COMMONWEALTH of VIRGINIA

A Rare Plant Inventory of Powerline Rights-of-Way in Virginia

Prepared for:
Virginia Power
Department of Environmental Policy and Compliance
Department of Forestry

Virginia Department of Conservation and Recreation
Division of Natural Heritage
Natural Heritage Technical Report 99-9
April, 1999

DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

A Rare Plant Inventory of Powerline Rights-of-Way in Virginia

Kathleen M. McCoy, Gary P. Fleming, and Stephen E. Killeffer
VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION
DIVISION OF NATURAL HERITAGE
217 Governor Street, Third Floor
Richmond, Virginia 23219

Natural Heritage Technical Report 99-09
April, 1999

Prepared for:

Virginia Power
Department of Environmental Policy and Compliance
Department of Forestry

This report should be cited as follows:
McCoy, K.M., G.P. Fleming, and S. E. Killeffer 1999. A rare plant inventory of powerline rights-of-way in Virginia. Natural Heritage Technical Report 99-09. Virginia Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. 32 pp. plus appendix.

TABLE OF CONTENTS

LIST OF FIGURES

TABLE

INTRODUCTION

In 1995 the Virginia Department of Conservation and Recreation's Division of Natural Heritage (DCR-DNH) and Virginia Power initiated a cooperative effort to survey powerline rights-of-way known or suspected to support rare plant species (Ludwig 1996). Powerline rights-of way serve as refuges for plants that are adapted to open-canopy conditions. Naturally open communities, while quite rare in Virginia today, were believed to have covered large acreage in the southeastern coastal plain and piedmont prior to european settlement (Christiansen 1981, Vogl 1973, Frost 1995). Open grassland and savanna communities were maintained by frequent wildfires in the pre-settlement era and historically up until the early parts of the twentieth century. Recent practices, however, have altered fire ecologies and significantly reduced the occurrence of open habitat communities (Fleming 1998). With the reduction of appropriate habitat, open-canopy plant communities are compromised and many native plants which are adapted to intense light conditions are now rare in Virginia. The line clearing practices of Virginia Power create suitable habitat for grassland plants by removing woody species that would otherwise succeed in fire's absence.

The first powerline surveys under this agreement were conducted by DCR-DNH and Virginia Power staff in 1995 in powerline rights-of-way south of the James and Appomattox Rivers, from the Dismal Swamp to eastern Halifax and Lunenberg Counties to the west (Ludwig 1996). In 1996 the surveys included additional powerlines south of the James River and also powerlines north of the river. The northern powerlines inventoried were in Caroline, Culpeper, Fauquier, Henrico, Charles City, and Glouchester counties (Van Alstine *et al.*1997). The survey focus in 1997 was again on powerlines south of the James River in Prince George, Surry, Sussex, Greensville, Southampton, Isle of Wight counties, and the City of Suffolk (Van Alstine *et al.*1998). In 1998, surveyors returned to southeastern Virginia to visit sites in Greensville, Brunswick, Southampton, Lunenburg counties, and the City of Suffolk. Many sites from previous powerline studies were revisited at a different time of the growing season. A day of field surveys was also done in Hanover County.

Field preparation began in early 1998. Topographic quadrangle maps, geologic maps, and aerial photographs were reviewed to select powerline sites. Habitats with strong potential for rarities were targeted. Visits were planned to sites known to support rare vegetation, for the purpose of capturing different season rarities. Field work began on June 6, 1998 and ended on September 30, 1998. Six days of powerline survey were completed by Va Power and DCR-DNH personnel during this time. The study area is shown in Figures 1, 2, and 3.

DCR-DNH is the state agency responsible by statutory authority under the Virginia Natural Area Preserves Act for inventory, database maintenance, protection, and management of Virginia's Natural Heritage Resources. Natural Heritage Resources are defined as "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest" (Virginia Natural Area Preserves Act, Section 10.1-209 through 217, Code of Virginia). The Division provides the only

comprehensive attempt to identify the Commonwealth's most significant natural areas through ongoing scientific biological survey. Data gathered during this state-wide survey are assembled and managed through a sophisticated Biological and Conservation Data System (BCD) in which information on ecosystems and species, their biology, habitats, locations, conservation status, and management needs is continually updated and refined. The Division is part of an international network of natural heritage programs that utilize standardized inventory methodologies and BCD technology.

NATURAL HERITAGE INVENTORY METHODOLOGY

Inventory in the Virginia powerline rights-of-way was conducted through the five basic stages listed below. The stages were followed sequentially; however, it was often necessary to repeat several of the steps as determined by and during the field visits.

1) Review of aerial photographs. Aerial photographs of the survey area were reviewed in detail to identify high potential powerline rights-of-way to be studied in the following stages. To aid in their interpretation, the photographs were compared with topographic and geologic maps.

2) Gathering existing information. Museum collection information on rare plant species in the targeted areas of Virginia was reviewed by DCR-DNH staff. Published and unpublished information was collected and assimilated in conjunction with review of aerial photographs. Maps of lands within the survey area were gathered, BCD databases accessed, and the recorded distribution of natural heritage resources examined. Survey dates were noted for lines known to support rarities. Natural resource personnel and biologists knowledgeable about the area were consulted for additional information.

3) Planning for field survey. Based on preceding efforts, field plans were developed to maximize the productivity of the limited field time. Among the factors considered were: which rights-of-way had the highest likelihood for rare plant occurrences; when the survey could best be conducted; ease of access; and how much time should be budgeted for completing the survey.

4) Field survey. During the field work stage, detailed information was collected on the rare plant species found in the powerline rights-of-way. Data recorded during each survey included the site location, directions, and a site description, as well as land use, potential hazards, exotic flora and fauna, and off-site considerations. When rare plant species occurrences were encountered, additional data were recorded, including the date(s) when the species was found, population boundaries and concentrations within those boundaries, approximate number of individuals, reproductive and phenological status, and species viability. Habitat factors such as moisture, light, and associated species, as well as any apparent immediate or long-term threats to the occurrence were also noted.

5) Compilation of results and preparation of final report. As field work was completed, DNH biologists reviewed the information gathered and compiled the results on standardized field forms. All results of this inventory have been incorporated into the DCR-DNH Biological and Conservation Data System (BCD).

RESULTS OF THE RARE PLANT INVENTORY

In 1998, twenty-eight powerline right-of-way sites were visited in six days of inventory work. Figures 1, 2, and 3 show all of the survey sites visited. Nineteen element occurrences of thirteen rarities were located as a result of the southeastern line inventories. Table 1 summarizes the findings, providing scientific and common names of the rarities, their Natural Heritage rank representing the species global (G) and state (S) rarity status, and the site (s) at which each was found in 1998. In this table, the site numbers correspond to those in Figures 1, 2, and 3. The individual site reports that follow present information about each site where rare plant species were found. Maps of the rare species locations are provided with the summaries.

Table 1. Rare Plant Species Found During the 1998 Field Surveys

SCIENTIFIC NAME	COMMON NAME	HERITAGE RANK*	SITE NUMBER
Amphicarpum purshii	blue maiden-cane	G4/S1	1
Asclepias longifolia	long-leaf milkweed	G4G5/S1	1
Asclepias rubra	red milkweed	G4G5/S2	14, 19
Carex barrattii	Barratt's sedge	G4/S2	15
Cleistes divaricata	spreading pogonia	G4/S1	15, 16
Desmodium tenuifolium	slim-leaf tick-trefoil	G3G4/S1	18, 19
Erigeron vernus	white-top fleabane	G5/S2	1
Gentiana autumnalis	pine-barren gentian	G3/S1	19
Juncus elliottii	bog rush	G4G5/S1S2	1
Paspalum dissectum	water paspalum	G4?/S2	17
Saccharum brevibarbe	short-beard plumegrass	G3G5/S1	12
Scleria minor	slender nutrush	G4/S2	7, 15, 18, 19
Zigadenus densus	dense-flowered camas	G5/S1	14

* See Appendix 1 for an explanation of Natural Heritage ranks.

INTRODUCTION TO THE SITE REPORTS

Brief site reports are provided for all sites where rare plants were located during this survey. The following standard reporting format is used for each site:

SITE NAME: Site names generally reflect a geographic locality and, in some cases, a prevalent landscape feature.

LOCALITY: The county (or counties) containing the site is listed.

QUADRANGLE: The name of the USGS 7.5' quadrangle that includes the site is listed.

QUADRANGLE CODE: The code used by DCR-DNH for the quadrangle is listed. The first five digits of the code represent latitude and longitude (in degrees) of the quadrangle.

LOCATION: Location of the site, using geographical landmarks, is given.

RARE PLANT SUMMARY TABLE: This field provides a synopsis of the rare plant species found at the site, together with their rarity ranks (global, state), the legal status, both Federal (USFWS) and within Virginia, and element occurrence ranks. The element occurrence ranks given refer to the populations' condition on the record date. See Appendix 1 for an explanation of the Natural Heritage and legal ranks.

SITE INFORMATION: Information regarding the site and its rare plants is presented. As is standard practice in Natural Heritage technical reports, the first reference to a species in a narrative is by scientific name, followed by its common name in parentheses. Subsequent references to the same species are by scientific name only.

SITE MAP: The site map, generated in ArcView GIS (Version 3.0, ESRI 1996) shows the location of rare plants identified during the 1998 inventory. These location maps are intended to provide resource managers with requisite site-specific information. However, since rare species are often sensitive to disturbance or may be sought out by collectors, we strongly recommend that this information not be shared with the general public or with persons not directly involved in the management of these sites.

BALM OF GILEAD POWERLINE

LOCALITY: Suffolk County **QUADRANGLE:** Suffolk **QUADRANGLE CODE:** 3607665

LOCATION: A powerline right-of-way just west of Saunders, VA. About 0.5 mile west of the junction of Route 664 with Route 642.

RARE PLANT SUMMARY TABLE

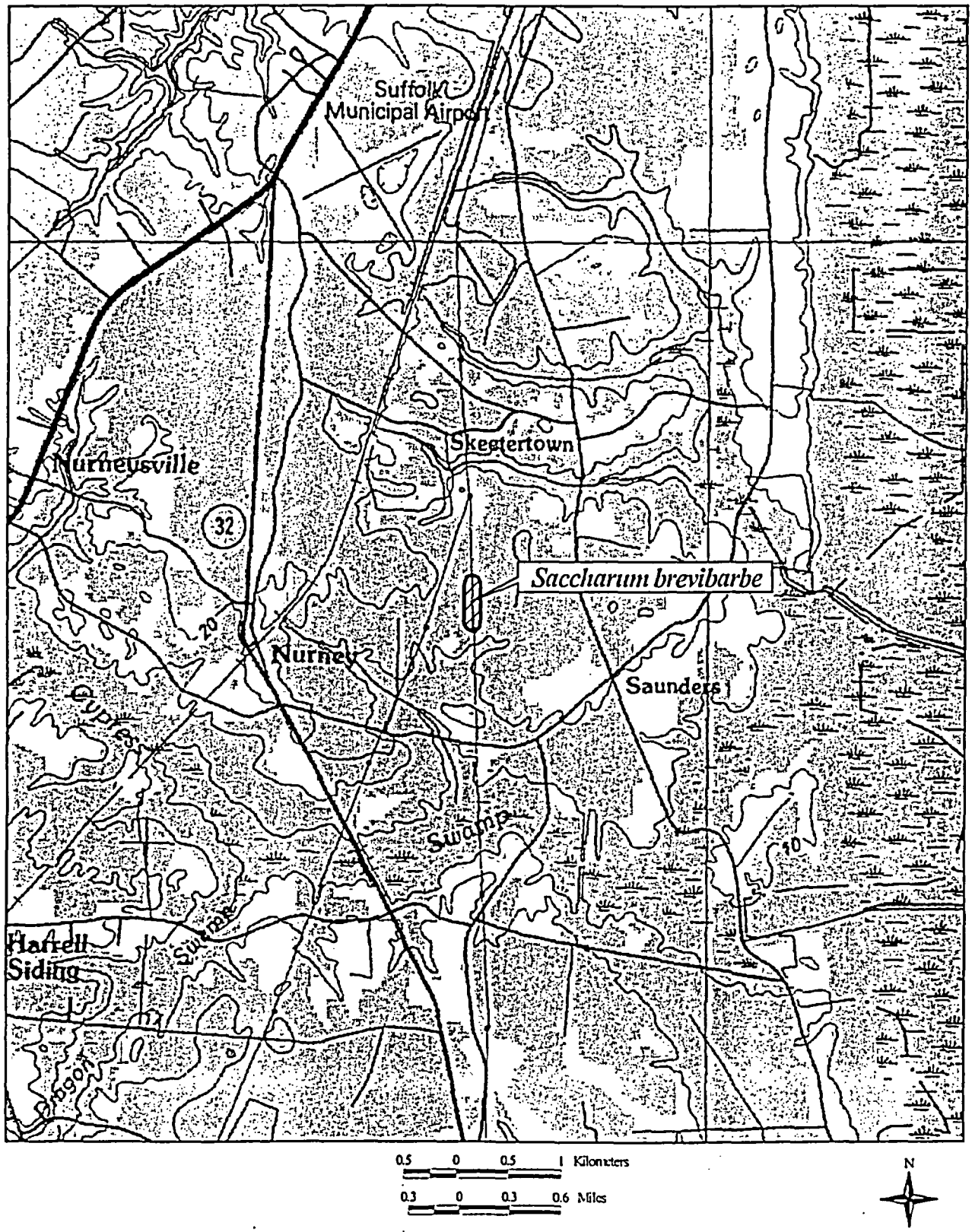
SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
Cleistes divaricata	spreading pogonia	G4	S1	-	-	C
Gentiana autumnalis	pine-barren gentian	G3	S1	-	-	C
Ilex coriacea	bay-gail holly	G5	S2	-	-	D
Rhexia petiolata	ciliate meadow-beauty	G4G5	S2	-	-	CD
*Saccharum brevibarbe**	short-beard plumegrass	G3G5	S1	-	-	BC
Scleria minor	slender nutrush	G4	S2	-	-	D

*1998 record

SITE INFORMATION: Early season visits were made to this site in 1991 and 1992 by VA Power and DCR-DNH personnel before the 1995 project agreement. Five element occurrences were recorded during these first surveys. This powerline was revisited in late September 1998 to search for late season rarities. The flat, seasonally wet powerline is dominated by *Pteridium aquilinum var. pseudocaudatum* (brachen fern) in much of the upland areas and diverse graminoids in the lower, wetter areas. Clay-rich soils here evidently retain moisture throughout the growing season. Other dominants include *Arundinaria gigantea* ssp. *tecta* (small cane), *Lycopodiella alopecuroides* (foxtail clubmoss), *Ilex glabra* (inkberry), and *Solidago fistulosa* (pine barrens goldenrod). A moderate size population of the rare grass *Saccharum brevibarbe* (short-beard plumegrass) was documented in the powerline.

In 1991, the surrounding wet *Pinus serotina* (pond pine) and *Pinus taeda* (loblolly pine) forests had included the wetland shrubs *Leucothoe axillaris* (coastal dog-hobble), *Clethra alnifolia* (sweet pepper-bush), and limited *Lyonia lucida* (shining fetterbush) (Ludwig 1991). In 1998, however, these adjacent forests had been cut and the habitat supporting the previously recorded element occurrences was significantly damaged by logging equipment. Future visits will be necessary to determine the rarities' recovery success.

Management of the powerline vegetation by Virginia Power has provided habitat for the rare species at the site. The logging of adjacent lands, however, has adversely affected the rarities and their available habitat. Broad, untargeted spraying of herbicides should be avoided.



Location of *Saccharum brevibarbe*
BALM OF GILEAD POWERLINE
USGS 100K Suffolk Quadrangle

DCR
Department of Conservation & Recreation

COLLIER BRANCH POWERLINE

LOCALITY: Greensville County **QUADRANGLE:** Barley **QUADRANGLE CODE:** 3607756

LOCATION: A powerline right-of-way about 1 mile east of the Route 632 and Route 633 junction. At the northern branch of Collier Branch, extending to Route 603. Northeast of Garners Mill, VA.

RARE PLANT SUMMARY TABLE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
*Amphicarpum purshii**	blue-maiden cane	G4	S1	-	-	CD
*Asclepias longifolia**	long-leaf milkweed	G4G5	S1	-	-	D
Coreopsis oniscicarpa	Atlantic tickseed	G4Q	S1	-	-	BC
*Erigeron vernus**	white-top fleabane	G5	S2	-	-	D
Eryngium integrifolium	savanna eryngo	G5	S1	-	-	C
Hypericum adpressum	creeping St. John's-wort	G2G3	S1	-	-	BC
*Juncus elliottii**	bog rush	G4G5	S1S2	-	-	C
Ludwigia hirtella	Rafinesque's seedbox	G5	S1	-	-	B
Mitreola sessilifolia	sessile-leaved hornpod	G4G5	S1	-	-	C
Sabatia campanulata	slender marsh rose-pink	G5	S2	-	-	AB

*1998 record

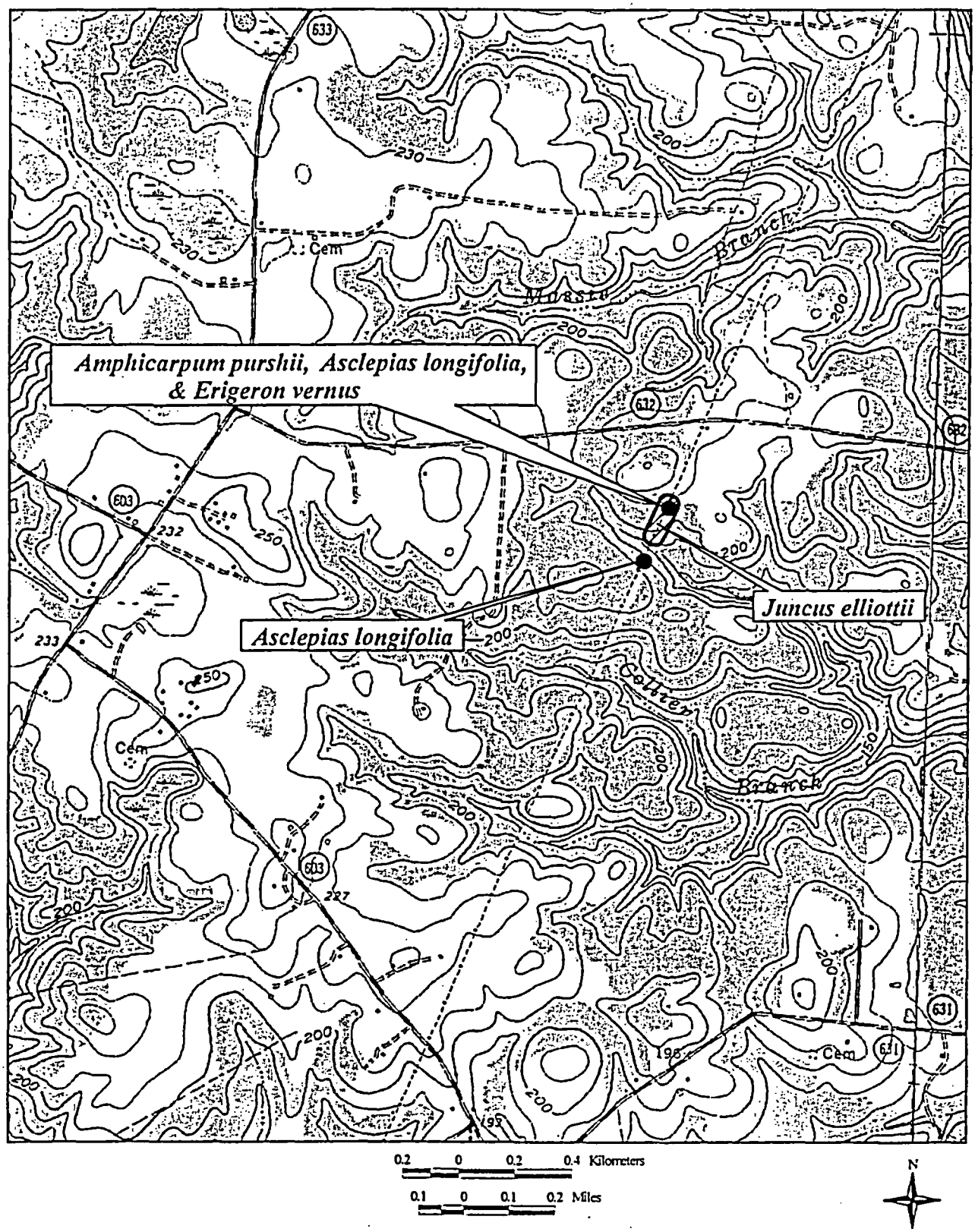
SITE DESCRIPTION: This seasonally wet site supports ten rare plant species, four of which were added through the 1998 survey. The primary feature of this section of powerline right-of-way is a gentle, south-facing swale adjacent to a stream crossing. The soil is a seasonally saturated, sandy-clay loam, possibly with a hardpan subsoil. There is little woody growth due to maintenance practices. This habitat differs somewhat from typical powerline "bogs" in southeast Virginia by the virtual absence of sphagnum mosses and visible seepage zones. Its vegetation is likewise highly unusual, and may replicate or represent the herbaceous component of fire-influenced, pine or pine-hardwood savannas which may have originally occupied this area. On much of the site, *Andropogon perangustatus* (narrow-leaved bluestem), *Rhynchospora inexpansa* (nodding beakrush), and *Chasmanthium laxum* (slender spikegrass) form a mid-height graminoid layer over a low graminoid/forb stratum dominated by dense populations of *Rhynchospora rariflora* (few-flowered beakrush), *Polygala cruciata* var. *aquilonia* (crossleaf milkwort), and the state-rare *Sabatia campanulata* (slender marsh rose-pink). *Pycnanthemum flexuosum* (hyssop-leaved mountain-mint), *Panicum rigidulum* var. *pubescens* (long-leaved panic grass), *Eupatorium rotundifolium* (roundleaf thoroughwort), and *Euthamia tenuifolia* var. *microcephala* (slender fragrant goldenrod) are also abundant and the whole area is exotic-free (Van Alstine *et al.*1998).

An outstanding assemblage of rare plant species is associated with this vegetation. One of these, *Eryngium integrifolium* (savanna eryngo) was an addition to the state's flora in 1997, while two others, the global rarity *Hypericum adpressum* (creeping St. John's-wort) and the state rarity *Mitreola sessilifolia* (sessile-leaved hornpod) were known historically from single localities elsewhere in southeastern Virginia. The 1998 *Amphicarpum purshii* (blue maiden-cane) record is the first for southeast Virginia. Other rarities discovered here in June 1998 are *Juncus elliotii* (bog rush), *Asclepias longifolia* (long-leaf milkweed), and *Erigeron vernus* (white-topped fleabane), all of very local distribution in the finest remaining bog-like habitats of the state.

There are several potential threats to the site. The adjacent pine-hardwood forest is used for timber production and the rarities could be irreparably damaged by heavy vehicle use of the right-of-way during tree harvest. Wildlife plantings by game clubs pose other threats to rarities, particularly affecting the potential of wetland habitat and the introduction of exotic weeds. Cultivated peanut fields are up slope from this site; crop expansion and/or associated eutrophic runoff could degrade the site and severely effect its rarities.

Existing powerline management has been successful in maintaining viable habitat for the rare species. However, prescribed burning would be a more desirable method of vegetation management at this site and could greatly expand suitable habitat if the forest lands adjacent to the right-of-way were included. Wildfires were probably frequent here originally but have been largely eliminated as an ecological factor. Broad, untargeted spraying of herbicides should be avoided.

The landowner should be contacted and informed about the significance of the site. Some form of protection for this site should be sought.



Locations of *Amphicarpum purshii*, *Asclepias longifolia*, *Erigeron vernus*, and *Juncus elliottii*
COLLIER BRANCH POWERLINE
USGS 7.5' Barley Quadrangle

DCR
Department of Conservation & Recreation

HANDSOM - GUM POWERLINE

LOCALITY: Southampton County **QUADRANGLE:** Courtland **QUADRANGLE CODE:** 3607761

LOCATION: A powerline right-of-way north-northwest of the junction of Routes 680 and 671, about 1.5 miles northwest of Handsom.

RARE PLANT SUMMARY TABLE

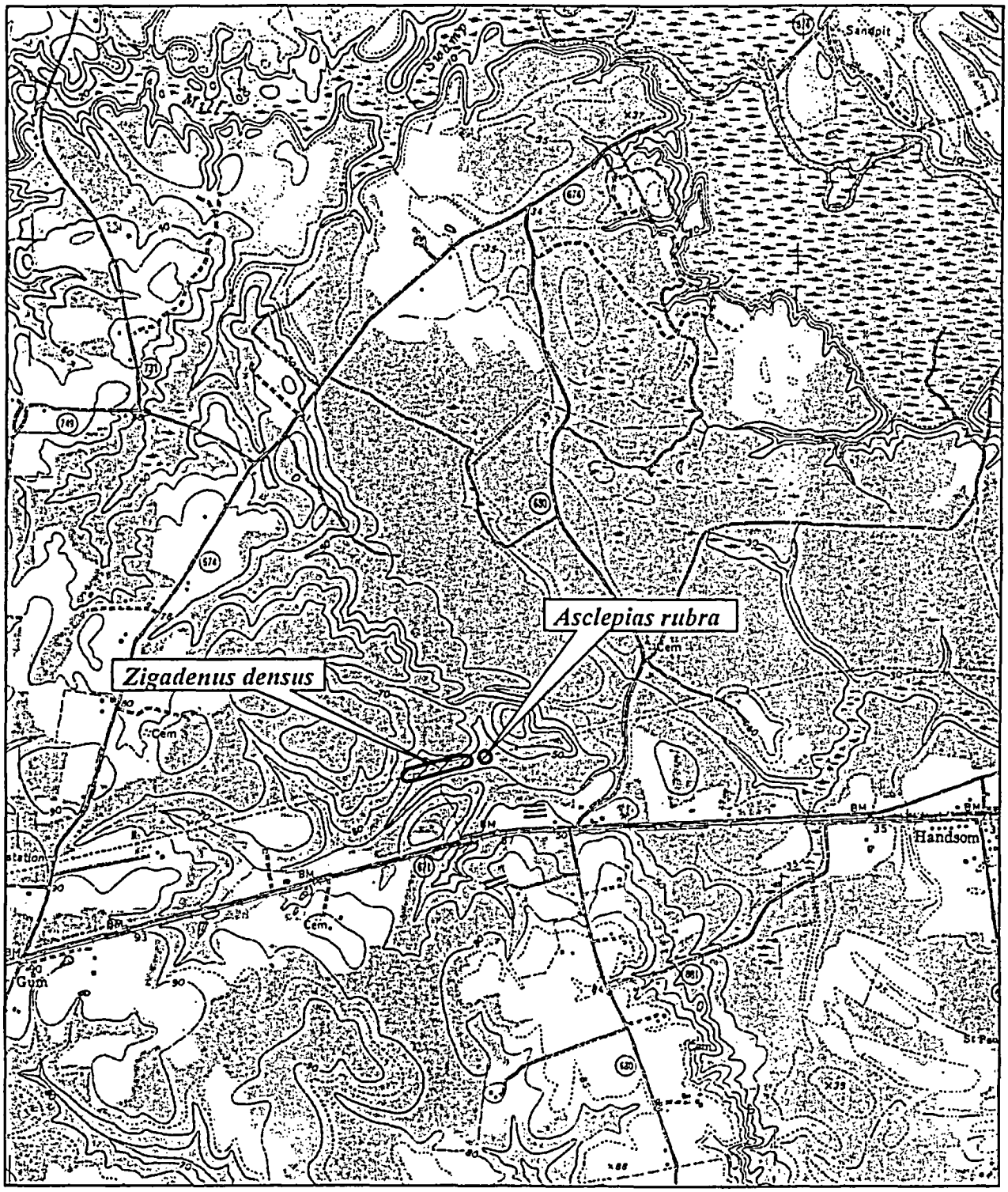
SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
*Asclepias rubra**	red milkweed	G4G5	S2	-	-	D
Eriocaulon decangulare	ten-angle pipewort	G5	S2	-	-	B
Hypericum setosum	a St. John's wort	G4G5	S1S2	-	-	C
Rhexia petiolata	ciliate meadow-beauty	G3?	S1	-	-	BC
Rhynchospora cephalantha var. attenuata	small capitate beakrush	G5G3?	S2	-	-	B
Sabatia difformis	two-formed pink	G4G5	S1	-	-	C
Sarracenia purpurea var. venosa	southern purple pitcher plant	G5T3T5	S2	-	-	BC
Scleria minor	slender nutrush	G4	S2	-	-	D
*Zigadenus densus**	dense-flowered camas	G5	S1	-	-	B

*1998 record

SITE INFORMATION: This significant site was revisited in June 1998 to survey for early season rarities. An October 1997 visit resulted in seven element occurrence records. Two more rarities, *Asclepias rubra* (red milkweed) and *Zigadenus densus* (dense-flowered camas), were recorded during the 1998 visit. The powerline right-of-way cuts across a long concave slope bordering a wooded bottomland and features an outstanding acidic powerline bog. Despite seasonally dry conditions at the time of both surveys, the habitat was moist due to abundant and apparently continuous groundwater seepage. A well developed sphagnum moss layer occupies most of the bog habitat, which covers up to two acres. Dominant plants include *Arundinaria gigantea* ssp. *tecta* (small cane), *Andropogon glomeratus* (bushy bluestem), *Rhynchospora gracilenta* (slender beakrush), *Eupatorium pilosum* (vervain thoroughwort), *Ilex glabra* (inkberry), *Dichanthelium dichotomum* (bog panic grass), and *Dichanthelium scabriusculum* (tall swamp panic grass). This site contains the largest and most vigorous populations in the state of *Eriocaulon decangulare*, *Rhexia petiolata*, and *Rhynchospora cephalantha* var. *attenuata*, and *Zigadenus densus*. Upland forest borders the north side of the right-of-way while a saturated gum-maple/cane swamp borders the south side. No exotic plant species degrade the habitat, and the line condition in 1998 was similar to that recorded in 1997.

Several of the land use practices within the powerline right-of-way and adjacent lands still pose a threat to the site. Timber production and hunt club wildlife plantings continue to seriously threaten the native vegetation. The vehicle track that traverses the north section of the bog is a concern. Cleared fields and fields under corn cultivation are within and border the site. The habitat for the rarities and the site's exotic-free condition are jeopardized by these activities. The landowner should be contacted to discuss protection of the swales before further damage is sustained.

Existing powerline maintenance has maintained favorable habitat for the rare species at this site. However, prescribed burning (or some combination of prescribed burning and routine right-of-way management) would be preferable, and could greatly expand suitable habitat if the forest lands adjacent to the right-of-way were included. Wildfires were probably frequent here originally but have been largely eliminated as an ecological factor. Broad, untargeted spraying of herbicides should be avoided.



Locations of *Asclepias rubra* & *Zigadenus densus*
HANDSOM - GUM POWERLINE
USGS 7.5' Courtland Quadrangle

DCR
Department of Conservation & Recreation

KILBY NORTHWEST POWERLINE

LOCALITY: City of Suffolk **QUADRANGLE:** Buckhorn **QUADRANGLE CODE:** 3607666

LOCATION: A powerline right-of-way section northwest of Kilby, VA. Parallel to Norfolk and Western railway and intersected by Route 637.

RARE PLANT SUMMARY TABLE

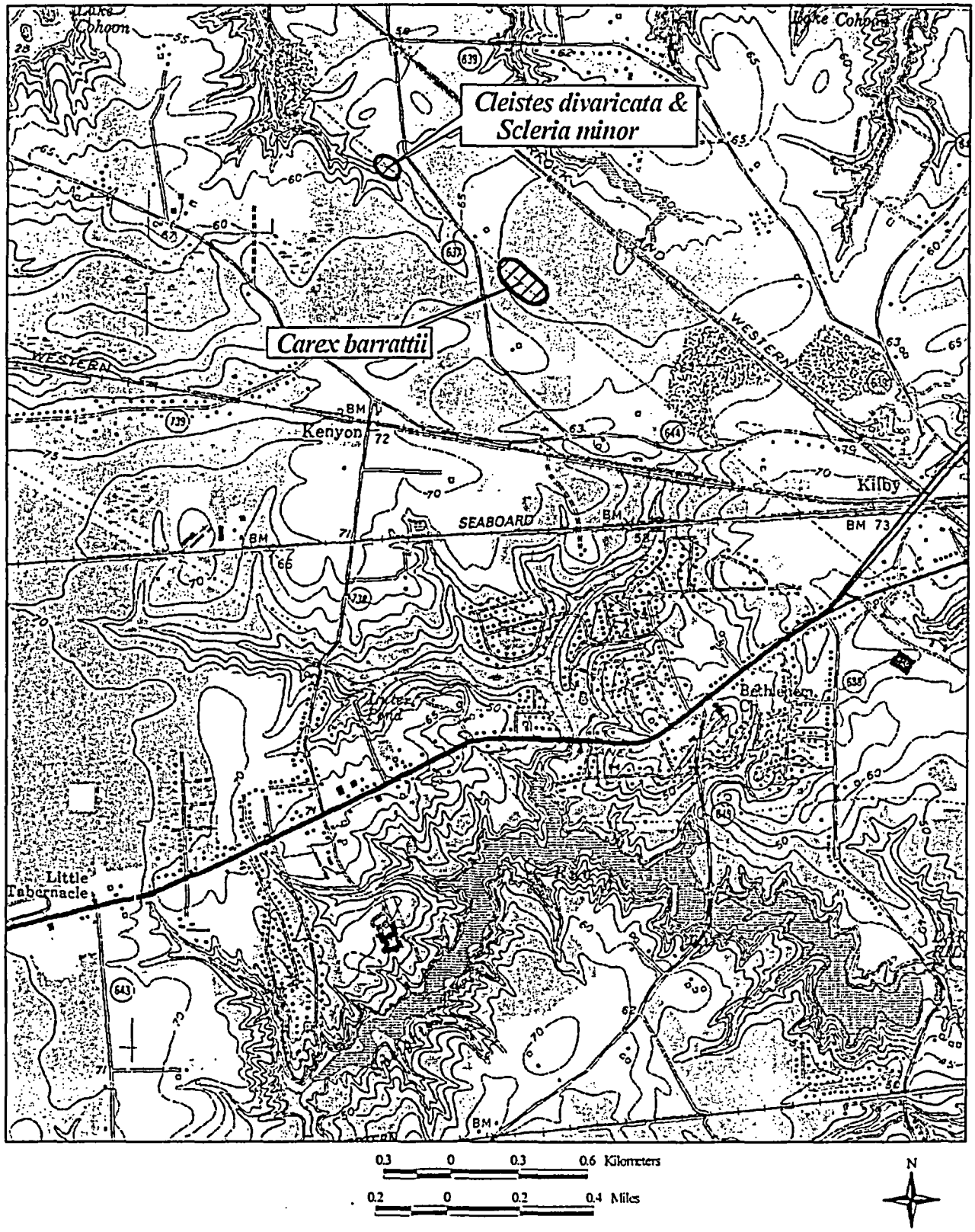
SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
Asclepias rubra	red milkweed	G4G5	S2	-	-	D
Calamovilfa brevipilis	pine barrens reedgrass	G4	S1	-	-	D
*Carex barrattii**	Barratt's sedge	G4	S2	-	-	BC
*Cleistes divaricata**	spreading pogonia	G4	S1	-	-	D
Ludwigia ravenii	raven's seedbox	G2?	S1	-	-	BC
*Scleria minor**	slender nutrush	G4	S2	-	-	B
Xyris platylepis	tall yellow-eyed grass	G5	S2	-	-	BC

*1998 record

SITE INFORMATION: Three new rarities were added to this site in June 1998. Route 637 divides this powerline into two sections. The eastern section is gently sloping and seasonally wet with scattered small depression wetlands. The dominants of this saturated section include *Arundinaria gigantea* ssp. *tecta* (small cane) *Pteridium aquilinum* var. *pseudocaudatum* (brachen fern), *Chasmanthium laxum* (slender spikegrass), *Andropogon glomeratus* (bushy bluestem) and dense mats of *Lycopodiella alopecuroides* (foxtail clubmoss). An abundant population of the state rare *Carex barrattii* (Barratt's sedge) occurs here over 0.5 acre.

The powerline section west of Route 637 is at a higher elevation and is characterized by dry sandy crests and wet, sphagnous swales. Several individual *Cleistes divaricata* (spreading pogonia) were in bloom in the wet, sphagnous western swales. Its associates include the rare *Xyris platylepis* (tall yellow-eyed grass), *Ilex glabra* (inkberry), *Polygala lutea* (yellow milkwort), *Osmunda cinnamomea* (cinnamon fern), *Andropogon glomeratus, Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Rhynchospora gracilenta* (slender beakrush), and *Rhododendron viscosum* (swamp azalea). *Scleria minor* (slender nutrush) is also located in the oligotrophic saturated swales of the western section. This rarity was abundant over 0.1 acre and occurred in sandy peat substrate. Associates of this substrate were *Ilex glabra, Eupatorium pilosum* (vervain thoroughwort), *Osmunda cinnamomea, Arundinaria gigantea* ssp. *tecta, Rhynchospora gracilenta*, and *Acer rubrum*. The populations of *Calamovilfa brevipilis* (pine barrens reedgrass) and *Asclepias rubra* (red milkweed) noted in 1997 were seen again in this year's survey and their status was updated in BCD.

Current management of the powerline vegetation by Virginia Power appears to have benefited the rare species at the site. Broad, untargeted spraying of herbicides should be avoided.



Locations of *Carex barrattii, Cleistes divaricata, & Scleria minor*
KILBY NORTHWEST POWERLINE
USGS 7.5' Buckhorn Quadrangle

DCR
Department of Conservation & Recreation

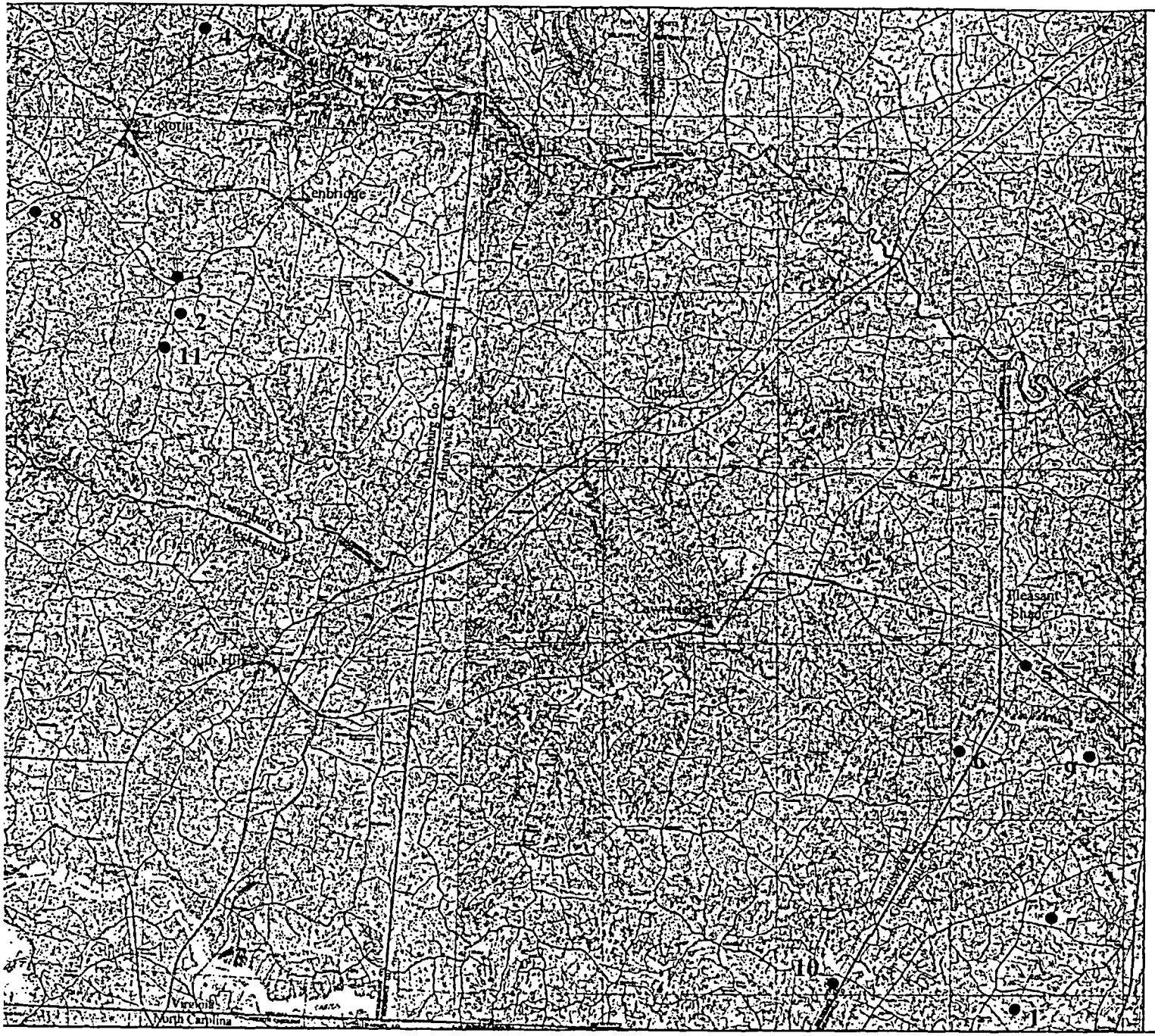


FIGURE 1. OVERVIEW OF THE 1998 VIRGINIA POWER STUDY AREA

Brunswick, Greensville, and Lunenburg Counties

● - Locations of Powerline Rights-of-Way Surveyed in 1998

POWERLINE RIGHTS-OF-WAY

1. Collier Branch Powerline
2. Crooked Creek Powerline
3. Good Hope Church Powerline
4. Modest Creek Powerline
5. Radium Flatwoods Powerline
6. Rising Star Church Powerline
7. Route 621 Powerline
8. Route 675 Powerline
9. South Meherrin Powerline
10. Southeast Brunswick Powerline
11. Unity Church Powerline

N

2 0 2 4 Kilometers

2 0 2 4 Miles

DCR
Department of Conservation & Recreation

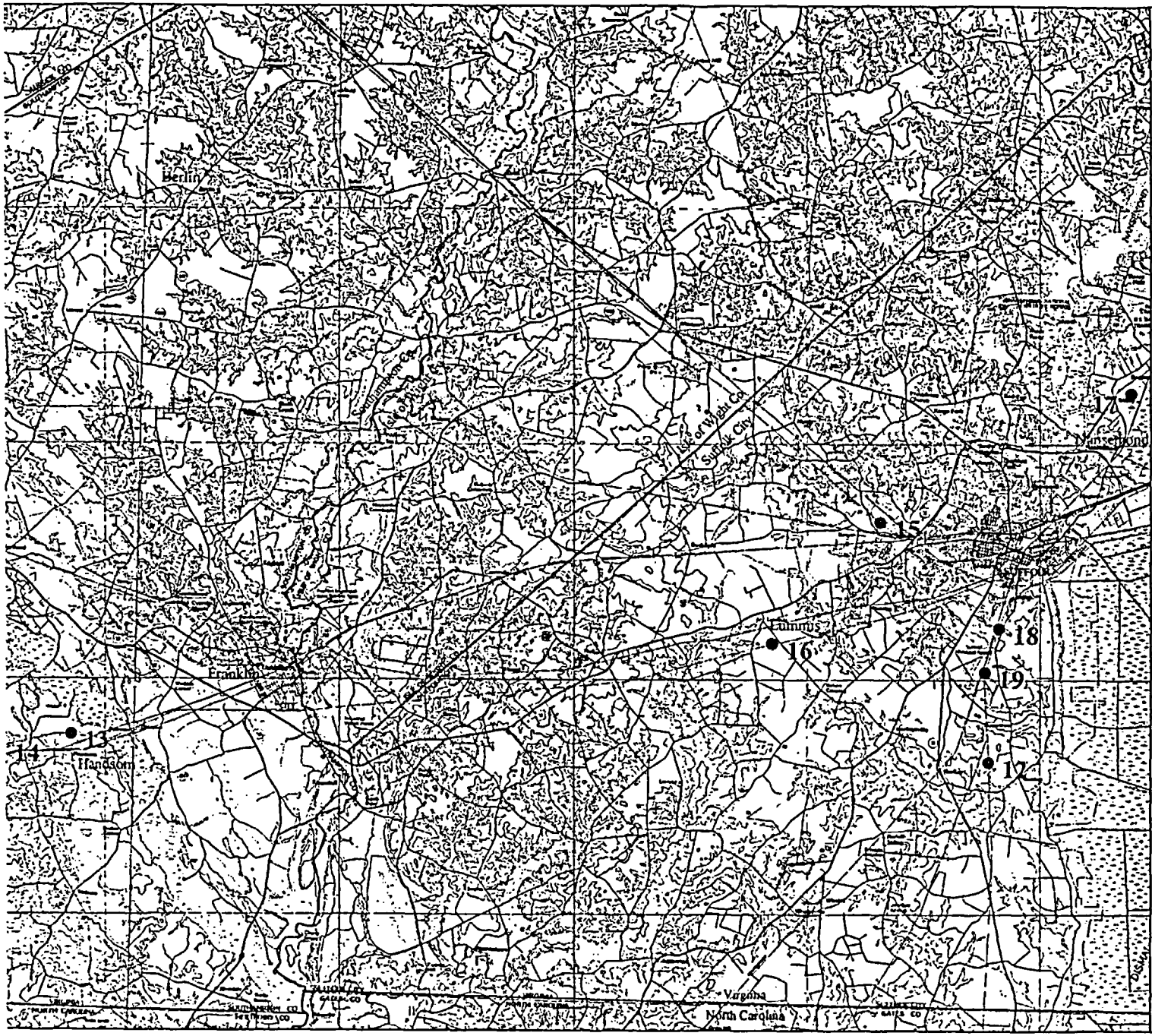


FIGURE 2. OVERVIEW OF THE 1998 VIRGINIA POWER STUDY AREA

City of Suffolk and Southampton County

● - Locations of Powerline Rights-of-Way Surveyed in 1998

POWERLINE RIGHTS-OF-WAY

12. Balm of Gilead Powerline
13. Handsom Powerline
14. Handsom - Gum Powerline
15. Kilby Northwest Powerline
16. Lummis Flatwoods
17. Rose of Sharon Church Powerline
18. Suffolk Airport North Powerline
19. Suffolk Airport South Powerline

N

2 0 2 4 Kilometers

2 0 2 4 Miles

DCR
Department of Conservation & Recreation

FIGURE 3. OVERVIEW OF THE 1998 VIRGINIA POWER STUDY AREA

Hanover County

● - Locations of Powerline Rights-of-Way Surveyed in 1998

POWERLINE RIGHTS-OF-WAY

20. Lanes Corner Powerline
21. Nuckols Road Powerline
22. Route 738 Powerline
23. Route 626 Powerline
24. Route 625 Powerline
25. Route 657 Powerline
26. Routes 623/624 Powerline
27. Slaydon Creek Powerline
28. U.S. Route 1 Powerline

N

0.6 0 0.6 1.2 Kilometers

0.6 0 0.6 1.2 Miles

DCR
Department of Conservation & Recreation
DIVISION OF NATURAL HERITAGE

LUMMIS FLATWOODS

LOCALITY: City of Suffolk **QUADRANGLE:** Buckhorn **QUADRANGLE CODE:** 3607666

LOCATION: A powerline right-of-way section southeast of Lummis, VA. Roughly parallel to the Norfolk and Western railway and intersected by Route 647.

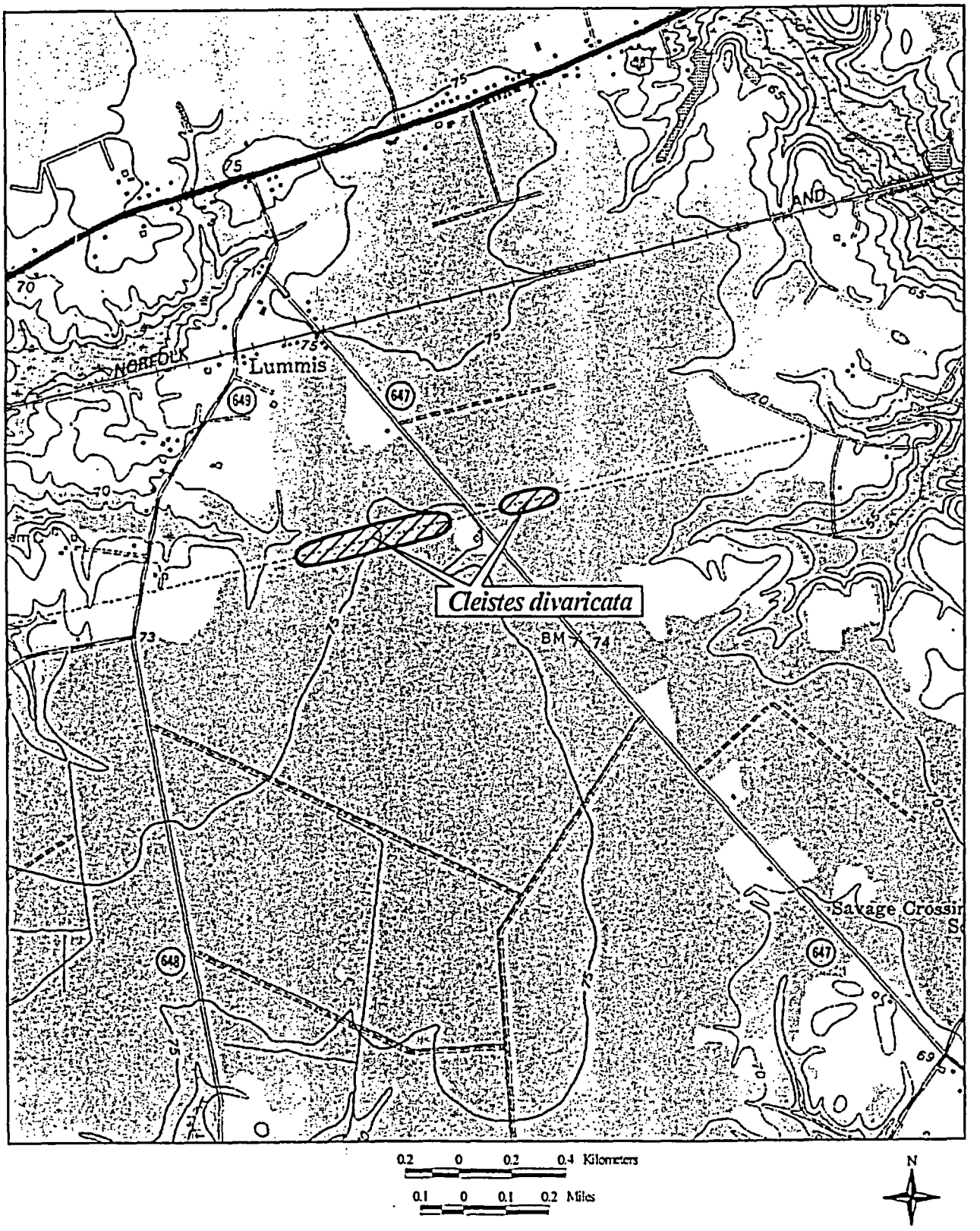
RARE PLANT SUMMARY TABLE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
*Cleistes divaricata**	spreading pogonia	G4	S1	-	-	AB
Gentiana autumnalis	pine-barren gentian	G3	S1	-	-	C
Rhynchospora debilis	savannah beakrush	G4?	S1	-	-	B
Scleria minor	slender nutrush	G4	S2	-	-	B
Sarracenia flava	yellow pitcher-plant	G4G5	S1	-	-	CD

*1998 record

SITE INFORMATION: This powerline right-of-way crosses a coastal plain flatwoods with extensive hardpan clay soils. The nutrient poor, permanently saturated condition of this area naturally inhibits woody plant growth. This condition, coupled with powerline clearing practices, creates a unique open habitat. This region likely supported ample open habitat for the rare species found in the powerline. Natural fires were historically more frequent and this area presumably supported shrub bog and savanna vegetation. Fire suppression and silvicultural practices have resulted in the conversion of open land to dense hardwood and pine plantations which surround the powerline (Ludwig, 1996). The powerline is dominated by native graminoid vegetation such as *Arundinaria gigantea* ssp. *tecta* (small cane), *Rhynchospora inexpansa* (nodding beakrush), and *Rhynchospora debilis* (savanna beakrush). Other associates include *Pteridium aquilinum* ssp. *pseudocaudatum* (Brachen fern) and *Ilex glabra* (inkberry). This site was visited two times during the 1998 field season. On the June visit, a large, impressive *Cleistes divaricata* (spreading pogonia) population was in flower. Flowering plant number was estimated to be between 100-150, with an estimated total of 200+ plants on the west side of Route 647. Four flowering plants were on the east side of Route 647. On the September visit, the powerline had been recently mowed and only a few swatches of vegetation remained. *Gentiana autumnalis* (pine-barren gentian) was flowering but due to the mowing, only a very small portion of the population recorded in 1994 was visible.

Current management of the powerline vegetation by Virginia Power appears to have benefited the rare species at the site. Broad, untargeted spraying of herbicides should be avoided. As noted in the first DCR-DNH/VA Power survey, adjacent logging continues to impact the site. Logging trucks have left deep ruts, large areas of exposed soil, and standing puddles. Trash dumping appears to have increased at the site. These unique flatwoods are worthy of protection; landowners should be contacted.



Location of *Cleistes divaricata*
LUMMIS FLATWOODS
USGS 7.5' Buckhorn Quadrangle

DCR
Department of Conservation & Recreation

ROSE OF SHARON CHURCH POWERLINE

LOCALITY: City of Suffolk **QUADRANGLE:** Chuckatuck **QUADRANGLE CODE:** 3607675

LOCATION: A powerline right-of-way near Wilroy, VA. Powerline access is from Route 337 north of Wilroy. The line was surveyed on the east side of Route 337, extending into the Great Dismal Swamp.

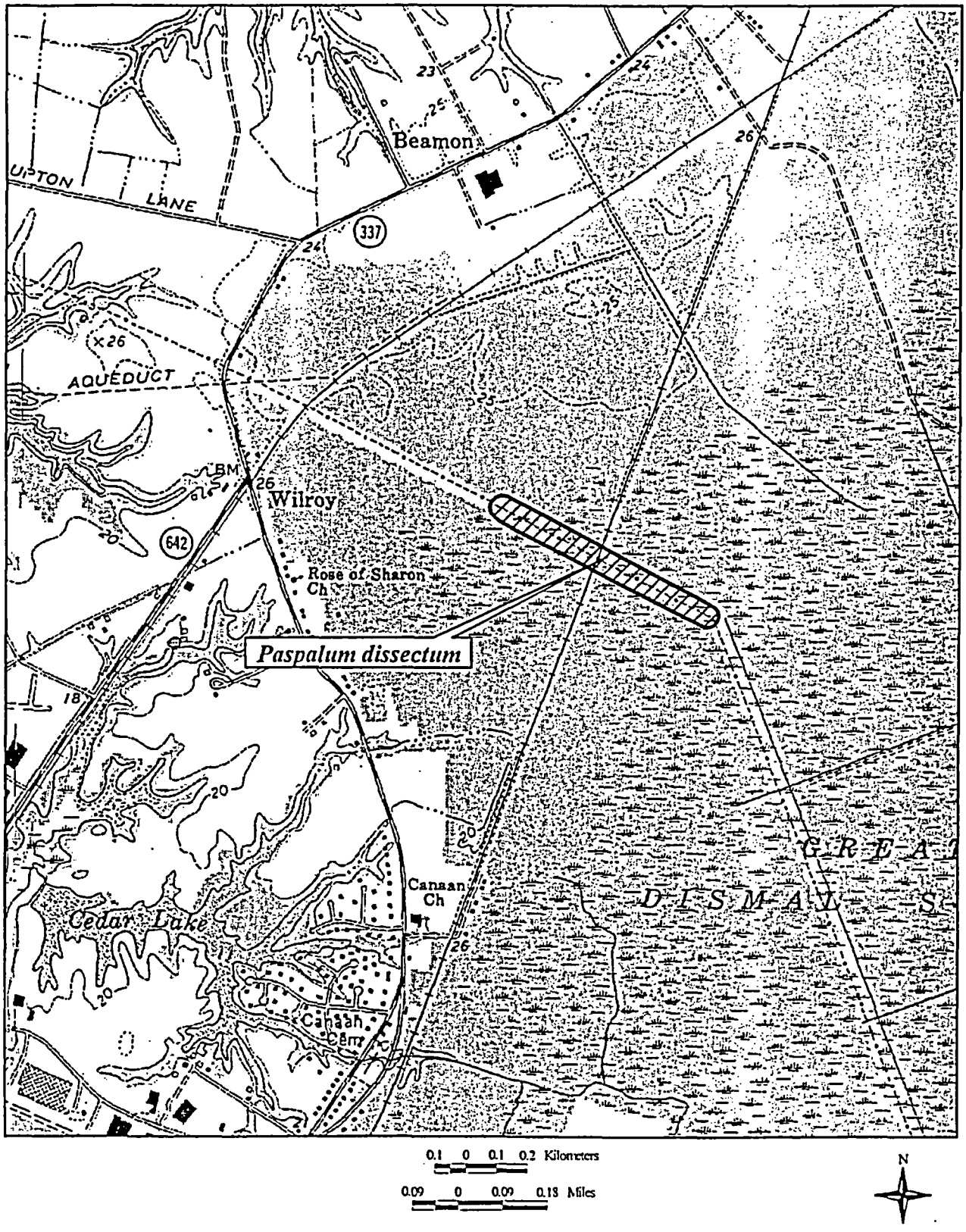
RARE PLANT SUMMARY TABLE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
Paspalum dissectum	water paspalum	G4?	S2	-	-	B

SITE INFORMATION: This site is located on the north edge of the Great Dismal Swamp and is mostly forested with saturated forests dominated by *Pinus taeda* (loblolly pine), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and dense *Arundinaria gigantea* ssp. *tecta* (small cane) understories.

Arundinaria gigantea ssp. *tecta*, *Panicum rigidulum* var. *rigidulum* (panic grass), and *Panicum verrucosum* (warty panic grass) dominate the vegetation of this powerline. A large population of the state rare grass *Paspalum dissectum* (water paspalum) occurs primarily in deep vehicle ruts. The species occurs over a large stretch of the powerline and ends approximately at the powerline curve. Its associates include *Panicum virgatum* (switchgrass), *Arundinaria gigantea* ssp. *tecta*, *Panicum verrucosum*, *Andropogon glomeratus* (bushy bluestem), and *Rhexia virginica* (Virginia meadow-beauty).

Current management of the powerline vegetation by Virginia Power appears to have benefited the rare species noted at the site. Broad, untargeted spraying of herbicides should be avoided.



Location of *Paspalum dissectum*
ROSE OF SHARON CHURCH POWERLINE
USGS 7.5' Chuckatuck Quadrangle

DCR
Department of Conservation & Recreation

ROUTE 621 POWERLINE

LOCALITY: Greensville County **QUADRANGLE:** Skippers **QUADRANGLE CODE:** 3607755

LOCATION: A powerline right-of-way east of Brink, VA. The powerline north of Route 621 was surveyed.

RARE PLANT SUMMARY TABLE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
*Scleria minor**	slender nutrush	G4	S2	-	-	BC
Hypericum setosum	a Saint John's wort	G4G5	S1S	-	-	

*1998 record

SITE INFORMATION: Route 621 powerline was first visited in 1995. A return visit was made in June 1998 to check for early season rarities. The powerline is characterized by acidic, oligotrophic seasonal wetlands. The southern end of the line surveyed was extremely wet with areas of standing water. The wet areas were dominated by moisture demanding graminoids. A new record of *Scleria minor* (slender nutrush) was recorded here. The state rare nutrush population was scattered in patches throughout the line.

Current management of the powerline vegetation by Virginia Power appears to have benefited the rare species at the site. Broad, untargeted spraying of herbicides should be avoided.

Location of *Scleria minor*
ROUTE 621 POWERLINE
USGS 7.5' Skippers Quadrangle

DCR
Department of Conservation & Recreation

SUFFOLK AIRPORT NORTH POWERLINE

LOCALITY: City of Suffolk **QUADRANGLE:** Suffolk **QUADRANGLE CODE:** 3607665

LOCATION: A powerline right-of-way just west of Route 604. Northeast of Suffolk Municipal Airport.

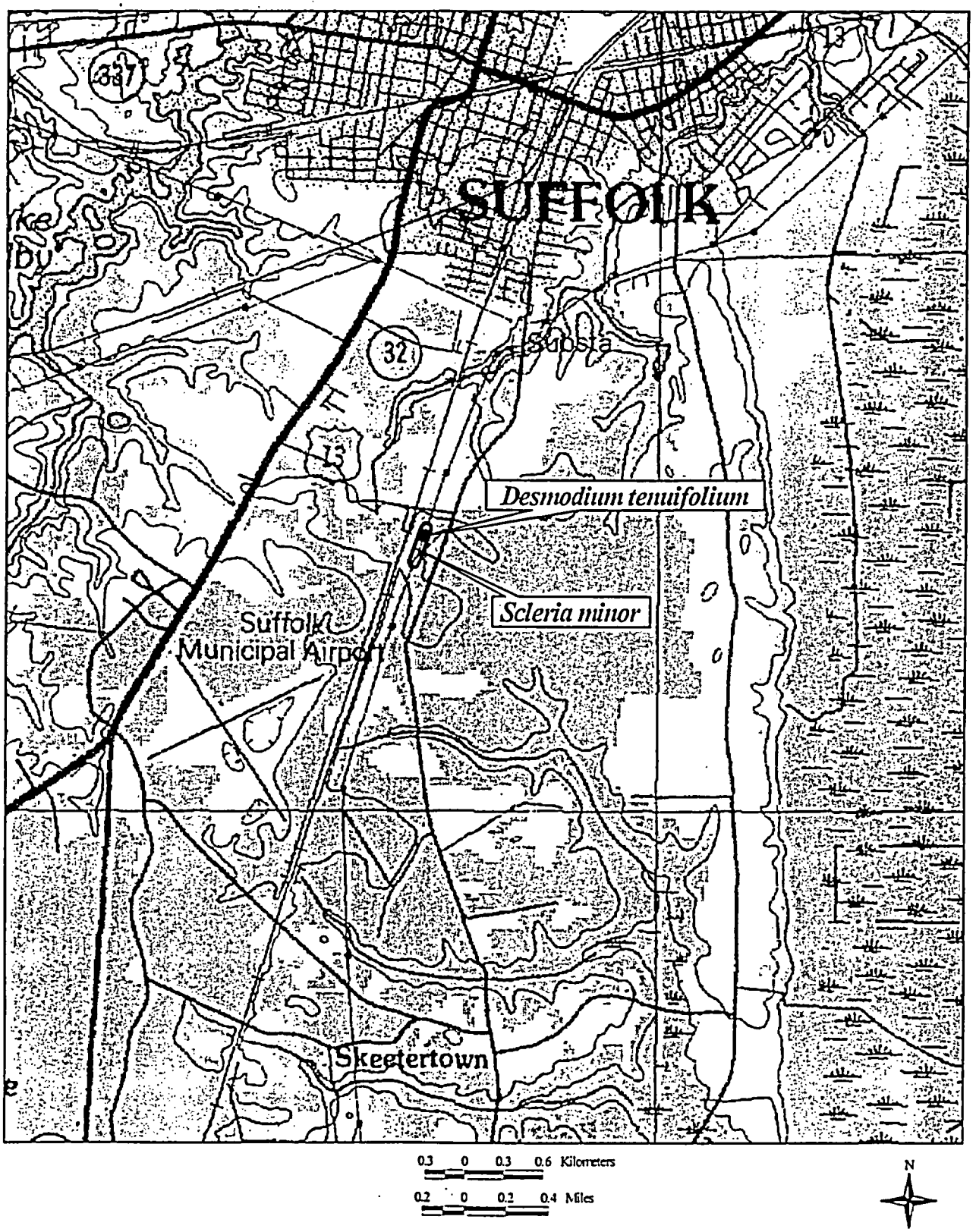
RARE PLANT SUMMARY TABLE

SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
*Desmodium tenuifolium**	slim-leaf tick-trefoil	G3G4	S1	-	-	CD
*Scleria minor**	slender nutrush	G4	S2	-	-	B
Ctenium aromaticum	tooth-ache grass	G5	S1	-	-	D
Gentiana autumnalis	pine-barren gentian	G3	S1	-	-	D

*1998 record

SITE INFORMATION: This section of powerline right-of-way has seasonally saturated clay soils which support outstanding grassland vegetation. This vegetation is entirely native and suggests that the area was once a wet pine savanna. Dominant or characteristic species include *Arundinaria gigantea* ssp. *tecta* (small cane), *Panicum virgatum* var. *cubense* (blunt panic grass), *Pteridium aquilinum* var. *pseudocaudatum* (bracken fern), *Chasmanthium laxum* (slender spikegrass), *Schizachyrium scoparium* (little bluestem), *Panicum rigidulum* var. *rigidulum* (tall flat panic grass), *Rhexia nashii* (hairy meadow-beauty), *Polygala lutea* (yellow milkwort), *Dichanthelium scabriusculum* (tall swamp panic grass), *Iris verna* (dwarf iris), *Bartonia virginica* (yellow screwstem), and *Lycopodiella alopecuroides* (foxtail clubmoss). Small populations of two rare species, the state rare *Ctenium aromaticum* (toothache grass) and the globally rare *Gentiana autumnalis* (pine-barren gentian) were located in 1997. (Van Alstine et al.1998). This year's survey produced two more rare species records, *Desmodium tenuifolium* (slim-leaf tick-trefoil) and *Scleria minor* (slender nutrush). The thirty *Desmodium tenuifolium* plants ranged over several square meters, and large numbers of *Scleria minor* occurred along the western edge of the powerline.

The powerline is bordered to the east by an industrial development and abandoned farmland, and to the west by cut over pine forest. These surrounding land uses pose potential threats to the powerline habitat but are not currently impacting the site. Management of the powerline vegetation by Virginia Power appears to have benefited the rare species at the site. Broad, untargeted spraying of herbicides should be avoided.



Locations of *Desmodium tenuifolium & Scleria minor*
SUFFOLK AIRPORT NORTH POWERLINE
USGS 100K Suffolk Quadrangle

DCR
Department of Conservation & Recreation

SUFFOLK AIRPORT SOUTH POWERLINE

LOCALITY: City of Suffolk **QUADRANGLE:** Suffolk **QUADRANGLE CODE:** 3607665

LOCATION: A powerline right-of-way northwest of Skeeter Crossing, VA. East-southeast of the Suffolk Municipal Airport. Surveyed north of Route 705.

RARE PLANT SUMMARY TABLE

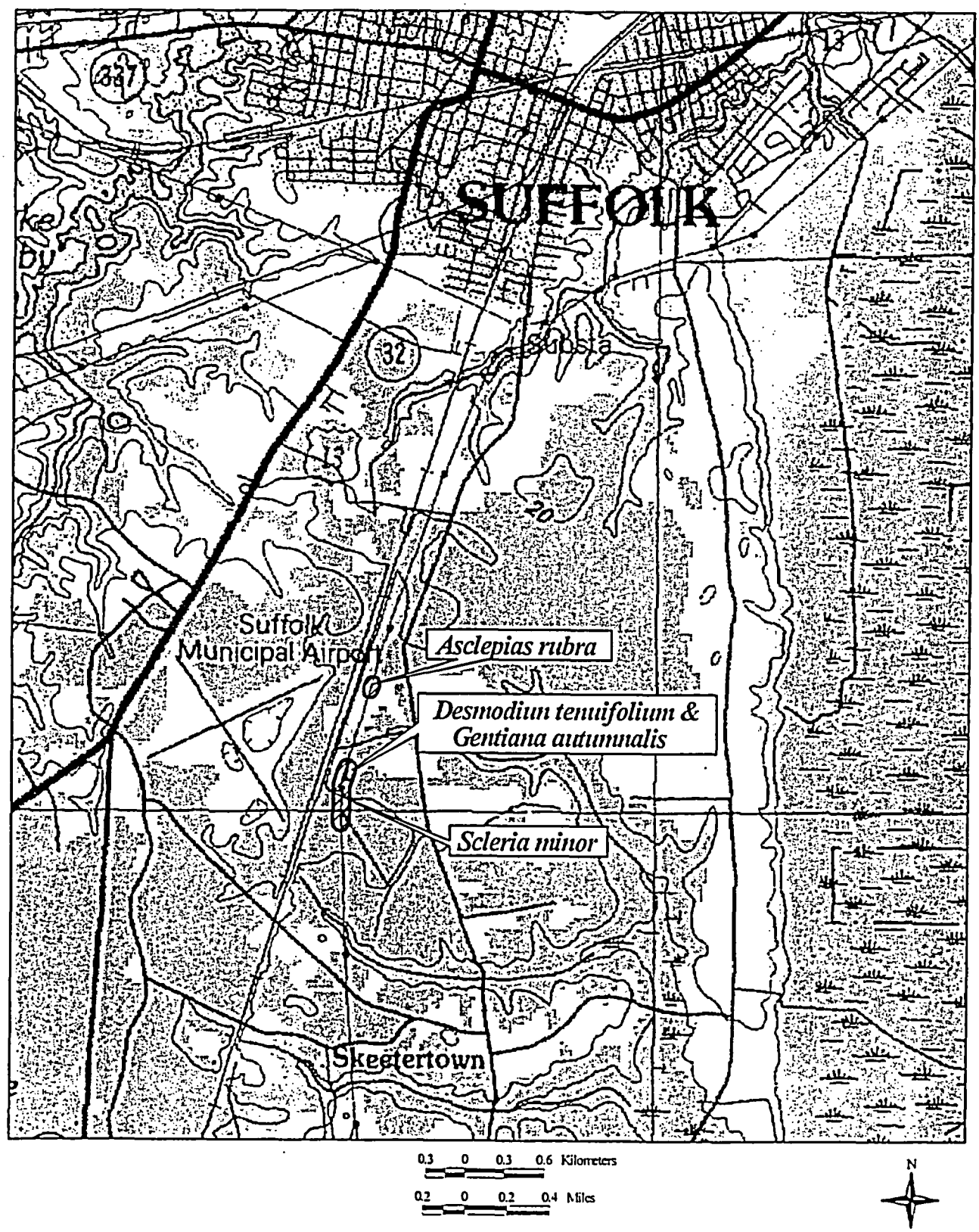
SCIENTIFIC NAME	COMMON NAME	GLOBAL RARITY RANK	STATE RARITY RANK	USFWS STATUS	VA LEGAL STATUS	ELEMENT OCCURRENCE RANK
Asclepias rubra (1)	red milkweed	G4G5	S2	-	-	B
Asclepias rubra (2)*	red milkweed	G4G5	S2	-	-	AB
Calamovilfa brevipilis	pine barrens reedgrass	G4	S1	-	-	D
Desmodium tenuifolium (1)	slim-leaf tick-trefoil	G3G4	S1	-	-	CD
Desmodium tenuifolium (2)*	slim-leaf tick-trefoil	G3G4	S1	-	-	CD
*Gentiana autumnalis**	pine-barren gentian	G3	S1	-	-	CD
*Scleria minor**	slender nutrush	G4	S2	-	-	B
Solidago latissimifolia	Elliot goldenrod	G5	S2	-	-	B
Xyris platylepis	tall yellow-eyed grass	G5	S2	-	-	C

*1998 record

SITE INFORMATION: This powerline right-of-way traverses a flat, seasonally wet landscape at the north and south ends of the survey area. Lower elevation sphagnum seeps lie in the center of the line. A cornfield intrudes into the right-of-way on a hillside between two of these swales. The largest swale supports coarse and weedy eutrophic wetland vegetation, possibly as a result of fertilizer run-off. In the remainder of the right-of-way, vegetation is distinctly oligotrophic and entirely native, suggesting that of wet pine savannas and bogs. Dominant or characteristic species include low *Arundinaria tecta* ssp. *tecta* (small cane), *Panicum virgatum* var. *cubense* (blunt panic grass), *Pteridium aquilinum* var. *pseudocaudatum* (bracken fern), *Chasmanthium laxum* (slender spikegrass), *Rhynchospora inexpansa* (nodding beakrush), *Schizachyrium scoparium* (little bluestem), and *Lycopodiella alopecuroides* (foxtail clubmoss). In the swales, *Polygala lutea* (yellow milkwort), *Andropogon glomeratus* (bushy bluestem), *Dichanthelium dichotomum* (bog panic grass), *Rhexia nashii* (hairy meadow-beauty), *Pycnanthemum flexuosum* (hyssop-leaved mountain-mint), *Rhynchospora gracilenta* (slender beakrush), *Platanthera cristata* (crested fringed orchid), and *Magnolia virginiana* (sweetbay magnolia) are also prominent. The rarities *Xyris platylepis* (tall yellow-eyed-grass), *Asclepias rubra* (red milkweed), *Solidago latissimifolia* (Elliott goldenrod), *Calamovilfa brevipilis* (pine barrens reedgrass) and *Desmodium tenuifolium* (slim-leaf tick-trefoil) were recorded at this site in 1997 (Van Alstine *et al.* 1998). New populations of *Asclepias rubra* and *Desmodium tenuifolium* were located in 1998. The new *Asclepias rubra* population of 200+ plants in bud and early flower occurred over approximately 0.5 acre. The small *Desmodium tenuifolium* population was recorded north of the powerline bend, on the eastern edge of the line. Two new rare species occurrences, *Gentiana autumnalis* (pine-barren

gentian) and *Scleria minor* (slender nutrush), were also recorded from the powerline. *Gentiana autumnalis* occurred in the same range as the new *Desmodium tenuifolium* population. The large *Scleria minor* population was common along both edges of the powerline bend.

Overall the current management of the powerline vegetation by Virginia Power appears to have benefited the rare species at the site. The intrusion of the cornfield and possible fertilizer run-off may have eutrophied some previous habitat for rarities. There were old tires dumped in the site near the southernmost *Asclepias rubra* and *Xyris platylepis* occurrences and further dumping should be discouraged. Broad, untargeted spraying of herbicides should be avoided.



Locations of *Asclepias rubra, Desmodium tenuifolium, Gentiana autumnalis, & Scleria minor*
SUFFOLK AIRPORT SOUTH POWERLINE
USGS 100K Suffolk Quadrangle

DCR
Department of Conservation & Recreation

DISCUSSION

The 1998 surveys continued to demonstrate the value of powerline rights-of-way as suitable habitat for rare, light-demanding species. Nineteen element occurrences of thirteen elements (rarities) were recorded through the survey of twenty-eight powerlines. Many previously studied powerlines were revisited. Return visit findings suggest that habitats which support several rarities in one season are likely to harbor other rarities throughout the growing season. This is probably due to the uniqueness and quality of habitats. A current conservation science approach is aimed at identifying unique plant communities for conservation. By preserving rare habitats, the vegetation specialized to those habitats is also protected, even before the areas can be intensively surveyed (Maybury 1998). The concentration of grassland/savanna rare species in powerlines supports this concept. The maintenance practices of Virginia Power clearly provide viable open habitat for rare grassland and savanna vegetation by simulating the open habitat conditions that once covered large areas in Virginia.

Through the course of this agreement, 119 powerlines have been surveyed, 10 of these revisited in different years and seasons, and the list of rarity records continues to grow. The addition of these records to the BCD database has enhanced our knowledge of these plants and their requisite habitats. This increased understanding allows for improved selection of powerline sites that have high potential for rarities. The findings of this project are significant and promising powerlines remain to be explored. It is hoped that the agreement between VA Power and DCR-DNH will be continued.

However, as mentioned in previous reports, management and protection of the most significant sites would increase the value of this joint project. Herbicide application techniques should be closely monitored in areas identified in the project reports to support rare vegetation. No areas treated with broadcast herbicide spray were noted in this year's study. Recent mowing encountered at many sites limited the capability of the surveyors to make complete surveys of these powerlines. No rarities were recorded from the Hanover County powerlines, but many of these lines had been recently cut and surveying was limited to remaining swatches of vegetation. Future visits could better determine if rarities exist in these powerlines. Because of many threats to the critical powerline habitats, it is essential that landowners of the most significant sections be notified and informed of options for protection.

ACKNOWLEDGMENTS

This project was initiated by Virginia Power's Department of Environmental Policy and Compliance and Department of Forestry. In large part credit for this project is due to the initiative and guidance of Bill Bolin and Roger Leadman, respective directors in those departments.

Bill Bolin's continued assistance in 1998 in the provision of administrative and field support was indispensable. Rick Willis provided direct access and transportation to powerline sites, as well as generous support with field supplies. We thank these and other involved Virginia Power staff for their contributions to this project.

We also thank our DCR-DNH staff who were involved in aspects of the 1998 survey including Chris Ludwig for his field inventory contributions, and Megan Rollins and Joe Weber for making the ArcView graphics available.

REFERENCES

Christensen, N.L. 1981. Fire regimes in southeastern ecosystems. Pages 112-136 in H.A. Mooney T.M.Bonnicken, N.L. Christensen, J.E. Lotan, and W.A. Reinsers, eds. Fire regimes and ecosystem properties. USDA Forest Service Gen. Tech. Rep. WO-26. Code of Virginia. Virginia Natural Area Preserves Act, sections 10.1-209 *et seq.*

Environmental Systems Research Institute, Inc. 1996. ArcView GIS. ESRI, Redlands, CA.

Fleming G.P. and W.H. Moorhead III. 1998. Comparative wetlands ecology study of the Great Dismal Swamp, Northwest River and North Landing River in Virginia. Natural Heritage Tech. Rep. 98-9, Virginia Dept. of Conservation and Recreation, Div.. of Natural Heritage, Richmond. Unpublished report submitted to the U.S. Environmental Protection Agency. 181 pp. plus appendices.

Frost, C.C. 1995. Presettlement fire regimes in southeastern marshes, peatlands, and swamps. Pages 39-60 in S.I. Cerulean and R.T. Engstrom, eds. Proceedings 19th Tall Timbers Fire Ecology Conference, Tall Timbers Research Station, Tallahassee, FL.

Ludwig, J.C. 1996. A rare plant inventory of southeastern Virginia powerline rights-of-way. Natural Heritage Technical Report 96-7. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. May, 1996. 63 pp. plus appendix.

Maybury, Kathleen P., editor. 1999. Seeing the forest *and* the trees: Ecological Classification for Conservation. The Nature Conservancy, Arlington, Virginia.

Van Alstine, N.E., J.C. Ludwig, and G.P. Fleming. 1997. A rare plant inventory of selected powerline right-of-way sites in Virginia. Natural Heritage Technical Report 97-8. Virginia Dept. of Conservation and Recreation, Div.. of Natural Heritage, Richmond. 29 pp. plus appendix.

Van Alstine, N.E., G.P. Fleming and A. Belden, Jr. 1998. A rare plant inventory of additional powerline rights-of-way in southeastern Virginia. Natural Heritage Technical Report 98-6. Virginia Dept. of Conservation and Recreation, Div.. of Natural Heritage, Richmond. 53 pp. plus appendix.

Vogl, R. J. 1973. Fire in southeastern grasslands. Pages 175-198 in Proceedings Annual, Tall Timbers Fire Ecology Conference 12, Tall Timbers Research Station, Tallahassee, FL.

APPENDIX 1.
EXPLANATION OF THE NATURAL HERITAGE RANKING SYSTEM

Each of the significant natural features (species, community type, etc.) monitored by DNH is considered an element of natural diversity, or simply an element. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare; 5 = abundant; Table 1). The primary criterion for ranking elements is the number of occurrences, i.e. the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, for highly mobile organisms, the total number of individuals. Other considerations include condition of the occurrences, number of protected occurrences, and threats. However, emphasis remains on the number of occurrences, so that ranks essentially are an index of known biological rarity. These ranks are assigned in terms of an element's rarity within Virginia (its State or S-rank) and the element's rarity over its entire range (its Global or G-rank).. Subspecies and varieties are assigned a Taxonomic (T-) rank in addition to their G-rank. Taken together, these ranks give an instant picture of an element's rarity. For example, a rank of G5/S1 indicates an element which is abundant and secure range-wide, but extremely rare in Virginia. Ranks for community types are provisional or lacking, due to ongoing efforts by the Natural Heritage network to classify community taxa. Rarity ranks used by DNH are not legal designations, and they are continuously updated to reflect new information.

Definition of Natural Heritage state rarity ranks. Global ranks are similar, but refer to a species' range-wide status. Note that GA and GN are not used and GX means extinct. Sometimes ranks are combined (e.g., S1S2) to indicate intermediate or somewhat unclear status. Elements with uncertain taxonomic validity are denoted by the letter Q, after the global rank. Ranks for most community types have not been generated due to ongoing community classification efforts. These ranks should not be interpreted as legal designations.

S1 Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.

S2 Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.

S3 Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

S4 Common; usually more than 100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

S5 Very common; demonstrably secure under present conditions.

SA Accidental in the state.

SH Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.

SN Regularly occurring migrants or transient species which are non-breeding, seasonal residents. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SX Apparently extirpated from the state

The spot on the landscape that supports a natural heritage resource is an element occurrence. DNH has mapped over 9,000 element occurrences in Virginia. Information on the location and quality of these element occurrences is computerized within the Division's BCD system, and additional information is recorded on maps and in manual files.

In addition to ranking each element's rarity, each element occurrence is ranked to differentiate large, outstanding occurrences from small, vulnerable ones. In this way, protection efforts can be aimed not only at the rarest elements, but at the best examples of each. Species occurrences are ranked in terms of quality (size, vigor, etc.) of the population; the condition (pristine to disturbed) of the habitat; the viability of the population; and the defensibility (ease or difficulty of protecting) of the occurrence. Community occurrences are ranked according to their size and overall natural condition. These element occurrence ranks range from A (excellent) to D (poor).

Sometimes these ranks are combined to indicate intermediate or somewhat unclear status, e.g. AB or CD, etc. In a few cases, especially those involving cryptic animal elements, field data may not be sufficient to reliably rank an occurrence. In such cases a rank of E (extant) may be given. Element occurrence ranks reflect the current condition of the species' population or community. A poorly-ranked element occurrence can, with time, become highly-ranked as a result of successful management or restoration.

Element ranks and element occurrence ranks form the basis for ranking the overall significance of sites. Site biodiversity ranks (B-ranks) are used to prioritize protection efforts, and are defined as follows:

B1 Outstanding Significance: only site known for an element; an excellent occurrence of a G1 species; or the world's best example of a community type.

B2 Very High Significance: excellent example of a rare community type; good occurrence of a G1 species; or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type; good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type; excellent or good occurrence of state-rare species.

B5 General Biodiversity Significance: good or marginal occurrence of a community type or state-rare species.

Note: sites supporting rare subspecies or varieties are considered slightly less significant than sites supporting similarly ranked species.

The U.S. Fish and Wildlife Service (USFWS) is responsible for the listing of endangered and threatened species under the Endangered Species Act of 1973, as amended. Federally listed species (including subspecific taxa) are afforded a degree of legal protection under the Act, and therefore sites supporting these species need to be highlighted. USFWS also maintains a review listing of potential endangered and threatened taxa known as candidate species and species of concern. Table 2 illustrates the various status categories used by USFWS and followed in this report. The status category of species is based largely on the Service's current knowledge about the biological vulnerability and threats to a species.

In Virginia, two acts have authorized the creation of official state endangered and threatened species lists. One act (section 29.1-563 through 570, Code of Virginia), administered by the Virginia Department of Game and Inland Fisheries (DGIF), authorizes listing of fish and wildlife species, not including insects. The other act (section 3.1-1020 through 1030, Code of Virginia), administered by the Virginia Department of Agriculture and Consumer Services (VDACS), allows for listing of plant and insect species. In general, these acts prohibit or regulate taking, possessing, buying, selling, transporting, exporting, or shipping of any endangered or threatened species appearing on the official lists. Species protected by these acts are indicated as either listed endangered (LE) or listed threatened (LT). Species under consideration for listing are indicated as candidates (C).

U.S. Fish and Wildlife Service species status codes, with abbreviated definitions.

LE Listed endangered

LT Listed threatened

PE Proposed to be listed as endangered

PT Proposed to be listed as threatened

S Synonyms

C Candidate: status data supports listing of taxon as endangered or threatened, but listing has been delayed by pending proposals of higher priority taxa.