Plant Communities of the SCNPS Canby's Dropwort Preserve

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The SCNPS now has its very own Preserve, the 52 acre Canby's Dropwort Preserve (CDP from now on), in Bamberg County. As you probably know, this Preserve was essentially a gift to SCNPS from Nature Conservancy, as the latter organization is trying to divest itself of smaller landholdings to concentrate on landscape scale management. On the other hand, protection of individual populations of rare and threatened plants, including the federally endangered Canby's Dropwort (*Oxypolis canbyi*), fits well with the mission of SCNPS. In addition to *Oxypolis canbyi* itself, the entire wetland ecosystem it inhabits is rare and endangered. For example, in South Carolina over 90% of Carolina Bays over 1.2 ha (around 3 acres) in size have been ditched or destroyed (Edwards and Weakley 2001, based on Bennett and Nelson 1991). Across the southeastern Coastal Plain as a whole, over a third of all rare plant species as recognized by state Heritage Programs inhabit depressional wetlands (Sutter and Kral 1994, Edwards and Weakley 2001).

Overall, the acquisition of the CDP presents a tremendous opportunity to SCNPS to manage and restore our own property. This is a pleasant change since up till now all we have had a chance to do is to indirectly influence public land management.

As a first step in planning our management strategy, SCNPS President John Brubaker and I made a very preliminary inventory of the site last 20th July. This article presents the results of our investigations. Also I have tried to summarize some of the pertinent ecological and botanical literature and discuss restoration issues.

First of all, we do indeed have Canby's Dropwort at the CDP. This is something of a relief because Nature Conservancy had not seen the plant in recent years and the bay in which the plant was living had been dry for an extended period. Indeed, observations by botanist and fellow SCNPS member Pat McMillan suggested that *Oxypolis canbyi* had declined greatly statewide due to the severe drought of the late 1990's and early 2000's. However, on our visit the bay was flooded and, lo and behold, there was the plant, growing in waist high water. All told, we saw a couple of patches numbering perhaps twenty plants total. Not a large population, but much better than locally extirpated.

Incidentally, for those not familiar with *Oxypolis canbyi*, it is a perennial herbaceous plant in the carrot family. The carrot family, or Apiaceae (formerly Umbelliferae) is distinguished by having flowers in umbels which are defined in Godfrey and Wooten (1981) as "a flat or convex flower cluster in which the flower stalks arise from a common point". The cowbanes or dropworts, i.e. the genus Oxypolis, consists in the southeastern USA of a relatively few species of wet sites, all of them rather rare or uncommon. In South Carolina we have four species of dropworts. *Oxypolis rigidior* lives mostly along swamp ecotones and is probably the most common cowbane. *Oxypolis ternata* is a very rare species of pristine wet pine savannas. Oxypolis filiformis is an uncommon plant of wet savannas, bogs and cypress depressions. And lastly there is Oxypolis canbyi itself which occurs in "natural depressional wetlands in the Coastal Plain from southwest GA through SC to southeastern NC" (Weakley 1999). It is also found in Maryland and formerly ranged as far north as Delaware, but is now extirpated from that part of its range.

With respect to plant recognition, the main problem is that *O. canbyi* and *O. filiformis* are very similar in appearance and can occur in the same habitat. Both plants are tall and relatively unbranched with stems circular in cross section and phyllodial leaves. This means that rather than typical broad or even grass-like leaves, the leaves tend to resemble truncated conical stems. The true botanical definition, according to Godfrey and Wooten (1981) is "an expanded bladeless petiole". Since a petiole is ordinarily the basal part of the leaf stalk that serves to attach the blade to the stem, a phyllode is simply an extension of the basal stalk that replaces the leaf blade. *O. canbyi* tends to have somewhat finer phyllodes than O. filiformis, but the only reliable way to distinguish the two for most botanists is to observe the fruits. Both species have winged planar fruits, but whereas *O. filiformis* has rather narrow delicate wings, O. canbyi has thick, corky ridges.

As Weakley (1999) indicates, O. canbyi typically inhabits depressional wetlands prone to long periods of inundation, particularly clay-based Carolina Bays in the inner Coastal Plain. The CDP is indeed located in the inner Coastal Plain but my impression at this point is that the depression inhabited by Canby's Dropwort is not actually a Carolina Bay though I may be wrong. As most of you know, the Carolina Bay is a unique geomorphic feature found only in the Carolinas. Carolina Bays are easily identified by aerial photo as elliptical depressions oriented along a northeast-southwest axis. I have not yet seen an aerial photo of the CDP site. Based on our site visit I suspect that the Oxypolis depression originated as a lime sink (i.e. a hole dissolved out of limestone bedrock) and is not a true Carolina Bay. For convenience Carolinians often refer to any large wetland depression as a bay and I will follow that convention here. From the plant point of view the distinction is of doubtful importance as long as the hydrological characteristics are similar. As noted above, *O. canbyi* is only one of numerous rare and threatened species that depend on isolated freshwater wetlands including limesink depressions and Carolina Bays. In a recent article, Edwards and Weakley (2001) catalogued 197 species of rare and threatened vascular plant species that occur in these habitats.

As one might expect, the plant community surrounding our Canby's Dropwort population is composed of other species tolerant of prolonged inundation. The two dominant grasses in the deepwater part of the bay are *Leersia hexandra* (Southern Cutgrass) and *Panicum hemitomon* (Maidencane). Weakley states that L. hexandra is uncommon in the Carolinas (1999) and describes the habitat as "clay based Carolina Bays, limesink ponds, lakes, pools, usually in places where periodically or seasonally inundated". Weakley (1999) also notes, interestingly enough, that L. hexandra, though a characteristic species of pristine wetland habitats in its native range, and not at all weedy, is in fact a noxious weed where it has been introduced into the new and old-world tropics. It may also be of interest that the related Catchfly Cutgrass (*Leersia lenticularis*), is also very tolerant of inundation but inhabits closed hardwood bottomland forests (e.g. along the Santee River in the Francis Marion NF) and swamps rather than open bays. An interesting identification character for the cutgrasses (*Leersia spp.*) generally is that the minute bracts covering the florets (miniature grass flowers) are covered with stiff spiny hairs. *L. hexandra* is also distinctive in that there is a distinct indentation in the stem at each joint, or node in grass terminology.

As noted above, the other dominant grass in the Oxypolis bay is Maidencane (*Panicum hemitomon*). A distinctive feature of this grass is its tendency to root prolifically at the nodes, particularly on the lower inundated part of the stem. Maidencane can be found in a wide variety of deepwater habitats, and is less confined to open bay situations than L. hexandra (Weakley 1999). Wetlands plant ecologist Dr. Kay Kirkman, in a very interesting laboratory study (Kirkman 1993), discovered that the capacity of Maidencane to withstand prolonged inundation depended on the presence of dead stalks of the previous year's growth, which function to channel oxygen to the roots. If the dead stalks are submerged for long periods, or consumed by winter fires, Maidencane tends to decline in importance in comparison to Leersia.

In addition to the two dominant grasses, other common plant species in the grassland community surrounding the *Oxypolis* population included *Iris virginica, Pluchea rosea, Rhexia virginica, Utricularea purpurea, Coreopsis falcata, Erianthus strictus, Carex striata, Rhynchospora careyana, Pontederia cordata,* and several others that remain to be identified. Most of the above species are in fact somewhat less tolerant of inundation than O. canbyi and the grasses, and occur in a zone slightly closer to the edge of the pond where the hydroperiod (duration of inundation) is slightly shorter. This sort of zonation is a characteristic feature of

depressional wetlands in the southeastern USA. Kirkman (1992, 1994) documented several vegetation zones in Carolina Bays. In the bays she studied the shallowest, i.e. outermost, zone was dominated by the "wetland" variant of *Andropogon virginicus* (broomsedge). Though broomsedge is often considered a "weedy" old field species, varieties or variants of *Andropogon virginicus* are in fact characteristic of a number of undisturbed habitats including pine flatwoods as well as depressional wetlands. In Kirkman's studies the zone interior to boomsedge zone was dominated by *Manisuris rugosa*. This species is quite tolerant of shallow water, but is less tolerant of prolonged submergence in deep water. *Leersia hexandra* and *Panicum hemitomon* occupied the deepest zones in the bays studied by Kirkman, just as they do in our Oxypolis Bay. Kirkman (1993) demonstrated that zonal or distributional differences among the dominant bay grasses, i.e. *Leersia hexandra,, Panicum hemitomon, Andropogon virginicus* and *Manisuris rugosa*, were closely tied to differences in physiological tolerances, particularly flood tolerance as measured by inundation studies and drought tolerance inferred from stomatal conductance measurements.

Perhaps one third of the total area of our *Oxypolis* bay is occupied by herbaceous vegetation. A much larger proportion is occupied by pondcypress, red maple, swamp gum, buttonbush, and other flood tolerant trees and shrubs. Many of these woody species appear to have invaded relatively recently, perhaps in the last 10-20 years, probably as a consequence of lack of fire. Bay vegetation needs to burn periodically to maintain the open, herbaceous character and to stimulate germination and reproduction of seed bank species (Kirkman 1994). In contrast, lack of fire produces a succession towards closed swamp forest. If this trend is allowed to continue we will lose the entirety of the open grassy habitat and our population of *Oxypolis canbyi* will disappear. Thus an immediate management challenge is to forestall or reverse this trend, probably by way of careful cutting and removal of larger woody stems.

In addition to the young swamp, which clearly represents a recent invasion into former herbaceous dominated vegetation, we also observed a much older swamp forest with large oaks (e.g. *Quercus michauxii, Q. phellos, Q. nigra*), other hardwood trees (*Liquidambar, Acer rubrum, Nyssa biflora*), and herbaceous species characteristic of such habitats (e.g. *Persicaria hydropiperoides, Boehmeria cylindrica, Phyllanthus carolinensis, Saururus cernuus*). Clearly this area predates recent fire suppression and must be considered part of the original vegetation of the site.

Most of the remainder of the site is covered by planted loblolly pine plantation. Most of this was bedded, a silvicultural technique designed to reduce competition and enhance drainage. This form of severe soil disturbance normally produces drastic alterations in vegetation, including destruction of the characteristic pineland bunchgrasses. In all probability most of the plantation area was originally occupied by longleaf pine woodland ranging from wet savanna and/or flatwoods near the pond edge to drier upland “high pine” in the areas away from the pond. This gradient in pineland vegetation is still clearly evident in the residual understory species. In the wetter areas this includes shrubs such as *Clethra alnifolia, Ilex myrtifolia* and *Vaccinium fuscatum,* as well as the rather shade tolerant grass *Chasmanthium laxa*. In the drier sections there remains surprisingly high herbaceous species richness including many characteristic longleaf plants such as *Centrosema virginica, Cyperus plukenetii, Dyschoriste oblongifolia, Dichanthelium oligosanthes, Cassia nictitans, Rhynchosia difformis, Galactia macrei, Lespedeza repens, Pirigqueta caroliniana, Euphorbia pubentissima,* and *Cnidoscolus stimulosus*. Finally, in a relatively narrow zone between the high and the low pine, there appeared to be a hint of what Dr. Richard Porcher and the older Coastal Plain botanists refer to as oak-hickory vegetation. This was suggested by the occasional white oak (*Quercus alba*) and mockernut hickory (*Carya alba*), two of the characteristic tree species of this vegetation type. Typical oak-hickory shrubs included *Callicarpa americana* and *Aralia spinosa,* as well as a few individuals of *Asculus pavia* (red buckeye) perhaps the most indicative oak-hickory shrub. Herbs typically associated with oak-hickory communities found at the site included *Erythrina herbacea, Chimaphila maculata, Desmodium paniculatum,* and *Dichanthelium laxiflorum.*

In summary, our preliminary investigation revealed that, in addition to the endangered Oxypolis population, our new preserve includes a nice area of wetland herbaceous dominated vegetation, a remnant area of hardwood swamp, and much area in need of restoration. As I mentioned above, the initial goal must be to clear the bay of hardwood invaders and promote the spread of *Oxypolis canbyi* and associated wetland

herbs. We may also need to undertake some active restoration via propagation and outplanting, of the dominant grasses of the shallow water zones, e.g. *Andropogon virginicus* and *Manisuris rugosa* which seem to have been mostly eliminated by the invading hardwoods. A secondary goal will involve upland restoration. In particular, we need to remove, or drastically thin, the planted loblolly pines to begin the conversion back towards natural longleaf pine woodland. We will also need to propagate and out-plant the dominant upland grasses, including wiregrass (*Aristida beyrichiana*), lopsided Indiangrass (*Sorghastrum secundum*), pineywoods dropseed (*Sporobolus junceus*), and little bluestem (*Schizachyrium scoparium*), the presumed dominant bunchgrasses eliminated by past soil disturbance. Once the bunchgrass cover is restored it will be possible to resume a natural burn regime that will perpetuate the upland communities as well as the herbaceous dominated wetland habitats.

I should conclude by emphasizing that much work remains to be done in the way of botanical investigation and ecological monitoring as well as restoration. Any SCNPS member, or anyone else, wishing to become involved with survey, monitoring or restoration work at the Preserve should contact John Brubaker.

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