PHYTOLOGIA

An international journal to expedite plant systematic, phytogeographical and ecological publication

Vol. 86 February 2004 No. 1

PHYTOLOGIA

An international journal to expedite plant systematic, phytogeographical and ecological publication

Vol. 86 February 2004 No. 1

PHYTOLOGIA

(ISSN 00319430)

Phytologia, a journal of plant systematics, phytogeography and vegetation ecology, is published three times a year by the Warner Herbarium, a research unit of the Department of Biological Sciences, Sam Houston State University.

Editor

Justin K. Williams
e-mail: bio_jkw@shsu.edu
PHONE: (936) 294-1552
FAX (936) 294-3940

Subscription Information & Scholarly Exchange

Phytologia
P.O. Box 2012
Sam Houston State University
Huntsville, TX 77341-2012

e-mail: bio_jkw@shsu.edu

Phytologia (Feb 2004) 86(1)

A LETTER FROM THE NEW OWNER AND THE NEW EDITOR OF *PHYTOLOGIA*

PHYTOLOGIA was established in 1933 by the late Henry A. Gleason (1882-1975) and Harold N. Moldenke (1909-1996). In their forward to the first issue the two entrepreneurs noted that their journal was "designed to expedite botanical publication." They further stated "In these days of depression, the announcement of a new botanical magazine is made with trepidation and will doubtless be received with suspicion."

To this end the journal fared well maintaining a steady stream of rapid publications. With Gleason's retirement as one of the editors in 1951, H. A. Moldenke and his wife Alma continued the enterprise, this with much effort and attrition of their time: they truly felt that they were serving the greater botanical community. For many years no financial gain accrued to the managers and publication costs per page were remarkably low, an original mission of the founding managers.

The Moldenkes continued as managers through the year 1988, whereupon they sold *PHYTOLOGIA* to Billie L. Turner, with the understanding that he would see to it that the journal continued to serve the botanical community as intended by its founders.

Almost immediately after acquiring the Journal, one of B. L. Turner's academic children, Michael J. Warnock, at the time a member of the faculty at Sam Houston State University, Huntsville, Texas, offered to take over stewardship of *PHYTOLOGIA* with the understanding that he would carry out the responsibilities entrusted to Turner by the Moldenkes. This he agreed to do, and the journal was sold to Warnock.

So it was that Warnock took over stewardship of *PHYTOLOGIA* in November of 1988, continuing this through the year 2003 (editing and publishing volumes 66-85). Unfortunately, newly assumed administrative duties as Director of Research at the University of Missouri, Columbia, precluded any sustained stewardship of the

Journal, and after a lapse of several years he agreed to resell *PHYTOLOGIA* back to the B. L. Turner.

In an effort to reestablish and maintain a tradition instituted by the two visionary and founding botanists, H. A. Gleason and H. N. Moldenke, we B. L. Turner and J. K. Williams present volume 86 of *PHYTOLOGIA**.

BLT

B. L. Turner
Prof. Emeritus
University ofTexas, Austin
Owner of *PHYTOLOGIA*

J. K. Williams
Assistant Professor
Sam Houston State University
PHYTOLOGIA, Editor

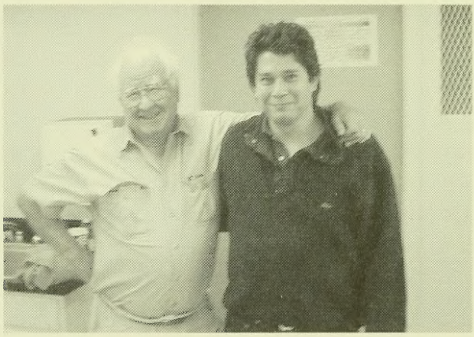

photo by T. L. Wendt

*The cover date for the previously published volume and issue of *PHYTOLOGIA*, Vol. 85(6), was December 1998, although the official publication date is August 2003 (*PHYTOLOGIA* 85: 511). In an effort to eliminate any future potential nomenclatural complications resulting from a question or confusion in priority, the cover date for Volume 86(1), is February 2004, consistent with the publication date. This will result in a 5 year publication gap in the serial publication of *PHYTOLOGIA*.

FLORISTICS OF BAYGALLS IN CENTRAL LOUISIANA

Barbara R. MacRoberts and Michael H. MacRoberts

Bog Research, 740 Columbia, Shreveport, LA 71104 and Herbarium Museum of Life Sciences, Louisiana State University in Shreveport Shreveport, LA 71115

Lynn Stacey Jackson
U.S.D.A. Forest Service, Kisatchie National Forest, Winn Ranger District, Winnfield, LA 71483

ABSTRACT

Headwater plant communities --- baygalls and pitcher plant bogs --- were studied in the northern part of the Winn Ranger District, Kisatchie National Forest, Louisiana. Floristically baygalls, discussed in this paper, form a fairly uniform community type across most of the West Gulf Coastal Plain.

KEY WORDS: baygall, West Gulf Coastal Plain, floristics, Kisatchie National Forest, Louisiana.

INTRODUCTION

Baygalls are a characteristic wetland community of the Atlantic and Gulf Coastal Plains extending through western Louisiana into eastern Texas (Allen et al. 1988; Bridges and Orzell 1989; Brooks et al. 1993; Christenson 1988; Harcombe et al. 1993; Nesom et al. 1997; Weakley et al. 1998). They are variable over their range but are generally characterized by such woody species as *Magnolia virginiana* (sweet bay) and *Ilex coriacea* (gallberry holly), for which the community is named. Other common associates are *Acer rubrum, Ilex opaca, Nyssa biflora, Persea palustris, Rhododendron* spp., and

Vaccinium spp. In western Louisiana and eastern Texas, baygalls are generally headwater communities occurring at streamheads or on short slopes that receive enough seepage to be permanently saturated. They are recognized as a natural community in both Louisiana and Texas (Diamond et al. 1987; Louisiana Natural Heritage Program 1994; Texas Natural Heritage Program 1993; Turner et al. 1999; Weakley et al. 1998; Van Kley 1999*a,b*) and have been described for various localities in the West Gulf Coastal Plain (Ajilvsgi 1979; Brooks et al. 1993; Marks and Harcombe 1981; Martin and Smith 1991; Nesom et al. 1997; Nixon et al. 1980, 1983; Nixon and Ward 1988; Orzell 1990; Van Kley 1999*a,b*; Watson 1979).

As with most plant communities, descriptions usually center on woody species because they can be identified year round and are relatively easily quantified. The herbaceous layer is often briefly mentioned but seldom described in detail. In this study we describe both.

SITE DESCRIPTION

This study was conducted on the northern part of the Winn Ranger District, Kisatchie National Forest, in northern Natchitoches and Winn parishes, Louisiana. All study sites are located within what is generally classified as riparian forest habitat that is adjacent to, and often surrounded by, upland longleaf pine forest (Martin and Smith 1991). The area was originally dominated by longleaf pine (Eldredge 1934; Martin and Smith 1991), notably in forest/savanna form on uplands, but today in some areas the longleaf pine has been replaced with off-site species such as loblolly pine. The longleaf pine forest community type has received detailed ecological and distributional attention in the West Gulf Coastal Plain (Bridges and Orzell 1989; Evans 1997; Frost 1993; Harcombe et al. 1993; Van Kley 1999*a,b*).

The area has a subtropical humid climate with hot summers and mild winters. The average annual precipitation is about 140 cm spread evenly throughout the year. The average annual temperature is about

20C (extreme range is about -7C to 38C). Thunderstorms average about 60 days per year and are concentrated in the growing season (Olson and Platt 1995). Fire was an important element in the evolution of the plants and animals of the area, many communities being dependent on growing season burns ignited by lightning strikes (Bridges and Orzell 1989; Drewa et al. 2002; Frost 1998; Harcombe et al. 1993; Olson and Platt 1995; Platt 1999).

Baygalls are situated on loamy fine sand, fine sandy loam, or fine loamy sand (Malbis, Betis, Ruston, Sacul). All are below uplands (ridgetops) of similar soils but with gentler gradients (1-5 percent as opposed to 5-12 percent). All are Paleudults and Hapludults (suborder = Udults, Order = Ultisols) (Martin et al. 1990). There is little topographic relief except for slightly rolling hills. The study area is on the older geologic surfaces, notably the Sparta formation of Tertiary age (Groat and Roland 1984).

The study area in general consists of two north-south ridges divided by Saline Bayou. The watershed of the western area flows into Black Lake Bayou to the west and the Saline Bayou to the east. The watershed of the eastern ridge flows into Saline Bayou to the west and Dugdemona River to the east. All ultimately discharge into the Red River.

METHODS

1. We made monthly visits to each of six baygalls (numbers 5 through 10) between March and November 1999 to obtain complete floristic lists for each site. The study sites are listed in Appendix 1 by name and number. All sites were between 0.1 and 0.2 ha in size. Voucher collections for many of the species are deposited at BRIT and LSU. Plant nomenclature follows Kartesz and Meacham (1999); scientific authorities for all names used in this paper can be read from that reference.

Species	Number of Individuals	Mean Diameter (cm)	Range (cm)
Magnolia virgin.	32	10.5	2-30
Nyssa biflora	30	8.0	2-40
Persea palustris	29	3.5	2-10
Viburnum nudum	9	2.0	2
Acer rubrum	7	6.1	2-10
Ilex opaca	5	2.4	2-3
Chionanthus virg.	4	4.0	2-10
Vaccinium sp.	4	2.3	2-3
Liquidambar styra.	4	4.0	2-6
Toxicodendron v.	3	2.7	2-4
Taxodium distich.	3	13.7	12-17
Pinus taeda	1	12.0	12
Alnus serrulata	1	2.0	2
Quercus alba	1	18.0	18

Table 1. Dominant woody species.

2. In May and June 1999 we established ten, 5 X 5 meter quadrats (25 m sq.), one in each of ten baygalls; we added four sites to the original six to increase our sample size. Frequency and diameter of all woody species with a dbh of 2 cm or greater were recorded. Herbaceous species presence was described by identifying all species in the plots; herbaceous cover was measured and percent cover estimated for major species. Canopy cover was estimated for the quadrat.

3. A soil sample was collected from the upper 15 cm of each of the ten 5 X 5 meter plots and analyzed by A & L Laboratories, Memphis, Tennessee.

RESULTS

Appendix 2 summarizes the total species composition of six

Species	Percent by plot									
	1	2	3	4	5	6	7	8	9	10
Athyrium filix-fem.						6				
Bignonia capreolata						1				
Carex atlantica								19		
Carex debilis			15	4	6	10			2	
Carex leptalea	21		2			2		18	3	10
Chasmanthum laxum			1							2
Dichanthelium dich.							1	1		
Dichanthelium sp.										4
Eleocharis tortilis					2		2	5		10
Gelsemium semper.								1		
Liverworts	2						2	3	1	3
Lycopus rubellus							1			
Mitchella repens	2	1	1	30		4		2	1	
Osmunda cinnam.	1	1	5	2	4	7		5	4	
Osmunda regalis	1	1	1			2			5	
Platanthera clav.										1
Rudbeckia scabrifolia						4				
Scleria sp.		1								
Scleria triglomerata							1			
Solidago patula						3	2		1	
Sphagnum sp.				10						
Viola primulifolia	2		1							
Woodwardia areolata	22	1	30	20	88	50	50	30	60	
Woodwardia virginica									3	20
Xyris laxifolia								1		
Total	50	5	52	69	98	82	70	80	81	54

Table 2. Percent herbaceous ground cover by plot.

baygalls. Appendix 3 shows occurrence by plot for each species in the 5 X 5 m plots. Table 1 summarizes the larger woody vegetation in ten 5 X 5 m plots. Table 2 gives the percent of herbaceous ground cover by dominant species in each plot. Only species accounting for 1% or more

in any plot are included. Table 3 gives percentage frequency of all species from the baygalls as rated in Reed's (1988 and update) hydrophytic classification. It also gives the prevalence index for the entire sample (see Cowardin et al. 1979; Federal Manual 1989; MacRoberts and MacRoberts 2001; Reed 1988; U.S. Corps of Engineers 1987 for an explanation of terms and measures). Table 4 gives information on soil samples from the ten sample sites.

DISCUSSION

There were 40 families, 61 genera, and 89 species in the six baygalls. The average baygall had 52 species (range 39 to 68). Dicots accounted for 54 percent of the total species. All sites had liverworts and *Sphagnum*, which are not included in the totals. Sorenson's Index of Similarity among the six baygalls ranges from 62 to 87, indicating that they are all floristically the same community.

Magnolia virginiana, *Nyssa biflora*, and *Persea palustris* were clearly the dominant woody species, both in number of individuals and in basal area within the 5 X 5 m plots. Several species, for example, *Smilax laurifolia*, were present in many plots, but since the stems were always less than 2 cm diameter, they are not listed among those in Table 1. Canopy cover of the ten plots ranged from 80% to 100% and averaged 94%.

Overall herbaceous cover ranged from 5% to 98% and averaged 65%. Ferns and monocots dominated. The following species are listed in order of dominance in the herbaceous layer: *Woodwardia areolata* (35.1%), *Carex leptalea* (5.6%), *Mitchella repens* (4.1%), *Carex debilis* (3.7%), *Osmunda cinnamomea* (2.9%), *Woodwardia virginica* (2.3%), *Carex atlantica* (1.9%), *Eleocharis tortilis* (1.9%), liverworts (1.1%), *Osmunda regalis* (1.0%), *Sphagnum* sp. (1.0%). All the other species in these plots accounted for less than 1% each of the total herbaceous layer.

	OBL	FACW	FAC	FACU	UPL	Prev. Index	Sample Size
All species	27	39	24	10	0	2.17	89
Woody species	9	38	35	18	0	2.62	34
Herb. species	38	40	16	6	0	1.89	55

Table 3. Species percents by wetland categories, prevalence index, and species sample size (see text for category explanation).

The flora of these baygall sites is clearly dominated by hydrophytes. About 80% are OBL, FACW, and FAC (50% or higher qualifies a site as wetland). Counting all species for these sites, the prevalence index is 2.17, meaning that baygalls are wetlands (1.0 means that all species are obligate wetland species, 5.0 means that all species are obligate upland [dry] species). Woody and non-woody species differed in prevalence: the prevalence index for woody species was 2.62 and that for herbaceous species was 1.89. This suggests either that woody vegetation has a greater moisture gradient than non-woody species or that the species are somewhat misclassified.

The soils are acidic and low in nutrients and organic matter, falling within the normal range of soil chemistry of baygalls and pitcher plant bogs in east Texas and west Louisiana except that the pH for the present group of baygalls is slightly lower (MacRoberts and MacRoberts 2001; MacRoberts et al. 2002; Nesom et al. 1997; Nixon and Ward 1986).

The West Gulf Coastal Plain is ecologically part of the eastern flora. Using Kartesz and Meacham (1999), we determined the distribution of the species that occur in our study sites. We found 95% to be eastern, 3% cosmopolitan (found throughout North America), and 2% endemic. The endemics are *Rudbeckia scabrifolia* and *Rhododendron oblongifolium*. The cosmopolitan species are *Carex leptalea*, *Juncus effusus*, and *Athyrium filix-femina*.

Site	Exchangeable ions (ppm)					
	pH	P	K	Ca	Mg	OM%
1	4.5	11	32	322	46	1.9
2	4.3	10	51	458	69	3.3
3	4.4	10	28	196	52	3.1
4	3.7	13	62	58	41	4.8
5	4.1	4	30	147	36	1.9
6	4.1	6	22	78	25	2.2
7	4.6	15	19	1136	36	1.8
8	4.1	2	16	103	31	2.3
9	4.3	8	25	86	28	2.8
10	4.0	11	33	135	69	4.4

Table 4. Soil chemistry.

Baygalls in the West Gulf Coastal Plain occur in association with pyrogenic communities (Bridges and Orzell 1989; Harcombe et al. 1993). But unlike these communities, baygalls are not pyrogenic. We have witnessed in many instances that prescribed fire, both in growing and non-growing season, does not penetrate far, if at all, into baygall communities but at most fingers into the edges. These fires, which historically probably occurred once every few years and which probably occurred in the growing season and were caused by lightning, cleared the surrounding lands but usually left these baygall "islands" intact.

Comparing baygalls with other plant communities in the West Gulf Coastal Plain indicates that, while distinct, they are most closely related to pitcher plant bogs as indicated by ordination (Van Kley 1999*a*) and direct species comparisons (MacRoberts and MacRoberts 2001; Nixon and Ward 1986). For example, comparing the total floristic list for six baygalls to four small pitcher plant bogs on the Kisatchie District of the Kisatchie National Forest with comparable species numbers gives an Index of Similarity (Sorenson's) in the mid-30s (MacRoberts and

MacRoberts 2001). Thus, while sharing many species, baygalls and bogs do not share enough to be considered the same plant community.

Martin and Smith (1991) have distinguished between "wooded seeps" and "bayhead swamps" but little in their description separates these entities; these authors admit that the two communities are very similar and intergrade. Brooks et al. (1993) found that wooded seeps graded into wet creek bottoms or bayhead swamps. On the basis of quantitative data, Van Kley (1999*a*) and Turner et al. (1999) found that these "different" communities were clearly one. Our work supports the conclusion that they be considered the same.

This does not mean that baygalls are uniform. Most of our baygalls are the same community type described by Nixon et al. (1983) as "wet," which occurs at branch heads, creek heads, wet creek bottoms, and seepages. However, some show similarities to bogs (Nixon and Ward 1988). Notable is site 10, which showed bog similarities and may have been a bog at one time.

While we found *Nyssa biflora* and *Viburnum nudum* important, Nixon et al. (1980) and Nixon and Ward (1988) in their study of wet creek bottoms in Nacogdoches County and in the Trout Creek drains on the Angelina National Forest in Texas did not. As they point out, at least in their Trout Creek location, the herbaceous species are a mixture of baygall and seepage bog species, which may partly explain the difference (Nixon and Ward 1986). In the Trout Creek area, baygalls and bogs are often contiguous and the species from one grade into the other in ecotonal zones.

Brooks et al. (1993) studied baygalls on a north-south gradient in east Texas from southern Rusk to central Hardin counties. They found that, while *Nyssa biflora* and *Magnolia virginiana* were important in both northern and southern examples, *Acer rubrum*, *Liquidambar styraciflua*, and *Morella carolinensis* were important in the north and *Cyrilla racemiflora*, *Ilex coriacea*, and *Quercus laurifolia* were important in the south. They also found that *Persea palustris* (which

was important in the Winn District baygalls) was not paticularly important in either group.

Nixon et al. (1983) in their study of different segments of a single streamside in San Augustine County found that different areas of the stream had different species composition, depending on moisture.

Nesom et al. (1997) found that in Walker and Anderson counties on the western edge of the baygall community range, such trees as *Magnolia* and *Persea* have entirely dropped out of the flora and such species as *Viburnum nudum* dominate.

ACKNOWLEDGMENTS

This work was supported by Chief's Grant 08-99-06-CCS-003, National Forest Foundation 08-99-06-CCS-007, and National Fish and Wildlife Foundation, Headwater Community Plant Restoration 99-100-011. Thanks to Guy Nesom and Jim Neal for reviewing an earlier version of the paper.

LITERATURE CITED

Ajilvsgi, G. 1979. Wild flowers of the Big Thicket. Texas A. & M. University Press, College Station, Texas.

Allen, C.M., C.H. Stagg, and S.D. Parris. 1988. Analysis of the vegetation in pitcher plant bogs in two baygalls at Ft. Polk in west central Louisiana. Proc. Louisiana Acad. Sci. 50:1-8.

Bridges, E.L. and S.L. Orzell. 1989. Longleaf pine communities of the West Gulf Coastal Plain. Natural Areas Journal 19:246-263.

Brooks, A.R., E.S. Nixon, and J.A. Neal. 1993. Woody vegetation of wet creek bottom communities in eastern Texas. Castanea 58:185-196.

Christensen, N.L. 2000. Vegetation of the southeastern Coastal Plain. Pp. 297-448. *In* M.G. Barbour and W.D. Billings (Eds.), North American terrestrial vegetation. Cambridge University Press, New York.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service Report FWS/OBS-79/31. Washington, D.C.

Diamond, D.D., D.H. Riskind and S.L. Orzell. 1987. A framework for plant community classification and conservation in Texas. Texas J. Sci. 39:203-221.

Drewa, P.B., W.J. Platt, and E.B. Moser. 2002. Fire effects on resprouting of shrubs in headwaters of southeastern longleaf pine savannas. Ecology 83:755-767.

Eldredge, I.F. 1934. Areas characterized by the major forest types state of Louisiana. U.S.D.A. Southern Forest Experiment Station. New Orleans, Louisiana.

Evans, R.E. 1997. Distribution and composition of historical forest types in two eastern Texas counties; with special reference to longleaf pine. MS Thesis. Stephen F. Austin State University, Nacogdoches, Texas.

Federal Interagency Committee for Wetland Delineation. 1989. Federal manual for identifying and delineating jurisdictional wetlands. U.S.Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. Soil Conservation Service, Washington, D.C.

Frost, C.C. 1993. Four centuries of changing landscape patterns in thelongleaf pine ecosystem. Proc. Tall Timbers Fire Ecology Conference 18:17-43.

Frost, C.C. 1998. Presettlement fire frequency regimes of the United States: A first approximation. Proc. Tall Timbers Fire Ecology Conference 20:70-81.

Groat, C.G. and H.L. Roland. 1984. Geologic map of Louisiana. Louisiana Geological Survey, Baton Rouge, Louisiana.

Harcombe, P.A., J.S. Glitzenstein, R.G. Knox, S.L. Orzell, and E.L. Bridges. 1993. Vegetation of the longleaf pine region of the West Gulf Coastal Plain. Proc. Tall Timbers Fire Ecology Conference 18:83-103.

Kartesz, J.T. and C.A. Meacham. 1999. Synthesis of North American flora. North Carolina Botanical Garden, Chapel Hill.

Louisiana Natural Heritage Program. 1994. Natural wetland plant communities found outside of the Louisiana coastal zone. Unpublished report, Louisiana Department of Wildlife and Fisheries. Baton Rouge, Louisiana.

MacRoberts, M.H. and B.R. MacRoberts. 2001. Bog communities of the West Gulf Coastal Plain: a profile. Bog Research Papers in Botany & Ecology 1:1-151.

MacRoberts, B.R, M.H. MacRoberts, and L.S. Jackson. 2002. Floristics and management of pitcher plant bogs in northern Natchitoches and Winn parishes, Louisiana. Proc. Louisiana Acad. Sci. 64:14-21.

Marks, P.L. and P.A. Harcombe. 1981. Forest vegetation of the Big Thicket, southeast Texas. Ecological Monographs 51:287-305.

Martin, D.L. and L.M. Smith. 1991. A survey and description of the natural plant communities of Kisatchie National Forest, Winn and Kisatchie Districts. Louisiana Dept. Wildlife and Fisheries. Baton Rouge, Louisiana.

Martin, P.G., C.L. Butler, E. Scott, J.E. Lyles, M. Mariano, J. Ragus, P. Mason, and L. Schoelerman. 1990. Soil survey of Natchitoches Parish, Louisiana. U.S.D.A. Soil Conservation Service, Washington, D.C.

Nesom, G.L., B.R. MacRoberts, and M.H. MacRoberts. 1997. A new plant community type in southeast Texas related to baygalls. Phytologia 83:371-383.

Nixon, E.S., J.W. Higgins, P.L. Blanchette, and F.A. Roth. 1980. Woody vegetation of a wet creek branch in east Texas. Texas J. Sci. 32:337-341.

Nixon, E.S., R.L. Ehrhart, S.A. Jasper, J.S. Neck, and J.R. Ward. 1983. Woody, streamside vegetation of Prairie Creek in east Texas. Texas J. Sci. 35:205-213.

Nixon, E.S. and J.R. Ward. 1986. Floristic composition and management of east Texas pitcher plant bogs. Pp. 283-287. *In* D.L. Kulhavy and R.W. Conner (Eds.), Wilderness and natural areas in the eastern United States: a management challenge. School of Forestry, Stephen F. Austin State Univ., Nacogdoches, Texas.

Nixon, E.S. and J.R. Ward. 1988. Vegetation of a wet creek bottom site in eastern Texas. Texas J. Sci. 40:358-361.

Olson, M.S. and W.J. Platt. 1995. Effects of habitat and growing season fires on resprouting of shrubs in longleaf pine savannas. Vegetation 119:101-118.

Orzell, S.L. 1990. Texas Natural Heritage Program inventory of National Forests and Grasslands in Texas. Unpublished report. Texas Natural Heritage Program, Austin, Texas.

Platt, W.J. 1999. Southeastern pine savannas. Pp. 23-51. *In* R.C.

Anderson, J.S. Frailsh, and J.M. Baskin (Eds.), Savannas, barrens, and rock outcrop communities of North America. Cambridge University Press, New York.

Reed, P.B. 1988 (and 1996 update). National list of plant species that occur in wetlands: national summary. U.S. Fish and Wildlife Service, Biological Report 88(24). Washington, D.C.

Texas Natural Heritage Program. 1993. Plant communities of Texas (series level). Unpublished report. Texas Natural Heritage Program, Austin, Texas.

Turner, R.L., J.E. Van Kley, L.S. Smith, and R.E. Evans. 1999. Ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain. The Nature Conservancy, Nacogdoches, Texas.

U.S. Army Corps of Engineers. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1. U.S. Army Eng. Waterway Exp. Stn., Vicksburg, Mississippi.

Van Kley, J.E. 1999*a*. The vegetation of the Kisatchie sandstone hills, Louisiana. Castanea 64:64-80.

Van Kley, J.E. 1999*b*. The vegetation of the high terrace rolling uplands, Louisiana. Castanea 64:318-336.

Watson, G. 1979. Big Thicket plant ecology. Big Thicket Museum, Saratoga, Texas.

Weakley, A.S., K.D. Patterson, S. Landall, and M. Pyne. 1998. International classification of ecological communities: terrestrial vegetation of the southeastern United States. Working Draft. The Nature Conservancy, Chapel Hill, North Carolina.

Appendix 1. Site numbers, locations, and common names. All sites are on the Winn Ranger District, Kisatchie National Forest.

1) Strange Road Baygall. Natchitoches Parish, Compartment 18. T12NR6WS1/12.
2) Lewis Klein Baygall. Natchitoches Parish, Compartment 18. T13NR6WS35/36.
3) Thalictrum Baygall. Natchitoches Parish, Compartment 18. T13NR6WS25/26/35/36.
4) Road 506 Baygall. Winn Parish, Compartment 5. T13NR5WS9.
5) Compartment 18 Baygall. Natchitoches Parish, Compartment 18. T13NR6WS26.
6) Compartment 19 Baygall. Natchitoches Parish, Compartment 19. T13NR6WS25.
7) Rudbeckia Baygall. Natchitoches Parish, Compartment 1. T13NR7WS2.
8) Snake Baygall. Natchitoches Parish, Compartment 1. T13NR6WS7.
9) Cypress Branch Baygall. Winn Parish, Compartment 5. T13NR5WS8/9.
10) Road W5A Baygall. Winn Parish, Compartment 5. T13NR5WS4.

Appendix 2. Vascular plants occurring in six baygalls (x = present, -=absent)

FAMILY/ SPECIES	SITE					
	5	6	7	8	9	10
ACERACEAE						
Acer rubrum	x	x	x	x	x	x
ANACARDIACEAE						
Toxicodendron vernix	x	x	x	x	x	x
APIACEAE						
Oxypolis rigidior	x	-	-	-	x	x
Ptilimnium capillaceum	-	-	-	-	-	x
AQUIFOLIACEAE						
Ilex opaca	x	x	x	x	x	x
I. vomitoria	x	x	-	x	x	x
ARACEAE						
Arisaema triphyllum	x	x	-	-	-	x
ASTERACEAE						
Doellingeria sericocarpoides	-	-	-	-	x	x
Elephantopus nudatus	-	-	-	-	x	-
Eu patorium perfoliatum	x	x	x	x	-	x
E. rotundifolium	-	x	x	-	x	x
Helianthus angustifolius	-	-	-	-	-	x
Liatris pycnostachya	-	-	-	-	-	x
Rudbeckia scabrifolia	-	-	x	-	-	-
Solidago patula var. *strictula*	x	x	x	-	x	x
S. rugosa var. *aspera*	-	-	-	-	-	x
Symphyotrichum lateriflorum	x	x	-	x	x	x
BETULACEAE						
Alnus serrulata	x	x	-	x	x	-
BIGNONIACEAE						
Bignonia capreolata	x	x	-	-	x	x

FAMILY/ SPECIES	SITE					
	5	6	7	8	9	10
BLECHNACEAE						
Woodwardia areolata	x	x	x	x	x	x
W. virginiana	x		x		x	x
CAPRIFOLIACEAE						
Viburnum nudum	x	x	x	x	x	x
CLUSIACEAE						
Hypericum crux-andreae				x		
CORNACEAE						
Cornus florida	-	x				
Nyssa biflora	x	x	x	x	x	x
CUPRESSACEAE						
Taxodium distichum				x		
CYPERACEAE						
Carex atlantica	x	x		x	x	x
C. crebriflora	-				x	x
C. crinata	x					x
C. debilis	x	x		x	x	x
C. glaucescens	x	x	x	x		x
C. intumescens	x		-			-
C. leptalea	x	x		x	x	x
C. lurida	x	x				-
Eleocharis tortilis	x		x	x		x
E. tuberculosa	-		x	-	-	
Rhynchospora caduca	x		-			
R. glomerata	x	x	x	x		x
R. gracilenta	-		x	x	x	x
Scleria oligantha	-		x	x	-	x
S. triglomerata	x	x	x	-	-	x
DRYOPTERIDACEAE						
Athyrium filix-femina	x	x	-	x	x	x
ERICACEAE						
Rhododendron canescens	x	x	x	x	x	x
R. oblongifolium	x	x	x	-	-	

FAMILY/ SPECIES	SITE					
	5	6	7	8	9	10
Vaccinium fuscatum	x	x	x	x	x	x
V. corymbosum	x	x				x
ERIOCAULACEAE						
Eriocaulon decangulare						x
FAGACEAE						
Fagus grandifolia		x				
Quercus alba	x	x		x	x	
Q. nigra						x
GENTIANACEAE						
Bartonia paniculata			x			
HAMAMELIDACEAE						
Liquidambar styraciflua	x	x	x	x	x	x
IRIDACEAE						
Sisyrinchium mucronatum		x				
JUNCACEAE						
Juncus effusus	x	x				
LAMIACEAE						
Lycopus rubellus	x	x	x	x	x	x
LAURACEAE						
Persea palustris	x	x	x	x	x	x
LILIACEAE						
Melanthium virginicum	x	x		-	x	x
LOGANIACEAE						
Gelsemium sempervirens	x	x		x	x	x
MAGNOLIACEAE						
Magnolia virginiana	x	x	x	x	x	x
MELASTOMATACEAE						
Rhexia mariana			-			x
R. petiolata	-	-		-	-	x
MYRICACEAE						
Morella cerifera	-	x	x	-	-	x
M. carolinensis	x	x	x	x	x	x
OLEACEAE						

FAMILY/ SPECIES	SITE					
	5	6	7	8	9	10
Chionanthus virginicus	x					x
ORCHIDACEAE						
Calopogon tuberosus						x
Platanthera ciliaris						x
P. clavellata	x	x	x	x		x
Pogonia ophioglossoides						x
OSMUNDACEAE						
Osmunda cinnamomea	x	x	x	x	x	x
O. regalis	x	x	x	x	x	x
PINACEAE						
Pinus palustris		x		x	x	x
P. taeda	x	x		x	x	x
POACEAE						
Chasmanthium laxum	x	x	x	x	x	x
Dichanthelium commutatum	x	x			x	x
D. dichotomum var. *dichotomum*	x	x	x	x	x	x
Leersia virginica	x	-	-			
Panicum verrucosum	-	-	-	-	x	
Saccharum giganteum			-			x
ROSACEAE						
Photinia pyrifolia	-	x	x		x	x
RUBIACEAE						
Mitchella repens	x	x		x	x	x
SMILACACEAE						
Smilax bona-nox	x	x		-		-
S. glauca	x	x		-		x
S. laurifolia	x	x	x	x	x	x
S. rotundifolia	-			x	-	-
VERBENACEAE						
Callicarpa americana	x	x	x	x	x	x
VIOLACEAE						
Viola primulifolia	x	x	x	x	x	x

FAMILY/ SPECIES	SITE					
	5	6	7	8	9	10
VITACEAE						
Vitis rotundifolium	x	x	x	x	x	x
XYRIDACEAE						
Xyris ambigua	-				x	x
X. laxifolia	-		x	x		
Sphagnum	x	x	x	x	x	x
Liverworts	x	x	x	x	x	x

Appendix 3. Species/plot occurrence.

Species	Occurrence by Plot									
	1	2	3	4	5	6	7	8	9	10
Vaccinium sp.	x	x	x	x	x	x	x	x	x	x
Woodwardia areolata	x	x	x	x	x	x	x	x	x	
Magnolia virginiana		x	x	x	x		x	x	x	x
Osmunda cinnamomea		x	x	x	x	x	x		x	x
Persea palustis		x		x	x	x	x	x	x	x
Michella repens	x	x	x	x		x		x	x	
Nyssa biflora	x	x		x	x			x	x	x
Carex leptalea	x		x			x		x	x	x
Liquidambar styr.			x		x	x	x	x	x	
Viburnum nudum	x	x	x			x		x		x
Carex debilis			x	x	x	x			x	
Ilex opaca	x	x	x	x				x		
Liverworts	x						x	x	x	x
Morella carolinensis			x	x			x	x		x
Osmunda regalis	x	x	x			x			x	
Acer rubrum		x	x					x	x	
Dichanthelium sp.							x	x	x	x
Eleocharis tortilis					x		x	x		x
Lycopus rubellus	x		x				x		x	
Smilax laurifolia	x	x	x							x
Rhododendron sp.		x					x			x
Solidago patula						x	x		x	
Callicarpa americana					x	x				
Athyrium filix-fem.		x				x				
Chasmanthium laxum			x							x
Chionanthus virgin.			x	x						
Ilex vomitoria						x			x	
Morella cerifera	x	x								
Pinus taeda	x				x					
Toxicodendron vernix		x								x
Scleria sp.		x					x			

Appendix 3. Species/plot occurrence (cont.).

Species	Occurrence by Plot									
	1	2	3	4	5	6	7	8	9	10
Woodwardia virginica									x	x
Viola primulifolia	x		x							
Alnus serrulata		x								
Photinia pyrifolia						x				
Bignonia capreolata						x				
Carex atlantica								x		
Eupatorium rotund.									x	
Gelsemium semper.								x		
Platanthera clave.										x
Quercus alba						x				
Rhynchospora caduca			x							
Rudbeckia scabrif.							x			
Sphagnum sp.				x						
Taxodium distichum								x		
Vitis rotundifolia			x							
Xyris laxifolia								x		

THE STATUS OF *CAREX TENAX* CHAPMAN (CYPERACEAE) IN THE WEST GULF COASTAL PLAIN

Michael H. MacRoberts[1], Suzanne Birmingham Walker[2], & Barbara R. MacRoberts[1]

[1]Bog Research, 740 Columbia, Shreveport, Louisiana 71104, U.S.A. & Herbarium, Museum of Life Sciences, Louisiana State University in Shreveport, Shreveport, Louisiana 71115, U.S.A.

[2]14671 State Highway 87 South, Shelbyville, Texas 75973, U.S.A.

ABSTRACT

Carex tenax Chapman is uncommon over much of its range. Recent discoveries of new locations of this species in east Texas prompts this review of its status in the West Gulf Coastal Plain, where it is now known from six counties in east Texas and three parishes in adjacent Louisiana. It occurs in xeric sandylands and arenic dry uplands, and its absence in many apparently suitable sites suggests that the species is truly rare in the West Gulf Coastal Plain.

KEY WORDS: *Carex tenax* Chapman, Cyperaceae, West Gulf Coastal Plain.

Carex tenax is endemic to the Atlantic and Gulf Coastal plains, extending from North Carolina to east Texas (Ball 2002). It is reported as being rare in Florida, Louisiana, and North Carolina (Kartesz & Meacham 1999). In the West Gulf Coastal Plain, it is known from Texas (Correll & Johnston 1970; Turner et al. 2003) and Louisiana (Thomas & Allen 1993) but has not been found in Arkansas (Hyatt 1998) or Oklahoma (Taylor & Taylor 1989). In Louisiana, it is listed as an S2 species (Louisiana Natural Heritage Program 1999) and is reported from Natchitoches and Vernon parishes (MacRoberts &

MacRoberts 1995a; Thomas & Allen 1993). In Texas, it has been reported from Hardin County only (Correll & Johnston 1970; Matos & Rudolph 1985; Turner et al. 2003). It is not currently listed as rare in Texas (Texas Natural Heritage Program 1995; Texas Organization of Endangered Species 1993), although it once was (Matos & Rudolph 1985).

We recently located *C. tenax* in Shelby and San Augustine counties, Texas, and at a new location in Hardin Co., Texas. In Shelby Co., we found it at three sites within a one mile radius centering on 31° 39' 50"N and 94° 14' 40"W, which is about 9.5 miles SSW of Center. The single San Augustine Co. site is about 13 miles south of Center at 31° 35' 54" N and 94° 11' 37" W. The new Hardin Co. site is in the Turkey Creek Unit of the Big Thicket National Preserve on the Sandhill Loop of the Kirby Nature Trail. These new sites ranged in elevation from 75 to 426 feet. All are found in xeric sandylands (grossarenic dry uplands, arenic dry uplands) (MacRoberts & MacRoberts 1995a; Turner et al. 1999). *Carex tenax* was found almost invariably near or under an oak or pine (several areas had pine plantations) in partial shade. Our observations on the species in Louisiana and Texas are similar: the species, while inhabiting open xeric sandylands, apparently prefers to be in partial shade and is an "edge" species. Plant associates include *Berlandiera pumila, Bulbostylis ciliatifolia, Carya texana, Cnidoscolus texanus, Croptilon divaricatum, Croton glandulosus, C. michauxii, Cyperus grayioides, C. retrofractus, Dalea villosa, Diodia teres, Eriogonum longifolium, E. multiflorum, Froelichia floridana, Helianthus debilis, Liatris elegans, Loeflingia squarrosa, Matelea cynanchoides, Mimosa hystricina, Mirabilis albida, Monarda punctata, Opuntia humifusa, Paspalum setaceum, Penstemon murrayanus, Paronychia drummondii, Polanisia erosa* var. *erosa, Quercus incana, Q. margaretta, Selaginella arenicola* ssp. *riddellii, Stylisma pickeringii, Tradescantia reverchonii, Yucca louisianensis* (authorities can be read in Kartesz & Meacham 1999). The habitat in which *C. tenax* occurs --- xeric sandylands and arenic dry uplands--- is found virtually throughout the West Gulf Coastal Plains (McBryde 1933; Bridges & Orzell 1989; MacRoberts & MacRoberts 1994, 1995b, 1995b, 1996; MacRoberts et al. 2002a,

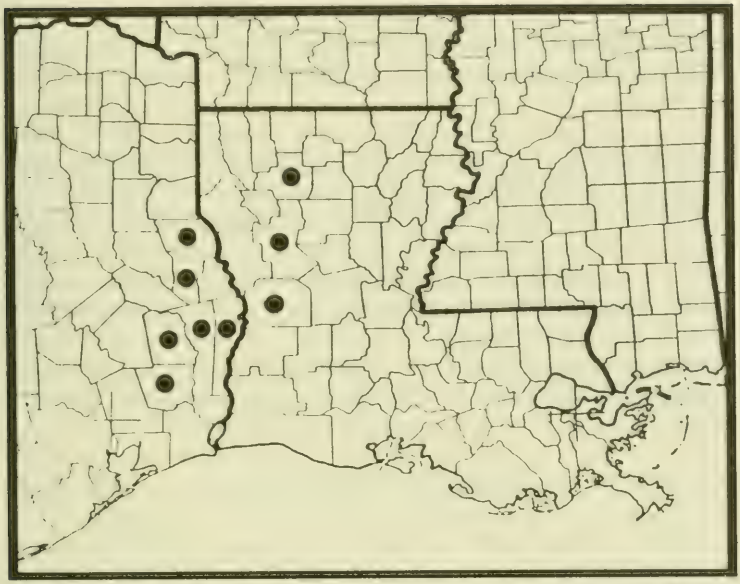

Figure 1. Distribution of Carex tenax in the West Gulf Coastal Plain.

2002b; Turner et al. 1999). Searches for *C. tenax* in northwestern Louisiana have failed to locate a population (MacRoberts & MacRoberts 1995b) as have searches for the species in Texas in the Post Oak Savanna region, e.g., xeric sites in Anderson County (MacRoberts et al. 2002a; Singhurst et al. in prep.). The absence of *C. tenax* in apparently suitable sites in east Texas and west Louisiana suggests that the species is truly rare in the West Gulf Coastal Plain.

We searched, or had curators search, ASTC, BRCH, BRIT, VDB, TAMU, SBSC, LSU, LSUS, SFRP, and TEX. We also contacted knowledgeable individuals who might have additional information. As a result we located specimens of *C. tenax* from Bienville Parish, Louisiana (Phil Hyatt, pers. comm.) and Newton and Tyler counties, Texas (Edwin Bridges and Steve Orzell, pers. comm.). These specimens also come from xeric sandyland and arenic dry upland

habitat. Figure 1 shows the known county/parish locations for *C. tenax* in the West Gulf Coastal Plain.

DOCUMENTATION: LOUISIANA: Bienville Parish: (*Hyatt 8368* [SFRP] *8370* [MICH]), Natchitoches Parish: (*MacRoberts & MacRoberts 2282* [VDB], *2294* [NLU], *2334* [LSU], *2356* [LSUS]), Vernon Parish: (*Thieret 30144* [LAF], *Hyatt 8224* [MICH]). TEXAS: Hardin Co.: (*Orzell & Bridges 8900* [MICH], *Brown 4502* [ASTC]. *Matos & Rudolph 556* [ASTC]), *MacRoberts & MacRoberts 5631* [TEX], *Singhurst 2494* [BAYLU]), Jasper Co.: (*Singhurst & Bridges* 12,419 [BAYLU]), Newton Co.: (*Orzell & Bridges 6322* [to be deposited]), San Augustine Co.: (*MacRoberts, MacRoberts & Walker 4907* [TEX]), Shelby Co.: (*MacRoberts, MacRoberts & Walker 4695* [VDB]), Tyler Co.: (*Orzell & Bridges 9105* [MICH]).

ACKNOWLEDGMENTS

Billie Turner, Larry Brown, Stanley Jones, Phil Hyatt, Steve Orzell, and Edwin Bridges aided with this study as did the curators and staff of all herbaria cited.

LITERATURE CITED

Ball, P.W. 2002. *Carex* Linnaeus sect. Hallerianae. Pp. 487-489. In: Flora of North America Editorial Committee (ed.). Flora of North America. Vol. 23. Oxford University Press, New York.

Bridges, E.L. & S.L. Orzell 1989. Longleaf pine communities of the west gulf coastal plain. Natural Areas Journal 9:246-263.

Correll, D.S. & M.C. Johnston. 1970. Manual of the Vascular Plants of Texas. Texas Research Foundation, Renner, Texas.

Hyatt, P.E. 1998. Arkansas *Carex* (Cyperaceae): a briefly annotated list. Sida 18:535-554.

Kartesz, J.T. & C.A. Meacham. 1999. Synthesis of North American Flora. Version 1.0. North Carolina Botanical Garden, Chapel Hill, North Carolina.

Louisiana Natural Heritage Program. 1999. Rare plant species of Louisiana. Unpublished report. Louisiana Department of Wildlife and Fisheries. Baton Rouge, Louisiana.

MacRoberts, M.H. & B.R. MacRoberts. 1994. Floristics of a xeric sandyland in western Louisiana. Phytologia 77:414-424.

MacRoberts, M.H. & B.R. MacRoberts. 1995a. Noteworthy vascular plant collections on the Kisatchie National Forest, Louisiana. Phytologia 78:291-313.

MacRoberts, B.R. & M.H. MacRoberts. 1995b. Floristics of xeric sandhills in northwestern Louisiana. Phytologia 79:123-131.

MacRoberts, B.R. & M.H. MacRoberts. 1996. Floristics of xeric sandhills in east Texas. Phytologia 80:1-7.

MacRoberts, B.R., M.H. MacRoberts, & J.C. Cathey. 2002a. Floristics of xeric sandylands in the Post Oak Savanna region of east Texas. Sida 20:373-386.

MacRoberts, M.H., B.R. MacRoberts, B. Sorrie, & R. Evans. 2002b. Endemism in the West Gulf Coastal Plain: importance of xeric habitat. Sida 20:767-779.

McBryde, J.B. 1933. The vegetation and habitat factors of the Carrizo Sands. Ecol. Monogr. 3:247-297.

Matos, J.A. & D.C. Rudolph. 1985. The vegetation of the Roy E. Larsen Sandylands Sanctuary in the Big Thicket of Texas. Castanea 50:228-249.

Singhurst, J.R., J. Cathey, D. Prochaska, H. Haucke, & W.C. Holmes. in prep. Vascular flora of Gus Engeling Wildlife Management Area, Anderson County, Texas. Unpublished Report, Texas Parks and Wildlife, Austin, Texas.

Taylor, R.J. & C.E.S. Taylor 1989. An annotated list of the ferns, fern allies, gymnosperms and flowering plants of Oklahoma. Southeastern Oklahoma State Univ., Durant, Oklahoma.

Texas Natural Heritage Program.1995. Special plant list. Unpublished report. Texas Parks and Wildlife Department, Austin, Texas.

Texas Organization for Endangered Species. 1993. Endangered, threatened and watch lists of Texas plants. Publ. 9, Austin, Texas.

Thomas, R.D. & C.M. Allen. 1993. Atlas of the vascular flora of Louisiana. Louisiana Dept. Wildlife and Fisheries, Baton Rouge, Louisiana.

Turner, B.L., H. Nichols, G. Denny & O. Doron. 2003. Atlas of the vascular plants of Texas. Sida, Bot. Misc. 24:1-888.

Turner, R.L., J.E. Van Kley, L.S. Smith, & R.E. Evans. 1999. Ecological classification system of the national forests and adjacent areas of the West Gulf Coastal Plain. The Nature Conservancy, Nacogdoches, Texas.

DIMORPHOTHECA SINUATA AND *ZINNIA VIOLACEA* (ASTERACEAE), TWO ESCAPED CULTIVARS, NEW TO FLORA OF TEXAS

Eric L. Keith
Raven Environmental Services
P.O. Box 6482
Huntsville, Texas 77342, U.S.A.
eric.keith@excite.com

ABSTRACT

Two cultivated annual composites are reported as new to the Texas flora: *Dimorphotheca sinuata* DC., *Zinnia violacea* Cav.

KEYWORDS: *Dimorphotheca*, *Zinnia*, Asteraceae, Flora, Texas.

Dimorphotheca sinuata DC., glandular cape marigold, has been reported as escaped from cultivation in California and Oregon (Hickman 1993, USDA 2002). Until now, the species has not been reported for Texas (Correll & Johnston 1970, Hatch et. al. 1990, Jones et. al. 1997, Nesom & Brown 1998, Sloan-Nelson 1996, Turner et. al. 2002). Approximately a dozen plants were found blooming in shades of orange and yellow along a recently constructed roadside with black clayey soil. These plants may be the result of direct seeding or contaminants in grass seeds, however, several plants were present at the same location in spring 2002.

Voucher specimen: **Walker Co.**: Roadside of Veteran's Memorial Parkway app. 1 mi S of TX Hwy 30, 19 Feb 02, *Keith* 94 (BRIT).

Zinnia violacea Cav., Elegant Zinnia, has been reported for nine states in the eastern United States (Gandhi & Thomas 1989, USDA 2002, Wunderlin & Hansen 2003). Approximately, 10 individuals were found in full bloom along a black, clayey roadside and adjacent pasture. This species has not been previously reported as escaped from

cultivation in Texas (Correll & Johnston 1970, Hatch et. al. 1990, Nesom & Brown 1998, Nelson 1996, Turner et. al. 2002), however, Jones et. al. (1997) list this species as cultivated. The plants appear to have successfully reproduced because the area where they occurred is on the edge of a cattle pasture where intentional cultivation was unlikely. In addition, two plants were found at the same locality in July 2003.

Voucher specimens: **Walker Co.**: Blackland pasture at intersection of Veteran's Memorial Parkway and Smither Ave., 18 Jul 02, *Keith 200* (BRIT); Blackland pasture at intersection of Veteran's Memorial Parkway and Smither Ave, 4 Aug 02, *Keith 206* (SHST).

ACKNOWLEDGMENTS

Thanks to Guy Nesom at the Botanical Research Institute of Texas for identifying *Dimorphotheca sinuata* and verifying the identification of *Zinnia violacea*.

LITERATURE CITED

Correll, D.S. and M.C. Johnston. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner, TX.

Gandhi, K. N. and R. D. Thomas. 1989. Asteraceae of Louisiana. Sida Botanical Miscellany No. 4. SMU Herbarium, Dallas. p.179.

Hatch, S.L., K.N. Gandhi, and L.E. Brown. 1990. Checklist of the vascular plants of Texas, MP-1655. Texas Agric. Exp. Sta., College Station.

Hickman, James C. (Ed.). 1993. The Jepson manual: higher plants of California. Berkeley, CA: University of California Press. p. 246.

Jones, S.D., J.K. Wipff, and P.M. Montgomery. 1997. Vascular Plants of Texas. A comprehensive checklist including synonomy, bibliography, and index. University of Texas Press. Austin.

Nesom, G. L. and L. E. Brown. 1998. Annotated checklist of the vascular plants of Walker, Montgomery, and San Jacinto Counties, East Texas. Phytologia 84 (2): 107-153.

Sloan-Nelson, K. B. 1996. Floristic Study of Walker County, Texas: Asteraceae. Masters of Arts, Sam Houston State University.

Turner, B.L., H. Nichols, G. Denny & O. Doron. 2003. Atlas of the vascular plants of Texas. Sida, Bot. Misc. 24:1-888.

USDA, NRCS. 2002. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Wunderlin, R. P., and B. F. Hansen. 2003. Atlas of Florida Vascular Plants (http://www.plantatlas.usf.edu/).[S. M. Landry and K. N. Campbell (application development), Florida Center for Community Design and Research.] Institute for Systematic Botany, University of South Florida, Tampa

KEYS TO THE FLORA OF FLORIDA -- 9, *OXALIS* (OXALIDACEAE)

Daniel B. Ward

Department of Botany, University of Florida, Gainesville, Florida 32611, U.S.A.

ABSTRACT

Oxalis (Oxalidaceae) is represented in Florida by 8 species, with *O. corniculata* treated as consisting of 2 varieties and *O. dillenii* of 2 subspecies. Extended commentary is provided regarding the correct typification of *O. stricta*, with brief discussion addressing the nomenclature of other species. An amplified key is given to the Florida taxa. Two species are excluded.

KEY WORDS: *Oxalis*, Oxalidaceae, Florida flora.

Oxalis (Oxalidaceae) in Florida is a moderate sized, readily recognized genus with some species sharply defined and others subtly distinguished and intergrading, some names consistently applied and others wholly conflicting depending on which student of the genus is considered authoritative. Though K. R. Robertson (J. Arnold Arbor. 52:649-665. 1971) excellently summarized the then-current nomenclature of the southeastern species as seen by G. Eiten (Taxon 4:99-105. 1955; Amer. Midl. Nat. 69:257-309. 1963; see also: Ph.D. diss., Columbia Univ. 1959), a later worker, A. Lourteig (Phytologia 42:57-198. 1979), has significantly challenged the application of certain important species. It is believed the present study may be the first subsequent effort to resolve the differences in interpretation between these two authors.

Eiten (1955) has typified *Oxalis stricta* L. (1753) as the largely northern, erect plant with septate hairs and slender fleshy rhizomes. A very different conclusion was reached by Lourteig (1979).

Two species are involved: an erect septate-haired plant common in both America and Europe (and thus likely familiar to Linnaeus), here called *Oxalis stricta* (by Lourteig called *O. fontana*); and a lax stemmed nonseptate-haired plant native to America and introduced rarely to Europe, here called *O. dillenii* (by Lourteig called *O. stricta*). [The plants are unmistakably different on a significant suite of characters. The hair character, not the most obvious, is used here only as a convenient label.] Linnaeus (1753:435) cited with his new *O. stricta* the pre-Linnaean publications of Gronovius (1743), Tournefort (1700), and Morison (1680) and, by implication, their associated specimens and plates; at that time he possessed no specimens of his own. The underlying specimens and illustrations differ; it is agreed (Eiten, Lourteig) that the Gronovius reference is to a nonseptate specimen within the circumscription of *O. dillenii*, while Morison's plate corresponds to the septate-haired taxon. [The authors either did not search the herbaria of Morison (OXF) and Tournefort (P), or found nothing. Their (unstated) presumption appears to have been that Morison left no specimen and Tournefort had neither an illustration nor surviving specimen.] Later, after publishing *O. stricta*, Linnaeus obtained a specimen of the septate-haired plant (LINN 600.33) which he marked as "stricta."

Conflict centers on application of I.C.B.N. (Art. 9.2), the criteria for selecting a lectotype when more than one specimen or illustration was available to the original author. Eiten (1955) noted that B. L. Robinson (J. Bot. 44:386. 1906) had selected as lectotype a Virginia specimen of Gronovius (BM: Clayton 474), the nonseptate-haired plant, but argued that this selection was contrary to Linnaeus's intent. He then selected as lectotype the Morison plate (t. 17, f. 3) of the erect septate-haired plant. This action led him to use *O. stricta* and *O. dillenii* Jacq. (1794) for the septate-haired and nonseptate-haired plants respectively. Lourteig (1979:60) was not persuaded. She -- without reference to the actions by Robinson or Eiten -- argued that Linnaeus

had worked with Gronovius (and, by implication, was familiar with his specimen), while it was "unlikely he had in mind the specimens of Tournefort and of Morison;" she selected the Gronovius specimen as lectotype. She then used *O. fontana* Bunge (1833) and *O. stricta* for the septate- and nonseptate-haired plants, respectively.

Although a lectotype may be superceded if original type materials are rediscovered or if one can show that the lectotype is in serious conflict with the protologue (I.C.B.N., Art. 9.17), it is not common for authors to propose reversal of their predecessor's lectotypifications. The present situation is further unusual in that argument is made for a double reversal -- Eiten (1955) of Robinson (1906), and Lourteig (1979) of Eiten (1955). It must tax even the nomenclaturally adept reader to follow the arguments and to decide whether to use *O. stricta* and *O. dillenii* for the septate and nonseptate plants, as did Eiten, or use *O. fontana* and *O. stricta*, as did Lourteig. Practice, as in so many other examples, has been for writers to take the easier pathway and docilely to follow the conclusions of the latest author. Thus, after Eiten (1955, 1963), American writers commonly used *O. stricta* for the septate-haired plant, and after Lourteig (1979) -- without a whimper of protest or, for that matter, indication of understanding -- have employed that name for the nonseptate-haired plant. Eiten's perhaps excessively detailed style, and Lourteig's failure to mention Eiten's contrary action or to refute the specifics of his argument, is not helpful.

But even with the complexity of the arguments as presented, still other factors may be mentioned. Though a type may be a specimen or an illustration (I.C.B.N., Art. 8.1), the superiority of actual plant material is well appreciated; had no lectotype yet been chosen, selection of the nonseptate Gronovius specimen over the Morison plate would be favored. That preference, though not in itself determining typification, may have influenced Robinson (1906) in his selection as type the Virginia specimen rather than the European illustration. Of greater weight, however, and pointing in the opposite direction, is the probability, not well brought out by either author, that Linnaeus would likely have known the plant often found as a weed in European gardens, added later to his herbarium, and illustrated by Morison, while

he would have encountered the nonseptate-haired American introduction only by brief contact with the Gronovius specimen, if at all. Further, his epithet is apt only for the European plant; that species is quite erect, or strictus (at least when young), while the plant represented by the Gronovius specimen is invariably lax and sprawling. Additional importance can be attributed to the dominant (but not universal) European practice of recognizing the plant common there as *O. stricta*.

One thus has the choice of accepting the earlier Robinson lectotypification and typifying *O. stricta* as a plant Linnaeus scarcely (or never) knew, or rejecting that lectotypification and re-lectotypifying *O. stricta* as the plant familiar in Europe and probably to Linnaeus. The advantages of the latter choice are obvious. Stability without doing violence to nomenclatural precision is best attained by rejection of the early Robinson (1906) lectotypification of the nonseptate-haired plant (per Eiten, 1955), and selection of the erect, septate-haired plant common both in Europe and eastern North America (and introduced into Florida) as the basis for the name *Oxalis stricta* L.

The judgment of Eiten (1963) is cautiously accepted here that variation within *Oxalis dillenii* is best apportioned by recognition of ssp. *dillenii* and ssp. *filipes*. In contrast, Lourteig (1979) held these taxa at specific rank, with different names; she recognized *O. stricta* (as discussed above) and *O. florida* Salisb. The differences (in pubescence, and size and robustness of the plants, as noted in the key) are appreciable and intermediates seem few. In respects ssp. *filipes* is closer to *O. corniculata* than to ssp. *dillenii* (Eiten, 1963:268). Lourteig's unwillingness to address Eiten's arguments leaves one reluctant to endorse her conclusions and nomenclature. Yet it would not appear unreasonable for one to recognize the two taxa as species -- as have essentially all previous authors -- with the names *O. dillenii* and *O. florida*. [Eiten (1963:301) was incorrect in claiming *O. florida* is superfluous (I.C.B.N., Art. 52.1). The name cited in synonymy by Salisbury (1796) was pre-Linnaean which, since not available for his use, does not disturb the legitimacy of *O. florida*.]

The assignment of *Oxalis corniculata* L. (1753) is now established by Eiten's (1955) lectotypification of the name. In Florida two distinct forms occur: leaves green, variable in size, fruits glabrous; and leaves bronze-purple, small, fruits long-pubescent. Eiten (pers. comm., Oct 1967) has been unwilling to assign varietal names. Lourteig (1979) treated these taxa as *O. corniculata* var. *corniculata*, and var. *atropurpurea* Planch. (incl. *Xanthoxalis* Langloisii); she also recognized var. *villosa* (Bieb.) Hohen.

Decision has been deferred as to proper treatment of *Oxalis priceae* Small. This name represents a complex of perennial (rhizomatous), relatively large flowered, little-known taxa usually restricted to undisturbed woodlands and too easily dismissed as waifs of *O. dillenii* or other more common species. Eiten (1963) divided *O. priceae* into three subspecies distinguished on features of stem and pedicel pubesence. Two, ssp. *colorea* (Small) Eiten, and ssp. *texana* (Small) Eiten, were reported to reach Florida. Lourteig (1979) -- again without reference to the arguments of Eiten -- recognized three species, one with two subspecies. Comparison is difficult because this second author interpreted both the taxa and their types quite differently and permitted no taxa to bear the names assigned by the first author. Further study may justify some degree of separation. [D. M. Mulcahy (Amer. J. Bot. 51:1045-1050. 1964), incidental to his primary interest in flower form, reported variations in growth patterns and heterostyly among the three taxa.] But, at least within Florida, the difference are so subtle and intergrading that they are not believed worthy of recognition.

The renaming of *Oxalis priceae* as *O. lyonii* Pursh (1813), by Lourteig (1979), is in error. The type of *O. lyonii* was from Cumberland Island, an early-settlement plantation in southeastern coastal Georgia. Lourteig, finding Pursh's type to be lost and lacking other collections from near the type locality that she could assign to *O. lyonii*, neotypified her interpretation of the name with a Mississippi specimen of Eiten's ssp. *texana*. However that entity, a rather uncommon perennial of dry, usually undisturbed woodlands, apparently does not extend eastward to Florida, much less the Atlantic

coastal plain. [Reports of its presence in Florida are based on misidentified specimens (Cooley - USF) or specimens of ssp. *colorea*.] Pursh's description of *O. lyonii* is mostly language appropriate only to the genus, but contains phrases ("...caule ramoso decumbente...siliquis tomentosis...") exactly fitting *O. dillenii*, a species common on agricultural soils of eastern Georgia. [*O. priceae* is erect above its rhizomatous base, with finely pubescent fruits.] Though claimed otherwise by Lourteig, no part of Pursh's description uniquely implies he had in hand any member of the *O. priceae* complex. True *O. lyonii* is probably a synonym of *O. dillenii*, as has been supposed by previous authors (Eiten, 1963.; etc.). Lourteig's neotype is clearly in conflict with the protologue of *O. lyonii*, and should be set aside. If the complex is left undivided, *O. priceae* retains its priority.

Oxalis violacea is so clearly a native in the northern states that it is easily assumed to be so in Florida. Yet its habitat here is essentially confined to roadsides and other disturbed, widely separated areas. Northward, its coherent range largely stops in mid-Georgia (S. B. Jones & N. C. Coile, Distribution of the Vascular Flora of Georgia. 1988). It is best treated as introduced.

The introduced South American species of Sect. *Ionoxalis* are perhaps best addressed by M. E. Denton (Publ. Mus. Michigan State Univ. Biol. 4:455-615. 1973). Introduced species are denoted by an *.

The "amplified key" format employed here is designed to present in compact form the basic morphological framework of a conventional dichotomous key, as well as data on habitat, range, and frequency. This paper is a continuation of a series begun in the 1970s (vide Phytologia 35:404-413. 1977). I wish to thank David W. Hall and Kent D. Perkins for constructively reviewing the manuscript, and to acknowledge extended correspondence with Dr. George Eiten and his assistance with certain identifications, though all nomenclatural interpretations are my own.

Oxalis L. Wood Sorrels

1. Petals yellow to orange-yellow; sepals without orange dots (tubercles) at apex; plants annual or short-lived perennial; base fibrous or of thin rhizomes.....Sect. Corniculatae

    2. Hairs of petioles and stem septate (multicellular); stems erect, arising from a slender shallow rhizome; annual or short-lived perennial herb. Floodplains. Mid-panhandle (Liberty County: Apalachicola River); rare. Summer-fall.....**Oxalis* stricta L. [*O. europaea* Jord.; *O. fontana* Bunge; *Xanthoxalis cymosa* Small]

    2. Hairs of petiole and stem non-septate (unicellular); stems creeping or decumbent from fibrous roots, or erect from a perennial base (if erect, corolla >12 mm. long).

        3. Corolla <11 mm. long; longer internal flower structures (either stamens or pistil) <5 mm. long; stems creeping or decumbent, from fibrous roots.

            4. Mature capsules gradually tapering to apex; seeds and their transverse ridges uniformly brown; stems creeping, rooting at nodes; perennial herb. Moist soil of gardens, lawns. All year.....**Oxalis corniculata* L.

                4a. Leaflets ca. 1.5 cm. broad, green; stems both creeping and ascending-erect. Throughout Florida: common .....var. *corniculata* [*Xanthoxalis corniculata* (L.) Small]

                4a. Leaflets ca. 1 cm. broad, dark maroon; stems closely creeping. Throughout Florida; common..... .....var. *atropurpurea* Planch. [*Xanthoxalis langloisii* Small]

4. Mature capsules with parallel sides, abruptly tapering to apex; seeds brown with gray or white crests or distinct spots on transverse ridges; stems often decumbent at base but only rarely rooting at nodes; annual or perennial herb. Gardens, pastures, moist disturbed areas. Spring-summer. .....*Oxalis dillenii* Jacq.

4b. Capsules densely pilose; stem hairs strictly appressed upwards; plants relatively robust (stems 1.5-2 mm. thick). Nearly throughout (south to Polk, Brevard counties; excl. south peninsula); common...ssp. *dillenii* [*O. lyonii* Pursh; *Xanthoxalis stricta*, misapplied]

4b. Capsules partially or completely glabrous; some or all stem hairs retrorse; plants relatively slender (stems 1-1.5 mm. thick). Throughout Florida; common..... .....ssp. *filipes* (Small) Eiten [*O. florida* Salisb.; *Xanthoxalis brittoniae* Small; *Xanthoxalis filipes* Small]

3. Corolla 12-14 mm. long; longer internal flower structures (either stamens or pistil) 6-8 mm. long; stems erect from base, with short rhizomes; perennial herb. Mesic woodlands. Panhandle (Escambia County, east to Gadsden, Liberty counties); infrequent. Spring. Restricted to undisturbed habitats and often overlooked.....*Oxalis priceae* Small [*O. lyonii*, misapplied; *Xanthoxalis colorea* Small; *Xanthoxalis macrantha*, misapplied; *Xanthoxalis priceae* Small; *Xanthoxalis recurva*, misapplied]

1. Petals pink to lavender; sepals usually with orange dots (tubercles) at apex; plants perennial; base stocky, tuberous or bulbous..... .....Sect. Ionoxalis

5. Leaflets angular obcordate or obdeltoid; petals pinkish purple; sepals 4 mm. long, with distinct orange dot at tips; perennial herb. Moist waste areas, fencerows. Peninsula (Duval, Alachua counties, south to Dade County); infrequent. Spring-summer..... .....* *Oxalis intermedia* A. Rich.
[*O. latifolia*, misapplied; *Ionoxalis intermedia* (A. Rich.) Small]

5. Leaflets rounded obcordate.

6. Plant arising from a segmented, woody taproot; leaflets <2.5 cm. broad; sepals densely appressed-pubescent; petals red or pinkish red (rarely white); inflorescences delicate, usually compound, often many (to 100) per plant; perennial herb. Moist disturbed areas. West and mid-panhandle (Escambia to Leon, Franklin counties); rare. Spring...* *Oxalis rubra* St.-Hil.

6. Plant arising from a fleshy bulb or cluster of bulblets; sepals glabrous or sparsely pubescent toward base; inflorescences usually few (1-10) per plant.

7. Leaflets 2.5-5.0 cm. broad; inflorescence compound; petals purplish pink; sepals 5 mm. long, with no or indistinct orange dot (tubercle) at tips; perennial herb. Fencerows, dooryards, moist disturbed areas. Throughout; mostly near habitations, where often common. Winter-spring..... .....* *Oxalis corymbosa* DC.
[*O. debilis* HBK. var. *corymbosa* (DC.) Lourteig; *O. martiana* Zucc.; *Ionoxalis Martiana* (Zucc.) Small]

7. Leaflets 1.5-2.0 cm. broad; inflorescence simple; petals violet; sepals 3 mm. long, with distinct orange dot (tubercle) at tips; perennial herb. Dry waste areas, rocky outcrops. Mid-panhandle (Calhoun, Jackson counties, scattered east to Putnam County); rare. Spring, fall. Not persisting. .....VIOLET WOOD SORREL..* *Oxalis violacea* L.

[*Ionoxalis violacea* (L.) Small]

Excluded names:

Oxalis pes-caprae L. Buttercup Oxalis

Oxalis cernua Thunb.

Bolboxalis cernua (Thunb.) Small
Reported for "waste-places and cult. grounds, N. Fla." (Small, 1933). Perhaps once cultivated. No Florida specimens are known.

Oxalis triangularis St. Hil.
Reported [as ssp. *papilionacea* (Hoffmanns. ex Zucc.) Lourteig] for Leon Co. (Wunderlin, Hansen & Anderson, 2002), based upon a 2001 specimen (Anderson 19691 - FSU). Stated as "several plants," but without clear evidence of naturalization.

BIOLOGICAL STATUS OF THE NAMES *ABRONIA CARLETONII* AND *A. NEALLEYI* (NYCTAGINACEAE)

B. L. Turner

Plant Resources Center University of Texas Austin, TX, 78713, U.S.A.

ABSTRACT

The taxonomic history of *Abronia carletonii* Coulter & Fisher and A. *nealleyi* Standl. is reviewed. Galloway (1975), in his revisionary treatment of the genus *Abronia* for the North America desert region, concluded that the two names were synonymous, A. *carletonii* having priority. After examination of the holotype of the latter, this collected in eastern Colorado, I conclude that it is a late-flowering atypical element of the widespread, highly variable, *A. fragrans* Nutt. ex Hook.f *Abronia nealleyi* is typified by material from Reeves Co., Texas. It is a localized species, occurring on bare gypsum outcrops in northern Culberson and Reeves counties of Trans-Pecos, Texas and closely adjacent New Mexico (Eddy Co.).

KEY WORDS: *Abronia,* Nyctaginaceae, Texas

Abronia carletonii was proposed by Coulter & Fisher in 1892, basing this upon a single specimen collected in "eastern Colorado" in 1891 by M. A. Carleton (holotype: *Carleton459,* FM!). Its authors thought their new species to be:

> Most closely related to *A. turbinata* Torr., having the coriaceous double wing of the section, but differing from that species in having slender white glabrous (but minutely glandular) stems, more numerous flowers, broader rose-colored attenuate or cuspidate bracts, and the perianth and its lobes not so deeply cut.

M. E. Jones subsequently reduced *A. carletonii* to varietal status under *A. turbinata*. Standley (1909), however, retained *A. carletonii* (at the time this still known only by the type), noting that "It is not the same as *A. angustifolia* [sic] as Mr. Jones claims, but seems to me much nearer *A. fragrans*."

Galloway (1975) also retained A. *carletonii* but included in this *A. nealleyi*, the latter based upon a single collection made by Nealley in 1893 from "Screw Bean," Reeves Co., Texas. Standley (1909) has provided an excellent sketch of *A. nealleyi*.

In addition to the types mentioned in the above, Galloway cited and/or mapped eight additional collections of *A. carletonii*, as follows:

New Mexico. Eddy Co.: two collections mapped, but not cited.

San Miguel Co.: San Jeronimo, *Benedict 2334* (US).

Texas. Brewster Co. [sic]: " About 25 mi. E of W end of Paso-Tex pipe line road, *Correll & Rollins 23192* (LL). The locality concerned is actually in northern Culberson or Hudspeth counties.

Culberson Co.: two collections mapped, but not cited.

El Paso Co.: two collections mapped, but not cited.

Hudspeth Co.: "Ables", *Parks & Cory 1504* (TAES).

I consider all of the above cited specimens to be *A. nealleyi* (except for the collection from San Miguel Co., New Mexico, which is probably an aberrant specimen of *A. fragrans;* at least it does not belong to *A. nealleyi* as conceived here).

My interest in the several names of *Abronia* mentioned in the above was stimulated by my attempt to place a name upon an erect perennial herb having lanceolate leaf blades that seemed confined to

bare gypsum outcrops of north-cenrtral Trans-Pecos, Texas and closely adjacent New Mexico (Eddy Co). Field work revealed numerous populations of the taxon concerned along state highway 652 from its entry into New Mexico eastwards to Orla, Texas, this also attested to by numerous vouchers on file at SRSC and LL-TEX. Careful study of this material, along with a study of the literature, strongly suggested that these populations are best referred to A. *nealleyi.*

Application of the name *A. carletonii* is moot. Its distribution as portrayed by Galloway (as noted above) made little morphogeographical sense, nor did he map the taxon as occurring in Colorado, where the type was reportedly collected. To resolve the problem I borrowed the type of *A. carletonii.* A brief description of the type and comments upon its likely biological status follows.

Comments upon the type of *Abronia carletonii*

The holotype lacks a root and appears to be a late-flowering sprig taken from a prostrate stem devoid of primary leaves. Its flowering secondary branches possess relatively small flowers. Except for its prostrate stems, the plant superficially resembles *A. nealleyi.* Closer inspection, however, shows that the stems and leaves are lacking the villous vestiture of *A. nealleyi* and, along with its depauperate state and sporatic distribution as displayed by Galloway, I have no hesitation in referring the type material of *A. carletonii* to *A. fragrans.* The latter species is common throughout the western portions of the central grasslands, namely Wyoming, Colorado, and New Mexico, as is obvious from the dot maps of the species provided by Galloway (1975) and Barkley (1976). Indeed, an immature anthocarp from the type of *A. carletonii* (now deposited in a packet on the type sheet itself) shows this to possess five compressed wings, the latter not dilated at their apices. Using Galloway's key to the species of *Abronia,* if annual, the type itself would key to *A .fragrans.* Regardless, for the Atlas of Texas Plants (Turner et al. 2003) I should have taken up the name *A. nealleyi* for material occurring on the gypsum out crops of Culberson and Reeves counties formally called *A. carletonii* by most

workers (e.g.. Reed 1969; Correll and Johnston 1970; Johnston 1988; and yet others). The present contribution calls attention to the misnomer concerned.

ACKNOWLEDGEMENTS

I am grateful to the staff at Field Museum (FM) for the loan of type material of *A. carletonii*, and to Mike Powell and Gayle Turner for reviewing the manuscript.

LITERATURE CITED

Barkley, T. [ed.] 1976. Atlas of the Flora of the Great Plains. Iowa State Univ. Press, Ames.

Correll, D.S. and M.C. Johnston 1970. Manual of the Vascular Plants of Texas. Texas Research Foundation, Renner, Texas.

Galloway, L.A. 1975. Systematics of the North American desert species of *Abronia* and *Tripterocalyx* (Nyctaginaceae). Brittonia27: 328-347.

Johnston, M.C. 1988. The Vascular Plants of Texas [an updating], privately published by the author, Austin, Texas.

Reed, C.F. 1969. Nyctaginaceae, in Flora of Texas 2: 151-220.

Standley, P.C. 1909. The Allionaceae of the United States , with notes on the Mexican species. Contr. U. S. Nati Herb. 12: 303-389.

Turner, B.L., H. Nichols, G. Denny & O. Doron. 2003. Atlas of the vascular plants of Texas. Sida, Bot. Misc. 24:1-888.

SUBSCRIPTION INFORMATION

PHYTOLOGIA is published three times a year by the Warner Herbarium, P.O. Box 2012, Sam Houston State University, Huntsville, TX 77341-2012. Annual domestic individual subscription (3 issues): $30.00. Annual domestic institutional subscription (3 issues): $90.00. Foreign and/or airmail postage extra.

INFORMATION FOR AUTHORS

Articles from botanical systematics and ecology, including biographical sketches, critical reviews, and summaries of literature will be considered for publication in *PHYTOLOGIA*. Authors should arrange for two workers in the appropriate field to review the manuscript before submission. Copies of reviews should be forwarded to the editor with the manuscript. Additional review may occur for articles proposing significant nomenclatural changes and or revisions to established taxa. Effort will be made to locate a reviewer for author (s) if he/she desires. Articles should be submitted digitally, either by disk, CD or email. Language of manuscripts may be either English or Spanish. Format of articles should follow past issues of *PHYTOLOGIA*.

Cost of publication is currently $13.00 US per page for publication without reprints. PDF files of reprints will be made available to authors upon request. Page charges are due with manuscripts. No extra charges is made for line drawings or grey scale photos. Extra fees will be charged for color photos, the charge will be determined on an individual basis. Page chare deferment will be considered for graduate students currently enrolled in a masters or doctoral program.