Powerline Easements as Refugia for State Rare Seepage and Pineland Plant Taxa

Philip M. Sheridan, Steve L. Orzell, and Edwin L. Bridges

Field surveys of selected powerline easements on the inner coastal plain of Georgia, Maryland, and Virginia uncovered significant rare seepage and pineland plant taxa in comparison to the surrounding fire-suppressed and human altered landscapes. Surveys of selected powerline easements resulted in the discovery of 65 state rare plant species from 24 counties in three states. Twenty-two state rare plant species are documented on powerline easements for Georgia, 12 for Maryland, and 31 for Virginia. Two state endangered and three state threatened plants were found in Georgia powerline easements while 3 state endangered and two state threatened were found in Maryland. Rare plant taxa occur on powerline easements for several reasons: right-of-way management strategies have replaced natural disturbances; naturally open herbaceous seeps harboring rare plant taxa were crossed by powerlines; seeds were dispersed to the easement by wind or other vectors; plants were present in low numbers, dormant or in seed banks prior to powerline easement clearing; or a combination of some or all of these factors. Periodic mechanical clearing of brushy vegetation to maintain powerline easements can replace natural disturbances such as fire and beaver activity and thereby may allow some disturbance adapted rare plants to persist that might otherwise be locally extirpated through fire suppression and subsequent woody invasion of open space habitat niches. Powerline rare plant refugia might serve as a local measure of biodiversity in regions where the surrounding natural vegetation has been highly altered or subjected to fire suppression and seepage bog or pineland plants are now found in powerline easements.

Keywords: Powerlines, rights-of-way, biodiversity, state rare plants, pitcher plant bogs

INTRODUCTION

Rights-of-way habitats (e.g. railroads, roadsides, powerlines, fencelines, etc.) have historically been surveyed by botanists to discover rare plant populations, primarily due to their easy access. One of the early pioneers of this method was the botanist Roland Harper who used railroad rights-of-way as a method for finding rare plant populations (Core 1970, Harper 1904a,b, 1905a,b, 1907). We became interested in powerline easements as rare plant habitats when we observed that herbaceous seepage plants were often locally restricted to areas underneath powerlines. We therefore began surveying selected powerline easements to locate and assess the potential for rare plant occurrences. We suspected that powerline easements serve as both refugia for rare plant populations and as a measure of local plant biodiversity, particularly in regions where the surrounding landscape has been highly altered or subject to fire suppression.

Seepage habitats in the southeastern United States are a type of wetland characterized by a distinctive flora of sundews (Drosera: Droseraceae), bladderworts (Utricularia: Lentibulariaceae), butterworts (Pinguicula: Lentibulariaceae) and pitcher plants (Sarracenia: Sarraceniaceae) (Folkerts 1982). In the southeastern United States they typically occur on side valley slopes or headwaters of small tributaries and are permanently fed by diffuse telluric groundwater (Bridges and Orzell 1989, Folkerts 1991). Seepage habitats located at heads of stream branches in Maryland and Virginia have been classified as magnolia bogs (McAtee 1918). Seepage wetland soils are typically acidic and are of either organic or mineral composition. The herbaceous flora requires periodic fires or some form of natural disturbance (e.g., beaver activity) to maintain the diversity of the herbaceous species rich groundcover (Bridges and Orzell 1989, Fenwick and Boone 1984, Frost and Musselman 1987, Frost 1993, 1995, Folkerts 1982, Rudis and Skinner 1991, Waldrop et al. 1992).
MATERIALS AND METHODS

Our study was confined to southern Georgia and the inner coastal plain of Maryland and Virginia (Fig. 1). Field study sites were determined by locating power-line rights-of-way through potential habitats on USGS 7.5 minute series topographic maps. Accessible sites were evaluated during field surveys. The vascular flora of each site was inventoried, sometimes with repeat site visits, and representative plant collections were made and prepared as herbarium voucher specimens.

Voucher specimens are deposited at the following herbaria: Fairchild Tropical Gardens (FTG), George Mason University (GMUF), and Virginia Commonwealth University (VCU). Each site is coded by an alpha-numeric site code consisting of state (first two letters), county (next four letters), and site identification number. For example, VADINW001 is the first site visited in Dinwiddie County, Virginia. Additional site-specific locational information is available from the authors.

Plant nomenclature and identification follows either Kartesz (1994) or Wunderlin, Hansen and Bridges (Vascular Flora of Central Florida, unpublished manuscripts). Plant determinations were performed by the authors as well as Dr. Ted Bradley (curator-GMUF), Mark Strong (United States herbarium) and Robert Wright. Rare species status was determined by consulting state rare plant lists and/or publications (Georgia Natural Heritage Program 1991, 1993, Patrick et al. 1995, Ludwig 1997, Maryland Natural Heritage Program 1994). Global and state ranking of plants follows The Nature Conservancy and the respective state natural heritage ranking scheme (Table 1).

Fig. 1. Map of states and counties where rare plants were collected. Physical map of southeast used with permission of W.H. Duncan.
RESULTS

Twenty-two state rare plant species are documented on powerline easements for Georgia, 12 for Maryland, and 31 for Virginia. Two state endangered and three state threatened plants were found in Georgia powerline easements while three state endangered and two state threatened were found in Maryland (Table 1). A maximum of 10 rare species was recorded in Virginia from VADINW001 (Figs. 2-4). No federally endangered or federally threatened listed species were found on powerline easements. Future discoveries of additional rare plant taxa and other noteworthy plants are possible since our surveys did not account for all seasonal and yearly variation present at the sites. In several cases additional rare plants were observed at some sites but specimens were not collected due to the depauperate condition of the plant material, small population size, etc.

### Table 1. List of state rare plants collected on powerline easements

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<td>Scleria minor</td>
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State Status: N = none; E = state endangered; T = state threatened; H = inferred that the species has not been observed in the wild for 20 or more years.

Global Rank: G2 = globally imperiled, 6-20 populations; G3 = very rare and local throughout its range or found locally in a restricted range or because of other factors making it vulnerable to extinction, 21-100 populations; G4 = apparently secure globally although it may be rare in parts of its range, 100-1000 populations; G5 = demonstrably secure globally, though it may be quite rare in parts of its range, 1000+ populations.

State Rank: S1 = critically imperiled in the state, 1-5 populations; S2 = imperiled in the state, 6-20 populations; S3 = rare or uncommon in the state, 21-100 populations.
Fig. 2. Powerline easement at VADINW001, 1987. Ten rare seepage plants have been recorded from this one acre site.

Fig. 3. White-fringed orchid (*Platanthera blephariglottis*) and yellow pitcher plant (*Sarracenia flava*) growing in right-of-way at VADINW001, 1987.

*Delphinium carolinianum* Walt. — Carolina larkspur.  
GACRAW001: 27 May 1994, Sheridan and Determan 1574 (FTG).

*Erica californica* Koern. — Texas pipewort.  
GAMARI02: 10 April 1991, Sheridan 685 (FTG).

*Helianthus longifolius* Pursh — Longleaf sunflower.  
GATAYL001: 9 Sept 1990, Bridges and Orzell 15036 (FTG) GATAYL006, 8 Sept 1990, Bridges and Orzell 14993 (FTG).

*Kalmia carolina* Small — Carolina sheep-laurel.  
GATAYL001: 6 May 1987, Bridges and Orzell 5167 (FTG).

*Pinguicula vulgaris* Wood & Godfrey — Southern butterwort.  
GAMARI02: 10 April 1991, Sheridan 684 (FTG).

*Plantago lanceolata* (L.) L. — Snowy orchid.  

*Rhododendron angustifolium* L. — Oconee azalea.  

*Rhynchospora oligantha* Gray — Beakrush.  
GAMARI01: 9 Sept 1990, Bridges and Orzell 15074 (FTG).

*Rhynchospora stenophylla* Chapman — Beakrush.  
GACRAW001: 8 June 1989, Sheridan and Scholl 183 and 188 (FTG); 8 Sept 1990, Bridges and Orzell 14940 (FTG).  
GACRAW005: 18 June 1994, Sheridan and Patrick 1726 (FTG).  
GADVCA008: 13 June 1994, Sheridan 1672 (FTG).  
GATAYL001: 9 Sept 1990, Bridges and Orzell 15150 (FTG).  
GATAYL006: 3 June 1989, Sheridan and Scholl 94 (FTG); 8 Sept 1990, Bridges and Orzell 14997 (FTG).  
GATAYL008: 8 Sept 1990, Bridges and Orzell 15024 (FTG).

*Sarracenia flava* L. — Yellow pitcher plant.  

Each plant collection is listed in alphabetical order first by state, then by genus and species. Following the scientific name is the authority, common name, collection site code, date of collection, collector(s), and herbarium acronym where the specimen is deposited. Collections for 1996 remain in the senior author’s personal herbarium awaiting deposit to a public facility.

**Georgia collections**

*Baldus nigricans* (Harper) Small — Purple baldunia.  

*Chamaecyparis thyoides* (L.) B.S.P. — Atlantic white cedar.  
GATAYL001: 6 May 1987, Bridges and Orzell 5171 (FTG).
Sarracenia minor Walt. — Hooded pitcher plant.
Sarracenia psittacina Michx. — Parrot pitcher plant.
GAEARL002: Sheridan 1155 (FTG).
Sarracenia purpurea L. — Purple pitcher plant.
GATATT010: 21 August 1992, Sheridan, Troup, Patrick, Determan, Jenkins, Nordman 1231 (FTG).
Sarracenia rubra Walt. — Sweet pitcher plant.
GACRAW001: 8 Sept 1990, Bridges and Orzell 14933 (FTG). GAMARI001: 9 Sept 1990, Bridges and Orzell 15080 (FTG); 2 Nov 1991, Sheridan 1109 (FTG).
GATAYL017: 7 Sept 1987, Sheridan and Scholl 449 (GMUF).

Stylisma pickeringii (Torr. ex M.A. Curtis) Gray var. pickeringii — Pickerling morning-glory.
GATALB002: 9 Sept 1990, Bridges and Orzell 15166 (FTG). GATALY006: 3 June 1989, Sheridan and Scholl 71 (FTG); 8 Sept 1990, Bridges and Orzell 14890 (FTG); 18 June 1994, Sheridan 1717 (FTG).
Warea cuneifolia (Muhl. ex Nutt.) Nutt. — Warea.
GATAL001: 9 Sept 1990, Bridges and Orzell 15125 (FTG). GATALY006: 8 Sept 1990, Bridges and Orzell 14879 (FTG).

Xyris chapmanii Bridges & Orzell-Chapman yellow-eyed grass. GAMAR001: Bridges and Orzell 15065 (FTG).

Xyris drummondii Malme — Drummond yellow-eyed grass. GAMAR001: 9 Sept 1990, Bridges and Orzell 15082 (FTG).

Xyris scabrifolia Harper — Harper yellow-eyed grass. GAMAR001: 9 Sept 1990, Bridges and Orzell 15109 (FTG).

Maryland collections


Virginia collections


Ctenium aromaticum (Walt.) Wood — Toothache grass. VADINW001: 19 July 1986, Strong and Sheridan 86-001 (GMUF).


Sabatia bractiata Ell. — Narrow-leaf pink. VASUS004: 1 July 1990, Sheridan and Scholl 555 (FTG).


Tetrannonotheca helianthoides L. — Pineland squarehead. VACHES001: 30 June 1990, Sheridan and Scholl 549 (FTG).


Significance of collections

The 1987 Helium nucleus collection from Taylor County, Georgia is significant because this species was considered state historical in Georgia. No Georgia collections have been reported since the 1940s (Tom Patrick, pers. comm. 1997) and only two stations were known (Rock 1957). Pinguicula primuliflora and Stylosanthes pickeri var. pickeri are both Georgia state threatened species. The S. pickeri var. pickeri from Talbot County, Georgia represents a county record as well. Collections of Rhynchospora stenophylla and Xyris chapmanii are new additions to the flora of Georgia. The range of the state endangered Sarracenia rubra was expanded by finding county records on powerline easements in Crawford and Marion counties, Georgia (Fig. 5) and
Occurrences of rare woody species such as Castanea pumila, Chamaecyparis thyoides, and Kalmia angustifolia indicate persistence of these species despite clearing methods.

**DISCUSSION**

The occurrences of state rare plant species on power-line easements can be attributed to several factors:

1. Powerlines crossed rare plant habitats which were historically kept open by natural disturbance, such as fire or beaver, and are now maintained by right-of-way maintenance practices.
2. Naturally open herbaceous areas harboring rare plant taxa were crossed by powerline easements and their associated rare plant populations have persisted.
3. Rare plants were present in low numbers, dormant or in the seed bank prior to clearing for development of the powerline easement through optimal habitat.
4. Rare plants occur elsewhere in the region and have been dispersed into the site by wind or other vectors.
5. A combination of some or all of these factors.

Periodic mechanical clearing of brushy vegetation to maintain powerline easements can replace natural disturbances, such as fire and beaver activity, and thereby may allow some disturbance adapted rare plants to persist that might otherwise be locally extirpated through fire suppression and subsequent woody invasion of open space habitat niches. Powerline easement management of vegetation tends to reduce tree and shrub layer competition thereby favoring the diverse, species rich groundcover component found in pinelands and seepage bogs. Powerline easements across environmental gradients and associated ecotones historically kept open by natural processes often have the greatest potential to harbor rare seepage and pineland plant taxa. Powerline easements which cut through landscapes with historical occurrences of herbaceous seepage bogs can serve as significant refugia for rare plant taxa (Fig. 6).

Fernald (1937) recorded several stations in Virginia for the locally abundant *Sarracenia flava* while other species such as *Tetratogyne lihanthoides* (Fernald 1940) and *Zigadenus densus* (Fernald 1939) were only found at a few or single locations. Mrs. Shands (pers. comm. 1985) reports that *S. flava* commonly occurred in cow pastures in Sussex County during the same time period as Fernald’s explorations. Pederson (1941a,b) advocated a vigorous statewide fire suppression campaign which led to encroachment of herbaceous wetlands by woody vegetation. Powerlines constructed during this time period could have crossed over populations of rare plants thereby perhaps permitting their survival during an era of fire suppression. Species such as *Platanthera blephariglottis, Sarracenia flava* and *Zigadenus glaberrimus* have been locally extirpated (Frost and Musselman 1987) in Virginia where fire has been suppressed (Fig. 7).
bog was also discovered in Decatur County, Georgia nearby powerline seepage bog GADECA008 in the winter of 1996 (Sheridan and Underwood, field notes). Collections from the powerline easement at GADECA008 of Rhynchospora stenophylla, an obligate seepage species, support the occurrence of naturally open seepage bogs in the region. Similar rare plant occurrences fidelity to herbaceous conditions at GAMAR001 indicate naturally open herbaceous seepage bogs on the Georgia Fall Line. Naturally open seepage bogs had not previously been documented from either extreme southwest Georgia or the Fall Line Sand Hills of western Georgia.

Some of the creek systems with Atlantic White Cedar (Chamaecyparis thyoides) in the Fall Line Sand Hills of Georgia (Taylor, Talbot, and Marion Counties) contain rare wetland plant species in their riparian zones. When powerlines cross these riparian areas they provide open space niches for seepage species and easy access for the discovery of noteworthy plants that are associated with Atlantic White Cedar habitats.

With few exceptions most of these rare seepage wetland plants are probably not moving along power line right-of-ways and colonizing new sites. All Sarracenia species have hydrophobic seeds and seem to be chiefly dispersed by floating locally within a site or moving downstream (Folkerts 1988; Sheridan 1996). Genera such as Juncus and Drosera and some members of the Cyperaceae have small, light seeds which potentially could become airborne and spread to appropriate habitat. The senior author has also observed an apparent case of Drosera capillaris and Rhynchospora species coming up from a seed bank at VADNW002 as well. Sites for colonization and germination may be provided when easements are mechanically cleared and soil lightly disturbed.

The senior author has also observed Sarracenia flava and S. purpurea persisting in low numbers in overgrown, wooded seepage habitats in Virginia. Chelone lutea, Platanthera blephariglottis, and Zigadenus glaberrimus have flowered following clearing of woody vegetation from a site in Virginia (Sheridan, pers. obs.). These species may survive in either low numbers, lie dormant, or in the seed banks in wooded seepage bogs provided there is periodic disturbance to stimulate flowering, fruiting and recruitment of seedlings. Powerlines constructed over such isolated populations would tend to provide the open conditions that would enhance these populations.

All or part of these factors may interact at any particular site to explain the presence of rare seepage wetland and pineland plant species on powerline right-of-way.

CONCLUSIONS AND RECOMMENDATIONS

Research needs to be completed on the recovery mechanisms for the rare plant taxa found in powerline easements in order to determine the limits in the range of tolerable disturbance types and frequencies. In addition more ecologically sound vegetation management
strategies are needed to ensure the long term viability of these sites as both refugia for rare plant taxa and the significant biodiversity remnants of seepage bog communities and pineland groundcover types.

Powerline refugia might serve as a local measure of the biodiversity in regions where the surrounding natural vegetation has been highly altered or subjected to fire suppression and seepage bogs and pineland plants are now restricted to powerline easements.

Mechanical clearing of powerline easements should be continued to maintain the open space niches that favor rare herbaceous plants. Efforts to control or reduce any adverse side effects from mechanical clearing (soil erosion, sheet wash, rutting of seepage bogs, etc.) should be implemented. Effects of the application of herbicides on rare plant populations also needs to be studied. Other management strategies that delay moving or clearing operations until flowering/fruiting are encouraged.

Future powerline routes in coastal Georgia, Maryland, and Virginia should consider seepage wetlands as prime routes. New lines may serve as a means of restoring and protecting valuable wetlands. Restoration of wetlands through powerline maintenance may be eligible for tradable mitigation credits or cash.

Existing rights-of-way should be evaluated for rare plants and effective conservation measures considered. Rare plant location data should be restricted and not publicly available to prevent vandalism of sites. A public relations campaign should be initiated to educate the public about the valuable contribution utility companies have provided to maintain rare plant biodiversity.

When the senior author approached a local chapter of a national conservation agency in 1985 about acquiring or protecting a power line bog he was told, "Powerlines aren't natural areas". He had already come to realize, however, that indeed powerlines were substituting for natural areas in certain parts of the country and were worth protecting and investigating. In the last few years the Virginia Natural Heritage Program has realized the important role of powerlines as rare plant habitats and has begun investigating such areas (Springton 1995). We heartily endorse this effort and look forward to a bright future between power companies and environmental groups ensuring both preservation of our natural resources and reliable energy supplies.

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