North Carolina surveys for federally threatened *Aeschynomene virginica* (Sensitive Joint-vetch)

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1601 Mail Service Center, Raleigh, NC 27699-1601

Prepared by NC Natural Heritage Program
1601 Mail Service Center, Raleigh, NC 27699-1601

Aeschynomene virginica in Tidal Freshwater Marsh habitat in Virginia. Photo by Misty Buchanan.

NORTH CAROLINA Natural Heritage Program
SCIENCE GUIDING CONSERVATION

Albemarle - Pamlico National Estuary Partnership

Project summary

Sensitive Joint-vetch (*Aeschynomene virginica*), a federally threatened plant, currently occurs in Maryland, New Jersey, Virginia, and North Carolina. In Maryland, Virginia, and New Jersey, its habitat is tidal freshwater marshes (Tyndall 2011). *A. virginica* seems to grow best in marsh edges at an elevation near the upper limit of tidal fluctuation, in areas where plant diversity is high (USFWS 1995).

In early 2013, none of the historical populations in North Carolina were thought to persist (NCNHP 2013). The occurrences most recently observed in NC (last seen in 2011), were in wet roadside ditches, not high quality habitat. Most surveys in NC for this species have focused on previously known locations at roadside ditches, rather than high quality estuarine habitat.

In 2012, botanists from North Carolina surveyed populations in Virginia and Maryland to learn successful survey techniques, and in 2013, these survey methods were applied in North Carolina. Despite training in habitat identification, in 2013, no new Sensitive Joint-vetch populations were found in high quality habitat along the Trent River, Neuse River, or in Swan quarter National Wildlife Refuge, or in any new sites within roadside ditches. Only one small population was found in North Carolina (at a location previously believed extirpated).

Project scope of work

This project funded one season of field surveys and data collection from multiple locations in North Carolina in 2013. Biologists from the North Carolina Natural Heritage Program (NCNHP), U.S. Fish and Wildlife Service (USFWS), and Albemarle-Pamlico National Estuary Partnership (APNEP) participated in the surveys. In 2012, three of the participating biologists (Laura Robinson and Misty Buchanan from N.C. Natural Heritage Program and Dale Suiter from U.S. Fish and Wildlife Service) had visited sites in Maryland (with Wesley Knapp from Maryland Natural Heritage Program) and Virginia (with Johnny Townsend from Virginia Natural Heritage Program) to learn plant and habitat identification and survey techniques. The data collected during the 2013 surveys in North Carolina were used to update the records of element occurrences in N.C. and evaluate the status of *Aeschynomene virginica* populations in the state and contribute to assessments of the species' global range.

The ideal time for *A. virginica* surveys is during flowering and fruiting times in August to early-October each year. During this period, motor boat, kayak, and ground surveys were completed for historical occurrences and for sites with high quality potential habitat where plants have not been reported. Table 1 lists all known Element Occurrences (EO) records in North Carolina and those that were surveyed in 2013. Figure 1 shows all areas surveyed in 2013 covering historical EOs and potential sites.

Table 1. Element Occurrences (EO) records for Aeschynomene virginica in North Carolina

EO Num	EO Rank	Site or location description	County	Last observation year	2013 Comments
1	F – Failed to Find	Mattamuskeet National Wildlife Refuge	Hyde	1995	Not found
2	D – poor viability	Wichards Beach Rd. between Washington and Chocowinity	Beaufort	2013	2 Plants located
3	X - Extirpated	US Hwy 264, 0.7 mi. east of Lake Landing Canal	Hyde	1991	Not found – considered extirpated
4	X - Extirpated	US Hwy 264 west of Lake Landing	Hyde	1997	Not found – considered extirpated
5	X - Extirpated	Near Engelhard: east of SR 1311, about 0.1 mile north of the junction of SR 1311 and SR 1314	Hyde	1991	Not found – considered extirpated
6	X - Extirpated	0.3 mi. northwest of Engelhard on northeast side of SF 1311	Hyde	1985	Not found – considered extirpated
7	X - Extirpated	Wet ditch on north side of SR 1305, about 1 mi. west of Fairfield	Hyde	1985	Not found – considered extirpated
8	F – Failed to Find	Marshy thicket, one mi. south of Washington, Pamlico River	Beaufort	1957	Not surveyed
9	X – Extirpated	Sandy road bank on south side of Trent River on old US 70	Craven	1949	Not found – considered extirpated
10	F – Failed to Find	Pond, 0.5 mi southwest of James City, pond margin	Craven	1956	Not found; no suitable habitat remaining at pond margins.
11	X - Extirpated	Waste place near US Hwy 264, 0.4 mi. west of New Holland	Hyde	1958	Not found – considered extirpated
12	F – Failed to Find	US Hwy 264 north of Scranton Creek	Hyde	2004	Not found
13	H - Historical	Lenoir County	Lenoir	Pre-1900	Not surveyed in 2013 – not enough original location information for surveying.
20	F – Failed to Find	US Hwy 264 near Lake Landing	Hyde	2011	Not found

Searches for historical occurrences

On September 11, 2013 the area surrounding two historical records in the vicinity of James City (Element Occurrences 9 and 10) were surveyed by foot in roadside ditches along old Highway 70 and the nearby roadsides and by kayak within Scotts Creek (Figure 2 and 11). In planning the surveys, NCNHP botanists consulted historical maps from the 1950's showing the locations of the roads and waterways near the time the original specimens from this area were collected. Surveys attempted to cover the areas most likely to match the historical collection sites.

On September 17 and 18, botanists from NCNHP and USFWS searched for ten historical records in the roadside ditches surrounding Lake Mattamuskeet (EOs 1, 3, 4, 5, 6, 7, 11, 20), Scranton Creek (EO 12), and Chocowinity (EO 2) (Figures 3, 4, and 5).

Surveys of suitable habitat for new occurrences

Survey sites where *A. virginica* could potentially occur were identified based on NHP records of Tidal Freshwater Marsh natural communities, aerial photographs, and proximity to historical EOs of *A. virginica*. Potential sites with extensive marsh habitat were surveyed along the Trent River and lower Neuse River near Hog Island by motorized boat on August 26-27 (Figure 6 and 12). Marshes were surveyed by motorized boat in the upper reaches of Juniper Bay Creek and Rose Bay within and near Swan quarter National Wildlife Refuge on September 17 (Figure 7, 13, and 14). The extensive marsh north of Lake Mattamuskeet at the bridge crossing of Highway 94 over the Alligator River and Intracoastal Waterway was also surveyed near the roadside, but not within the marsh.

Results & Discussion

In 2013 surveys, only one historical EO was relocated during this survey, EO 2 near Chocowinity. All other sites had no *A. virginica* plants and were determined to be either extirpated ("X") if the plants had not been seen in several decades and had not been found in at least three survey attempts, or sites were determined to be failed to find ("F") if it was not found in 2013, but there have been less than three unsuccessful survey attempts made in recent years (Table 1). No new *Aeschynomene virginica* populations were found in high quality habitat along the Trent River, Neuse River, or in Swan quarter National Wildlife Refuge, or in any new sites within roadside ditches surveyed.

The only population currently known to exist within North Carolina is EO 2, which occurs adjacent to a railroad track, near a manmade ditch and roadside (Figures 8-10). There were only two plants found, one mature plant in fruit and one seedling. The population may have been sprayed with herbicide this year, as the only two plants there appeared to be just outside of an herbicide spray zone. Additionally, Tobacco Budworms (*Heliothis virescens* (F.)) were documented and feeding on the leaves and immature legumes of the larger plant (specimens were identified by David Stephan, at North Carolina State University Plant Disease and Insect Clinic). Given the small size of this population, the poor quality of

the habitat, and the documented threats, this population is considered to have poor viability (EO rank "D").

Aeschynomene indica, a closely related species to *A. virginica*, was observed in 2013 near the locations for EO 9 and 12, and in potential habitat surveyed on the lower Neuse River. As a result of these field observations, some questions arose as to whether these sites may have been originally misidentified. Herbarium records for EO 9 and 10 were re-examined and confirmed as correct identifications for *A. virginica*. The herbarium records further confirm that these populations have been extirpated at these locations.

Although no new *A. virginica* populations were located thus far in high quality marsh habitat, during these surveys 3,862 acres of Tidal Freshwater Marsh natural community element occurrence records were created or updated in the Natural Heritage Program database. It was also noted that marshes within Swan quarter National Wildlife Refuge that were previously mapped as freshwater marshes were observed to be transitioning into brackish marshes, an indication of recent increase in salinity from sea level rise.

Recommendations for future research

Currently only one small population of *Aeschynomene virginica* is known to occur in North Carolina. The next step for this population is to contact the landowners at this site to discuss possible protection and avoidance of herbicide use along the railroad right-of-way. The authors hope that 2013 was the first of several years of surveys for *Aeschynomene virginica* in North Carolina. More than one year's surveys are necessary to fully assess the status of this species in North Carolina and contribute to understanding of its global range and conservation status. In future years, surveys should be conducted on the Pamlico River near Washington and at Lake Mattamuskeet National Wildlife Refuge. An airboat or kayak is the only feasible method for surveys at Lake Mattamuskeet, due to shallow waters and mucky soils. Other areas with freshwater marshes and potential habitat similar to the populations in Virginia includes islands and marshes in northern Currituck Sound and at Goose Creek State Park.

Project partners and contributors

In addition to funding this project, APNEP staff Dean Carpenter and Lindsey Smart assisted with two days of surveys on the Trent and Neuse Rivers and provided the boat to complete these surveys. Dale Suiter, botanist from the U.S. Fish and Wildlife Service-Raleigh field office, participated in surveys on the Trent and Neuse Rivers, Lake Mattamuskeet, Swan quarter, and roadside ditches in the surrounding area, and coordinated survey logistics on Wildlife Refuge properties. Allie Stewart, Lake Mattamuskeet National Wildlife Refuge biological technician provided and drove a boat for surveys at Swan quarter and participated in roadside surveys in Hyde County near Lake Mattamuskeet. Laura Robinson and Misty Buchanan from N.C. Natural Heritage Program organized and led survey efforts. NCNHP staff Scott Pohlman and John Finnegan also participated in one day of surveys.

Final budget, including total APNEP funds used

Service	**Expenditures**
NCNHP Salaries	$2874.18
NCNHP Social Security	$204.75
NCNHP Retirement	$427.28
NCNHP Medical Insurance	$271.45
NCNHP Transportation	$82.50
NCNHP Lodging	$144.08
NCNHP Meals	$195.60
Total	$4,199.84

Leverage committed in RFP/Scope

$2,408

Final leverage reported

Service	**Expenditures**
USFWS Salaries	$1,398.40
USFWS Social Security	$67.39
USFWS Retirement	$177.87
USFWS Medical Insurance	$70.80
USFWS Transportation	$120.00
USFWS Lodging	$395.40
USFWS Meals	$140.00
Gas for boat	$250.00
Total	$4,262.65

Match committed in RFP/Scope. N/A

Final match reported. N/A

Table 2: GPS coordinates (decimal degrees) of beginning and end points of linear surveys.

Survey Site	**Latitude (survey start point)**	**Longitude (survey start point)**	**Latitude (survey end point)**	**Longitude (survey end point)**	**Suitable habitat found (yes/no/marginal)**	***A. virginica* found (yes/no)**
Trent River	35.076 N	77.133 W	35.099 N	77.049 W	Yes	No
Lower Neuse River	35.172 N	77.1 W	35.132 N	77.048 W	Yes	No
James City (Scotts Creek)	35.091 N	77.039 W	35.087 N	77.038 W	Yes	No
James City (Old Hwy 70)	35.09 N	77.035 W	35.042N	77.001 W	No	No
Scranton Creek area roadsides	35.555 N	76.439 W	35.494 N	76.563 W	Marginal	No
Juniper Bay Creek	35.421 N	76.209 W	35.399 N	76.239 W	No	No
Rose Bay Creek	35.463 N	76.422 W	35.465 N	76.436 W	No	No
Lake Mattamuskeet area roadsides	35.599 N	76.233 W	35.441 N	76.186 W	Marginal	No

Table 3: GPS coordinates of point surveys.

Survey Site	**Latitude**	**Longitude**	**Suitable habitat found (yes/no/marginal)**	***A. virginica* found (yes/no)**
EO 1	35.539 N	78.18 W	Marginal	No
EO 2	35.526 N	77.064 W	Marginal	Yes
EO 3	35.484 N	76.063 W	Marginal	No
EO 4	35.48 N	76.092 W	Marginal	No
EO 5	35.52 N	76.023 W	Marginal	No
EO 6	35.544 N	76.059 W	Marginal	No
EO 7	35.536 N	76.245 W	Marginal	No
EO 11	35.442 N	76.177 W	Marginal	No
EO 12	35.505 N	76.446 W	Marginal	No
EO 20	35.478 N	76.104 W	Marginal	No

Acres or linear feet of land protected or restored. N/A

Electronic copy of printed materials, handouts, signage, and other communications materials.

The features that distinguish *Aeschynomene virginica* and *Aeschynomene indica* are based on somewhat vague characters in the published floras and plant keys. Based on 2013 observations of these species in the field, NCNHP noted the most distinguishing characteristics between these two similar species and assembled photos of these characteristics for comparison in Figure 15. These figures are being shared and distributed to our partners and other biologists for identification purposes. Electronic copies of photos and all materials will be made available to APNEP.

Photographs (if applicable) to accompany the text in the report.

See figures 8- 15.

All relevant summary statistics.

Activity	**Results**
Participants in surveys	8 (4 NCNHP, 2 APNEP, 2 USFWS)
Total Length of surveyed area	**79.5 miles**
Acreage of Marshes assessed (via ground surveys and interpretation of aerial photos near surveyed areas)	3,862 acres
Historical *A. virginica* occurrences surveyed in 2013	12
A. virginica plants found in 2013 in North Carolina	2

References

North Carolina Natural Heritage Program. 2013. Unpublished survey data in Element Occurrence Database. Office of Land and Water Stewardship, Department of Environment and Natural Resources, Raleigh, NC.

Tyndall, R. Wayne. 2011. Long-term monitoring of two subpopulations of the federally threatened *Aeschynomene virginica* (Sensitive Joint-vetch) in Maryland. Castanea 76(1): 20-27.

U.S. Fish and Wildlife Service. 1995. Sensitive Joint-vetch Recovery Plan. U.S. Fish and Wildlife Service, Northeast Region.

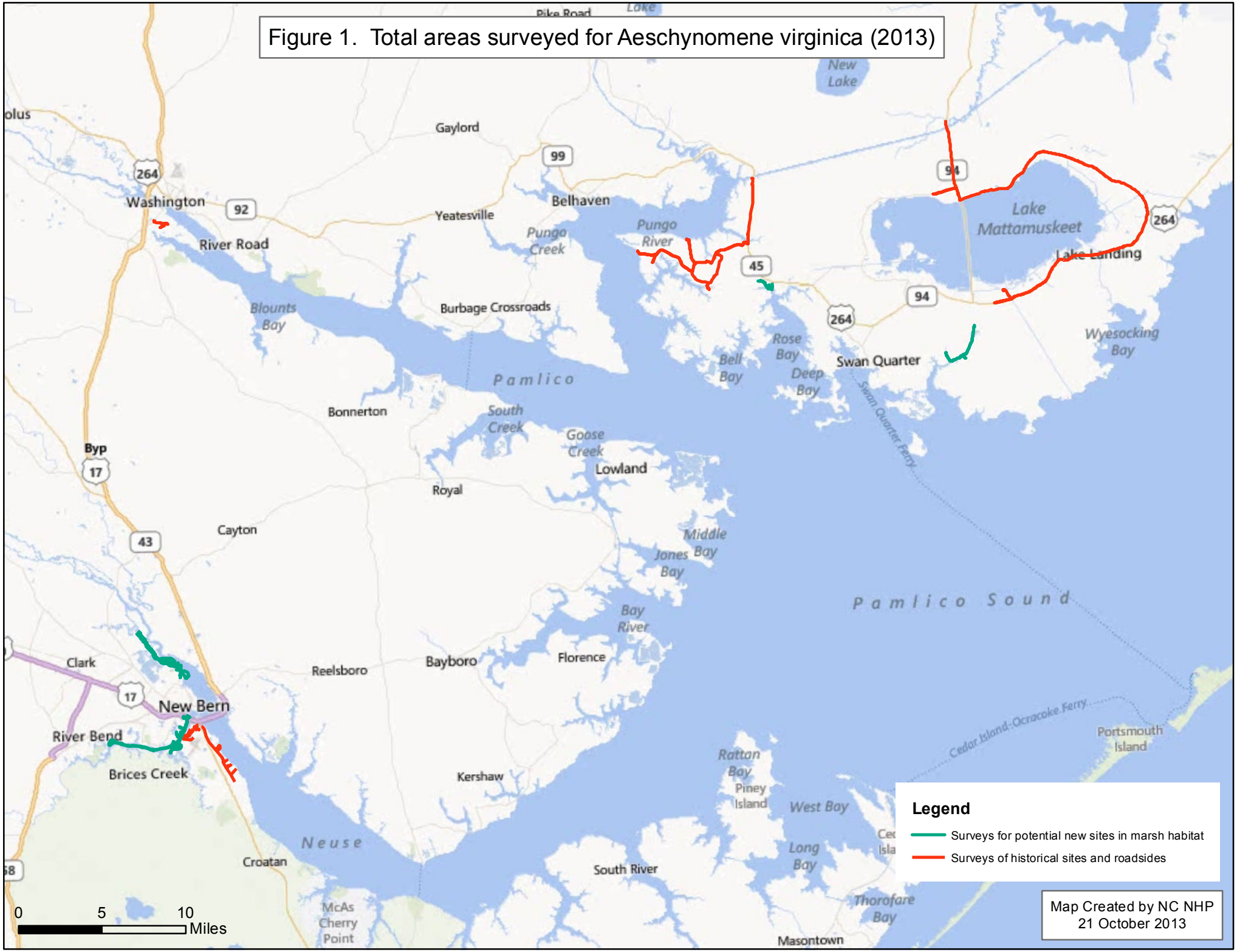
Figure 1. Total areas surveyed for Aeschynomene virginica (2013)
Gaylord
Washington
River Road
Yeatesville
Belhaven
Pungo Creek
Pungo River
Lake Mattamuskeet
Lake Landing
Blounts Bay
Burbage Crossroads
Pamlico
Bell Bay
Rose Bay
Deep Bay
Swan Quarter
Wyesocking Bay
Swan Quarter Ferry
Bonnerton
South Creek
Goose Creek
Lowland
Royal
Byp
Cayton
Middle Bay
Jones Bay
Pamlico Sound
Bay River
Clark
Reelsboro
Bayboro
Florence
New Bern
River Bend
Brices Creek
Kershaw
Rattan Bay
Piney Island
West Bay
Long Bay
Neuse
Croatan
South River
Thorofare Bay
McAs Cherry Point
Masontown
Cedar Island-Ocracoke Ferry
Portsmouth Island
0 5 10 Miles
Legend
Surveys for potential new sites in marsh habitat
Surveys of historical sites and roadsides
Map Created by NC NHP
21 October 2013


Figure 2. 2013 Surveys for Aeschynomene virginica
James City vicinity (Craven Co.)
Scotts Creek
EO 10
EO 9
Legend
Surveys for potential new sites in marsh habitat
Surveys of historical sites and roadsides
Sensitive joint-vetch records
0
0.5
1
Miles
Map Created by NC NHP
21 October 2013
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Coastal Carolina Regional Airport
Granthams
Taberna
Taberna Country Club
Neuse River Estates
Creekwood
Gables Run
Brices Crossing
Longleaf Pines
Thurman
Bridge Creek
Brice Creek
Duck Creek
Howell Rd
Scott St
Vail St
Neuse Dr
Green Springs Rd
Airport Rd
Hill St
US-70 E
Kale Rd
Creekside Park Dr
Old Airport Rd
Conner Grant Rd
Sellhorn Blvd
Emmen Rd
Geneva Rd
Brugg Ct
Mellen Rd
Taberna Circle
W Thurman Rd
Bradford Dr
Mt Pleasant Rd
Old Cherry Point Rd
Marion Dr
Lilliput Dr
National Forest Rd
Trent River
Neuse

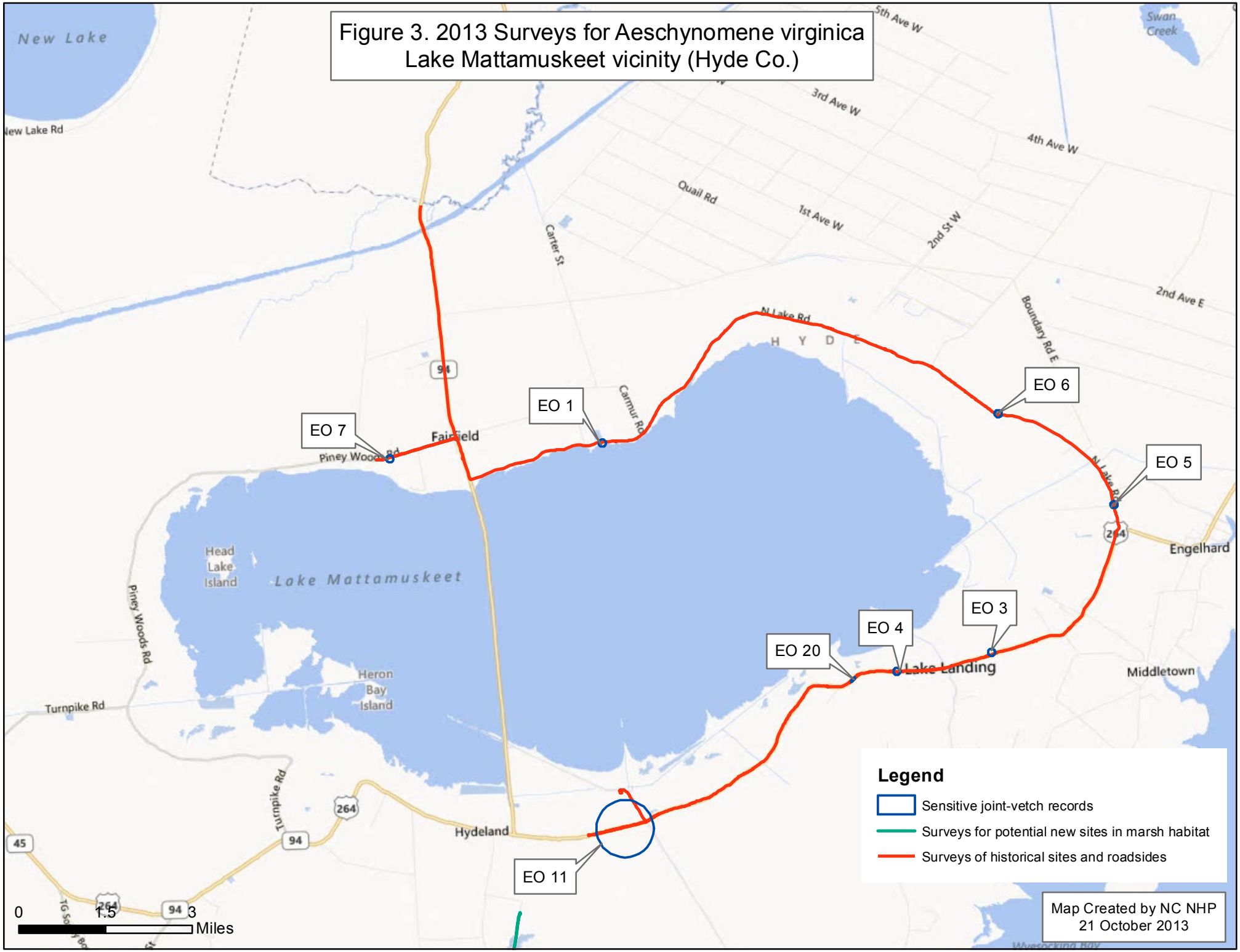


Figure 3. 2013 Surveys for Aeschynomene virginica
Lake Mattamuskeet vicinity (Hyde Co.)
New Lake
Swan Creek
5th Ave W
3rd Ave W
4th Ave W
Quail Rd
1st Ave W
2nd St W
2nd Ave E
Carter St
Boundary Rd E
N Lake Rd
H Y D E
Carmur Rd
EO 1
EO 6
EO 7
EO 5
EO 3
EO 4
EO 20
EO 11
Fairfield
Piney Woods Rd
Head Lake Island
Lake Mattamuskeet
Heron Bay Island
Engelhard
Middletown
Lake Landing
Hydeland
Turnpike Rd
94
264
45
0 1.5 3
Miles
Legend
Sensitive joint-vetch records
Surveys for potential new sites in marsh habitat
Surveys of historical sites and roadsides
Map Created by NC NHP
21 October 2013

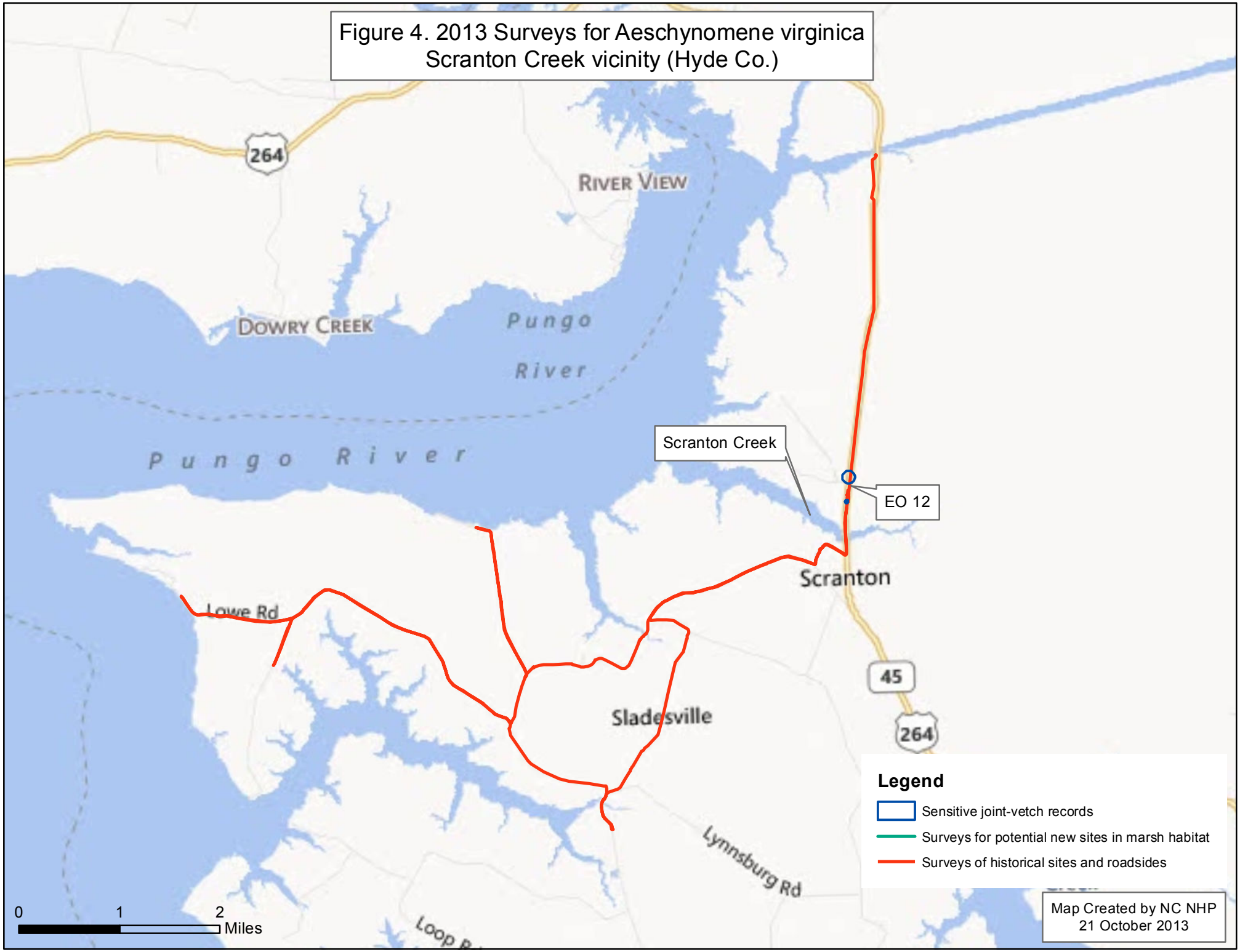


Figure 4. 2013 Surveys for Aeschynomene virginica
Scranton Creek vicinity (Hyde Co.)
264
River View
Dowry Creek
Pungo
River
Pungo River
Scranton Creek
EO 12
Scranton
Lowe Rd
45
264
Sladesville
Lynnsburg Rd
Legend
Sensitive joint-vetch records
Surveys for potential new sites in marsh habitat
Surveys of historical sites and roadsides
0
1
2
Miles
Map Created by NC NHP
21 October 2013

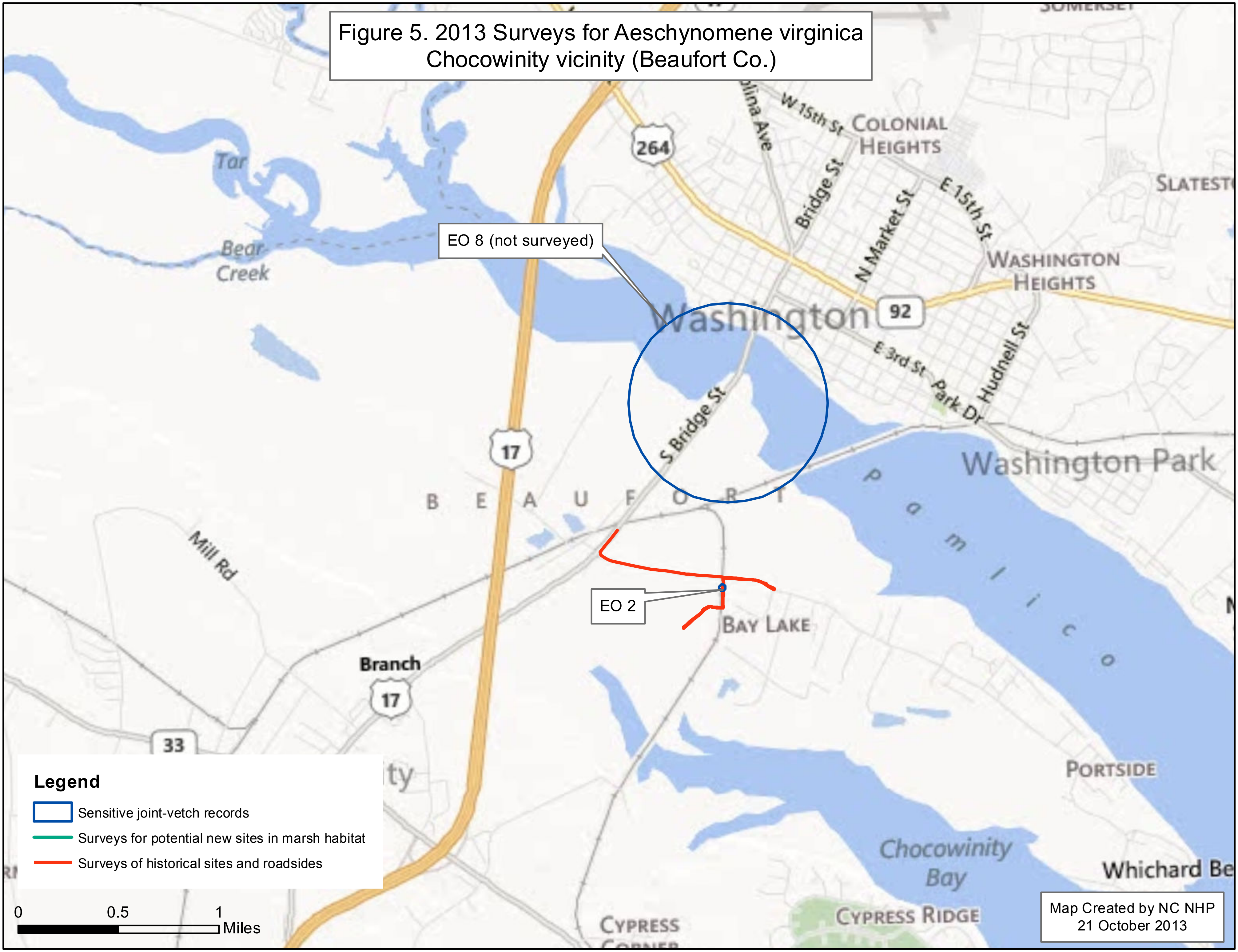
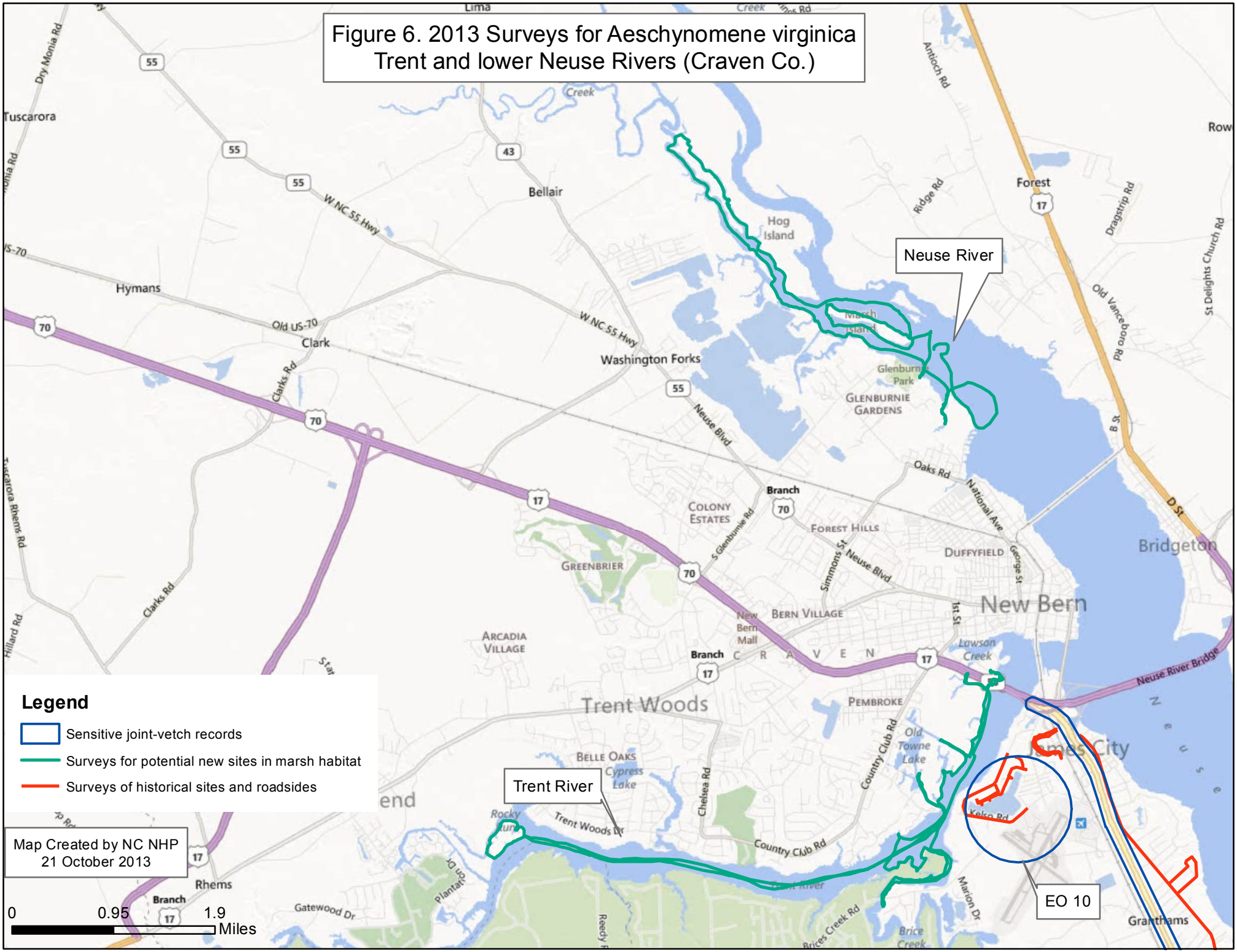

EO 8 (not surveyed)
EO 2
Tar
Bear Creek
Washington
Washington Park
Colonial Heights
Washington Heights
Slateste
Somerset
W 15th St
E 15th St
Bridge St
N Market St
E 3rd St
Park Dr
Hudnell St
S Bridge St
264
92
17
33
B E A U F O R T
Mill Rd
Branch
Bay Lake
Pamlico
Portside
Chocowinity Bay
Whichard Be
Cypress Ridge
Cypress Corner
Legend
Sensitive joint-vetch records
Surveys for potential new sites in marsh habitat
Surveys of historical sites and roadsides
0
0.5
1
Miles
Map Created by NC NHP
21 October 2013

Figure 5. 2013 Surveys for Aeschynomene virginica
Chocowinity vicinity (Beaufort Co.)

Figure 6. 2013 Surveys for Aeschynomene virginica
Trent and lower Neuse Rivers (Craven Co.)



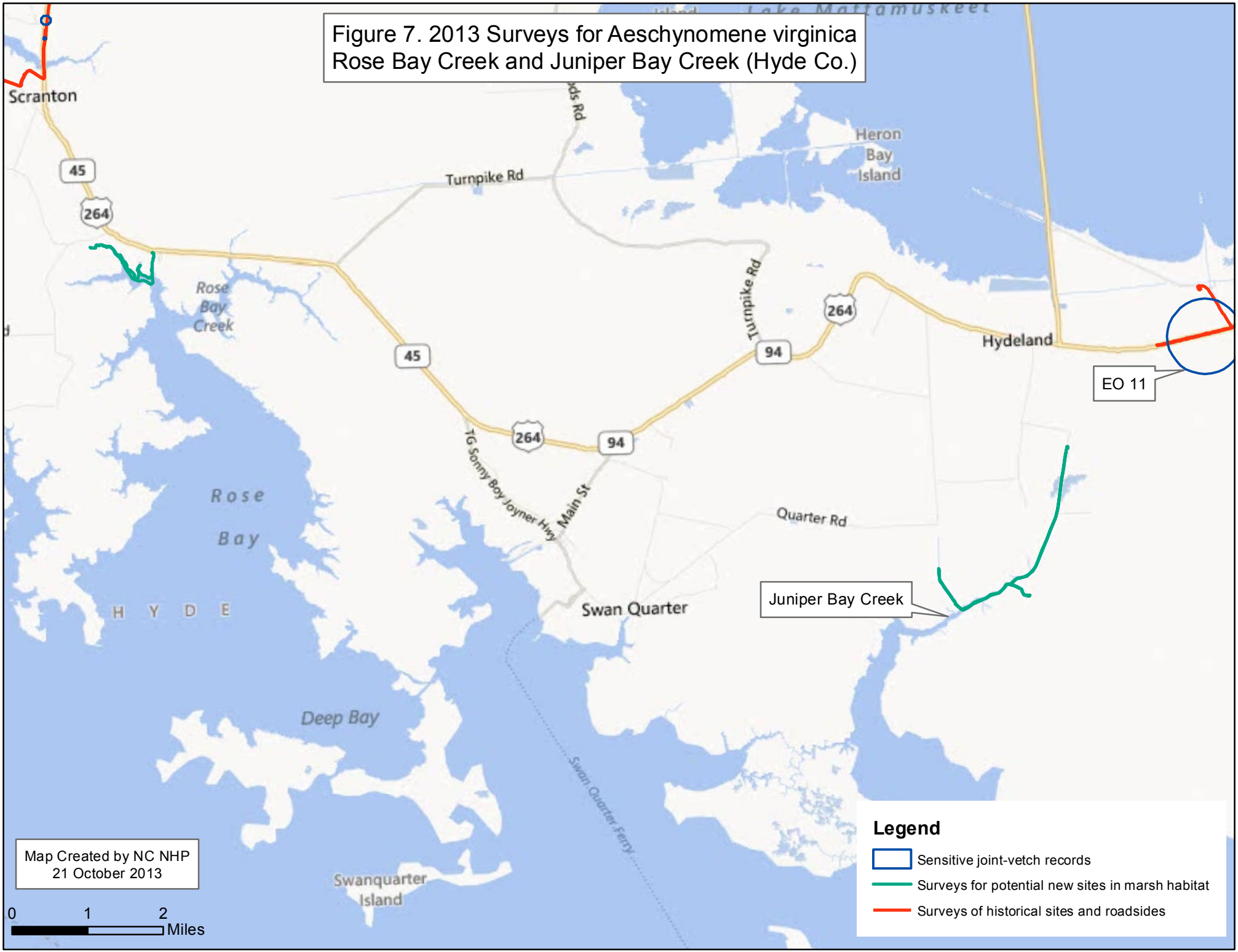


Figure 7. 2013 Surveys for Aeschynomene virginica
Rose Bay Creek and Juniper Bay Creek (Hyde Co.)
Scranton
45
264
Turnpike Rd
Heron Bay Island
Rose Bay Creek
45
Turnpike Rd
264
94
Hydeland
EO 11
TG Sonny Boy Joyner Hwy
Main St
264
94
Rose Bay
Quarter Rd
Juniper Bay Creek
H Y D E
Swan Quarter
Deep Bay
Swan Quarter Ferry
Swanquarter Island
Map Created by NC NHP
21 October 2013
0 1 2
Miles
Legend
Sensitive joint-vetch records
Surveys for potential new sites in marsh habitat
Surveys of historical sites and roadsides

Figure 8. *Aeschynomene virginica* EO 2. Extant population of 2 plants, along ditch and railroad tracks in Chocowinity, Beaufort Co. Plants are just beyond herbicide spray zone. Photo by Laura Robinson.

Figure 9. Tobacco budworm on *Aeschynomene virginica at* EO 2. Photo by Laura Robinson.

Figure 10. Herbivory evidence on *Aeschynomene virginica* fruit at EO 2.

Figure 11. John Finnegan (NCNHP) assisting with *Aeschynomene virginica* surveys on Scotts Creek, near James City. Photo by Laura Robinson.

Figure 12. Freshwater Tidal Marshes surveyed along the Trent River. Photo by Laura Robinson.

Figure 13. Marsh surveys along Rose Creek Bay. Photo by Laura Robinson.

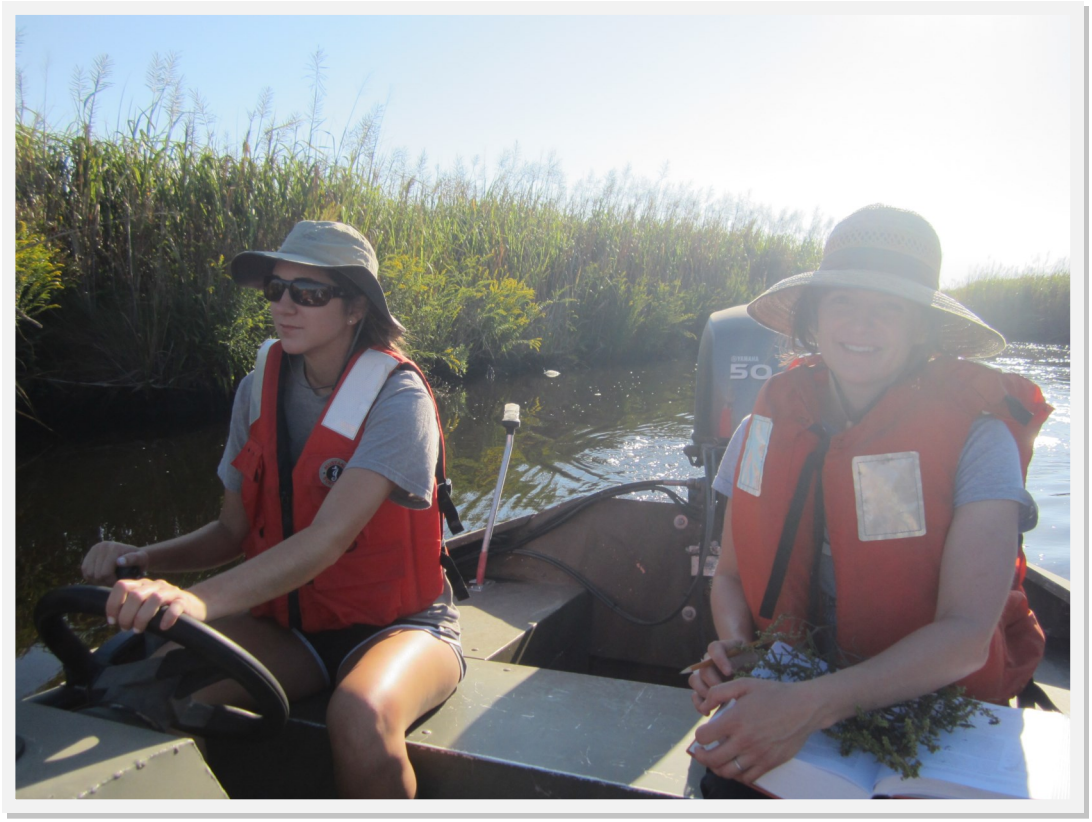


Figure 14. Allie Stewart (Lake Mattamuskeet NWR) and Misty Buchanan (NCNHP) surveying Juniper Creek Bay marshes. Photo by Laura Robinson.

Figure 15. Distinguishing characteristics and comparison between *Aeschynomene virginica* and *Aeschynomene indica*.