

# THE SPECIES LILY

The Newsletter of the Species Lily Preservation Group  
Affiliated with The North American Lily Society



*L. pyrophilum*  
Spring, 2005

## SLPG GOALS

- \* Growing as many species lilies as possible, especially those rare and in danger of extinction.
- \* Making excess species bulbs available to members.
- \* Collecting, preserving, planting, growing and distributing species seed.
- \* Collecting all possible information on each species: its habitat, distribution, cultural needs, etc.
- \* Disseminating cultural information on each species.
- \* Assembling a slide and photo record of all species lilies.
- \* Identifying areas where specific species grow and seeking protection for these areas.

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Reprinting of Mark Skinner and Bruce Sorrie's article is made by kind permission of the Missouri Botanical Garden Press.

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Front Cover Photo: Ft. Jackson, Richland County, SC

Back Cover Photo: Moore County, NC.

### SLPG Membership Meeting

Winnipeg, Manitoba, Canada

14 July 2005

4:45 — 5:45 p.m.

Please attend and vote on the Bylaws changes.

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Conservation and ecology of  
*Lilium pyrophilum*,  
a new species of Liliaceae  
from the Sandhills region of the Carolinas and Vir-  
ginia, United States

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*Introduction.* For some time botanists in the Sandhills region have known of the existence of an unusual and perhaps undescribed true lily. In their flora of the Carolinas, Radford *et al.* (1968) mentioned robust *Lilium michauxii* Poiret plants in bogs that resembled *Lilium superbum* L. It is these plants, previously masquerading in herbaria under both those names, that we describe here as *L. pyrophilum*.

Since its recognition as distinctive in the mid-1970s (Russo, 1997), the taxonomic identity of this new lily has been debated. As Radford *et al.* (1968) suggested, it is similar to the other pendent-flowered lilies in the region, *L. michauxii* and *L.*

*superbum*. However, regional botanists recognized that the turk's-cap lily (*L. superbum*) *per se* does not occur in the lower part of the Piedmont, which is the hilly region between the Appalachian Mountains and the inner Atlantic Coastal Plain of which the Sandhills are a part. The Carolina lily (*L. michauxii*) is quite recognizable by its compact bulb, striking obovate leaves, fragrant flowers, and drier habitat. Speculation therefore centered on a link between the unknown lily and *L. iridollae* M.G. Henry, a rare endemic lily from the Panhandle region of Florida and adjacent Alabama (Henry, 1946). Indeed, natural heritage programs recorded Carolina populations of *L. pyrophilum* as *L. iridollae* (e.g., North Carolina Natural Heritage Program 1999), and early status reports commissioned because of *L. pyrophilum*'s rarity assumed the Carolina Sandhills lily populations represented a significant range extension for *L. iridollae*. This suggestion was well-founded because both overall morphology and the baygall (*Magnolia*, *Ilex*), *Sarracenia* bog, and streamhead habitats of these two species are closely similar. Others (Moretz and Smith, 1995) suggested that the unknown lily had been previously described from Mississippi as *L. gazarubrum* M.K. Roane and J.N. Henry (1980). However, we have examined lilies from very near the type locality of *L. gazarubrum* in Choctaw Co., Mississippi, and have also seen the type, and like Adams (1981), we conclude that *L. gazarubrum* can be accommodated within *L. superbum*. Extended field and herbarium study and unpublished morphometric analysis ultimately led us to determine that the lily described here is distinctive and new.

***Lilium pyrophilum*** M. W. Skinner and Sorrie, sp. nov. TYPE: U.S.A. North Carolina, Moore Co., Highway 73 near Pinehurst, 149 m, 4 Aug. 1995 (fl). *M.W. Skinner* 272 (holotype, GH), 271 (isotype, MO). Figures 1,2. [Figure 2 is all the small photos.]

*Bulb* a slowly growing scaly rhizome, horizontal and elongate, 2.4-2.8 x 5.2-8.6 cm, 0.3-0.5 times taller than long, lacking scales between the 2-3 bulb units that represent annual growth, the young end sometimes dichotomously branched at 120° from

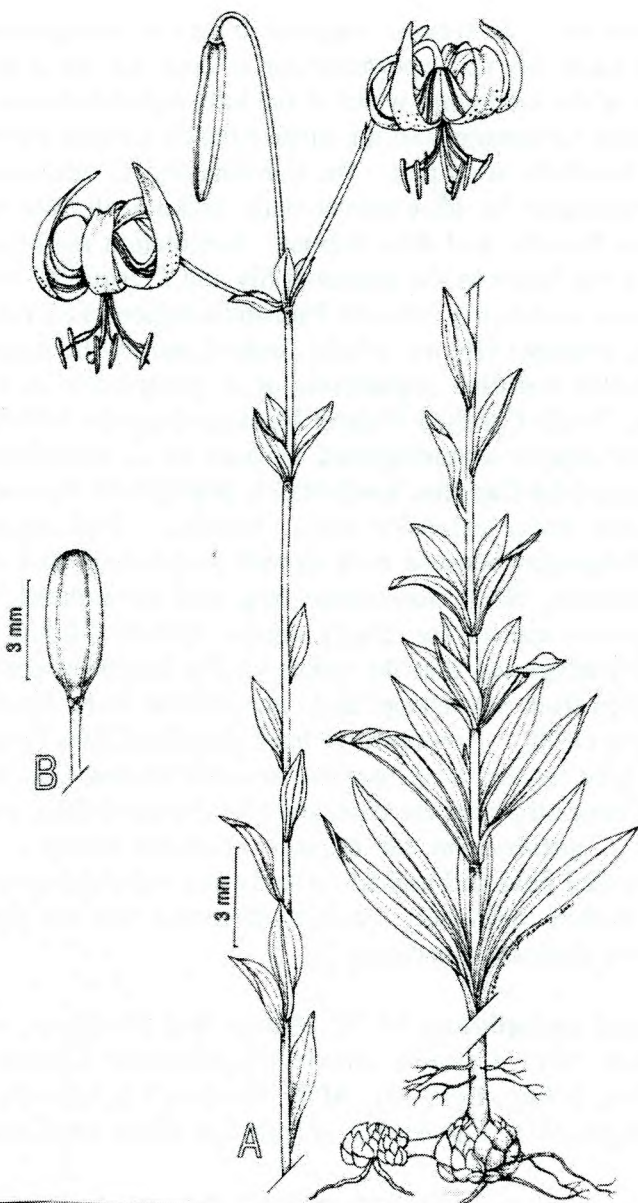
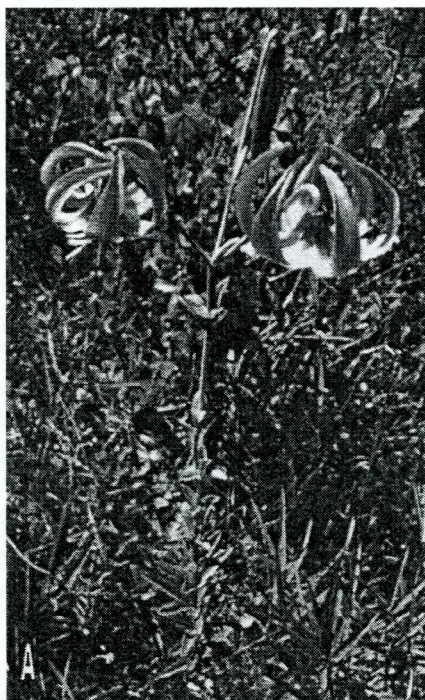


Figure 1. M.W. Skinner & Sorrie. A. Habit with bulb and flowers, based on the type collection (M.W. Skinner 272) from Moore County, North Carolina B. Capsule before opening

main axis; scales (modified leaves) numerous, fleshy and starchy, unsegmented, longest 1.1-1.9 cm, white; roots on each bulb mostly contractile and thus thick (to 5mm) and often concentrically wrinkled, a few thinner and fibrous. *Stems* to 1.6 m, erect,  $\pm$  glabrous, green, adventitious roots (stem roots) above the bulb sometimes present. *Leaves* numerous, simple, exstipulate and sessile, narrowly elliptic, 2.3-12.2 x 0.8-2.4 cm, 1.6-10.3 times longer than broad, apex acute (scarcely acuminate on upper stem), margin entire, usually glabrous, not undulate, green and somewhat lighter below, the major veins 3, these glabrous below, the lower leaves scarcely ascending or ascending, drooping at tip or



Habit of the type specimen  
(M.W. Skinner, (272)  
Moore Co., NC

not, upper ascending and appressed, (scattered or) in 0-12  $\pm$  proximal whorls of 3 or more leaves, 3-11(-15) per whorl. *Inflorescences* terminal, racemose (umbellate in small plants) and open, maturing acropetally, 1-7 flowered; bracts generally 1-2 per flower, often one broadly lanceolate and basal to the pedicel, the other narrowly lanceolate, adaxial, and attached near the middle of the pedicel; pedicels 6.8-16.5 cm. *Flowers* bisexual, pendent, shaped as a "turk's-cap", radial (or slightly vertically bilateral as flower matures), not fragrant; tepals free, reflexed 1/5-1/4 along length from base, red-orange or dusky red (magenta or pinkish, pale orange, red) apically to (pale) yellow (yellow-orange) centers to visibly green basally, magenta spots concentrated in proximal 1/2-2/3, sepals 3,  $\pm$  lanceolate and narrowed at the base, 6.7-8.9 x



Habit, Ft. Jackson  
Richland Co., SC

1.1-1.7 cm, glabrous, each with an ad-axial nectar-bearing surface basally and with two sharp parallel longitudinal median ridges abaxially, apex usually acute; petals 3 and similar to the sepals, 6.3-8.7 x 1.5-2.2 cm, apex acute, the basal nectaries less extensive than those on the sepals, with two rounded longitudinal median ridges adaxially; stamens 6, free, opposite the perianth parts, quite exserted; filaments parallel at first then widely spreading at 12-28°, 4.5 – 5.9 cm; usually pale green; anthers versatile, oblong, 1.1-1.8 cm when fresh, magenta (purple), becoming darker; pollen rust-colored, becoming lighter; pistil 1, compound, 3-lobed with 3 chambers, oblong, 3.4-6.4 cm; ovary superior, 1.5-2.8 cm; axile placentae 6; ovules as many as seeds, a few developing without embryos; style

1, round in cross-section, initially parallel to flower axis but generally elongating and curving toward periphery, pale green and often spotted purple; stigma 3-lobed. *Capsules* loculicidal, the valves 3, erect, ± oblong-obovate, with constricted base, not strongly winged, 2.8-4.7 x (1.3-)1.5-1.9 cm, 1.7-2.8 times longer than broad, green maturing brown. *Seeds* many, in 6 ranks, shape a flat 60° wedge, surface verrucose, light brown with darker ovate embryo in center.

*Etymology.* The epithet is from the Latin for “fire loving”, and is employed here because of the very frequent fires that are essential to main-



Rhizome, the next year's bulb at left  
Ft. Jackson, Richland Co, SC  
(M.W. Skinner 267)

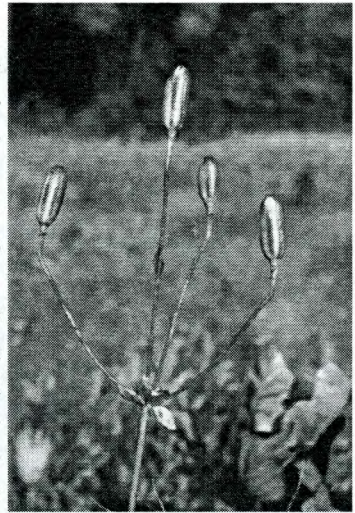


tain proper habitats for *L. pyrophilum*. Because the species is restricted to the Sandhills of the Carolinas and adjacent Virginia we propose the vernacular name of Sandhills lily.

*Phenology.* Flowers in summer (late July - mid Aug.); capsules mature in late October.

*Distribution.* The known range of *Lilium pyrophilum* extends from southeastern Virginia to south-central South Carolina, wholly within the Atlantic Coastal Plain. The great majority of populations occur within the Sandhills region, an area of rolling topography dissected by abundant blackwater streams. Although this physiographic region extends from the Carolinas to central Alabama, in terms of floristics and phytogeography the core area extends from Johnston County in east-central North Carolina to Richmond County in extreme east-central Georgia (Sorrie and Weakley, 2001). We have documented the lily from ten counties in North Carolina, four in South Carolina, and two in Virginia (Figure 3), at elevations ranging from 25-150 m.

The Sandhills region is a significant area of speciation within the North American coastal plain (Sorrie and Weakley, 2001), and many endemics have been recognized there. The following are distributed exclusively within the core Sandhills region, or have the majority of their populations there: *Astragalus michauxii* (Kuntze) F.J. Hermann, *Liatris cokeri* Pyne & Stucky, *Lycopus cokeri* Ahles ex B. Sorrie, *Physalis lanceolata* Michaux, *Pityopsis pinifolia* (Elliott) Nuttall, *Pyxidantha barbulate* Michaux var. *brevifolia* (Wells) Ahles, *Stylisma pickeringii* (Torrey ex M.A. Curtis) A. Gray var. *pickeringii*, *Vaccinium crassifolium* Andr anszky ssp. *sempervirens* (Anderson & Rayner) Kirkman & Ballington. *Lycopus cokeri* is a very fre-



Fruiting stalk from the type locality.  
Moore, Co., NC

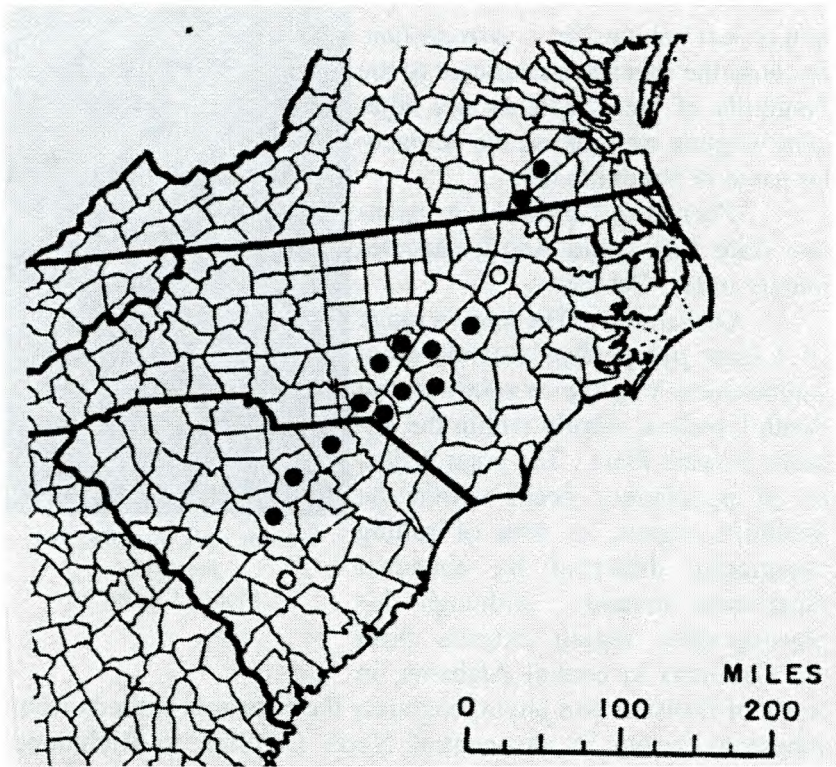


Figure 3. *L. pyrophilum* distribution in Virginia, North Carolina and South Carolina. Solid circles represent counties with extant populations documented since 1990, open circles counties where the species is historical (pre-1990) and presumed extirpated.

quent associate of *Lilium pyrophilum*, whereas *Liatris cokeri*, *Physalis lanceolata*, and *Pityopsis pinifolia* occur on adjacent dry to xeric slopes.

*Habitat: the physical setting.* The Sandhills region (also known as the Fall-line Sandhills) constitutes the innermost portion of the coastal plain and abuts the Piedmont physiographic province. The fall-line is a distinct geological boundary separating the younger Cretaceous and Tertiary age sediments to the east and the older Paleozoic formations to the west (Fenneman, 1938). Parent materials of the Sandhills are unconsolidated to partly con-

solidated sands, gravels, and clays.

Compared with the rest of the coastal plain, topography in the Sandhills is highly varied, with elevations that range from 30 to 180 m above sea level. The term "rolling hills" is apt; although the region is highly dissected, there are few sharp geomorphic features. Rock outcrops are scarce. Drainage creeks are abundant; most lie 10-30 m below the surrounding hilltops and small plateaus, whereas larger streams and rivers lie significantly lower. A number of large rivers traverse the Sandhills from their origins in the Piedmont or mountains. All drainages that originate in the Sandhills are dark tea in color due to high tannin content and are termed blackwater streams.

Upland soils in the Sandhills are acidic well-drained sands and loamy sands; subsoils may be sandy throughout, or have a clayey or loamy layer. Soils of streamheads and creeks are finer loams and loamy sands; those along rivers contain considerable organic matter.

*Habitat: plant communities.* *Lilium pyrophilum* occurs almost exclusively in ecotonal situations within the longleaf pine (*Pinus palustris* Miller) ecosystem. It inhabits narrow transition zones—usually two to ten meters—between dry longleaf pine-oak-wiregrass uplands and wet, wooded creeks and streamheads. Upland communities (usually longleaf pine-oak-wiregrass with scattered low shrubs) quickly give way to a shrub-cane-fern-herb ecotone, in turn replaced by a tree-shrub-sphagnum streamhead with flowing water. Due to the hilly topography of the Sandhills region and myriad drainage creeks, ecotonal habitats once were abundant across the landscape, but widespread fire suppression and conversion of streamheads to fishing ponds, farm impoundments, swimming ponds, and water reservoirs have severely reduced these plant communities.

Ecologists usually ally ecotonal communities of the Sandhills region with the adjacent wetland communities based on the substantial percentage of shared species vs. the much smaller percentage of species in common with adjacent uplands (Schafale and Weakley, 1990). Indeed, there is a mix of upland and wetland plants, but Sandhills ecotones support a significant number

of species that do not normally occur in either “parent” community. In fact, some of these species such as pine barren reedgrass (*Calamovilfa brevipilis* (Torrey) Scribner) and savanna cowbane (*Oxypolis ternata* (Nuttall) Heller) occur in the Sandhills only in ecotones and related seepage habitats. Phytogeographically, these plants may be considered a subset of those that are characteristic of wet savannas and flatwoods of the outer coastal plain of the Carolinas, particularly the colorful pitcherplants (*Sarracenia*), meadow-beauties (*Rhexia*), seedboxes (*Ludwigia*), milkworts (*Polygala*), orchids, sundews (*Drosera*), and yellow-eyed-grasses (*Xyris*).

*Lilium pyrophilum* is most closely associated with three distinctive wetland communities, as follows:

1. *Streamhead Pocosin*. This community occurs along headwaters of creeks and stream branches where seepage water from adjacent ecotones forms definite rivulets. It extends downstream as long as such seepage is important to plants relative to stream flooding. The term “pocosin” is used because the usually dense evergreen shrubs and sparse canopy are reminiscent of true pocosins that develop on peat that accumulates on flatter and younger portions of the coastal plain (Schafale and Weakley, 1990, Sharitz and Gibbons, 1982). Typical shrubs and vines are titi (*Cyrilla racemiflora* L.), fetterbush (*Lyonia lucida* (Lamarck) K. Koch), inkberry (*Ilex glabra* (L.) A. Gray and *I. coriacea* (Pursh) Chapman), highbush blueberry (*Vaccinium formosum* Andréanszky and *V. fuscatum* Aiton), sweet pepperbush (*Clethra alnifolia* L.), evergreen bayberry (*Myrica heterophylla* Rafinesque), redbay (*Persea palustris* (Rafinesque) Sargent), poison sumac (*Toxicodendron vernix* (L.) Kuntze), and blaspheme vine (*Smilax laurifolia* L.). Trees may be sparse or fairly dense, with tuliptree (*Liriodendron tulipifera* L.), pond pine (*Pinus serotina* Michaux), swamp black gum (*Nyssa biflora* Walter), red maple (*Acer rubrum* L.), sweetbay (*Magnolia virginiana* L.), and occasionally Atlantic white cedar (*Chamaecyparis thyooides* (L.) B.S.P.). Sphagnum moss is usually abundant and cane (*Arundinaria tecta* (Walter) Muhlenberg) frequent to common.

Streamhead Pocosin ecotones are normally dominated by

low shrubs and cane down-slope and herbs and graminoids up-slope, but complex patterns may be produced depending on soil moisture and disturbance. Woody plants are kept short by recurring fires (or mowing in powerlines). Prominent shrubs are dangleberry (*Gaylussacia frondosa* (L.) Torrey & A. Gray ex Torrey), *Clethra alnifolia*, *Ilex glabra* and *I. coriacea*, maleberry (*Lyonia ligustrina* (L.) DC.), swamp azalea (*Rhododendron viscosum* (L.) Torrey), blueberries (*Vaccinium crassifolium* and *V. tenellum* Aiton), dwarf witchalder (*Fothergilla gardenii* L.), and honeycups (*Zenobia pulverulenta* (Bartram ex Willdenow) Pollard). Important grasses include *Ctenium aromaticum* (Walter) Wood, *Muhlenbergia expansa* (Poiret) Trinius, *Aristida virgata* Trinius, *A. stricta* Michaux, *Dichanthelium* spp., *Panicum virgatum* L. var. *cubense* Grisebach, *Andropogon glomeratus* (Walter) B.S.P., *Calamagrostis coarctata* (Torrey) Eaton, and *Calamovilfa brevipilis*. Conspicuous sedges include *Rhynchospora* spp. (up to a dozen taxa), *Carex glaucescens* Elliott, *C. turgescens* Torrey, *Eleocharis tuberculosa* (Michaux) Roemer & Schultes, *E. tortilis* (Link) Schultes, and occasionally *Eriophorum virginicum* L. Other frequent monocots include *Juncus trigonocarpus* Steudel, *Eriocaulon decangulare* L., and *Lachnocaulon anceps* (Walter) Morong. The majority of *Lilium pyrophilum* populations occur in the mid to lower portions of this ecotonal habitat type, and only rarely in the Streamhead Pocosin proper.

*1.a. Canebrake Variant.* Where burned very frequently, Streamhead Pocosins support fewer trees and shrubs. These are replaced by dense stands of *Arundinaria tecta* called canebrakes. Species diversity is low relative to normal streamhead communities, although ectones remain diverse. Only small populations (1 to 5 plants) of *Lilium pyrophilum* occur in this habitat type.

*2. Sandhill Seep.* This community occurs on slopes where the clay layer abruptly forces water to the surface, usually where there is a sudden increase in the angle of the slope. Sandhill Seeps occur within the upland pine-oak-wiregrass community as a patch of shrubs, ferns, and cane that form a "rim" across the slope. They may be connected to Streamhead Pocosins and Small Stream Swamps, and may have perennially active seepage or be

merely moist. Once numerous in the Sandhills region, high quality examples are now rare due to fire-suppression. *Lilium pyrophilum* appears to be rare in this habitat.

3. *Coastal Plain Small Stream Swamp*. This community occurs downstream from Streamhead Pocosins where water volume is great enough to cause frequent flooding following rainstorms. It is dominant along the major blackwater streams through the Sandhills region. Canopy dominants are *Nyssa biflora*, loblolly pine (*Pinus taeda* L.), *Acer rubrum*, willow oak (*Quercus phellos* L.), water oak (*Q. nigra* L.), sweetgum (*Liquidambar styraciflua* L.), and scattered pond cypress (*Taxodium ascendens* Brongniart). Subcanopy trees include American holly (*Ilex opaca* Aiton), *Cyrilla racemiflora*, *Persea palustris*, and *Magnolia virginiana*. Shrubs and vines vary from sparse to dense and include doghobble (*Leucothoe axillaris* (Lamarck) D. Don), blackberry (*Rubus argutus* Link), *Smilax laurifolia*, greenbrier (*Smilax rotundifolia* L.), sawbrier (*Smilax glauca* Walter), poison ivy (*Toxicodendron radicans* (L.) Kuntze), sweetspire (*Itea virginica* L.), and crossvine (*Bignonia capreolata* L.). Herbs are poorly represented, except in light gaps and right along the streambanks. Due to the persistently saturated soils, fire is only a minor component of the ecology of this community. Ecotones to Small Stream Swamps are generally less diverse than those of streamheads due to diminished seepage from adjacent uplands. Only small populations (1 to 5 plants) of *Lilium pyrophilum* occur in these ecotones.

*Rarity, management, and conservation.* *Lilium pyrophilum* is a very rare plant with clearly defined threats. It is highly vulnerable due to rarity within its limited range and patchy habitat, widespread land conversion to other uses, and modern suppression of fires. Today it survives on properties on which prescribed fire is a management tool or where periodic cutting or mowing takes place, such as in powerline and gasline rights-of-way.

The total number of individual plants documented at the 42 known extant (1990-present) populations is approximately 205; there are eleven populations represented only by historical

Ownership	Type of Protection	Populations	Individuals
Private	none	3	16
National wildlife refuge	passive	1	2+
Military Reservations:			
Camp Mackall	passive	2	2
Fort Bragg	passive	21	63
Fort Jackson	passive	1	7
State forest	passive	1	1+
State game land	passive	5	15
Private with utility easement	Management agreement	6	89
State park	active	1	7
Private conservation	active	1	3

Table 1. Summary of protection of known *L. phyrophilum* populations.

(pre-1990) collections. The six largest extant populations number 42, 25, 15, 12, 11, and 10 individual plants; all others hold fewer than 10 plants each, with most limited to 1 to 3 individuals.

Fortunately, nearly all populations receive protection (Table 1) that varies from active conservation to management agreements to passive conservation. Thirty-nine of 42 extant populations and 189 of 205+ total plants are protected at some level. Although this degree of protection is encouraging despite the small overall population, future prospects remain uncertain. Even if landowners are aware of the lily on their property and wish to foster it, most do not have the resources available to monitor populations nor to conduct specific management protocols. Lilies survive on several properties not as a result of management activities targeted at the plants, but because of the general use of prescribed fire to improve habitat for federally endangered red-cockaded woodpeckers, for improved military troop

maneuverability, and for forestry management. On Fort Jackson in South Carolina, exploding ordnance starts the frequent fires that contribute most to habitat maintenance. In utility rights-of-way, lilies survive because periodic cutting to promote human access reduces competition from encroaching woody plants. More sobering is the realization that all four unprotected populations occur on private land in fire-suppressed situations. The general lack of burning within the private sector foretells slim prospects for finding significantly more lilies.

The Sandhills lily currently occupies an extremely narrow range of plant communities and there is no evidence to suggest that it formerly had wider ecological amplitude. Like its close relative *L. iridollae*, it appears to be a habitat specialist that requires the unusual combination of saturated soils and periodic fire. Within the Sandhills region other rare Carolina endemics such as *Kalmia cuneata* Michaux and the federally endangered *Lysimachia asperulifolia* Poiret also share these requirements. Each inhabits the inner portions of the ecotone where shrubs and/or cane are dominant, rather than laterally where graminoids prevail. Disturbance in the form of periodic fire (or cutting of utility rights-of-way) provides a release from competing shrubs and tree saplings, followed by a brief period of a few years when flowering and fruiting take place.

Although we acknowledge the ecological importance of fire to this new lily, we also realize that frequent fire is not a panacea for all members of the longleaf pine ecosystem. Each has its own limits of fire tolerance with regard to frequency, seasonality, and intensity. Research is needed on the specific effects of fire on *Lilium pyrophilum*. That nearly as many lilies exist in powerlines and gaslines as in areas that burn frequently suggests that mechanical disturbance may be important as well. But what form, if any, did this disturbance take in pre-settlement times? Is it an adequate long-term substitute for fire? To our knowledge no public utility uses fire as a management tool; it should be tried where practicable and compared with traditional cutting. The use of herbicides in rights-of-way is a concern—



does it affect the lily? If so, widespread use of herbicides may significantly reduce chances of finding additional populations of Sandhills lily.

Populations of rare lilies in North America have been decimated in the recent past by collectors and fanciers who hope to appreciate these plants in their home gardens (Skinner and Pavlik, 1994). These misguided efforts usually end in failure due to the highly specific habitat requirements of most geographically restricted lilies. We encourage botanists and plant lovers to appreciate these plants in the field, and caution that removal of plants from most populations would be in violation of existing state or federal laws.

Biologists and land managers continue to find new populations, but overall numbers remain extremely low. Therefore, we recommend that the US Fish and Wildlife Service consider *Lilium pyrophilum* for listing under the federal Endangered Species Act, and urge state protection as well.

*Similar species.* *L. pyrophilum* is one of a monophyletic group of lilies (Skinner, 2001) that also includes *L. superbum* (turk's-cap lily), *L. michauxii* (Carolina lily), and *L. iridollae* (Panhandle lily). This species group is characterized by a generally southern distribution in the United States, green styles, large flowers (sepals 5.7 – 10.5 cm) with large anthers (1.0 – 2.6 cm), buds that are triangular in cross-section, generally smooth-margined and smooth-veined leaves, sepals with two abaxial longitudinal ridges, and whitish bulbs. The remaining *Lilium* of eastern North America with pendent flowers also represent a well formed clade marked by a primarily northern distribution, red styles, smaller flowers (sepals 3.2 – 9.3 cm) with smaller anthers (0.4 – 1.3 cm), round buds with smooth backs, scarious-margined and scarious-veined leaves that are therefore noticeably rough, and bulbs that are yellow or become so with age. This group includes Gray's lily (*L. grayi* Watson), Canada lily (*L. canadense* L.), and Michigan lily (*L. michiganense* Farwell). A key to *L. pyrophilum* and allies follows:

KEY TO THE *LILIIUM* SPECIES OF THE EASTERN UNITED STATES WITH PENDENT FLOWERS, GREEN STYLES, TRIANGULAR BUDS, AND TWIN ABAXIAL SEPAL RIDGES

1. Leaves strongly oblanceolate, noticeably pale beneath, somewhat fleshy; flowers strongly fragrant.

.....*Lilium michauxii*

1. Leaves elliptic or weakly oblanceolate, scarcely pale beneath, thin; flowers not fragrant.

2. Rhizomes with 3-4 annual bulbs, 9.6-18.4 cm, scaleless sections between annual bulbs 2.7-5.4 cm; bulb scale leaves or their abscission scars present; leaves subtly oblanceolate; flowers yellow-orange, 1-3; coastal Alabama and west Florida.....*Lilium iridollae*

2. Rhizomes with 2(-3) annual bulbs, 5.2-10.2 cm, scaleless sections between annual bulbs 0.3-3.8(-4.6) cm; bulb scale leaves or their abscission scars absent; leaves ± narrowly elliptic; flowers orange or reddish, 1-20 or more; south and east United States.

3. Plants 1.2-2.8 m; leaves 7.1-26.1 cm, 3.9-18.4 times longer than broad, usually horizontal or drooping, in 6-24 whorls of 3 or more; flowers red-orange (red, orange) to yellow (yellow-orange) to green basally, 1-20 or more; Louisiana to Missouri, east to Florida and New Hampshire.....*Lilium superbum*

3. Plants 0.63-1.6 m; leaves 2.3-10.3(-12.2) cm, 1.6-7.6(-10.3) times longer than broad, usually ascending, in 0-12 ± proximal whorls of 3 or more; red-orange or dusky red (magenta or pinkish, pale orange, red) apically to (pale) yellow (yellow-orange) centers to green basally, 1-7; Sandhills of Virginia and North and South Carolina.

.....*Lilium pyrophilum*

Of the four taxa, *L. michauxii* is the most derivative and is easily distinguished by its strongly obovate or oblanceolate leaves which are few in number, darker green above and lighter below,

fleshy, and undulate along the margins. Its compact bulb, preference for well-drained sites, and delicately scented flowers with exceedingly wide petals (1.8-2.9 cm) are also distinctive. It is the only pendent lily sympatric with *L. pyrophilum*. *L. iridollae* is narrowly endemic to Escambia, Santa Rosa, Okaloosa, and Walton counties in the western Florida panhandle and Baldwin, Escambia, and Covington counties in adjacent Alabama, and it is allopatric to *L. pyrophilum*. Although its habitat within the long-leaf pine ecosystem is similar, it is morphologically divergent by virtue of an elongate rhizome that retains 3-4 years growth, the presence of basal (winter) leaves (otherwise known in North American lilies only in the distantly related pine lily, *L. catesbaei* Walter), subtly oblanceolate stem leaves, and particularly long pedicels (to 23 cm vs. a maximum of 19 in the other three species). Its vibrant and uniformly orange-yellow flowers are usually diagnostic as well.

*L. superbum* is more similar to the Sandhills lily than other congeners. It occurs directly to the north and east of the limited range of *L. pyrophilum*, but is absent to the west through the Piedmont; it then reappears along the Appalachian spine. Overlap in blooming times of the two taxa is moderate (Table 2), thus reproductive isolation is achieved geographically and to some degree phenologically. As its name suggests, *L. superbum* is taller and more robust than the other lilies within its general range, including *L. pyrophilum* (Table 2). It bears more and larger flowers, has longer and relatively narrower leaves, and has more whorls of 5 or more leaves (Table 2), and these are rather evenly spaced along the stem. *L. pyrophilum* typically has the leaf whorls concentrated toward the bottom of the stem, and the leaves are strongly ascending, which is often characteristic of lilies that occur in very high light environments. Of subtle importance is the shape of the floral tube, which is slightly longer and more tubular in *L. pyrophilum* than in *L. superbum* (Table 2).

This *may* be related to pollinator effectiveness (Skinner, 1988), as the Sandhills lily is pollinated at least partially by hummingbirds whereas *L. superbum* is almost entirely swallowtail

	<i>L. pyrophilum</i>	<i>L. superbum</i>
DistrLinnaeus)ibution	Sandhills of SC, NC and VA	Coast and mountains from NH to NC, MO, LA and FL
Habitat	Streamhead pocosins, sandhill seeps, swampy streams, wet utility lines; fires extremely frequent (every 1-3 years)	Rich, moist woods, roadsides, streamsides; fires vary (every 1-100 years)
Blooming period	Peak in early Aug. (late July to mid Aug.)	Peak in mid-late July (July to early Aug.)
Pollinators	Ruby-throated hummingbirds ( <i>Archilochus colubris</i> Linnaeus) and palamedes swallowtails ( <i>Papilio palamedes</i> Drury), probably other swallowtails, including spicebush ( <i>P. troilus</i> Linnaeus); relative importance of bird and butterfly pollinators unknown.	Large swallowtails, esp. spicebush, also tiger ( <i>P. glaucus</i> Linnaeus) and pipevine ( <i>Battus philenor</i> Linnaeus).
Plant height (cm) P << 0.001	103.4 (63-160) [27]	174.4 (18-280) [31]
Rhizome height P = 0.02	26.0 (23.9-28.1) [4]	33.4 (23.5-43.9) [17]
Rhizome longest scale (mm) P = 0.09 (not significant)	15.5 (11-18.9) [4]	21.8 (11.8-39.3) [17]
Leaf arrangement	Usually whorled, whorls often clustered toward bottom of plant, lower leaves scarcely ascending or ascending, drooping at tip or not, upper ascending and appressed to stem narrowly (to broadly) elliptic	Always whorled, whorls evenly spaced on stem, leaves horizontal and drooping at tips, upper leaves often ascending in sun, (very) narrowly elliptic (to scarcely oblanceolate)
Leaf shape	Narrowly (to broadly) elliptic	(very) narrowly elliptic (to scarcely oblanceolate)
Leaves per plant P << 0.001	51 (29-102) [27]	96.5 (40-186) [31]
Whorles per plant of 5 or more leaves	3.9 (0-10) [27]	8.4 (3-14) [31]
Leaf length (mm) P << 0.001	62.2 [23-103 (-122)] [206]	138.8 (71-261) [205]

Table 2. Major differences between *L. pyrophilum* and *L. superbum*. Measurements are means, (ranges) and [sample sizes]; p values indicate the probability that the samples are from the same statistical population, and are from independent sample T-tests performed using Statistica (1999). Fire frequencies are from Frost (1998).

	<i>L. pyrophilum</i>	<i>L. superbum</i>
Leaf length/width ratio P << 0.001	4.1 {1.6-7.6 (-10.3)} [206]	9.9 (3.9-18.4) [205]
Flower color	Muted orange-red or yellow-orange with red dusting on tips (variable and sometimes reddish pink, red-orange, magenta, dusky red, or salmon), grading to (pale) yellow (yellow-orange) centers to green at base; maroon spots often large	(pale) red-orange (pale red, red, orange, yellow scarcely suffused with red) grading to yellow (yellow-orange) to green at base; magenta (maroon) spots only in yellow and often large
Flowers per plant P << 0.001	1.7 (1-7) [57]	3.7 (0-22) [299]
Sepal length (mm) P = 0.014	78.1 (67-89) [25]	83.5 (68-105) [37]
Floral tube length (mm) P << 0.001	17.9 (13.1-24.3) [25]	13.0 (8.9-16.5) [37]
Capsule length (mm) P = 0.001	38.9 (28.2-47.0) [21]	45.3 (28.8-61.5) [23]

Table 2 continued

butterfly-pollinated, notwithstanding infrequent visits from hummingbirds. This longer, thinner tube sometimes obscures the noticeable “green star” that is formed by the six areas of nectary tissue in the widely flaring *L. superbum*; instead *L. pyrophilum* often displays a green triangle formed only by the sepal nectaries.

The rhizomes of *L. pyrophilum* and *L. superbum* are closely similar, though the latter tends to grow from a larger bulb as befits its greater stature. *L. superbum* also has a tendency toward longer scales that are two-segmented rather than entire, and a more marked tendency toward clonal growth that is a result of repeated dichotomous branching within the rhizomes.

*Phytogeography and theories of origin.* We propose three alternatives for the origin of the new taxon. The authors do not necessarily agree on the likelihood of each, but we feel that carefully chosen molecular evidence might be conclusive.

1. As a peripherally isolated derivative of *L. superbum* or its ancestor. This theory acknowledges the phenotypic similar-

ity between these two species and their current lack of sympatry.

2. Hybrid origin. Throughout its limited range *L. pyrophilum* co-occurs with *L. michauxii*, but it overlaps scarcely if at all with *L. superbum* in the coastal plain of southeastern Virginia. It is conceivable that *L. pyrophilum* arose through past contact between these other two species and has evolved its own suite of morphological, biological, and ecological characteristics. Today, *L. superbum* and *L. michauxii* are sympatric over a large area of mountains and piedmont from Virginia to Alabama. Though they rarely produce hybrids (Adams 1982), the possibility of hybrid origin cannot be excluded as physical conditions and plant genotypes are fluid. Hybrids between *L. michauxii* and *L. pyrophilum* are known from disturbed habitats associated with utility rights-of-way, and are best recognized by the fine tepal spots and broad petals of the former species. Whether they occur in more natural settings is uncertain.

3. Common ancestry with *L. iridollae*. Eleven vascular plant species occur in the Sandhills region of the Carolinas as disjuncts from the Gulf region where *L. iridollae* grows (Sorrie et al., 1997; Sorrie and Weakley 2001), and a number of others share essentially the same pattern of disjunction. Some of these species occur in the same streamhead habitats as *L. pyrophilum*, including *Carex turgescens* Torrey, *Eriocaulon texense* Koern., *Rhynchospora leptocarpa* (Chapman ex Britt.) Small, *R. macra* (C.B. Clarke) Small, *R. oligantha* A. Gray, *Xyris chapmanii* Bridges & Orzell, and *X. scabrifolia* Harper. It may be significant that these same species also co-occur with *Lilium iridollae* in the Gulf Coastal Plain, and it suggests that the historical events that introduced these grasslike species to the Sandhills may also have brought a common ancestor of *L. iridollae* and *L. pyrophilum* into that region.

The specimens cited below (herbarium acronyms are listed in full in the Acknowledgments) represent seven extant (1990-present) populations, each in a distinct county (the Lee Co., North Carolina historical collection from 1961 has recently been verified to represent an extant population), and eleven historical

populations (collected prior to 1990). Most of these historical populations have been surveyed but habitat is generally degraded and we assume the plant is extirpated at each location. Four counties—Nash and Northampton in North Carolina and Kershaw and Orangeburg in South Carolina—are represented only by historical specimens collected before 1990. There are current sight records (North Carolina Natural Heritage Program and South Carolina Heritage Trust databases, 1999) from 35 additional populations that add four additional Carolina counties to the total with extant populations, as well as a sight record from one additional county of Virginia, Sussex Co. (B. Van Eerden, personal communication). Thus *L. pyrophilum* is currently known from 42 populations in 12 counties, and historically at 11 populations in these and four additional counties.

*Paratypes*. U.S.A. **North Carolina**: Cumberland Co., 6.8 mi S of Fayetteville on NC 87, 7 Aug. 1957, *H.E. Ahles* 33525 (GA, NCU). Harnett Co., wet soil by route 53, 1 mi S of Pineview, 1 Aug. 1927, *H.R. Totten s.n.* (NCU); Fort Bragg Military Reservation, Northern Training Area, seep and pocosin complex, 6 Aug. 1993, *B.A. Sorrie* 7512 with *B. Van Eerden* and *T. Hippensteel* (NCU) and 3 Aug. 1995, *M.W. Skinner* 270 (GH). Hoke Co., pocosin border 3.9 mi W of Montrose, 9 Aug. 1957, *H.E. Ahles* 33802 (NCU). Johnston Co., streamhead under powerline, 20 July 1999, *P. McMillan* 3900-a with *E. Hajnos* (CLEMS). Lee Co., wet seepage along railroad, 2 mi S of Lemon Springs, 29 July 1961, *A.E. Radford* 44148 (NCU). Moore Co., open shrub bog, Hog Island, SR 2026, 31 July 1974, *J.H. Carter III* 1003 (wwh); seepage areas in powerline near Pinehurst, 9 Aug. 1992, *B.A. Sorrie* 6746 (bas) and 7 Aug. 1993, *B.A. Sorrie* 7513 (NCU). Nash Co., recently burned dry pocosin on US 64, 2 1/2 mi SW of Nashville, 22 July 1949, *W.B. Fox* and *R.K. Godfrey* 2734 (NCSC). Northampton Co., low undrained roadside 3 mi N of Jackson, 2 Aug. 1958, *J.W. Hardin* 910 (NCSC). Richmond Co., peat sedge bog near US 1, 5 mi N of Rockingham, 24 July 1956, *A.E. Radford* 14323 (NCU); seepage bog in powerline near Sandhills Game Land, 27 July 1997, *B.A. Sorrie* 9367.5 (bas) and 4 Aug.

2000, *B.A. Sorrie 10584* (NCU). Richmond/Scotland Co., near Pine Lake, 30 July 1933, *F. Smith s.n.* (DUKE). **South Carolina:** Chesterfield Co., peat sedge bog 8 mi E of Patrick, 11 Aug. 1956, *A.E. Radford 15809* (NCU). Kershaw Co., powerline crossing of a cleared pond pine pocosin, dirt road off US 1, 3 Sept 1982, *D.A. Rayner 1496* (USCH). Orangeburg Co., boggy woodland border 3 mi NE of Orangeburg on SC 33, 19 July 1957, *H.E. Ahles 31685* (NCU). Richland Co., Fort Jackson Army Installation, South Impact Area, 15 April 1992, *J.B. Nelson 12269* (USCH) and 1 Aug. 1995, *M.W. Skinner 267* (GH). **Virginia:** Greenville Co., W of Jarratt in powerline, diverse seepage wetland, 8 Aug. 1991, T.J. Rawinski 11,471 (VPI).

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## Proposed Bylaws Changes

The SLPG board has voted to recommend the following proposed Bylaw changes to be voted on at the upcoming SLPG Membership meeting at Winnipeg this July. Last year the Board divested itself from the finances of the Conservator in the growing and selling of species lily bulbs. The benefit to the group is that high quality species bulbs are available to the membership and the SLPG does not get involved with the finances and profit of this endeavor, thereby not endangering our status as a not-for-profit organization.

The Board also proposes to change the language of the Bylaws concerning the Conservator so the SLPG can appoint one or more Conservators. We need to be thinking ahead to keep a supply of high quality species bulbs available to our members. The Conservator/s receives an endorsement from the group with the intent of providing high quality bulbs. Limiting the term of the conservator/s keeps the Board aware of the conservator/s activities and interest. The yearly term will give the Species Group the option to discontinue endorsement of an appointed conservator if it believes what has happened in the prior year is not in the best interest of the group.

I hope you will consider these recommended changed and repond with an affirmative vote in July.

Warren Summers, President

### SECTION III. CONSERVATIONIST

#### ARTICLE I. (Current language)

The conservator shall be appointed [yearly] or [for an indefinite term] by the board of directors at its annual meeting.

#### ARTICLE I. (Proposed change)

The conservator/s shall be appointed yearly by the board of directors at its annual meeting.

**ARTICLE II. (Current language)**

The conservator shall grow and distribute species lilies with an emphasis on those listed as being threatened or endangered, consistent with the goals of Section III, Article III below.

**ARTICLE II. (Proposed change)**

The conservator/s shall grow and distribute species lilies with an emphasis on those listed as being threatened or endangered, consistent with the goals of Section III, Article III below.

**ARTICLE III. (Current language)**

The conservator shall meet the guidelines set by the board of directors and run operations under the budget approved by the board. The conservationist shall present a copy of the year's proposed budget to the board of directors at least one month before the annual meeting.

**ARTICLE III. (Proposed change)**

The conservator/s shall meet the guidelines set by the board of directors. The conservator/s shall pay all expenses for and receive all profits from the sale of species lily bulbs.

**SECTION IV. BOARD OF DIRECTORS**

**ARTICLE II. (Current language)**

The board of directors shall consider proposals made to the group and make their considered recommendations to the members at the annual meeting. Proposals may be made by individual members through the president or secretary of the group.

The board of directors shall determine guidelines for the conservator and approve the conservator's budget yearly.

**ARTICLE II. (Proposed change)**

The board of directors shall consider proposals made to the group and make their considered recommendations to the members at the annual meeting. Proposals may be made by individual members through the president or secretary of the group.

The board of directors shall determine guidelines for the conservator/s.

