MONITORING OF POWER LINE ENDANGERED SPECIES 2015

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This report summarizes the status of North Carolina Natural Heritage Program (2015) element occurrences (EOs) for three federally endangered plant species -- **golden sedge** (*Carex lutea*), **roughleaf loosestrife** (*Lysimachia asperulifolia*), and **Cooley's meadowrue** (*Thalictrum cooleyi*) -- found within the Duke Energy Progress power line corridor located between NC 50 (Onslow County) and Lodge Road (Pender County). This document fulfills contract amendment three signed in February 2015 between myself and the North Carolina Forest Service. Specific EOs selected for monitoring within the portion of the power line plowed in 2011 were: Cooley's meadowrue (5 and 28), golden sedge (11) and roughleaf loosestrife (91, 95, 96, and 208). Additional EOs outside the plowed segment were included to serve as controls: Cooley's meadowrue EO 4 and golden sedge EO 3. Golden sedge EO 14 is located outside the corridor too, but has succeeded to a closed pine forest. Locations of all EOs along the power line are given in Figure 1. Photos from each site are presented in Appendix A. Vicinity photos and GPS readings were taken, using Natural Heritage Program location information, to approximate prior EOs where no plants were found. Soil series mentioned refer to mapping given in Barnhill (1990 and 1992).

Executive Summary: Within the power line plowed to contain the Juniper Road Fire in summer 2011, **golden sedge** clumps remained higher in numbers at EO11A compared to 2013 and the original count, but still not present at EO11B. There were no sedges present at EO14 whereas the control site (EO3) had two more plants than 2009. **Roughleaf loosestrife** populations were higher in individuals than last year at EO 96A, not present at 96B, and lower than past years at 96C. As in the past three years, no plants were present at EOs 91A/B/C, 95A/B, or 208. **Cooley's meadowrue** populations were considerably lower (79 fewer) in number than last year at the control site (EO 4) and not present at EO 28 this year; however, EO 5 had 94 plants, more than twice the highest number ever recorded for that population (see Table 1).

Management Needs/Growth Conditions: **Roughleaf loosestrife** occurrences at EO 96C were slightly lower than previous years, but plants originally counted near the powerpoles were being shaded out by woody vegetation. Numbers of plants at 96A increased over last year, but 96B suffered complete loss likely the result of vehicular traffic (see Appendix A). Continued reduction in **Cooley's meadowrue** numbers from last year at EOs 4 and 28 were related to aggressive growths of small trees/shrubs. Lack of any plants at EO 28 was directly related to an extensive thicket of *Hypericum galioides*, *Rosa palustris*, and *Rubus spp*. that dominated the area. At EO5 a recent prescribed burn by Division of Parks and Recreation staff was associated with reduced sapling/shrub

overstory and a dramatic increase in numbers. Periodic (1-3 year intervals) prescribed fires or careful cutting at all locations is recommended to avoid further loss. Such management also would benefit **golden sedges** at EO3 and EO11A (same location as EO4 and EO28 for **Cooley's meadowrue**) plus protection of all sites from compaction and rutting by vehicles is needed (e.g., EO 96B – **roughleaf loosestrife**).

Species (EO)	Original Monitoring (date)	2012	2013	2014	2015
Carex lutea (3 - Control)	5 (2009)	1	8	6	7
Carex lutea (11A)	55 (2006)	38	41	68	67
Carex lutea (11B)	4 (2004)	0	0	0	0
Carex lutea (14)	"more than one" (2001)	0	0	0	0
Lysimachia asperulifolia (91A/C)	70 (1999)	0	0	0	0
Lysimachia asperulifolia (91B)	25 (1999)	0	0	0	0
Lysimachia asperulifolia (95A)	10 (2002)	0	0	0	0
Lysimachia asperulifolia (95B)	"lots of plants" (2002)	0	0	0	0
Lysimachia asperulifolia (96A)	40 (2002)	0	0	105	121
Lysimachia asperulifolia (96B)	20 (2002)	0	0	12	0
Lysimachia asperulifolia (96C)	30 (2002)	14	15	17	10
Lysimachia asperulifolia (208)	29 (2011)	0	0	0	0
Thalictrum cooleyi (4 - Control)	191 (2009)	120	196	152	73
Thalictrum cooleyi (5)	25 (2011)	33	22	41	94
Thalictrum cooleyi (28)	62 (2006)	104	40	4	0

Table 1. Comparisons of element occurrence counts (subpopulations denoted by capital letters) in the power line corridor.

SITE DESCRIPTIONS –

A. Golden Sedge (*Carex lutea*) –

EO3 (Control): visited on April 27 (N34.63697, W77.61350). Seven clumps of plants with perigynia were present. There was more cover of shrubs and small trees compared to 2014. Plant associates included: *Acer rubrum, Andropogon spp., Cyrilla racemiflora, Cladium jamaicense, Erigeron vernus, Ilex glabra, Liquidambar styraciflua, Morella cerifera, Lachnanthes caroliniana, Polygala lutea, Rhynchospora spp., Sarracenia flava, and Thalictrum cooleyi*. Site, underlain by the Foreston soil series, was not burned, cut, or plowed during the previous year.

EO11: visited on April 27
Subpopulation A (N34.55273,W77.75674). A total of 67 clumps with perigynia were observed. Associates included: *Dichanthelium scabriusculum, Physostegia*

virginiana ssp. *praemorsa, Eupatorium capellifolium, Juncus* spp., *Liquidambar styraciflua, Morella cerifera, Nyssa biflora, Rhynchospora spp., and Rubus sp.* Soil furrows (Foreston/Woodington series transition) evident along wet edges of the corridor and interior pockets, but the central corridor had dense herbaceous vegetation and small shrubs; however a large thicket of *Hypericum galioides, Rosa palustris, and Rubus spp.* covered most of the adjacent area. A higher proportion of the clumps observed this year occurred in the open, moist area near Ashes Creek.

Subpopulation B (vicinity -- N34.55537,W77.75550). No plants present; most of the site with standing water except for sporadic stands of *Iris virginica* and *Lachnanthes caroliniana* as in 2013/14. Plow lines through Muckalee soil present along the edges of the corridor and in wettest spots.

EO14: visited on April 27 (vicinity -- N34.63667,W77.61750). No plants found; site remained overgrown with loblolly pines (*Pinus taeda*) and mixed shrubs/small trees (e.g., *Acer rubrum, Ilex glabra, Liquidambar styraciflua, Lyonia lucida, Morella cerifera*) which undoubtedly shaded out the former population found in 2001. A thorough search of adjacent lands, including the powerline corridor located immediately to the south, did not find any golden sedge occurrences in the Foreston soil.

B. Roughleaf Loosestrife (*Lysimachia asperulifolia*) –

EO91A, B, and C: visited on June 23 (vicinities for: A and C -- N34.58641, W77.68290; B -- N34.58381,W77.68633). No plants observed at any site. This was a power line segment that transitioned from *Aristida stricta* and *Vaccinium crassifolium* (dry) to *Woodwardia virginica*-dominated areas (wet) intermixed with *Carex striata, Ilex glabra, Lachnanthes caroliniana, Lyonia lucida, Persea palustris, Rhynchospora pallida,* and *Sarracenia flava.*. Soil furrows were visible among both the dry (sandy) and wetter (more organic matter) portions of this site -- Mandarin and Pactolus series.

EO95A and B: visited on June 23 (vicinity for: A -- N 34.61363,W77.76237; B -- N34.60534,W77.65696). No plants were present. Associates included: *Aristida stricta, Gaylussacia frondosa, Hypericum spp., Lacnanthes caroliniana, Lyonia lucida, Morella cerifera, M. caroliniensis, Osmundastrum cinnamomeum, Vaccinium crassifolium, Rhynchospora* spp., *Woodwardia virginica, Xyris spp.,* and *Zenobia pulverulenta*. These sites and the power line corridor in general alternated between well drained, sandy sections (Pactolus series) with mostly herbs versus poorly drained, high organic matter areas (Woodington and Torhunta series) dominated by pocosin shrubs; plow lines and ruts observed throughout.

EO96A: visited June 20 and 23 (A -- N34.56929, W77.72132). A total of 121 plants (>90% in flower) were observed in a linear population suggesting the area was "missed" by 2011 plowing. Other species observed were *Aristida stricta,*

Lacnanthes caroliniana, Lyonia lucida, Morella cerifera, Osmundastrum cinnamomeum, Polygala ramosa, Sarracenia flava, Vaccinium crassifolium, and Woodwardia virginica. Plow lines persistent among dry/sandy and wet/mucky surface horizons (Lynn Haven and Murville series) along the corridor.

EO96B: visited June 20 (N34.56985, W77.71983). No plants observed at this site, probably the result of recent vehicular disturbance. Other species observed were *Aristida stricta, Carex striata, Cyrilla racemiflora, Ilex coriacea, Lacnanthes caroliniana, Lyonia lucida, Morella cerifera, Polygala ramosa, Rhynchospora spp., Sarracenia flava, S. rubra, and Woodwardia virginica.* Plow lines persistent among dry/sandy and wet/mucky surface horizons (Lynn Haven and Murville series) along the corridor.

EO96C: visited on June 20 (N34.57266,W77.71118). There were 10 plants (8 in flower) found near a powerpole (third west of Bear Garden Road intersection with powerline) and within 25m to the southwest. Plant associates included: *Lacnanthes caroliniana, Polygala lutea, Sarracenia flava, and Woodwardia virginica*; soil (Lynn Haven series) with obvious furrows from plowing. Adjacent vegetation of small trees and shrubs (e.g., *Diospyros virginiana, Morella* spp., and *Persea palustris*,) were beginning to overtop loosestrifes growing near the power poles.

EO208: visited on June 23 (vicinity -- N34.62617,W77.62854): no plants present despite a thorough recent burn of this corridor segment which included EO 5 (Cooley's meadowrue – see below). Associates included *Arundinaria tecta, Dichanthelium scabriusculum, Centella erecta Coreopsis falcata, Eupatorium capillifolium, Ilex glabra, Lacnanthes caroliniana, Morella cerifera, Osmundastrum cinnamomeum, and Woodwardia virginica.* Furrows in the Stallings soil were visible throughout the site with standing water in some portions.

C. Cooley's Meadowrue (*Thalictrum cooleyi*) –

EO 4 (Control): visited on June 20, 23, and 26 (N34.63697,W77.61350). A total of 73 plants were counted, >75% in bloom. This location was close to *Carex lutea* EO3 with numerous other species such as: *Acer rubrum, Cyrilla racemiflora, Cladium jamaicense, Erigeron vernus, Ilex glabra, Liquidambar styraciflua, Morella cerifera, Polygala lutea, Rhynchospora spp., and Scutellaria integrifolia*. Site (underlain by the Foreston series) not mowed or burned in 2014. Many bushes of *Cyrilla* and *Morella* were tall (>1.5m) and clearly inhibited meadowrue growth/flowering. Several meadowrues were barely able to reach sunlight by growing through the shrub cover (Appendix A3).

EO 5: visited on June 20, 23, and 26 (N34.62919,W77.62443). There were 94 plants present, > 80% in bloom. Associates were: *Acer rubrum, Arundinaria tecta, Dichanthelium scabriusculum, Eupatorium capillifolium, Ilex glabra,*

Liquidambar styraciflua, Morella cerifera, Woodwardia virginica growing in Stallings/Torhunta soil. The recent prescribed burn removed prior overstory, reduced competition, and improved overall growth conditions for this species.

EO 28: visited on June 20 (N34.55273,W77.75674). No meadowrue plants present, only the following: *Carex lutea, Dichanthelium scabriusculum, Diospyros virginiana, Hypericum galioides, Physostegia virginiana* ssp. *praemorsa, Eupatorium capillifolium, Juncus* spp., *Liquidambar styraciflua, Morella cerifera, Nyssa biflora, Rhynchospora spp., Rosa palustris, and Rubus spp.* Soil (Foreston/Woodington series transition) furrows evident along wet edges of the corridor and interior pockets. This EO has experienced dramatic shading by the spread of *Hypericum galioides*, *Rosa palustris*, and *Rubus* spp. as a consequence of disturbance from plowing and subsequent lack of fire or mechanical removal of woody vegetation.

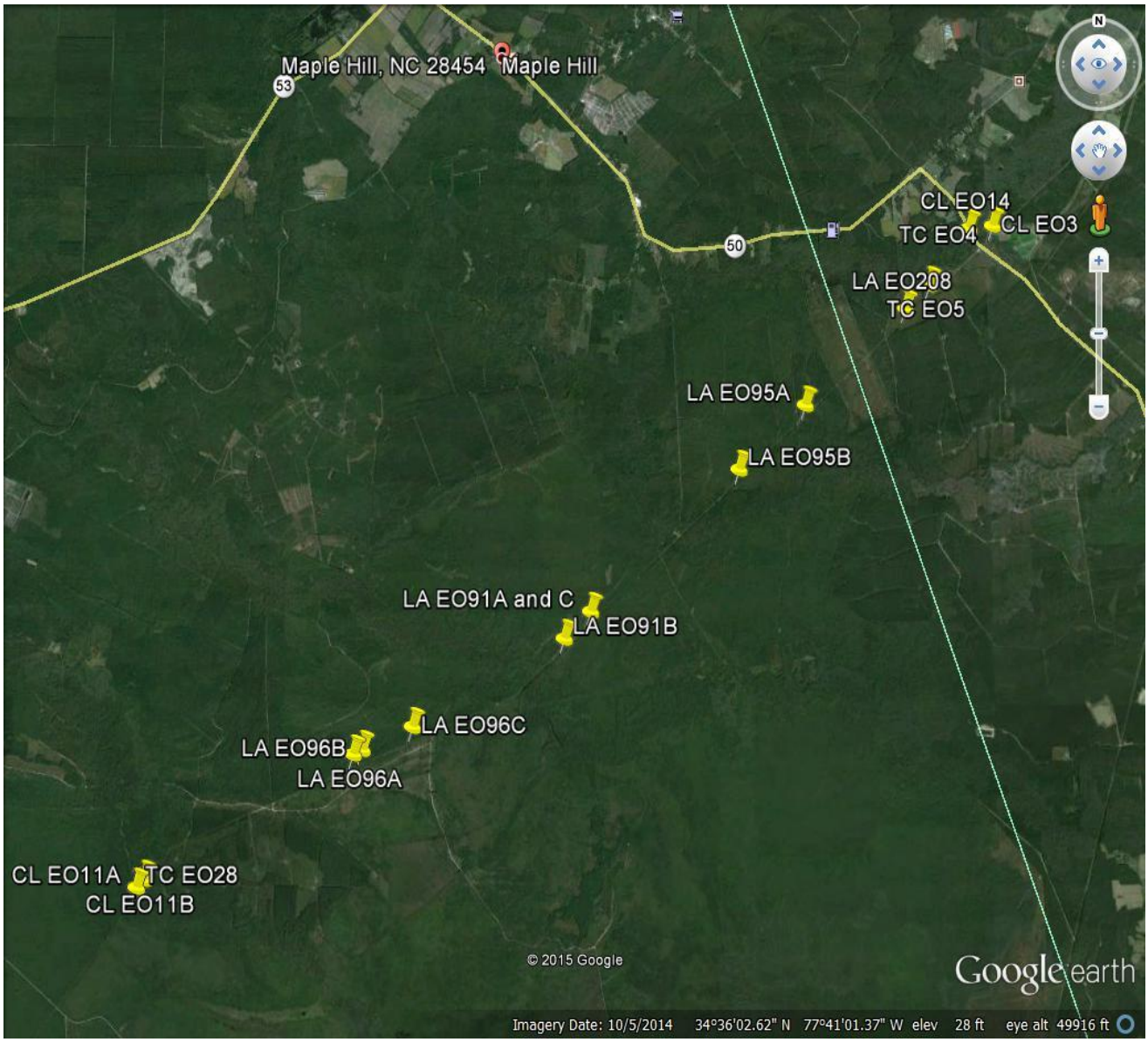
References

Barnhill, W.L. 1990. Soils survey of Pender County, North Carolina. United States Department of Agriculture, Soil Conservation Service. Washington, D.C.

Barnhill, W.L. 1992. Soils survey of Onslow County, North Carolina. United States Department of Agriculture, Soil Conservation Service. Washington, D.C.

North Carolina Natural Heritage Program. 2015. Element occurrences. Department of Environment and Natural Resources, Office of Conservation, Planning and Community Affairs. Raleigh, NC.

Figure 1. Locations of Element Occurrences (EOs) within the Duke Energy Progress Power Line Corridor near the Onslow – Pender County line and NC50.
CL = *Carex lutea* = **golden sedge**
LA = *Lysimachia asperulifolia* = **roughleaf loosestrife**
TC = *Thalictrum cooleyi* = **Cooley's meadowrue**



Appendix A

1. Golden Sedge Sites

EO3 – golden sedges with perigynia (April 27)

EO11A – golden sedges with perigynia (April 27)

EO11B vicinity (April 27) – no golden sedges present

EO14 vicinity (April 27) – no golden sedges present

2. Roughleaf Loosestrife Sites

EO91A and C vicinity (June 23) – no loosestrifes present

EO 91B vicinity (June 23) – no loosestrifes present

EO 95A vicinity (June 23) – no loosestrifes present

EO95 B vicinity (June 23) – no loosestrifes present

EO96A (June 20) – numerous loosestrifes in linear population

EO96 B (June 20) – no loosestrifes in area damaged by vehicular traffic

EO96C (June 20) – loosestrifes blooming adjacent to power poles

EO208 vicinity (June 23) – no loosestrifes found in recently burned corridor

3. Cooley's Meadowrue Sites

EO4 - Cooley's meadowrues growing in open spaces of shrub thicket with numerous white-bracted sedges (June 20)

EO 5 – meadowrues flowering within recently burned vegetation (June 23)

EO 28 – No meadowrues present; dense cover of *Hypericum galioides* and other shrubs (June 20)