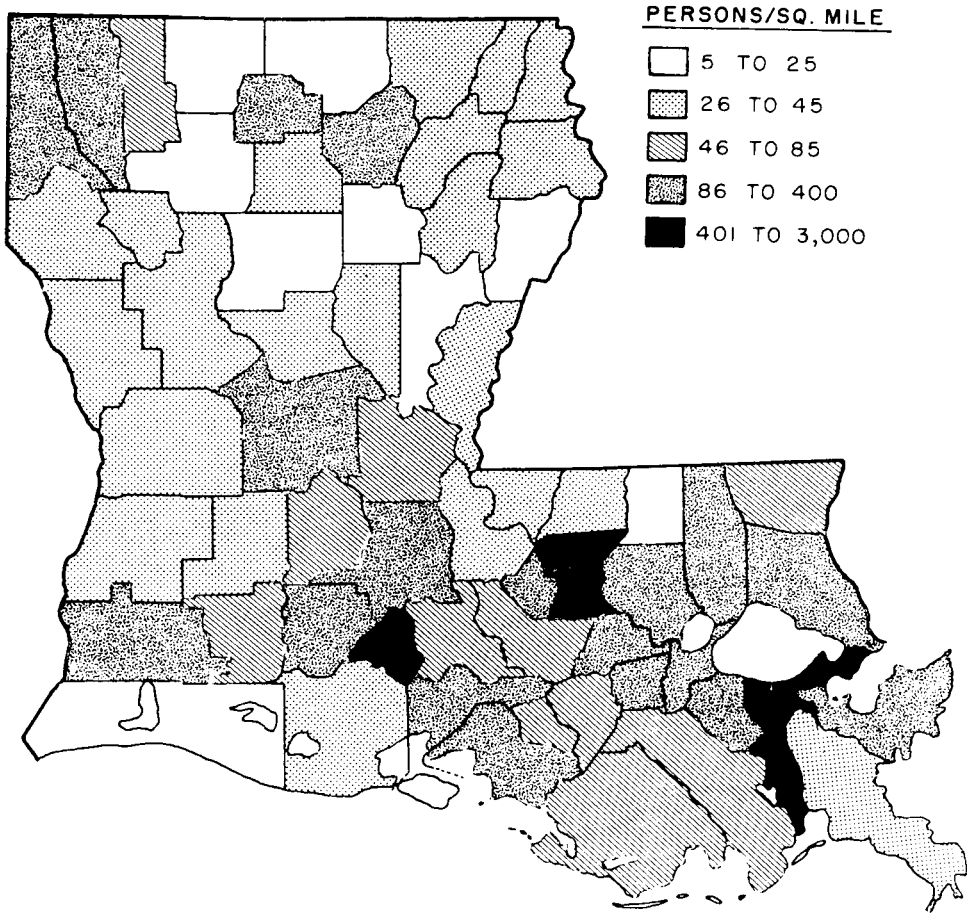

Figure 7.—*Population density, Louisiana, 1985 (State Planning Office).*

person in New Orleans. Many forest recreation enthusiasts of Lafayette, Houma, and New Orleans either make more use of their region's limited timberland, spend their time and money in more distant regions or adjacent states, or divert their leisure interests in forests with substitute activities on nontimberland areas.

Selected values associated with timberland have already been lost in the more densely populated regions. Several wildlife species that inhabit timberland (e.g., black bears, white-tailed deer) are absent or rare in urban areas. Aesthetics have also deteriorated. A special survey conducted in Southeast Louisiana indicates that 30 percent of the timberland contains artifacts associated with human use. Of the acres with one or more artifacts, 23 percent have beverage containers. Most timberland with artifacts is found near roads, urban areas, and agricultural fields. Improving aesthetics along roadsides and frequently used areas through education and litter clean-up efforts can alleviate some of these losses.

Activities

Among recreation uses closely associated with the recreation values of timberland are dispersed activities, such as hunting and camping. A 1984 inventory of hunting facilities indicated that 2,700,000 acres are owned or leased for hunting activities. One-third is owned or leased by private hunting clubs; the remainder is held by public agencies (Louisiana Department of Culture, Recreation, and Tourism [DCRT] 1984). Although not all of the acreage can be classed as timberland, a rough estimate is 1,450,000 acres, or 10 percent of the State's timberland. Regionally, hunting areas are widely distributed, with half of the acreage in the North and South Delta Units and limited acreage near metropolitan areas (fig. 10).

A total of 3,000 acres of camping facilities exist in Louisiana (DCRT 1984). The land area is small, but its influence on timberland is nevertheless important. Trees provide essential shade and other amenities for campers. Timberland adjacent to camping areas is used for hunting, hiking, and aesthetic enjoyment. Such timberland also helps maintain water quality for fishing, boating, and other water-based activities in streams and nearby water bodies.

In contrast to hunting acreage, camping acreage is concentrated near major metropolitan areas, although the majority are for trailers rather than tents (fig. 11, 12, 13). Most private campgrounds provide spaces for trail-

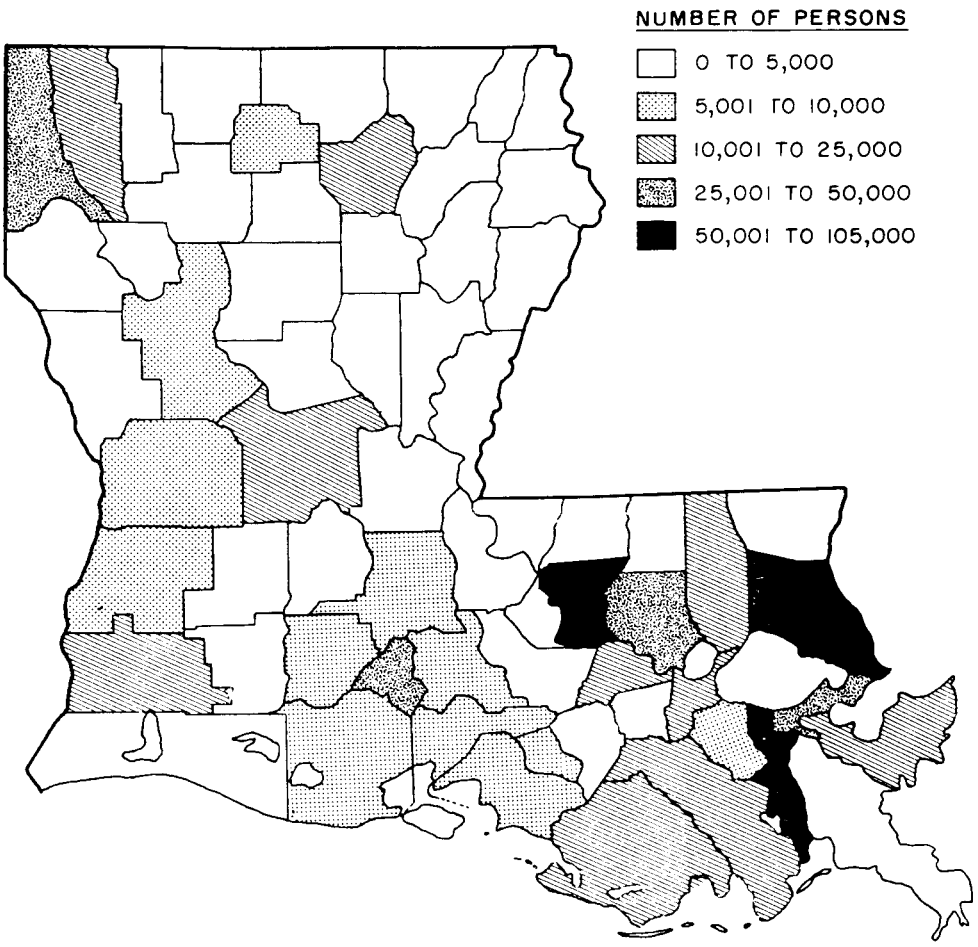

Figure 8.—*Projected increase in parish populations, Louisiana, 1985-1995 (State Planning Office).*

ers or vans; tent camping facilities are uncommon. Tent facilities are more frequent in public campgrounds.

The Louisiana Department of Culture, Recreation, and Tourism states that high priority needs exist for big game hunting areas in the regions of Monroe and Alexandria, and for camping facilities in the regions of Lake Charles and Lafayette (DCRT 1977). Supplying these needs may be a feasible timberland management option in the forested areas of these regions.

Aesthetics

The aesthetic, or landscape, value of Louisiana's timberland is particularly important to picnicking, sightseeing, fishing, and other off-site recreation activities. The design elements of seasonal color, shape, texture, and juxtaposition are important aspects of timberland areas (Crowe 1973). In Louisiana, seasonal color is relatively limited, especially in the southern parishes. Nevertheless, seasonal color affects a large number of outdoor enthusiasts as change coincides with major hunting seasons, and signals a short relief from the hot and humid conditions characteristic of Louisiana's climate. The vertical shape of most pines, coupled with their fine-textured, dark evergreen foliage, create a striking contrast to relatively flat landscapes. Live oak dogwood, and some other hardwoods have horizonta branching patterns and coarser textures which soften vertical contrasts in otherwise pure pine stands. Juxta position of sapling and seedling stands against olde sawtimber stands provides another contrast. Too fre quent or infrequent occurrence of these elements create monotony.

Design elements can be used effectively to enhance th value of timberland for aesthetics and other nontimbe values, while mitigating their effect on timber benefit (Crowe 1973). Pine plantations established in row adjacent to Louisiana's major thoroughfares have strong visual impact on the landscape, and affect a larg number of travelers. Rows that follow the subtle con tours of the land augment needed topographic relief an reduce soil erosion during early stand establishment rows that simply follow landowner boundaries or rights of-way encourage uniformity. Retention of mature vege tation along water bodies or water courses withi clearcuts and pine plantations creates a visual contras as well as biological diversity and edge habitat for variety of wildlife species. Nearby stands with abundan

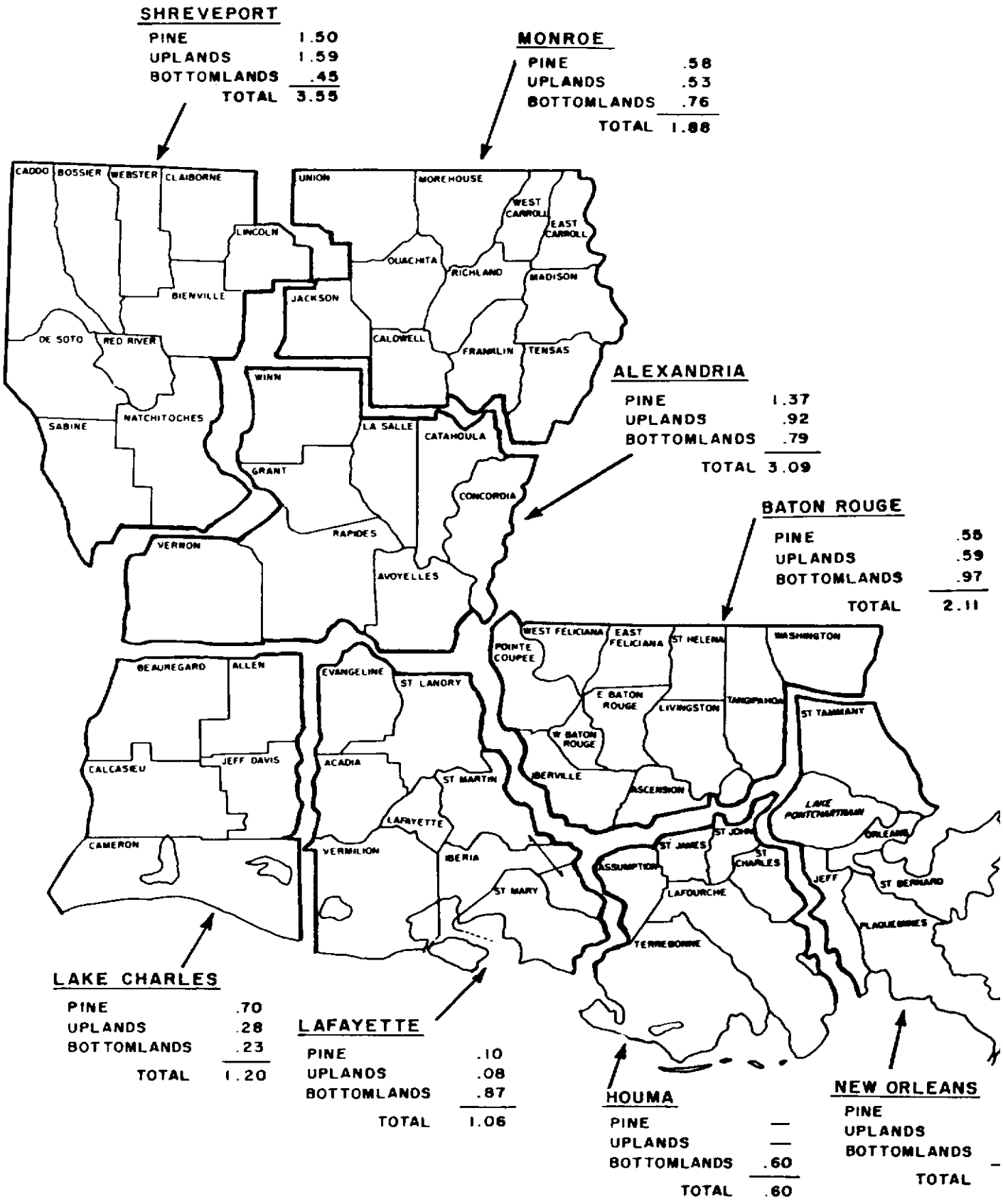

Figure 9.— *Forest acres (in millions) by State planning regions and forest type, Louisiana, 1984. Pine includes loblolly-shortleaf and longleaf-slash forest types; uplands include oak-pine and oak-hickory forest types; bottomlands include oak-gum-cypress and elm-ash-cottonwood forest types.*

Table 13. — *Population, timberland area per person, and timberland area by ownership class and state planning region[1], Louisiana*

State planning region	Population (U.S. Census 1980)	Timberland per person	Ownership class			
			All owners	Public	Forest industry[2]	Other private
			Thousand acres			
Shreveport	551,258	6.43	3,545	264	942	2,340
Alexandria	316,378	9.76	3,088	702	1,386	1,000
Baton Rouge	716,288	2.94	2,109	58	553	1,498
Monroe	318,815	5.90	1,881	207	727	948
Lake Charles	259,809	4.64	1,204	...	491	713
Lafayette	540,592	1.96	1,058	77	74	907
Houma	289,638	2.16	627	4	25	598
New Orleans	1,213,122	0.30	361	20	72	269
Statewide	4,205,900	3.30	13,873	1,331	4,270	8,272

[1]Rows and columns may not sum to totals due to rounding.
[2]Includes other private land leased to forest industries.

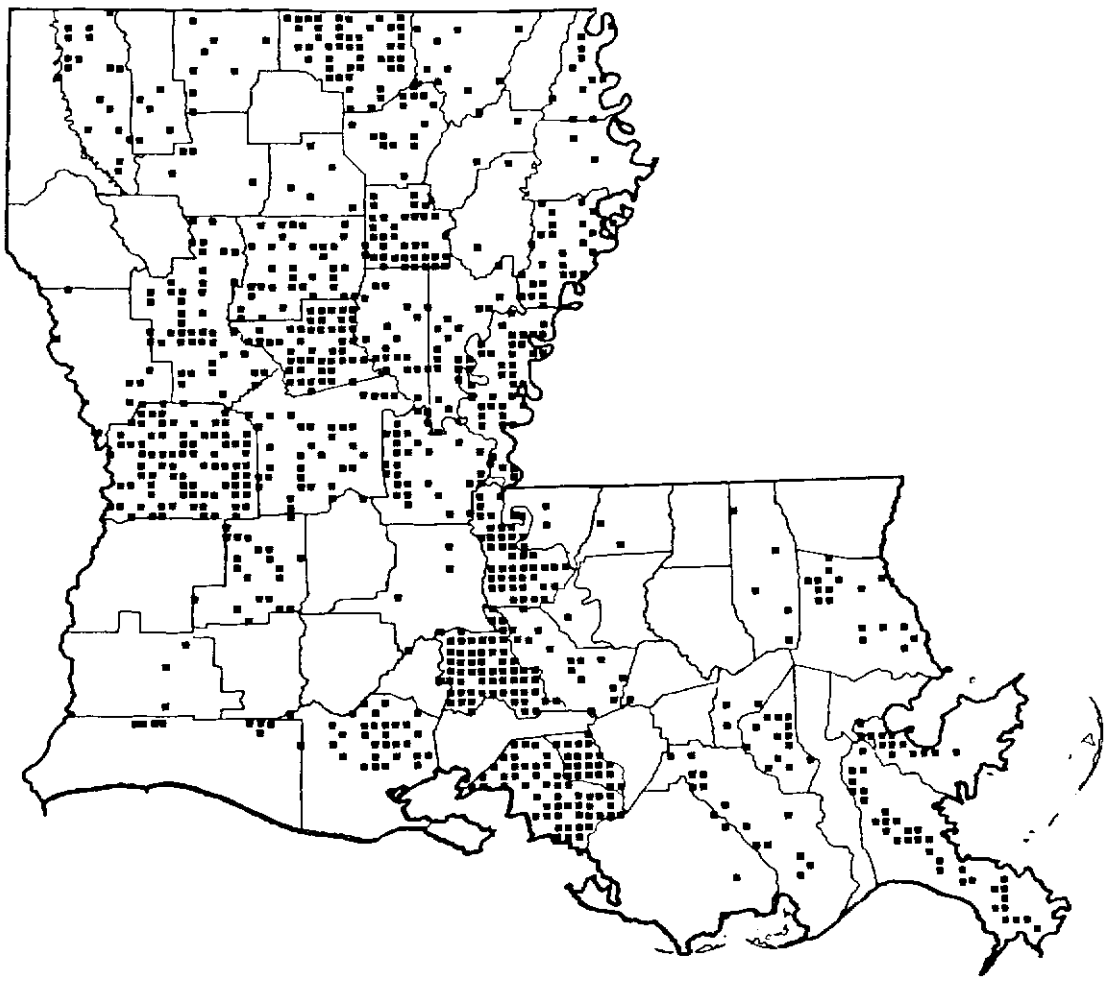

Figure 10.—*Areas designated for hunting, Louisiana, 1984 (DCRT). Each dot represents 3,000 acres.*

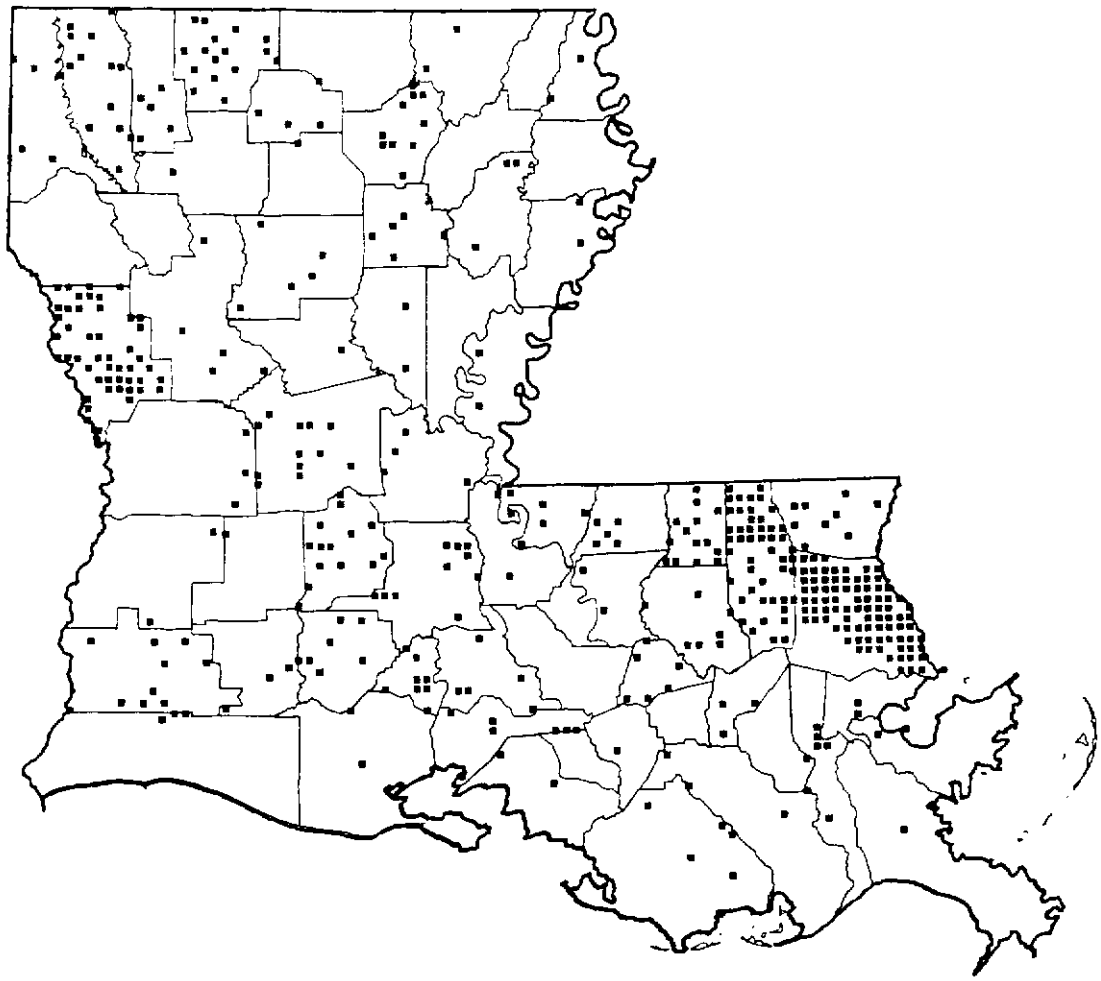

Figure 11.—*Areas designated for camping, Louisiana, 1984 (DCRT). Each dot represents 7 acres.*

snags, such as mature, unmanaged hardwood stands, greatly enhance the area's cavity-nesting bird habitat. Scheduling harvests in different years among adjacent timber stands promotes visual and biological diversity, supports a more continuous income to the landowner through periodic timber harvests, and reduces chances for wide fluctuations in water supplies and game habitats. Separating extensive acreages of pine plantations with non-forested areas also alleviates monotony (especially important along well-traveled roadways) and mitigates against catastrophic losses due to fire or pine beetle epidemics. Partitioning pine planations with hardwood stands can also be used but care must be exercised to avoid conditions that promote fusiform rust and other diseases with alternate hosts by using disease-resistant hardwood and pine varieties.

TRENDS IN SUPPLY

Trends in nontimber values of timberland are closely linked to changes in ownership, forest area, and stand structure. Forest industry landholdings declined 4 percent since 1974 to 3,603,100 acres, and other private landholdings declined 8 percent to 8,938,800 acres. Recognizing the multiple forest values in timberland, public agencies have increased timberland holdings 30 percent in the past 10 years to 1,330,700 acres, or percent of Louisiana's timberland acreage (Rosson a others 1988).

Total timberland has declined by 4.5 percent sir 1974. Major losses were due to the clearing of bottomla hardwood (oak-gum-cypress and elm-ash-cottonwo stands. Most of the recent public acquisitions have be in bottomland hardwood stands in the Delta Un where rapid conversion to agricultural uses intensifi the need to conserve remaining timberland. While sucl rapid conversion of timberland to agricultural uses unlikely to continue, one might expect additional pub acquisition of timberland as forests with abunda nontimber values become scarce.

In terms of stand structure, tables 14 and 15 prese current acreages by forest type and stand size class, a changes that have occurred since the 1974 survey. The has been a net gain in sawtimber stands in pine for types and a corresponding decline in poletimber stan because many of the pine poletimber stands have gro into the sawtimber size class (table 14). Shifts in sta dominance have favored loblolly and slash over shortl and longleaf pines in sawtimber stands. Sapling-seedli stand increases have occurred only in loblolly, suggesti

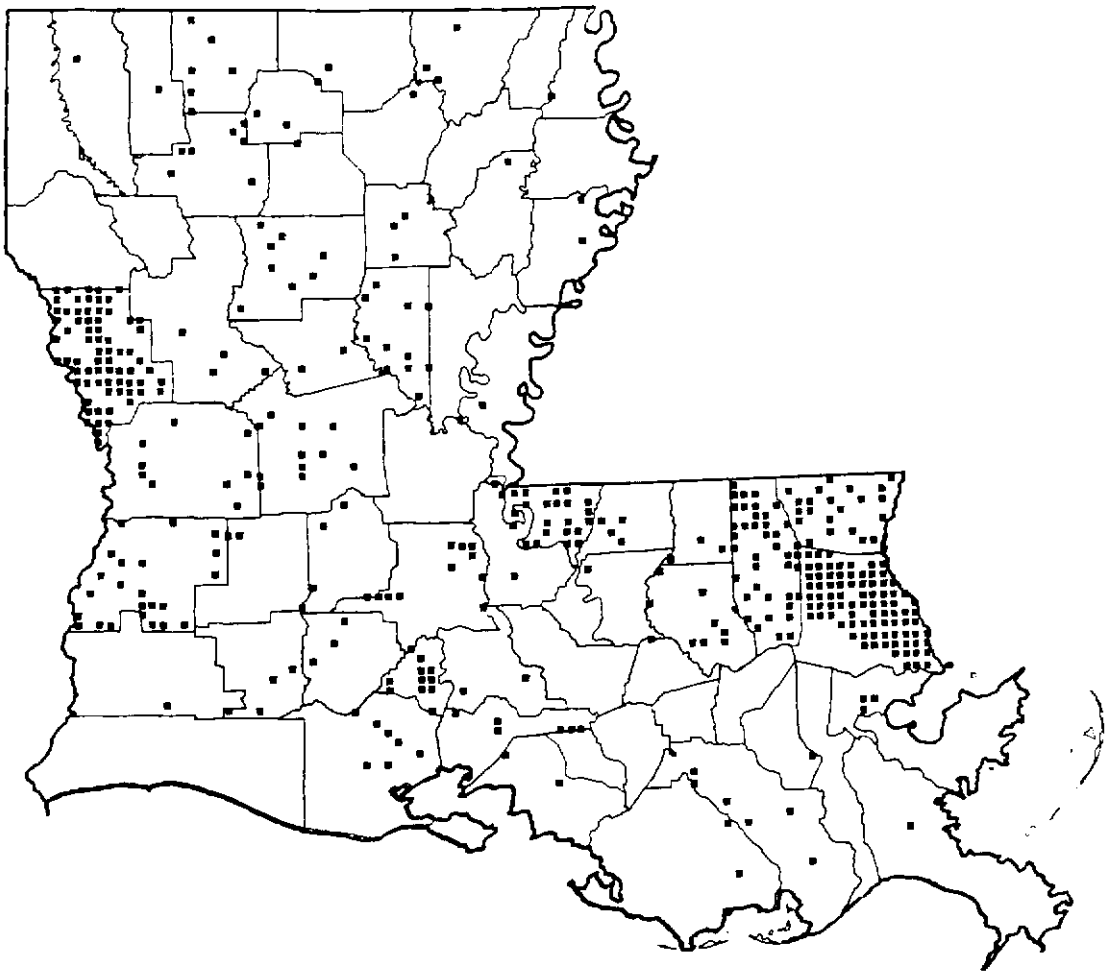

Figure 12.—*Number of tent sites, Louisiana, 1984 (DCRT). Each dot represents 9 tent sites.*

regeneration of loblolly is being favored over other pine types.

In hardwood forest types, there has been a net loss in sawtimber, poletimber, and sapling-seedling stands, largely due to declines in bottomland hardwood stands (table 15). Historically, the rapid reduction in Louisiana's bottomland hardwood stands for agricultural production is believed to have ended prior to 1980 (Rosson and others 1988). Gains in oak-hickory forest type, particularly in sawtimber and poletimber acreage, are linked to losses in oak-pine and some pine stands, suggesting selective removal of dominant pine trees is occurring without further pine timber management.

Timber production is expected to intensify in forests already managed for timber products. One can expect an increase in pine stands dominated by loblolly pine, along with a decline in other pine types. We can expect changes in wildlife habitat where extensive areas are clearcut and regenerated to pine. Young clearcuts of most any forest type increase the habitat for deer and other wildlife dependent on young forest vegetation; after 7 to 10 years the quality of the deer habitat on pine plantations deteriorates as non-pine vegetation dwindles (Dickson and Huntley 1985). One can also expect that much pine regeneration will be as plantations, with few large live trees and even fewer mast hardwoods or large dead trees. Such areas are most likely to occur where pine forest types and exclusive timber management predominate.

Countering the trend toward intensified pine timber management is a shift of pine and oak-pine forest acres to stands dominated by hardwoods. With time, demand for other forest values, particularly recreation, can be expected to rise with an increase in Louisiana's population. Oak-pine, oak-hickory, and remaining bottomland hardwoods (oak-gum-cypress and elm-ash-cottonwood) are likely to increase in importance as forests with wildlife, recreation, and old-growth potential. Greater utilization of young and low-timber quality hardwoods (e.g., for fuel or fiber) would limit future prospects for hardwood stands to retain mast, snag, and older trees with nontimber values.

Many of the longer-term historical changes in timberland acreage, stand structure, and future prospects for Louisiana's forest resources have been addressed elsewhere (Rosson and others 1988, Rudis and Birdsey 1986). Import restrictions, changes in forestry tax incentives, and other programs designed to alter the economics of timber production also have an effect on nontimber values. To what degree these policies or

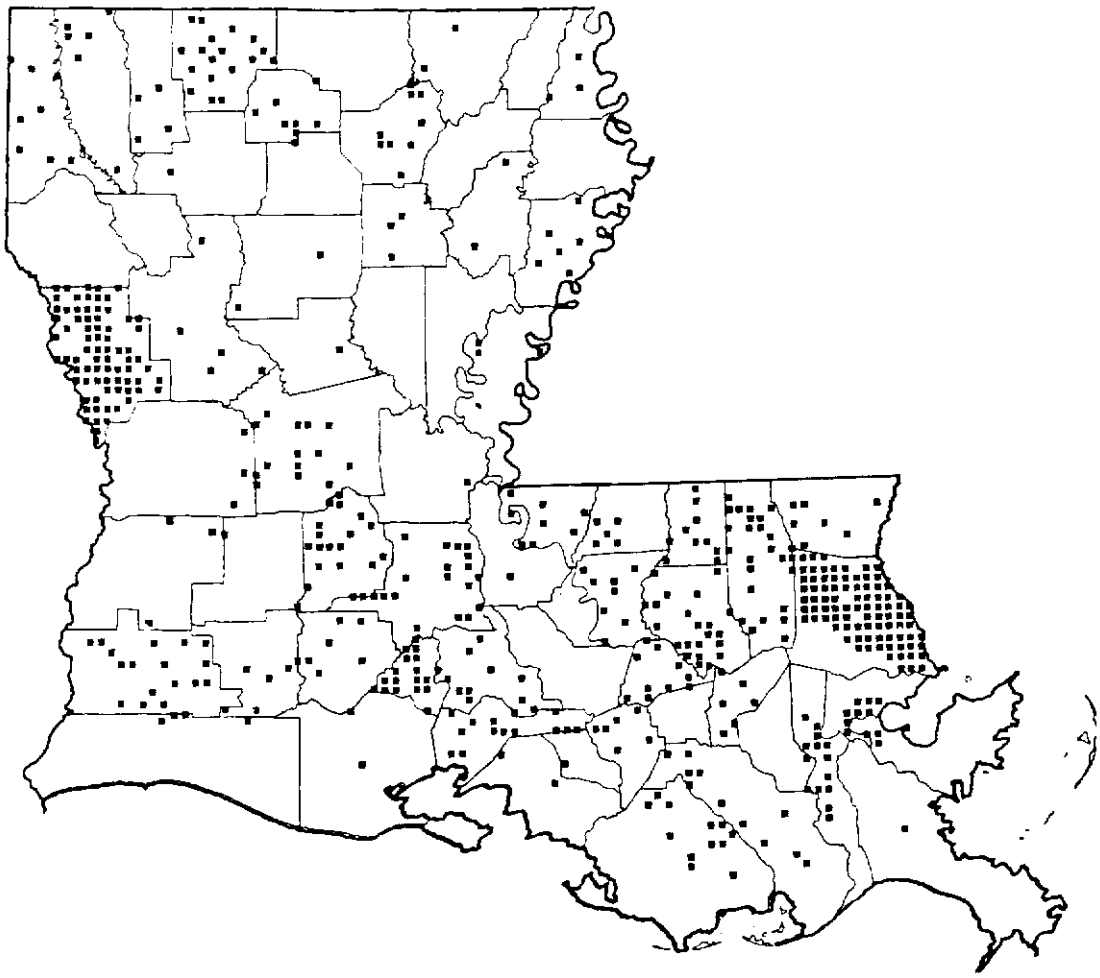

Figure 13.—*Number of trailer sites, Louisiana, 1984 (DCRT). Each dot represents 18 trailer sites.*

Table 14. —*Area of pine timberland by stand-size class and detailed forest type, 1984, and change since 1974, Louisiana*[1]

Stand-size class	Loblolly-shortleaf[2]				Longleaf-slash			
	Loblolly		Shortleaf		Slash		Longleaf	
	1984	Change	1984	Change	1984	Change	1984	Change
	Thousand acres							
Sawtimber	2,246.0	+210	221.5	-55	259.8	+131	191.9	-39
Poletimber	604.8	-208	58.9	-77	218.9	-120	62.8	+22
Sapling-seedling	835.3	+133	23.7	-34	135.6	-8	52.3	-49
Nonstocked	13.1	-15	0.0	-6	5.7	+6	6.3	-35
All classes	3,699.2	+120	304.2	-172	619.9	+10	313.2	-100

[1]Change information calculated from 1974 data revised to current standards. Columns may not sum to totals due to rounding.

[2]Other detailed loblolly-shortleaf type: spruce pine, 29,800 acres in 1984, up 16,500 acres from 1974; all in sawtimber size class.

Table 15.—*Area of hardwood timberland by stand-size class and forest type, 1984, and change since 1974, Louisiana*[1]

Stand-size class	Oak-pine		Oak-hickory		Oak-gum-cypress		Elm-ash-cottonwood	
	1984	Change	1984	Change	1984	Change	1984	Change
				Thousand acres				
Sawtimber	1,044.8	+6	799.8	+129	3,157.9	-55	227.2	-40
Poletimber	383.9	-104	584.1	+199	702.2	-372	103.3	-29
Sapling-seedling	473.5	-199	698.6	+87	258.0	-255	48.8	59
Nonstocked	11.0	+5	88.2	+31	259.5	+105	32.9	+0
All classes	1,913.3	-292	2,170.7	+446	4,377.6	-578	412.4	-128

[1]Change information calculated from 1974 data revised to current standards. Columns may not sum to totals due to rounding.

timber value changes will affect nontimber values is a matter for further study.

Cordell and Hendee (1982) state that U.S. demographic trends suggest more crowding and increased regulation of remaining timberland, reduced public sector involvement in providing other forest values, and a decline in wildlife and recreational opportunities in remote areas. The Conservation Reserve Program authorized under the Food Security Act of 1985 is aimed at retiring cropland with high erosion potential, and is expected to increase selected nontimber values (notably soil productivity, water quality, and wildlife habitat) in erosion problem areas (fig. 4). The program is aimed also at increasing the supply of forest resources where the land is planted with trees.

In the future, some reduction in timberland due to urban and agricultural development, an increase in road construction on remaining timberland, and a reduction in remote timberland areas can be expected to continue with increases in the State's population and increases in the demand for wood products. Timberland in public ownership is likely to increase in value for water, soils, range, wildlife, and recreation, if these become scarce on private land.

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Appendix

Survey Methods

Forest resource statistics were obtained by a sampling method employing a forest-nonforest classification on aerial photography and on-the-ground measurements of trees at sample locations. The estimate of timberland acreage is based on the photointerpretation of recent aerial photography using dot counts as to forest or nonforest condition. These dot counts yield the proportion of forest to nonforest areas in each parish. Forest area changes are then determined from field observations of permanent 3-mile grid of permanent plots. Additional plots (intensification plots) for classifying points as to forest or nonforest condition only are used to further reduce the sampling error for forest area. The field classifications of these two types of plots (3-mile grid and intensification) are used to correct photointerpretation errors and adjust the parish timberland acreage estimate from the dot counts. The intensity level of the 3-mile grid layout of permanent plots averages 5,760 acres per plot.

Volume estimates come entirely from individual tree measurements on forested plots. In Louisiana, five horizontal points were measured at each forested location. Trees 5.0 inches in diameter and larger were selected with a 37.5 factor prism; thus each tree selected with the prism represented 7.5 square feet of basal area. Trees smaller than 5.0 inches in diameter were tallied on a 1/275-acre fixed circular plot around the first 3 points of the 5-point cluster.

Volumes in Louisiana were derived from fixed form diameter-squared times bole length regression equations. These equations were developed from deterministic measurements of trees on 8 percent of the field locations. The deterministic measurements included diameter at breast height, total height, bole length, log length, and four upper stem diameters. Volumes for these trees were computed using Smalian's formula. Equations were developed for seven species groups in Louisiana; these equations were used to estimate volume of the remaining trees that were not measured deterministically.

Reliability of the Data

A relative standard of accuracy has been incorporated into the forest survey. This minimizes human and instrumentation error and permits the control of costs within prescribed economic limits.

The first type of error, estimating error, can be caused

by improperly calibrated instruments, by instruments with limited precision, by human error in measuring and compiling. All of these are minimized by a system that incorporates training, check plots, and an edit (consistency) check of the data received. Estimating error is not assessed statistically but the Forest Inventory and Analysis Unit holds it to a minimum by adequate training, experienced supervision, and emphasis on careful work.

The second type of error, sampling error, is associated with natural and expected deviation of individual measurements from the average of the whole sample. Thus, the deviation is susceptible to a mathematical evaluation of the probability of error. Sampling errors are based on one standard deviation. That is, the chances are 2 out of 3 that if the results of a 100 percent census were known the sample results would be within certain limits.

Estimates smaller than State totals have larger sampling errors. The smaller the area examined, the larger the sampling error. In addition, as area or volume totals are stratified by forest type, species, diameter class, ownership, or other subdivisions, the sampling error increases and is greatest for the smallest subdivisions. The sampling error for State totals and smaller estimates are depicted in table A1.

Table A1.—*Sampling error to which estimates are liable, two chances out of three, Louisiana, 1984*

Sampling error	Timberland area	Growing-stock volume
Percent	*Thousand acres*	*Million cubic feet*
0.3	13,872.6	...
1.0	1,248.5	...
2.0	312.1	17,140.3
3.0	138.7	7,617.9
4.0	78.0	4,285.1
5.0	49.9	2,742.4
10.0	12.5	685.6
15.0	5.6	304.7
20.0	3.1	171.4
25.0	2.0	109.7

DEFINITION OF TERMS

Forest Land Classes

Forest Land—Land at least 16.7 percent stocked by forest trees of any size, or formerly having such tree cover, and not currently developed for nonforest uses. Minimum area considered for classification is one acre.

Timberland—Forest land that is producing, or is capable of producing, crops of industrial wood and not withdrawn from timber utilization. Timberland is synonymous with "commercial forest land" in prior reports.

Productive-Reserved Forest Land—Productive public forest land withdrawn from timber utilization through statute or administrative regulations.

Tree Classes

Commercial Species—Tree species currently or prospectively suitable for industrial wood products. Excluded are noncommercial species. See species list.

Noncommercial Species—Tree species of typical small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products. See species list.

Growing-Stock Trees—Live trees of commercial species classified as sawtimber, poletimber, sapling, and seedlings. Trees must have a 12-foot butt log (a merchantable 12-foot log in the first 16 feet of the bole) now or prospectively to be classed as growing stock.

Rough Trees—Live trees of commercial species that are unmerchantable for saw logs currently or potentially because of roughness or poor form in the butt log. Also included are all live trees of noncommercial species.

Rotten Trees—Live trees of commercial species that are unmerchantable for saw logs currently or potentially because of rot deduction in the butt log.

Cull Trees—Rough or rotten trees.

Hardwoods—Dicotyledonous trees, usually broadleaved and deciduous.

Softwoods—Coniferous trees, usually evergreen, having needle or scalelike leaves.

Live Trees—Included are all size classes of growing-stock, rough, and rotten trees.

Salvable Dead Trees—Standing or down dead trees that were formerly growing stock and are considered merchantable.

Forest Types

Longleaf-Slash Pine—Forests in which longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include other southern pines, oak, and gum.

Loblolly-Shortleaf Pine—Forests in which loblolly, shortleaf, Virginia, sand, pond, spruce, pitch, and Table-Mountain pine or eastern redcedar singly or in combination, comprise a plurality of the stocking. Common associates include oak, hickory, and gum.

Oak-Pine—Forest in which hardwoods (usually upland oaks) comprise a plurality of the stocking, but in which softwoods, except cypress, comprise 25-49 percent of the stocking. Common associates include gum, hickory, and yellow-poplar.

Oak-Hickory—Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand would be classified oak-pine. Common associates include yellow-poplar, elm, maple, and black walnut.

Oak-Gum-Cypress—Bottomland forest in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand would be classified oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

Elm-Ash-Cottonwood—Forest in which elm, ash, or cottonwood, singly or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.

Nontyped—Timberland currently unoccupied with any live trees or seedlings, e.g. very recent clearcut areas.

Dimension Classes of Trees

Sawtimber Trees—Trees 9.0 inches and larger in d.b.h. for softwoods, and 11.0 inches and larger for hardwoods.

Poletimber Trees—Trees 5.0 to 8.9 inches in d.b.h. for softwoods and 5.0 to 10.9 inches d.b.h. for hardwoods.

Saplings—Trees 1.0 inch to 4.9 inches in d.b.h.

Seedlings—Trees less than 1.0 inch in d.b.h.

Stand-Size Classes

Sawtimber Stands—Stands at least 16.7 percent stocked with growing-stock trees, half or more of this stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber Stands—Stands at least 16.7 percent stocked with growing-stock trees, half or more of this stocking in sawtimber or poletimber trees, and with poletimber stocking exceeding that of sawtimber stocking.

Sapling-Seedling Stands—Stands at least 16.7 percent stocked with growing-stock trees, more than half of this stocking in saplings or seedlings.

Nonstocked Stands—Stands less than 16.7 percent stocked with growing-stock trees.

Stocking

Stocking is a measure of the extent to which the growth potential of the site is utilized by trees or preempted by vegetative cover. Stocking is determine by comparing the stand density in terms of number trees or basal area with a specified standard. Fu stocking is considered 100 percent of the stockin standard.

The tabulation by size class shows the density stan ard in terms of trees required per acre, for full stockin

D.b.h. (inches)	Number of trees	D.b.h. (inches)	Number of trees
Seedlings	600	16	72
2	560	18	60
4	460	20	51
6	340	22	42
8	240	24	36
10	155	26	31
12	115	28	27
14	90	30	24

Volume

Volume of Cull—The volume of sound wood in the bol of rough and rotten trees.

Volume of Growing Stock—Volume of sound wood i the bole of sawtimber and poletimber trees from a 1-foo stump to a minimum 4.0-inch top outside bark or to th point where the central stem breaks into limbs. Rough rotten, and noncommercial trees are excluded.

Volume of Saw-log—Net volume of the saw-log portio (between a 1 foot stump and 7.0 inches diameter outsid bark for softwoods and 9.0 inches dob for hardwoods) growing-stock sawtimber trees in cubic feet. Net volum equals gross volume less deductions for rot, sweep, an other defects that affect use for lumber to the poir where the central stem breaks into limbs. Rough, rotter and noncommercial trees are excluded.

Volume of Timber—The volume of sound wood in th bole of growing stock, rough, rotten, and salvable dea trees 5.0 inches and larger in d.b.h. from a 1-foot stum to a minimum 4.0-inch top outside bark, or to the poir where the central stem breaks into limbs.

Ownership Classes

Public Land—National Forest Land, other federa land, state, county, and municipal land.

National Forest Land—Federal lands that have bee legally designated as National Forests or purchase unit and other lands under the administration of the Fores Service, including experimental areas.

Other Federal Land—Federal lands other than Nationa Forests; lands administered by the Bureau of Lan Management and Indian Lands.

State, County, and Municipal Land—Lands owned b States, county-equivalent Louisiana parishes, and loca public agencies or municipalities, or lands leased to thes governmental units for 50 years or more.

Forest Industry Land—Lands owned by companies individuals operating wood-using plants (either primar or secondary).

Other Private Land—Lands privately owned by i dividuals or corporations, other than the forest industr

Miscellaneous Definitions

Basal Area—The area in square feet of the cros section at breast height of a single tree or of all the tree in a stand, usually expressed in square feet per acre.

D.b.h. (diameter at breast height)—Tree diameter i

inches, outside bark, measured at 4½ feet above ground.

Diameter Classes—The 2-inch diameter classes extend from 1.0 inch below to 0.9 inches above the stated midpoint. Thus, the 12-inch class included trees 11.0 inches through 12.9 inches d.b.h.

Mortality—Number or sound-wood volume of live trees dying from natural causes during a specified period.

Plantations—Stands evidenced by regeneration from planting or seeding. Forest Survey categorizes plantations by forest type based upon plot tally.

LIST OF SPECIES

Table A2 ranks all live trees (1.0 inches d.b.h. and larger) by relative importance and presents data on occurrence, relative importance, frequency, density, and basal area. The timber report (Rosson and others 1988) ranks species by survey unit and volume for all live trees and provides maps of the relative volume distribution of selected species.

Scientific and common names of tree species that were recorded on plots sampled in Louisiana:[1]

Genus and species	Common Name
Softwoods	
Juniperus silicicola	southern redcedar
J. virginiana	easter redcedar
Pinus echinata	shortleaf pine
P. elliottii	slash pine
P. glabra	spruce pine
P. palustris	longleaf pine
P. serotina	pond pine
P. taeda	loblolly pine
Taxodium distichum var. *distichum*	baldcypress
T. distichum var. *nutans*	pondcypress
Hardwoods	
Acer barbatum	Florida maple
A. negundo	boxelder
A. rubrum var. *rubrum*	red maple
A. saccharinum	silver maple
A. saccharum	sugar maple
Aesculus sp.[2]	buckeye
Betula nigra	river birch
Bumelia sp.[2]	bumelia
Carpinus caroliniana[3]	bluebeech
Carya sp.[2]	hickory
C. aquatica	water hickory
C. illinoensis	pecan
Castanea sp.[2]	chinkapin
Castanea dentata	American chestnut
Celtis laevigata	sugarberry
C. occidentalis	hackberry
Cercis canadensis[2]	eastern redbud
Cornus florida	flowering dogwood
Crataegus sp.[2]	hawthorn
Diospyros virginiana	common persimmon
Fagus grandifolia	American beech
Fraxinus americana	white ash
F. pennsylvanica	green ash
F. profunda	pumpkin ash
Gleditsia aquatica	water locust
G. triacanthos	honey locust
Ilex opaca	American holly
Juglans nigra	black walnut
Liquidambar styraciflua	sweetgum
Liriodendron tulipifera	yellow-poplar
Maclura pomifera	Osage-orange
Magnolia acuminata	cucumbertree
M. grandiflora	southern magnolia
M. macrophylla[3]	bigleaf magnolia
M. virginiana	sweetbay
Malus sp.[3]	apple
Melia azedarach[2]	chinaberry
Morus rubra	red mulberry
Nyssa aquatica	water tupelo
N. sylvatica var. *sylvatica*	blackgum
N. sylvatica var. *biflora*	swamp tupelo
Ostrya virginiana[2]	ironwood
Oxydendrum arboreum[2]	sourwood
Persea borbonia	redbay
Planera aquatica[3]	water-elm
Platanus occidentalis	American sycamore
Populus sp.	cottonwood
Prunus sp.[2]	cherries, plums
P. serotina	black cherry
Quercus alba	white oak
Q. bicolor	swamp white oak
Q. falcata var. *falcata*	southern red oak
Q. falcata var. *pagodifolia*	cherrybark oak
Q. incana[2]	bluejack oak
Q. laurifolia	laurel oak
Q. lyrata	overcup oak
Q. marilandica[3]	blackjack oak
Q. michauxii	swamp chestnut oak
Q. muehlenbergii	chinkapin oak
Q. nigra	water oak
Q. nuttallii	Nuttall oak
Q. palustris	pin oak
Q. phellos	willow oak
Q. prinus	chestnut oak
Q. shumardii	Shumard oak
Q. stellata var. *stellata*	post oak
Q. stellata var. *paludosa*	Delta post oak
Q. velutina	black oak
Q. virginiana[3]	live oak
Robinia pseudoacacia	black locust
Salix sp.	willow
Sassafras albidum	sassafras
Tilia americana	American basswood
T. heterophylla	white basswood
Ulmus alata	winged elm

U. americana	American elm
U. crassifolia	cedar elm
U. rubra	slippery elm
Vaccinium arboreum[2]	sparkleberry

[1] Names according to: Little, Elbert L., Jr. Checklist of United State Trees (Native and Naturalized). 1978. U.S. Department of Agriculture, Agr. Handbook No. 541, 375 p.

[2] Noncommercial species.

Table A2.—*Occurrence and relative importance (frequency, density, and basal area) of all live trees 1.0 inches diameter at breast height or greater by species on timberland, Louisiana, 1984*

Species	Occurrence[1]	Relative[2] importance	Relative[3] frequency	Relative[4] density	Relative[5] basal area
			Percent		
Loblolly pine	51.5	18.4	10.4	19.2	25.5
Sweetgum	30.6	11.0	10.2	13.2	9.5
Red maple	24.3	6.3	4.9	7.9	3.2
Water oak	24.4	4.1	4.9	3.4	3.8
Blackgum	23.5	3.8	4.7	4.2	2.4
Baldcypress and pondcypress	12.6	3.5	2.5	2.0	5.9
Shortleaf pine	17.5	3.4	3.5	2.6	4.1
Green ash	15.2	3.1	3.1	3.2	2.9
Southern red oak	18.7	2.8	3.8	2.2	2.3
Water tupelo	6.6	2.7	1.3	1.8	4.9
Bluebeech	11.9	2.5	2.4	3.8	1.3
Slash pine	6.4	2.3	1.3	2.2	3.3
Post oak	13.9	2.1	2.8	1.8	1.7
Winged elm	12.9	2.1	2.6	2.8	.7
White oak	13.5	2.0	2.7	1.6	1.7
Sugarberry and hackberry	9.8	2.0	2.0	1.8	2.1
Hickory (a)	13.6	1.9	2.7	1.7	1.4
Willow oak	10.3	1.7	2.1	1.2	1.9
Flowering dogwood	9.9	1.6	2.0	2.4	.6
Willow	5.7	1.4	1.2	1.0	2.1
Cherrybark oak	10.7	1.4	2.2	.9	1.3
Water hickory	7.5	1.4	1.5	1.2	1.5
Longleaf pine	6.9	1.3	1.4	.8	1.8
Ironwood	6.4	1.3	1.3	2.2	.4
Hawthorn	7.9	1.3	1.6	2.0	.3
American elm	8.2	1.2	1.7	1.0	1.1
Overcup oak	7.6	1.2	1.5	.5	1.5
Laurel oak	5.6	1.0	1.1	.9	1.0
American beech	6.1	.9	1.2	.3	1.1
Nuttall oak	4.8	.7	1.0	.2	.8
Common persimmon	4.6	.7	.9	.8	.2
Sweetbay	2.9	.6	.6	.7	.5
American holly	4.1	.6	.8	.7	.3
Boxelder	3.1	.6	.6	.6	.5
Black cherry	4.5	.6	.9	.5	.2
Swamp chestnut oak	3.6	.5	.7	.3	.5
White ash	3.6	.5	.7	.4	.3
Blackjack oak	2.6	.4	.5	.6	.3
Water-elm	2.0	.4	.4	.6	.3
Cottonwood	2.1	.4	.4	.1	.5
Sassafras	2.7	.4	.5	.4	.1
Swamp tupelo	0.9	.3	.2	.3	.5
American sycamore	2.2	.3	.4	.1	.4

Table A2.—*Occurrence and relative importance (frequency, density, and basal area) of all live trees 1.0 inches diameter at breast height or greater by species on timberland, Louisiana, 1984—Continued*

Cedar elm	1.9	.3	.4	.2	.3
Plum and cherry except black cherry	2.0	.3	.4	.4	.1
Sparkleberry	2.2	.3	.5	.4	.1
Slippery elm	2.0	.3	.4	.3	.2
Pecan	1.6	.3	.3	.2	.3
Honey locust	2.2	.3	.5	.1	.2
Spruce pine	1.4	.3	.3	.1	.4
Southern magnolia	1.9	.2	.4	.1	.2
Black oak	2.0	.2	.4	.2	.1
Yellow-poplar	1.6	.2	.3	.1	.2
Redbay	1.1	.2	.2	.3	.1
Sourwood	1.1	.2	.2	.2	.1
Red mulberry	1.3	.2	.3	.2	.1
Florida maple	.9	.1	.2	.2	(b)
Live oak	1.0	.1	.2	.1	.1
Eastern and southern redcedar	1.1	.1	.2	.1	(b)
Water locust	1.0	.1	.2	.1	.1
Shumard oak	.6	.1	.1	(b)	.1
Chinkapin	.4	.1	.1	.1	(b)
River birch	.4	.1	.1	(b)	(b)
Other species	(c)	.7	1.0	.5	.5
Total	495.9	100.0	100.0	100.0	100.0

Columns may not sum to totals due to rounding.

[1]Percent of 2,365 timberland plots surveyed.

[2]Sum of relative frequency + relative density + relative basal area and divided by 3.

[3]Occurrence times 100.0 and divided by 495.9.

[4]Out of the estimated number of live trees, 8,077 million trees Statewide.

[5]Out of the estimated basal area, 1,250 million square feet Statewide.

(a) Except pecan and water hickory.

(b) Less than 0.05 percent.

(c) Relative importance is less than 0.05 percent for each species not listed above. Occurrence is less than 0.35 percent for each species not listed above. (see species list)

Rudis, Victor A. Nontimber values of Louisiana's timberland. Resour. Bull. SO-132. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station; 1988. 27 p.

Principal findings of the 1984 survey of Louisiana's timberland are presented and discussed in terms of nontimber values: water quality, soils, range, wildlife habitat, aesthetics, and dispersed recreation.

Additional keywords: multiresource inventory, dead trees, snags, hard mast, species list.