Principes, 38(2), 1994, pp. 64–72

A Systematic Survey of Freeze-Damaged Palms in the New Orleans Area after the 1989 Freeze of the Century

SEVERN C. DOUGHTY,[1] DANIEL J. GILL,[2] AND DAVID C. BLOUIN[3]

[1]*Assistant District Agent, Louisiana State University Agricultural Center's Louisiana Cooperative Extension Service Room 107, Bronson Hall, LSU, Shreveport, LA 71115*
[2]*Area Horticulture Agent, Louisiana State University Agricultural Center's Louisiana Cooperative Extension Service, P.O. Box 9160, Metairie, LA 70055*
[3]*Professor, Experimental Statistics, Louisiana State University, Agricultural Administration Building, Baton Rouge, LA 70803*

Palms are used extensively in landscape horticulture in warmer regions of the contiguous United States, principally Florida, the northern Gulf of Mexico coast, Southern Texas, Arizona, and California. According to Tomlinson (1990), they are emblematic of tropical regions and their distinctive form is commonly associated with tropical plants. They have long been sought after by horticulturists even as early as the eighteenth century. Today they still are highly prized by landscape designers, horticulturists and collectors.

According to Uhl and Dransfield (1987), palms do have climatic limitations. They are found more in humid tropics and subtropics and are generally absent from semideserts and deserts unless a water source is present. Very few of the 2,700 species occupy temperate regions. According to Larcher and Winter (1981), a restriction in distribution for palms is the ground frost limit. Roots are the most vulnerable organ of palms, and they are very susceptible to freeze injury (Larcher and Winter 1981). Consequently, palms are unable to survive in regions where sufficient negative Celsius temperature durations develop in soil (Larcher and Winter 1981).

In the New Orleans, Louisiana area, USDA Cold Hardiness Zones 8B and 9A, 14 genera comprising 21 species have been identified growing in landscapes. Occasional advective freeze episodes occur which cause various levels of damage and death to certain species in the total palm population. One such severe episode occurred in 1989. According to the National Weather Service (1989), the severe advective freeze of December 1989 was by far the most significant of this century in New Orleans. Eighty-one of 82 hours, beginning on December 22 and ending on December 25, were below 32° F (0° C). Temperatures were at or below freezing for a consecutive 64 hours from December 22 through December 24. Perhaps more significant is the fact that of the three coldest outbreaks ever recorded in New Orleans, this was the worst, with 15 hours of 15° F (−9.4° C) or less occurring and a record low of 11° F (−11.67° C) on December 23.

Not only were low temperatures a factor, but also high winds contributed markedly to palm damage. Cold, drying winds desiccated plant tissues, obviously producing more damage to exposed plants than to those protected from high winds. In some cases wind protection meant survival or death to certain species such as *Washingtonia filifera* and *Livistona chinensis.*

The determination of freeze damage is often very hard to discern soon after the event but becomes more apparent with time. Freezing temperatures can damage or destroy leaves, the apical bud, the trunk or a combination of tissues. Depending upon the palm species, various plant parts were affected differently. For example, all *Phoenix canariensis* leaves were completely destroyed at 11° F (−11.67° C) temperature and damage was obvious several days after the freeze. The majority of *P. canariensis* apical buds survived. Trunk damage on *Phoenix canariensis* has been observed resulting from prior freezes especially within 3 ft. (.9 m) from the ground. This reduces water conduction to the leaves permanently. But this damage may not become apparent for years after the event. Larcher and Winter (1981) indicated that there was a positive correlation between growth activity and frost susceptibility which led them to expect seasonal variations in the cold sensitivity level. According to their work, simulated frost injury to juvenile *Trachycarpus fortunei* leaf bases, unfolding leaves and shoot apices were found to be seasonal. These tissues were able to withstand colder temperatures in January than in May or July. However, there were little differences found in mature leaves (Larcher and Winter 1981).

Two *Trachycarpus fortunei* palms out of 10 displayed significant damage to the trunk at soil level and it was not until a year and a half later that the plants began to decline. Two years after the December 1989 freeze, one palm was near death and the other was declining rapidly.

According to Donselman and Atilano (1981), when warm weather returns after a freeze, primary and/or secondary plant pathogens frequently attack damaged tissues. The extent of decay to severely damaged apical buds can cause death 3 months to several years after the freeze. Damaged trunk tissues also may be attacked, but the extent of damage is poorly understood. Significant cavities can occur, especially in *Butia capitata* and *Phoenix canariensis*, years after a severe freeze.

Tomlinson (1990) reported that tannin cells containing polyphenolic substances are abundant in palms. Whether these cells play a role in inhibiting decay and limiting pathogen invasion to the trunk needs further research.

In one species, *Livistona chinensis*, all leaves were completely destroyed at 11° F (−11.67° C) in 1989 and the damage was evident in approximately one week. By early spring some *L. chinensis* began producing new leaves, indicating that the plants had survived. However, by early summer many died, leaving their brown, shriveled leaves as sad reminders.

With so much palm damage apparent, a systematic survey was conducted to determine the extent of damage to palms in the metropolitan New Orleans area. There are accounts of various species of palms surveyed after cold episodes in Georgia (Manley 1967); Dallas, Texas (Hintz 1978); Daytona Beach, Florida (Smith 1964) and more recently at Fairchild Tropical Gardens in Miami (Hubbuch 1990). Another account of various palms surviving low temperatures may be reviewed by Popenoe (1973). However, no report of a systematic approach using thousands of palms and statistical analyses was found.

The main purpose of this study was to provide a systematic survey of cold-damaged plants. Several other purposes included the determination of the probability of success of the 21 species reported in various areas surrounding New Orleans.

Materials and Methods

The survey began August 16, 1990, approximately 8 months after the freeze, and ended October 30, 1990. Initially, metropolitan New Orleans was divided into 20 geographical regions. Randomly selected streets both with and without a known high population of existing palms were surveyed. All or part of 20 days totaling 57.25 hours were spent traveling approximately 1,125 miles by car.

Twenty-one species of palms belonging to 14 genera were found on both private and public properties and were assigned initially to one of seven categories of condition: (1) no visible freeze-related injury to either leaves or trunk; (2) lost most or all of their foliage but replaced them with vigorous new growth in early to mid-spring; (3) lost their foliage but replaced them slowly with half size and narrower new leaves; (4) lost their foliage and barely resprouted new growth with leaf size and shape severely malformed, small and spindly; (5) lost all of their foliage, resprouted but new growth died soon after emergence; (6) lost their foliage but did not resprout; and (7) lost their foliage, did not resprout and their trunks were either broken in two or had fallen over, indicating death of the apical meristem.

It was noted that one *Washingtonia robusta* that was placed in category six resprouted approximately five months after the completion of the survey. However, the new growth was very small and spindly. With 102 inches (259 cm) of rainfall officially reported in New Orleans for the year (42 inches [107 cm] over the average), decay apparently involved the apical meristem, and the new foliage died within five months.

Several *Sabal mexicana* palms also were reported in category six but resprouted after the survey. They still are growing and developing, and none has died in spite of the rainfall. However, new growth has been observed developing in only one quadrant of the apical meristem. For example, one palm developed growth in the northeast quad-

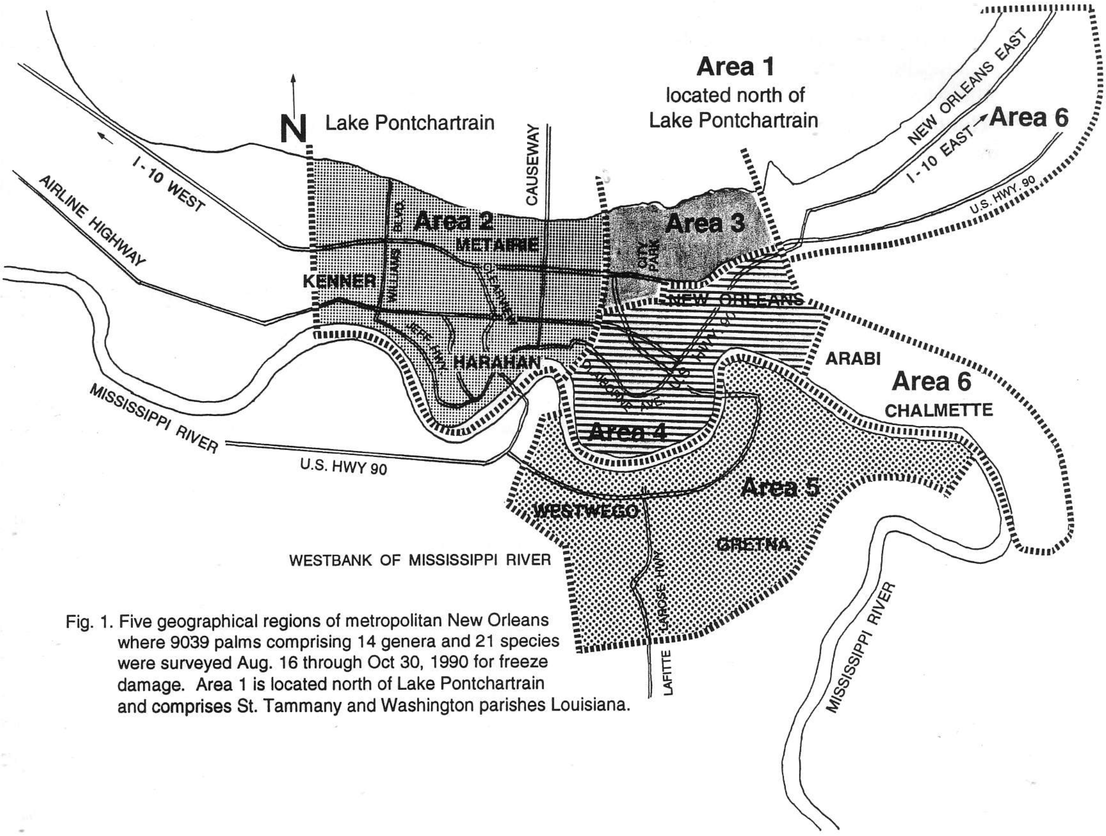

Fig. 1. Five geographical regions of metropolitan New Orleans where 9039 palms comprising 14 genera and 21 species were surveyed Aug. 16 through Oct 30, 1990 for freeze damage. Area 1 is located north of Lake Pontchartrain and comprises St. Tammany and Washington parishes Louisiana.

rant, and two others developed growth in the southern quadrant of the meristems.

High rainfall and decay also are suspected of killing several *Phoenix canariensis* palms after they were reported in categories two and three.

For purposes of statistical analyses and to provide more reliable estimates of survival, the initial 20 geographical regions were reduced to six. They are: area 1, north of Lake Pontchartrain; area 2, metro west; area 3, central; area 4, central south; area 5, west bank (geographically south); and area 6, east and southeast (Fig. 1). Also, the initial seven condition categories were reduced to three. Categories one and two were combined (good condition $r = 1$), categories three and four were combined (fair condition $r = 2$) and categories five, six and seven were combined (poor condition $r = 3$). In all statistical analyses, the percentage of palms doing well (condition category 1) was compared with the combined percentage doing fairly or poorly (condition categories 2 and 3) using the binomial test.

Results and Discussion

In examining all six areas, the total number of palms found and the percent in each category condition are given in Table 1. North of Lake Pontchartrain is not a good area in which to plant palms (Table 1). There was no statistical difference between the percentage doing well (47%) and the percentage doing fairly or poorly (53%). The remaining five areas south of Lake Pontchartrain were better for overall palm survival with the central (area 3) and central south (area 4) areas of the city showing the greatest percent survival rates.

Only seven palm species, with a total of 254 individuals, were found growing in area 1 (north of Lake Pontchartrain, Table 2). Of those, only *Sabal minor* can be highly recommended for survival. *Rhapidophyllum hystrix* and *Trachycarpus fortunei* were found to be statistically marginal species. *Butia capitata* and *Sabal palmetto* should not be considered for planting on the north shore

Table 1. Percentages of overall palm species and conditions by areas.

Area	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
North of Lake Pontchartrain (Area 1)	254	47^{NS}	31	22
Metro West (Area 2)	1,826	65***	20	15
Central (Area 3)	2,666	77***	14	9
Central South (Area 4)	1,881	70***	12	18
Westbank (Area 5)	830	58***	22	20
East & Southeast (Area 6)	1,582	54**	19	27

, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

because there was statistically more damage to these palms.

Phoenix canariensis and *Sabal* sp. representation was too low to analyze statistically. The identity of the *Sabal* is uncertain, but they may be immature specimens of *S. palmetto*, *S. mexicana*, *S. bermudana*, or *S. domingensis* (Zona 1990). Until positive identification can be made, the plants will be designated herein as *Sabal* sp.

In area 2, suburbs west of the city, there were 1,826 palms surveyed comprising 10 genera and 16 species (Table 3). Eight species were found to be reliable for planting: *Livistona chinensis*, *Phoenix canariensis*, *Rhapidophyllum hystrix*, *Sabal mexicana*, *S. minor*, *S. palmetto*, *S.* sp. seedlings and *Trachycarpus fortunei*. Although *Livistona chinensis* was found to be reliable for planting, the low representation (n = 11) lends caution when planting this palm species in spite of the results found here.

Survival of *Butia capitata* was not statistically significant. Therefore, it is considered marginal at best, even though 52% survived. The authors recommend not planting *Chamaerops humilis* and *Washingtonia filifera* because a significant number were damaged. Six species were found in insufficient numbers to accurately analyze statistically.

Area 3, close to Lake Pontchartrain but in the center of the city (west to east), contained 2,666 palms belonging to 11 genera and 16 species (Table 4). Survival of eight species was found to be statistically reliable for planting. These eight are *Butia capitata*, *Chamaedorea microspadix*, *Phoenix canariensis*, *Sabal minor*, *S. palmetto*, *S.* sp., *S.* sp. seedlings and *Trachycarpus fortunei*. It should be noted that *Sabal* sp. seedlings and *S.* sp. are grouped as one species since they are thought to be so interrelated.

Butia capitata, which resulted mostly as marginal or unreliable in the other areas, appeared to be statistically reliable in this area with 67% surviving. This was almost as reliable as *Phoenix canariensis*, which appeared very reliable in all but areas 1 and 6. Also, *P. canariensis* was found to be highly statistically reliable when compared with all species over all areas (74% $P < 0.001$).

No marginal palms were found in this area, and four species were found in insufficient numbers. Four species, *Chamaerops humilis*, *Livistona chinensis*, *Rhapis excelsa* and *Washingtonia fil-*

Table 2. Percentages of palm species and conditions in area 1 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Butia capitata	23	26**	30	43
Phoenix canariensis	2	50^{Z}	0	50
Rhapidophyllum hystrix	7	57^{NS}	29	14
Sabal minor	10	100***	0	0
S. palmetto	108	39**	36	25
S. sp.	3	100	0	0
Trachycarpus fortunei	101	52^{NS}	31	17

^{Z} Percentages statistically invalid due to low n.
, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

Table 3. Percentages of palm species and conditions in area 2 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Arenga engleri	3	0^{Z}	100	0
Brahea armata	3	100^{Z}	0	0
Butia capitata	164	52^{NS}	18	30
Chamaerops humilis	36	19***	75	6
Livistona chinensis	11	91***	9	0
Phoenix canariensis	84	81***	15	4
P. dactylifera	1	0^{Z}	100	0
P. reclinata	1	0^{Z}	100	0
Rhapidophyllum hystrix	9	100***	0	0
Sabal mexicana	8	100***	0	0
S. minor	39	97***	3	0
S. palmetto	791	57***	21	22
S. sp.	4	100^{Z}	0	0
S. sp. seedlings	33	100***	0	0
Trachycarpus fortunei	594	77***	20	3
Washingtonia filifera	40	13***	10	77
W. robusta	5	0^{Z}	0	100

^{Z} Percentages statistically invalid due to low n.
***, ^{NS} Significant at $P \leq 0.001$ or nonsignificant when comparing r = 1 to r = 2 and r = 3.

ifera are not recommended for planting in area 3 because they were more often damaged.

In area 4, in the center of the city and south of area 3, 1,881 palms were found, comprising 10 genera and 17 species (Table 5). Six species were found to be reliable. These include *Phoenix canariensis, Sabal mexicana, S. minor, S. palmetto, S.* sp. seedlings and *Trachycarpus fortunei.* Of the three marginal species, *Phoenix* spp., thought at present to be a *Phoenix* hybrid, is not readily available in the nursery trade, but a small population (n = 7), probably planted by the New Orleans Parkway and Park Commission, can be found in front of City Hall. Four species, *Livistona chinensis, Syagrus romanzoffiana, Washingtonia filifera* and *W. robusta,* are not recom-

Table 4. Percentages of palm species and conditions in area 3 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Brahea armata	2	100^{Z}	0	0
Butia capitata	101	67***	15	18
Chamaedorea microspadix	34	82***	18	0
Chamaerops humilis	42	36*	64	0
Livistona chinensis	35	23**	29	48
Phoenix canariensis	476	69***	21	9
P. reclinata	3	67^{Z}	33	0
Rhapidophyllum hystrix	2	100^{Z}	0	0
Rhapis excelsa	8	0**	100	0
Sabal mexicana	545	75***	15	10
S. minor	7	100***	0	0
S. palmetto	388	67***	18	15
S. sp.	177	80***	11	9
S. sp. seedlings	577	97***	1	2
Trachycarpus fortunei	251	83***	14	3
Washingtonia filifera	15	27*	13	60
W. robusta	3	0^{Z}	0	100

^{Z} Percentages statistically invalid due to low n.
*, **, *** Significant at $P = 0.05, 0.01, \leq 0.001$ when comparing r = 1 to r = 2 and r = 3.

Table 5. Percentages of palm species and conditions in area 4 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Brahea armata	1	100[Z]	0	0
Butia capitata	67	46[NS]	28	26
Chamaerops humilis	24	63[NS]	25	12
Livistona chinensis	119	8***	30	62
Phoenix canariensis	507	82***	8	10
P. dactylifera	2	100[Z]	0	0
P. reclinata	2	0[Z]	100	0
P. spp. (hybrid?)	7	43[NS]	28	29
Rhapidophyllum hystrix	4	100[Z]	0	0
Sabal mexicana	165	82***	9	9
S. minor	79	100***	0	0
S. palmetto	423	75***	13	12
S. sp.	44	98***	0	2
S. sp. seedlings	83	100***	0	0
Syagrus romanzoffiana	6	0**	0	100
Trachycarpus fortunei	218	76***	19	5
Washingtonia filifera	50	12***	4	84
W. robusta	80	1***	0	99

[Z] Percentages statistically invalid due to low n.
, *, [NS] Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

mended for planting in area 4, and four species were found in insufficient numbers to accurately assess statistically.

Area 5 is on the west bank of the Mississippi River (actually south of area 4). A total of 830 palms consisting of seven genera 12 species (Table 6) were found. Four species can be recommended for planting in area 5. They include *Phoenix canariensis, Sabal minor, S.* sp. seedlings and *Trachycarpus fortunei. Sabal* sp. seedlings, having apical buds relatively close to the ground, were protected more from cold, desiccating winds than were their taller-growing counterparts, and this is thought to be the reason for higher survival. *Sabal palmetto* was found to be marginal, as were *Butia capitata, Chamaerops humilis* and *Washingtonia filifera. Washingtonia robusta* was the only palm found to be unreliable, and four species were found in insufficient numbers.

Area 6, located to the east and southeast of the central city, contained 1,582 palms comprising 10 genera and 16 species (Table 7). Four species were found to be reliable for planting. They include *Sabal mexicana, S. minor, S.* sp., *S.* sp. seedlings and *Trachycarpus fortunei.* Four species were found to be marginal, including *Chamaerops humilis, Phoenix canariensis, P. reclinata* and *Sabal palmetto,* and five were found in insufficient numbers to accurately assess statistically. Three species, *Butia capitata, Washingtonia filifera* and *W. robusta,* were found unreliable for planting.

Sabal palmetto, found to be marginal in this area, may have been placed in this category because of statistical combination of data. At one new landscape site, 114 *S. palmetto* palms were in good condition (r = 1), 6 in fair condition (r = 2), and 104 in poor condition (r = 3). It is thus possible that *S. palmetto* may be more reliable than is indicated by these results.

In examining all species over all areas (Table 8), nine species appeared to be statistically reliable for planting: *Brahea armata, Chamaedorea microspadix, Phoenix canariensis, Rhapidophyllum hystrix, Sabal mexicana, S. minor, S. palmetto, S.* sp., *S.* sp. seedlings, and *Trachycarpus fortunei.* However, the authors recommend comparing these results with the area results carefully before making a final decision about planting palms in New Orleans and vicinity.

The reliability of two species, *Phoenix reclinata* (44%) and *P.* spp. hybrid (42%), was found to be marginal. *Phoenix reclinata* will probably not develop tall trunks but will remain alive through most cold episodes in the Gulf Coast region. It will not be a tall growing landscape accent plant, however.

Palms found to be statistically unreliable areawide included *Butia capitata, Chamaerops humilis, Livistona chinensis, Rhapis excelsa, Sya-*

Table 6. Percentages of palm species and conditions in area 5 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Butia capitata	62	45^{NS}	36	19
Chamaerops humilis	16	38^{NS}	62	0
Livistona chinensis	2	100^{Z}	0	0
Phoenix canariensis	37	86***	14	0
P. reclinata	2	100^{Z}	0	0
Sabal mexicana	1	100^{Z}	0	0
S. minor	6	100***	0	0
S. palmetto	461	50^{NS}	22	28
S. sp.	2	100^{Z}	0	0
S. sp. seedlings	6	100***	0	0
Trachycarpus fortunei	218	77***	20	3
Washingtonia filifera	11	27^{NS}	18	5
W. robusta	6	0**	0	100

^{Z} Percentages statistically invalid due to low n.
, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

grus romanzoffiana, *Washingtonia filifera*, and *W. robusta*. It should be pointed out that rhizomes and roots of *Rhapis excelsa* were not killed, but all that were surveyed had leaves and trunks that were killed to ground level. Because the species grows so slowly and with such sparse growth resulting after the freeze, it would not be acceptable as a reliable landscape plant in any area.

Three palms had low representation and could not be statistically evaluated. However, *Arenga engleri* behaved in the same way as *Rhapis excelsa*. Over the past 30 years *Phoenix dactylifera* has experienced a steady decline in cultivated populations in the study area due to cold temperatures, while *Serenoa repens*, an endangered species native to Louisiana, has declined not from cold episodes but from habitat decimation.

Conclusion

Landscape palms were surveyed for cold damage 8 to 10 months after the coldest weather episode recorded this century in the New Orleans, Louisiana area. Fourteen genera and 21 species

Table 7. Percentages of palm species and conditions in area 6 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Brahea armata	1	0^{Z}	0	100
Butia capitata	183	31***	22	47
Chamaerops humilis	13	38^{NS}	54	8
Livistona chinensis	3	67^{Z}	0	33
Phoenix canariensis	134	52^{NS}	27	21
P. reclinata	8	38^{NS}	50	12
Rhapidophyllum hystrix	2	100^{Z}	0	0
Rhapis excelsa	1	0^{Z}	100	0
Sabal mexicana	21	100***	0	0
S. minor	96	97***	3	0
S. palmetto	738	50^{NS}	16	34
S. sp.	9	100***	0	0
S. sp. seedlings	52	94***	6	0
Serenoa repens	1	100^{Z}	0	0
Trachycarpus fortunei	269	61***	32	7
Washingtonia filifera	24	21**	17	62
W. robusta	27	0***	4	96

^{Z} Percentages statistically invalid due to low n.
, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

Table 8. Percentages of palm species and conditions in all arees combined by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Arenga engleri	3	0^{Z}	100	0
Brahea armata	7	86**	0	14
Butia capitata	600	46*	22	32
Chamaedorea microspadix	34	82***	18	0
Chamaerops humilis	131	37***	58	5
Livistona chinensis	170	19***	28	53
Phoenix canariensis	1,240	74***	16	10
P. dactylifera	3	67^{Z}	33	0
P. reclinata	16	44^{NS}	50	6
P. spp. (hybrid?)	7	42^{NS}	29	29
Rhapidophyllum hystrix	24	88***	8	4
Rhapis excelsa	9	0***	100	0
Sabal mexicana	740	77***	13	10
S. minor	237	98***	2	0
S. palmetto	2,909	57***	19	24
S. sp.	239	85***	8	7
S. sp. seedlings	751	97***	2	1
Serenoa repens	1	100^{Z}	0	0
Syagrus romanzoffiana	6	0**	0	100
Trachycarpus fortunei	1,651	73***	22	5
Washingtonia filifera	140	16***	10	74
W. robusta	121	1***	1	98
Total	9,039			

Z Percentages statistically invalid due to low n.
*, **, ***, NS Significant at P = 0.05, 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

of palms, totalling 9,039 individuals, were surveyed and assigned to one of three condition categories within 6 geographic areas. Area 1, north of Lake Pontchartrain, was not a reliable area for the majority of the 21 species found. South of Lake Pontchartrain, areas 2, 3, 4, 5 and 6 were considered statistically better for overall palm survival, with area 3 best, followed by areas 4, 2, 5 and 6. Although species survival depended somewhat on area, 10 species were found to be statistically reliable south of Lake Pontchartrain: *Brahea armata, Chamaedorea microspadix, Phoenix canariensis, Rhapidophyllum hystrix, Sabal mexicana, S. minor, S. palmetto, S.* sp. seedlings and *Trachycarpus fortunei.* Two species, *Phoenix reclinata* and *P.* spp., were found to be marginal, and 7 species were found to be unreliable: *Butia capitata, Chamaerops humilis, Livistona chinensis, Rhapis excelsa, Syagrus romanzoffiana, Washingtonia filifera* and *W. robusta.* Due to low individual numbers, survival for three species could not be reliably estimated: *Arenga engleri, Phoenix dactylifera* and *Serenoa repens.*

This study outlines a procedure by which cold-damaged plants can be surveyed to serve as a future potential planting guide. It also provides a good inference as to the survivability of landscape palms in the New Orleans area. Both consumers and growers alike can benefit from this survey because growers can determine the probability of success of 21 palm species and grow those with greatest potential. Consumers, including professional landscape industry personnel, also will know which species are likely to survive in a landscape planting and can select those that are most cold hardy.

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LETTERS

Dear Natalie,

You may recall I sent some photos of the Coco-de-mer in my garden when it had one leaf? It has survived a third Durban winter (temperatures once or twice reportedly hit nightly lows of 7/8° C) but undeterred by the chilly temperatures and even the chilly political and violent climate of the emerging NEW SOUTH AFRICA, a wonderful second leaf has been produced. I would love to hear from other members living in a similar sub-tropical climate whether they have had any success in growing *Lodoicea*. I have heard that there are two growing in Southern Florida a climate somewhat similar to Durban's but reputedly a little warmer and more humid, especially during winter.

DAN LOUW
56 Clark Rd.
Glenwood 4001
Durban, South Africa

IN MEMORY OF RON HARRIS

***** A devoted plant person *****

A member of the Board of Directors of the International Palm Society and of the Southern California Chapter

May 13, 1948–November 28, 1993