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October 28, 2016

Mike Lee
Division of Water Resources
11th Floor
312 Rosa L. Parks Avenue
Nashville, Tennessee 37243

RE: Fifth Year Wetland and Stream Monitoring Report
Bledsoe County Correctional Complex
Pikeville, Tennessee

Dear Mr. Lee:

Enclosed for your review is the fifth annual wetland and stream monitoring report for the Bledsoe County Correctional Complex (BCCX) located in Pikeville, Tennessee (DOA File/Permit Number 200502425, TDEC §401 Water Quality Certification Number NRS 09.009). This document has been prepared in response to the above-cited permits. The report generally follows the format provided in the U.S. Army Corps of Engineers (USACOE) October 2008 Regulatory Guidance Letter 08-03; however, due to the complexity of the project we have exceeded the recommended size limits in some of the sections.

If you have any questions or need additional information, please contact us at jgroton@ensafe.com or (865) 693-3623, or rdow@ensafe.com or (615) 252-2834. Thank you again for your time and consideration regarding this project.

Sincerely,

EnSafe Inc.

By: Jimmy Groton
Senior Scientist

Ronald T. Dow, P.G.
Project Manager

Attachments

cc: Laura Waynick, State of Tennessee — Department of General Services
Steven Westerman, State of Tennessee — Department of Correction
Mike Lee, State of Tennessee — Department of Water Resources
Eric Reusch, Corps of Engineers
Tammy Turley, Corps of Engineers

EnSafe Contract Number: SBC529/000-04-2012
SES Number: CR.142.013.02
EnSafe Project Number: 0888816090

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Bledsoe County Correctional Complex

1045 Horsehead Road
Pikeville, Tennessee 37367

FIFTH YEAR WETLAND AND STREAM MITIGATION MONITORING REPORT

Prepared for:

TN Department of Correction

Tennessee Department of Correction
Office of Facilities, Planning & Construction
320 Sixth Avenue North
Nashville, Tennessee 37243

Prepared by:

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October 21, 2016

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SECTION 1 — PROJECT OVERVIEW

Mitigation Site Name: Bledsoe County Correctional Complex (BCCX), Pikeville, Tennessee

DOA Permit Number: 200502425

TDEC Permit Number: NRS 09.009

Parties Responsible for Monitoring: James P. Groton/EnSafe Inc., and Paul C. Durr/ Water Resources, LLC, under subcontract to EnSafe.

Monitoring Dates: EnSafe and Water Resources completed the 2016 (Year 5) monitoring on June 21-23, 2016. Fourth-year monitoring occurred on June 15-18, 2015. Third-year monitoring occurred on September 23-26, 2014. Monitoring did not occur during the 2012 calendar year (Year 2). Initial (Year 1) site monitoring was conducted on September 26-30, 2011.

Project Description: In February 2010 the Tennessee Department of Environment and Conservation (TDEC) granted the Tennessee Department of Finance and Administration a §401 Water Quality Certification to allow the filling of 1.96 acres of jurisdictional wetlands and alteration of 560 linear feet of streams and 715 feet of wet weather conveyances at BCCX. Impacts to these aquatic resources were determined to be necessary to facilitate the development of a major prison expansion project at the site. In June 2010 the U.S. Army Corps of Engineers-Nashville District (USACE) granted a §404 permit for the same project. After minor modification, the final TDEC permit was reissued in December of that year.

Mitigation for the wetland and stream impacts was initiated in early October 2010. Wetland mitigation occurred entirely onsite and involved the creation (i.e., establishment) of 4.18 acres of palustrine wetlands (4:1 ratio) and the enhancement of 6.12 acres of existing degraded wetlands (5:1 ratio). The entire wetland mitigation site was then planted with water-tolerant tree species that are indigenous to the local watershed. Planting was done at an approximate rate of 435 stems per acre. Stream mitigation was also undertaken onsite. It involved Level 1 enhancement of 2,660 feet of intermittent headwater tributaries to Bee Creek. Riparian zones of four tributary segments were planted with native shrubs. Twenty-five-foot-wide upland buffers lying on either side of the streams and wetlands were also planted. Additional details can be found in the document titled *Aquatic Resources Mitigation Plan, Bledsoe County Correctional Complex Bee Creek Mile 11.4, Right Bank, Pikeville, Tennessee*, drafted by Water Resources, LLC.

Particularly intense rainfall events in November 2010 and March 2011 caused flooding and attending erosion within the Wetland Creation Area. In April 2011 efforts were made to lessen further damage by controlling the rate of inflow to the site by re-contouring the splitter pond, reinforcing and reconstructing spreader berms, and placing coir log erosion barriers in areas shown to be especially prone to erosion. While these actions were partly successful, they did not control the erosion of soil to the extent desired. Soil loss, the presence of a shallow fragipan on northern portions of the Creation Area, and a protracted drought during the summer of 2011,

were thought to be largely responsible for low survivorship of planted trees and shrubs. Failure to meet desired performance standards were documented in the First Year Monitoring Report.

In response to the reported failure, USACE and TDEC requested that the permittee submit a revised work plan. The revised plan was submitted on October 1, 2012. The plan recommended a variety of corrective actions, most important of which were the installation of more than 2,500 feet of coir log erosion dams and the replanting of 5,650 wetland-adapted trees and shrubs. (See below for dates of corrective/maintenance actions.)

On August 24, 2015, Steve Westerman (Tennessee Department of Correction [TDOC]), Ron Dow and Jimmy Groton (EnSafe), and Paul Durr (Water Resources) met with Mike Lee (TDEC Division of Water Resources) during a Site Review at the BCCX mitigation site. The purpose of the site review was to observe current conditions at the Mitigation Area, discuss the preliminary 2015 monitoring results, and identify possible recommendations for future activities.
Mr. Lee summarized the findings of the site review in a letter on August 27, 2015. Mr. Lee noted that site performance generally appeared favorable. In particular he noted that the Enhancement Areas were meeting all performance criteria and that TDEC did not require any further monitoring of these areas.

Mr. Lee also noted that several areas did not meet performance criteria because heavy competition from sod-forming grasses and forbs had reduced tree seedling survival and that mowing incursions into stream buffers along the west side of Stream 1, the south side of Stream 2, and both sides of Stream 3 had further reduced stocking densities. He also noted that in the remaining stream buffer areas, density met performance criteria but not the requirement that no single tree species exceed 20% of the total density. Mr. Lee provided the following recommendations or conditions to help bring the site into compliance with the performance criteria:

- Unauthorized mowing has affected stream buffer zones along the west side of Stream 1, the south side of Stream 2, and both sides of Stream 3. Increase stream buffer zones from 25 to 50 feet in these three areas.

- Install signs at least every 300 feet along these areas that clearly state that no mowing or other disturbance is allowed. Prior to placement of the signs, these areas must be flagged so that signs are placed in the proper locations.

- Unauthorized mowing has also affected the upper segments of Wetland Enhancement Area U. The wetland boundary along the west side of the wetland should be flagged and marked with signs as described above.

- The Enhancement Areas are meeting all performance criteria, and no further monitoring is required.

- Monitoring of the Creation Area shall continue.

- The area to the northwest of the mitigation site, between its upper limits and the fence along the northern line that contains Wetland T and the hydrologic splitter that was installed to distribute water across the mitigation site, should be included within the compensatory Mitigation Area. Signs shall be placed around it as well. A brief discussion of the plant community composition within Wetland T should be provided in next year's monitoring report.

- In addition, some treatment or control of the reed canary grass shall occur.

On September 23, 2015, Ron Dow and Jimmy Groton (EnSafe) met with Mark Carnes (USACE) at his office in Nashville to brief him on Mr. Lee's recommendations and to seek concurrence on TDEC's recommendations. On October 7, 2015, EnSafe sent a letter to Mr. Carnes requesting written concurrence from USACE in regard to TDEC's recommendations. On June 3, 2016, Mr. Carnes (USACE) formally concurred with TDEC's recommendations via email.

On October 2, 2015, EnSafe ordered warning signs identifying that the BCCX Mitigation Area contained protected streams and wetlands and was off-limits to mowing and other access or disturbance (see Section 3, Tables and Site Photos). On October 5-6, 2015, Jimmy Groton (EnSafe) and Paul Durr (Water Resources) staked 32 warning sign locations with wooden stakes marked with white surveyor's flagging at the BCCX mitigation site, characterized Wetland T, and treated five reed canary grass patches at the mitigation site with a 5% solution of glyphosate approved for use in wetlands and other aquatic habitats. EnSafe treated a total area of approximately 0.16 acre. Four reed canary grass patches are inside the Mitigation Area; the fifth is located near the northeastern boundary of the site. On October 12, 2015, EnSafe contacted Tennessee 811 and requested utility clearance within a 20-foot radius of all staked sign locations; utility clearance was completed on October 16, 2015. On October 19-20, 2015, EnSafe installed 32 warning signs around the perimeter of the mitigation site (see Section 4, Site Maps). The signs clearly marked the protected area with a minimum 50-foot buffer on Streams 1, 2, and 3. Warning signs were also installed around the area to the northwest of the mitigation site and between its upper limits and the fence along the northern line that contains Wetland T and the hydrologic splitter that was installed to distribute water across the mitigation site. The inclusion of Wetland T and the wetland area between the splitter pond and the Creation Area in the mitigation site protects an additional 0.62 acre and 0.07 acre of wetlands, respectively. The entire Mitigation Area includes approximately 31.12 acres of streams, wetlands, and uplands.

Project Location: The mitigation site is located approximately 1,100 feet north-northeast of the intersection of State Route (SR) 285 and SR 301 in rural Bledsoe County, Tennessee (N35.7508°, W85.2359°). (See Section 4 for a general location map.)

Dates When the Mitigation Project Began and Was Completed: Initial mitigation construction began in September 2010 and was completed in October 2011. Initial wetland and riparian buffer vegetation planting was completed on December 11, 2010.

Performance Standards:
Created (i.e., Established) Wetlands — The site's performance standards for hydrology have been met, but have not yet been met for soils or herbaceous layer vegetation. They have been

conditionally met for planted woody vegetation in terms of average density, but two individual species (sweetgum and buttonbush) exceed 20% of the stocking density.

Enhanced Wetlands — Performance standards have been met for planted woody vegetation, herbaceous-layer vegetation, hydrology, and soils. In a letter dated August 27, 2015, Mr. Lee (TDEC) concurred, stating, "The division believes that the enhancement [wetland] areas are meeting all performance criteria and no further monitoring is required." On June 3, 2016, Mr. Carnes (USACE) concurred with TDEC's recommendations. EnSafe conducted qualitative, visual surveys of the Enhancement Areas in June and August 2016 to confirm that the Enhancement Areas were functioning as intended.

Streams — Performance standards have been conditionally met with respect to planted woody vegetation. In a letter dated August 27, 2015, Mr. Lee (TDEC) released the streams from further quantitative monitoring as long as buffer zones along all stream reaches were increased from 25 to 50 feet and protective signs were installed to prevent unauthorized mowing in the stream and wetland buffers. TDOC authorized EnSafe to increase all stream buffers to a minimum of 50 feet. On June 3, 2016, USACE concurred with TDEC's recommendations.

Gooseberry Transplant Area — The granite gooseberry coverage has increased by more than 59% over last year (4,128 ft^2 vs. 6,555 ft^2) in spite of strong competition from Japanese honeysuckle and native blackberry.

Other — The declaration of restriction for protecting the site in perpetuity has been prepared but has not yet been executed. In the meantime, the danger of disturbance is relatively low since the site lies on state-owned property. Signs designating the area as a protected stream and wetland Mitigation Area were installed in October 2015. Throughout 2016 mowers have respected the no mowing zones, and the widened buffers are developing into a more natural state. In June and August 2016, EnSafe treated nine reed canary grass infestations (the same five areas treated in 2015 and four newly discovered areas) with a 5% solution of glyphosate approved for use in wetlands and other aquatic habitats and spot-treated several invasive pest plants growing in the Mitigation Area: glossy false buckthorn, autumn-olive, multiflora rose, pear, Chinese privet, tree-of-heaven, and sericea lespedeza.

Dates of Corrective Actions or Maintenance:
Fall 2011 — Excess water coming from the splitter pond was diverted to the western half of the mitigation site. Also repairs were made to breaches in the rock spreader berm.

October 22, 2012 — The entire Enhancement Area was mowed to prepare for tree planting.

January 8-9, 2013 — Coir log erosion dams were installed in the Creation Area, and both the Enhancement and Creation Areas were replanted.

October 2015 — Per TDEC's request protective signs were placed around the perimeter of the entire 31.5-acre Mitigation Area to prevent unauthorized mowing or site access. The area to the northwest of the mitigation site, between its upper limits and the fence along the northern line that contains Wetland T and the hydrologic splitter that was installed to distribute water across the

mitigation site, was also included within the compensatory Mitigation Area. On June 3, 2016, Mr. Carnes (USACE) concurred with TDEC's recommendations.

Recommendations for Additional Corrective Actions: As previously noted, performance standards for woody vegetation in the Creation Area are being conditionally met (i.e., the area contains the target density of stems/acre, but survival rates of planted species cannot specifically be determined because of the influx of seedlings from adjacent seed sources, or, the species mix may be skewed too heavily towards one or more taxa). We recommend a discussion in 2016 with personnel from USACE and TDEC to determine what steps need to be taken to satisfy the oversight agencies.

Because of the occurrence of glossy false buckthorn, autumn-olive, multiflora rose, pear, Chinese privet, tree-of-heaven, and other invasive shrubs and small trees in the Mitigation Area, we strongly recommend that a regimen of herbicide applications continue in the 2017 growing season to control these and other invasive species at the site. The buckthorn and privet are capable of rapidly colonizing open, moist, or wet areas and supplanting desirable native vegetation. Although the other invasive woody species (i.e., autumn-olive, multiflora rose, tree-of-heaven, and pear) have the ability to spread rapidly, they are not considered wetland species and would be most problematic in uplands and buffer zones adjacent to the Mitigation Areas. Because of this, these other woody species would not be primary targets for control, but controlling them with herbicide applications whenever possible should be given consideration. Reed canary grass is extremely tolerant of wetland conditions; it can quickly spread into wetlands and crowd out native species.

In the near future, once TDEC and USACE agree that all performance standards have been attained and are sustainable, TDOC should execute the declaration of restrictions for the mitigation site. This step will be critical for the perpetual protection of these sensitive aquatic resources.

Finally, while not a corrective action per se, we strongly recommend to TDOC that going forward, all future site monitoring continue to occur at approximately the same time each year (mid-June to early July), if any continued monitoring is required. Herbaceous plant communities grow and reach maturity at different times throughout the growing season so unless sampling is conducted at the same time from one year to the next, comparisons of herbaceous population data cannot be made in a meaningful way. In 2014, for example, plant inventories took place in September when many of the autumn-flowering herbs and grasses were head-high in many locations. As a consequence it is very likely that populations of planted trees were underestimated because they were hidden beneath the dense, luxuriant growth of the herbaceous plants. The optimal time to sample wetlands on the Cumberland Plateau in Tennessee is in June or early July. This is also the time of year when wetland herb species diversity reaches a maximum and conditions are optimal to identify the grasslike plants – the grasses, rushes, and sedges.

Recommendations for the Future

- After submission of the Fifth Year Monitoring Report (2016 growing season), request from the regulators a No Further Action finding. If necessary, meet with regulators to discuss the site history, findings of past monitoring events, current project status, and other pertinent details. Conduct a final delineation of the site (including Wetland T) only if required by regulators.

- Contract with a land surveyor to have the boundaries of the Mitigation Area determined. Obtain a final boundary survey map with a written description of the boundaries.

- Work with the regulators and TDOC administration and solicitors to determine, and then put in place, the appropriate type of permanent protection mechanism for the property (i.e., deed restriction, conservation easement).

- Until the mitigation is closed out, continue to control invasive pest plants such as glossy buckthorn, multiflora rose, sericea lespedeza, and reed canary grass throughout the site.

SECTION 2 — PROJECT REQUIREMENTS

WETLANDS

Performance Standards	Year 5 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
Onsite mitigation will involve the creation of 4.18 acres of wetlands and the enhancement of 6.12 acres of wetlands in the headwaters of Bee Creek. Bare root seedlings will be planted at the rate of 435 stems/acre. No one species shall comprise more than 20% of the total. The entire wetland mitigation is to be protected in perpetuity through deed restriction and signage erected to indicate the protected status of the property. The specific performance standards associated with the mitigation action are summarized below.	Vegetation demographics were determined from 0.05-acre fixed area sample plots (for woody species) and 1-yd^2 plots (for herbs). Sampling methods are described in the site's final Aquatic Resource Mitigation Plan. Because native hydric soils were not known within the Creation Area prior to mitigative actions, soil profiles will be taken annually at each of the vegetation monitoring plots in order to document the transition to the hydric condition. The principal means used to judge the successful restoration of positive wetland hydrology will be the establishment of wetland vegetation. Other primary and secondary hydrologic indicators will be noted during monitoring.				
Creation Area: Success will be measured as a function of wetland plant dominance and the presence of positive wetland hydrology. At the end of 5 years, approximately 70% of herbaceous plant cover must consist of wetland-adapted species, and survival rates for planted woody species must be at least 75% (326 stems/acre). Areal coverage of exotic invasive species must be less than 5%. While the development of hydric soils is a desired goal, it is understood that hydric soil formation may take greater than 5 years to occur.	Vegetation	Total herbaceous plant cover is 85.31%. This is a slight increase since the 2015 monitoring effort, when cover was determined to be 79.62%. Wetland-adapted species comprise 67.27% of the cover, a 4.15% increase over the 2015 results. Although this falls somewhat below the targeted goal of 70% (at the end of 5 years), good progress continues to be made. This year 53 distinct taxa were identified (4 less than in 2015). Species diversity continues to be high in the Creation Area. The site was very dry this year, and examination of precipitation records for the year indicated that there was no rainfall between May 22 and June 23, 2016. No dwarf sundew plants were found in the Creation Area, presumably a result of the exceptionally dry weather. TDEC's Division of Natural Areas has designated this insectivorous plant as a Threatened species. Its listing as an S2 species indicates that there are < 20 known occurrences statewide.	Herbaceous Vegetation	No	Section 3: Tables 1 & 2 Section 3: Photos 1-8 Section 4: Maps 1 & 2

Performance Standards	Year 5 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
		Woody species density in the Creation Area is 520 stems/acre, which exceeds the performance standard. This is largely the result of a strong increase in the number of sweetgum and buttonbush. Some of this increase is the result of the plants becoming taller and more visible, but natural regeneration is also apparent. 99% of the species are considered wetland-adapted. Two species still exceed 20% of the stocking density (buttonbush, 29.81%; sweetgum, 29.81%).	Woody Vegetation	Conditionally Yes	
	Soils	Soils in the Creation Area have been mapped by the Natural Resources Conservation Service as containing Lily loam and Morehead-Bonair complex. The latter contains inclusions of hydric Bonair soils in low-lying areas and depressions. All residual hydric soils with depleted matrices were confirmed in all but one plot.	Soils	Yes	Section 3: Table 4
	Hydrology	A variety of primary and secondary hydrologic indicators are present in the Creation Area. These include sediment deposits, algal crust, surface soil cracks, sparsely vegetated concave surfaces, drainage patterns, crayfish burrows, geomorphic position, and a shallow aquitard.	Hydrology	Yes	
Enhancement Areas: The same performance standards described above for the Creation Area shall also apply for the Enhancement Areas. However, because the Enhancement Areas are already jurisdictional wetlands and contain hydric soils, they will not be monitored for that parameter.	Vegetation	On August 27, 2015, TDEC indicated that the Enhancement Areas were meeting all performance criteria and no further monitoring was required. On June 3, 2016, USACE concurred with TDEC's determination. Monitoring was discontinued in the Enhancement Areas in 2016. In 2014 two small populations of rare sedge species that are listed as Endangered by TDEC's Division of Natural Areas were discovered in the Enhancement Area. These include brown bog sedge and southern long sedge. Brown bog sedge is considered an S1 species meaning that there are five or fewer	Herbaceous Vegetation Woody Vegetation	Yes Yes	Section 3: Photos 9-10 Section 4: Maps 1 & 2

Performance Standards	Year 5 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
		known occurrences in the state. The southern long sedge is an S2 species indicating < 20 known occurrences. Qualitative, visual surveys in the Enhancement Areas confirmed that both of these populations are still intact.			
	Soils	Morehead-Bonair complex. This series is recognized as containing inclusions of hydric Bonair soils in low areas and depressions. Hydric soils were confirmed by USACE during a jurisdictional determination visit to the site in November 2008.	Soils	Yes	
	Hydrology	Several hydrologic indicators were observed during the monitoring survey. These include scattered soil saturation and shallow inundation, sediment deposits, drift lines, drainage patterns, crayfish burrows, and geomorphic position.	Hydrology	Yes	
Upland Buffer Area: 25-foot-wide buffers, external to riparian buffers on streams are to be planted with upland oaks in order to provide extra protection to the restored streams. Initial planting is to be at 435 stems/acre, but no performance standards for seedling survival are stipulated.	Vegetation	Total stocking density within upland buffer zones is 275 stems/acre. This represents a 48-stem increase since the last monitoring effort. Density of planted oak increased from 145 to 157.5 stems/ acre in 2016. In 2015 Plot 2 was not monitored because of mowing impacts (this year it was). Density comparisons are, therefore, not easily comparable. The vast majority of new stems this year are attributable to red maple. At the request of TDEC, oak/riparian buffers were increased by a **minimum** of 25 feet on the west side of Stream 1, the south side of Stream 2, and on both sides of Stream 3. The placement of signage to deter mowing in the buffer zones has been effective.	Vegetation	Not Applicable	Section 3: Table 3 Section 3: Photos 15-17 Section 4: Maps 1 & 2
	Soils	Not Applicable	Soils	Not Applicable	
	Hydrology	Not Applicable	Hydrology	Not Applicable	

Performance Standards	Year 5 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
Gooseberry Transplant Area: Multi-stemmed granite gooseberry shrubs are to be removed from the prison expansion footprint and transplanted to an upland area on the stream and wetland mitigation property. This effort will be undertaken in an attempt to preserve this exceptionally rare shrub. No performance standards for shrub survival are stipulated. (This action was completed in March 2009.)	Vegetation	Because of its highly colonial nature, it was not possible to make an accurate count of individual stems. As in previous years, an estimate of the plants' areal coverage was obtained by measuring the major and minor axes of all shrubs that could be located within the transplant area. Gooseberry areal coverage has increased by 59% increase in areal coverage since the last monitoring period (4,128 ft^2 to 6,555 ft^2). This has occurred in spite of strong competition from Japanese honeysuckle and native blackberry. Several large, invasive tree-of-heaven and autumn-olive were cut down, and the stumps were treated with herbicide to prevent re-sprouting.	Vegetation	Not Applicable	Section 3: Photo 21 Section 4: Maps 1 & 2
	Soils	Not Applicable	Soils	Not Applicable	
	Hydrology	Not Applicable	Hydrology	Not Applicable	
Note: Multiflora rose (*Rosa multiflora*) and autumn-olive (*Elaeagnus umbellata*) are Asiatic shrubs that are becoming invasive in upland buffers and adjacent to one or more of the stream Enhancement Areas. Multiflora rose is particularly evident near the lower (south) end of Stream Segment 1. While not yet a problem, they have the potential to rapidly overtake open, sunny areas such as those found on the mitigation site. Consideration should be given to controlling these species before they have a chance to spread further. The Tennessee Exotic Pest Plant Council offers suggestions for mechanical, biological, and chemical control on its website (http://www.tneppc.org/invasive_plants/67). We have also noted the establishment of a small number of glossy false buckthorns (*Frangula alnus*) along several of the mitigated stream segments. Unfortunately, this shrub was improperly included in the plant species mix received from the nursery and was probably confused with stream alder (*Alnus serrulata*). Though known in Tennessee from only one other county, this Eurasian species is a well-documented pest plant in other parts of the United States and should be eradicated as soon as possible. Several plants were pulled up or sprayed with herbicide during the sampling effort, but other larger individuals will have to be sprayed with herbicide during the next growing season. Reed canary grass is another invasive plant that has become established within the mitigation site. This Eurasian species has been planted throughout the United States and is a major threat to natural wetlands. It outcompetes most native species and presents a major challenge in wetland mitigation efforts. This plant forms large, single-species stands, with which other species cannot compete. Other invasive plants growing within the Mitigation Area include pear (*Pyrus* sp.), Chinese privet (*Ligustrum sinense*), sericea lespedeza (*Lespedeza cuneata*), tree-of-heaven (*Ailanthus altissima*), and Amur bush-honeysuckle (*Lonicera maackii*).					Section 3: Photos 9-10 Section 4: Maps 1, 2, & 3

STREAMS

Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
Stream mitigation will involve the enhancement of 2,660 feet of headwater tributaries to Bee Creek. Four individual segments are to be treated. Riparian shrub vegetation shall be planted 25 feet along both banks. Plantings shall be at least three rows deep along each channel and staggered on 10-foot centers. Bare root or containerized stock is permissible. No one species can comprise more than 20% of the total. Stream Mitigation Areas are to be protected in perpetuity through deed restriction and signage erected to indicate the protected status of the properties. The performance standards for the mitigation actions are described briefly below.	On August 27, 2015, TDEC recognized that tree and shrub survival was low along Stream 3 due to heavy competition from sod-forming grasses and forbs; mowing incursions along the west side of Stream 1, south side of Stream 2, and along both buffer areas of Steam 3 have further reduced stocking densities; in other areas, density meets performance criteria but not the requirement that no one species exceed 20% of the total. TDEC also recognized that it is not feasible to replant these riparian zones to bring them into compliance, because of the heavy growth of herbaceous species. Therefore, TDEC indicated that no further stream monitoring would be required if TDOC increased the riparian buffer areas from 25 to 50 feet on both sides of Stream 3, the west side of Stream 1, and the south side of Stream 2, and installed signs at least every 300 feet along these areas clearly stating that no mowing or disturbance is allowed. On April 26, 2016, TDEC further clarified that no additional monitoring was required on Stream 4. On June 3, 2016, USACE concurred with TDEC's determination and recommendations. Stream monitoring was discontinued in 2016. During site visits in June and August 2016, it was apparent that mowing crews are complying with the No Mow zones established throughout the Mitigation Area.	Yes	Section 3: Photos 11-14 Section 4: Maps 1 & 2
Note: Multiflora rose (*Rosa multiflora*) and autumn-olive (*Elaeagnus umbellata*) are Asiatic shrubs that are becoming invasive in upland buffers and adjacent to one or more of the stream Enhancement Areas. Multiflora rose is particularly evident near the lower (south) end of Stream Segment 1. While not yet a problem, they have the potential to rapidly overtake open, sunny areas such as those found on the mitigation site. Consideration should be given to controlling these species before they have a chance to spread further. The Tennessee Exotic Pest Plant Council offers suggestions for mechanical, biological, and chemical control on its website (http://www.tneppc.org/invasive_plants/67). We have also noted the establishment of a small number of glossy false buckthorns (*Frangula alnus*) along several of the mitigated stream segments. Unfortunately, this shrub was improperly included in the plant species mix received from the nursery and was probably confused with stream alder (*Alnus serrulata*). Though known in Tennessee from only one other county, this Eurasian species is a well-documented pest plant in other parts of the United States and should be eradicated as soon as possible. Several plants were pulled up or sprayed with herbicide during the sampling effort, but other larger individuals will have to be sprayed with herbicide during the next growing season. Reed canary grass is another invasive plant that has become established within the mitigation site. This Eurasian species has been planted throughout the United States and is a major threat to natural wetlands. It outcompetes most native species and presents a major challenge in wetland mitigation efforts. This plant forms large, single-species stands, with which other species cannot compete. Other invasive plants growing within the Mitigation Area include pear (*Pyrus* sp.), Chinese privet (*Ligustrum sinense*), sericea lespedeza (*Lespedeza cuneata*), tree-of-heaven, and Amur bush-honeysuckle (*Lonicera maackii*).			Section 3: Photos 9-10 Section 4: Maps 1, 2, & 3

SECTION 3 — TABLES AND PHOTOGRAPHS

Table 1. Substrate/Herbaceous Species Frequency and Average Cover Percent, BCCX Wetland Creation Area, Pikeville, TN, June 2016.

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
Bare Soil [1,2]	—	**75.00**	**8.38**	**-6.32**
Twig/Leaf Litter	—	**100.00**	**6.31**	**0.62**
Red maple (*Acer rubrum*)	Fac	0.00	0.00	-0.44
Slender leaf false foxglove (*Agalinis tenuifolia*)	Fac	18.75	0.38	0.38
Common ragweed (*Ambrosia artemisiifolia*)	Facu	25.00	0.25	-0.25
Broomsedge (*Andropogon virginicus*)	**Facu**	**93.75**	**13.94**	**4.06**
Sweet vernal grass (*Anthoxanthum odoratum*)	Facu	12.50	0.94	0.06
Bearded beggar-ticks (*Bidens aristosa*)	Facw	31.25	0.44	-0.06
Yellow-fruited sedge (*Carex annectens*)	Facw	31.25	0.81	0.06
Hirsute sedge (*Carex complanata*)	Facu	68.75	2.19	0.88
Sallow sedge (*Carex lurida*)	Obl	6.25	0.19	0.00
Swan's sedge (*Carex swanii*)	Facu	0.00	0.00	-0.13
Fox sedge (*Carex vulpinoidea*)	Obl	18.75	0.44	0.44
Mistflower (*Conoclinium coelestinum*)	Fac	0.00	0.00	-0.13
Marsh flatsedge (*Cyperus pseudovegetus*)	Facw	6.25	0.19	0.19
Queen Anne's-lace (*Daucus carota*)	Upl	18.75	0.38	-0.26
Tapered rosette grass (*Dichanthelium acuminatum*)	**Fac**	**93.75**	**7.31**	**0.50**
Deer-tongue grass (*Dichanthelium clandestinum*)	Fac	25.00	1.88	1.38
Cypress witch grass (*Dichanthelium dichotomum*)	**Fac**	**18.75**	**1.94**	**-2.81**

[1] Bolded entries indicate dominant species or substrates (i.e., cover contributions exceed 3%, and frequency values are greater than 10%).
[2] Bare soil areas also contain inclusions of a gelatinous species of cyanobacteria in the genus *Nostoc*. These need moist-wet conditions to become established but can withstand extended periods of dryness.

Table 1 (continued)

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
Open-flower rosette grass (*Dichanthelium laxiflorum*)	Facu	12.50	0.56	-2.44
Broom rosette grass (*Dichanthelium scoparium*)	**Facw**	**56.25**	**5.94**	**1.25**
Virginia buttonweed (*Diodia virginiana*)	Facw	50.00	2.31	1.81
Dwarf sundew (*Drosera brevifolia*)	Obl	0.00	0.00	-0.06
Slender spikerush (*Eleocharis tenuis*)	Facw	43.75	1.94	-1.44
Annual fleabane (*Erigeron annuus*)	Facu	6.25	0.06	-0.13
Prairie fleabane (*Erigeron strigosus*)	Facu	31.25	0.75	-0.06
Hyssop-leaf thoroughwort (*Eupatorium hyssopifolum*)	Fac	18.75	0.56	0.56
Boneset (*Eupatorium perfoliatum*)	Facw	37.50	1.44	0.63
Late-flowering thoroughwort (*Eupatorium serotinum*)	Fac	12.50	0.38	-0.57
Green ash (*Fraxinus pennsylvanica*)	Facw	6.25	0.06	0.06
Common sneezeweed (*Helenium autumnale*)	Facw	6.25	0.06	0.06
Purplehead sneezeweed (*Helenium flexosum*)	Fac	37.50	2.75	1.00
Velvet grass (*Holcus lanatus*)	Fac	18.75	0.50	-0.50
Orangegrass (*Hypericum gentianoides*)	Upl	0.00	0.00	-0.06
Dwarf St. John's-wort (*Hypericum mutilum*)	Facw	18.75	0.44	0.44
Annual marsh-elder (*Iva annua*)	Fac	6.25	0.06	0.06
Taper-tip rush (*Juncus acuminatus*)	Obl	6.25	0.31	-0.19
Greater poverty rush (*Juncus anthelatus*)	**Facw**	**81.25**	**4.00**	**0.75**
Soft rush (*Juncus effusus*)	Facw	18.75	1.13	0.69
Grass-leaved rush (*Juncus marginatus*)	Facw	12.50	0.19	-0.12

Table 1 (continued)

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
Japanese-clover (*Kummerowia striata*)	**Facu**	**75.00**	**4.00**	**0.12**
Ox-eye daisy (*Leucanthemum vulgare*)	Upl	12.50	0.38	0.38
Sweetgum (*Liquidambar styraciflua*)	Fac	0.00	0.00	-0.06
Downy lobelia (*Lobelia puberula*)	Facw	6.25	0.06	0.06
Seedbox (*Ludwigia alternifolia*)	Facw	12.50	0.31	0.31
Annual clubmoss (*Lycopodiella appressa*)	Facw	6.25	0.13	-0.01
Lance-leaf yellow loosestrife (*Lysimachia lanceolata*)	Fac	0.00	0.00	-0.19
Black medic (*Medicago lupulina*)	Facu	0.00	0.00	-0.06
Beaked panic grass (*Panicum anceps*)	Fac	56.25	3.25	3.25
Red-top panic grass (*Panicum rigidulum*)	Facw	0.00	0.00	-2.81
English plantain (*Plantago lanceolata*)	Upl	43.75	1.38	0.75
Common cinquefoil (*Potentilla simplex*)	**Facu**	81.25	6.31	-3.19
Heal-all (*Prunella vulgaris*)	Facu	43.75	1.25	0.69
Narrow-leaf mountain-mint (*Pycnanthemum tenuifolium*)	Facw	0.00	0.00	-0.19
Coarse-globe beaksedge (*Rhynchospora recognita*)	Facw	6.25	0.63	0.44
Wild-petunia (*Ruellia strepens*)	Fac	0.00	0.00	-0.13
Tall fescue (*Schedonorus arundinaceus*)	Facu	6.25	0.19	-0.25
Georgia bulrush (*Scirpus georgianus*)	Obl	25.00	1.13	0.00
Helmet-flower (*Scutellaria integrifolia*)	Facw	12.50	0.19	0.06
Horse-nettle (*Solanum carolinense*)	Facu	18.75	0.31	0.25
Tall goldenrod (*Solidago altissima*)	Facu	18.75	0.25	0.12
Late goldenrod (*Solidago gigantea*)	Facw	56.25	2.00	0.87

Table 1 (continued)

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
Gray goldenrod (*Solidago nemoralis*)	Upl	12.50	0.50	0.31
Wrinkle-leaf goldenrod (*Solidago rugosa*)	Fac	0.00	0.00	-0.13
Blue-eyed-grass[3] (*Sisyrinchium angustifolium*)	Facw	81.25	2.44	1.19
Panicled American-aster (*Symphyotrichum lanceolatum*)	Facw	0.00	0.00	-0.31
Downy American-aster (*Symphyotrichum pilosum*)	Fac	68.75	3.63	0.88
American-aster (*Symphyotrichum* sp.)	—	0.00	0.00	0.94
Yellow clover (*Trifolium campestre*)	Upl	6.25	0.06	-0.19
Red clover (*Trifolium pratense*)	Facu	0.00	0.00	-0.25
Unknown *Asteraceae*	—	6.25	0.06	-2.07
Unknown *Cyperaceae*	—	0.00	0.00	-0.25
Unknown moss		31.25	1.75	1.75
Unknown *Poaceae*		6.25	0.31	0.31
			∑= 100.00	

Note: Fac = Facultative, Facw = Facultative Wetland, Facu = Facultative Upland, Obl = Obligate Wetland, Upl = Obligate Upland

[3] *Sisyrinchium angustifolium* and *Sisyrinchium atlanticum* were not always clearly distinguishable. Therefore, for the purposes of this analysis, they were pooled together as *S. angustifolium*. *S. atlanticum* is also a Facw species.

Photo 5.

Creation Area, Photo Reference Point C4: North

Dominant Vegetation: red maple (Fac), buttonbush (Obl), false indigobush (Facw), tapered rosette grass (Fac), greater poverty rush (Facw)

Comments: Stunted vegetation in this part of the site is primarily the result of low soil fertility, but seasonal ponding of concave surfaces also plays a role.

Photo 6.

Creation Area, Photo Reference Point C4: South

Dominant Vegetation: sweetgum (Fac), purplehead sneezeweed (Fac), tapered rosette grass (Fac), Georgia bulrush (Obl)

Comments: Parts of the Creation Area are wet in winter through early summer. By mid-summer and fall they dry significantly. Such locations typically contain a mixture of wetland and non-wetland species.

Photo 7.

Creation Area, Photo Reference Point C4: East

Dominant Vegetation: sweetgum (Fac), buttonbush (Obl), soft rush (Facw), tapered rosette grass (Fac), common cinquefoil (Facu), deer-tongue grass (Fac)

Comments: A shallow, relatively impervious fragipan restricts rooting in this area. It also traps water at the surface. After heavy rains this area can become ponded. Cyanobacteria (*Nostoc* sp.) deposits are common on the soil surface.

Photo 8.

Creation Area, Photo Reference Point C4: West

Dominant Vegetation: sweetgum (Fac), broomsedge (Facu), purplehead sneezeweed (Fac), soft rush (Facw), slender spikerush (Facw)

Comments: This area is a favorite hunting ground of marsh hawks. Both male and female hawks have been observed preying on small rodents and songbirds.

PHOTO SUPPLEMENT

WETLAND ENHANCEMENT AREAS
STREAM ENHANCEMENT AREAS
UPLAND BUFFER AREAS
WETLAND ADDITION
REED CANARY GRASS CONTROL AREAS
GOOSEBERRY TRANSPLANT AREA

Table 5. Wetland T Species List, BCCX Wetland Mitigation Area

Scientific Name [1]	Common Name	Wetland Indicator
Acalypha rhomboidea	Three-seeded mercury	Facu
Acer rubrum	Red maple	Fac
Acer saccharinum	Silver maple	Facw
Agrimonia parviflora	**Harvest lice**	**Facw**
Agrostis gigantea	Redtop	Facw
Ambrosia artemisiifolia	Common ragweed	Facu
Andropogon virginicus	Broom-sedge	Facu
Asclepias incarnata	**Swamp milkweed**	**Obl**
Carex crinita	Fringed sedge	Obl
Carex frankii	Frank's sedge	Obl
Carex tribuloides	Blunt broom sedge	Facw
Carex vulpinoidea	Fox sedge	*Obl*
Cirsium discolor	Field thistle	Upl
Conoclinium coelestinum	Blue mistflower	Fac
Convolvulus arvensis	Field bindweed	Upl
Cyperus strigosus	Straw-color flatsedge	Facw
Desmodium sp.	Tick trefoil	—
Dichanthelium clandestinum	Deer tongue grass	Fac
Dichanthelium dichotomum	Cypress witch grass	Fac
Dichanthelium scoparium	Broom panic grass	Facw
Epilobium coloratum	Willow-herb	Facw
Erechtites hieraciifolius	American burnweed	Facu
Eupatorium serotinum	Late-flowering thoroughwort	Fac

[1] Bolded entries are dominant species.

Scientific Name [1]	Common Name	Wetland Indicator
Galium tinctorium	Stiff marsh bedstraw	Obl
Juncus anthelatus	Greater poverty rush	Facw
Juncus effusus	Soft rush	Facw
Leersia oryzoides	**Rice cut grass**	**Obl**
Lobelia cardinalis	Cardinal flower	Facw
Lonicera maackii	Amur bush-honeysuckle	Upl
Ludwigia alternifolia	Seedbox	Facw
Lycopus virginicus	Virginia water-horehound	Obl
Muhlenbergia schreberi	Nimblewill	Fac
Panicum anceps	Beaked panic grass	Fac
Panicum dichotomiflorum	Fall panic grass	Facw
Panicum rigidulum	**Red-top panic grass**	**Facw**
Persicaria pensylvanica	Pennsylvania smartweed	Facw
Persicaria punctata	Punctate smartweed	Obl
Phalaris arundinacea	**Reed canary grass**	**Facw**
Phytolacca americana	Pokeweed	Facu
Potentilla simplex	Old field cinquefoil	Facu
Pseudognapthalium obtusifolium	Eastern rabbit-tobacco	Upl
Pycnanthemum muticum	Clustered mountain-mint	Facw
Rhexia mariana	Maryland meadow-beauty	Obl
Rosa multiflora	Multiflora rose	Facu
Rubus argutus	Common blackberry	Facu
Rumex crispus	Curly dock	Fac
Salix nigra	Black willow	Obl
Sambucus canadensis	Elderberry	Fac

Scientific Name [1]	Common Name	Wetland Indicator
Schedonorus arundinaceus	**Kentucky 31 fescue**	**Facu**
Scirpus georgianus	Georgia bulrush	Obl
Scutellaria integrifolia	Helmet flower	Facw
Setaria parviflora	Marsh bristle grass	Fac
Solanum carolinense	Horse-nettle	Facu
Solidago altissima	Tall goldenrod	Facu
Solidago gigantea	Late goldenrod	Facw
Symphyotrichum pilosum	Oldfield American-aster	Fac
Tridens flavus	Purpletop	Facu
Vernonia gigantea	Tall ironweed	Fac
Vernonia noveboracensis	New York ironweed	Facw
Vicia angustifolia	Garden vetch	Facu
Xanthium strumarium	Cocklebur	Fac

Note: Fac = Facultative, Facw = Facultative Wetland, Facu = Facultative Upland, Obl = Obligate Wetland, Upl = Obligate Upland

Table 6. Additional Species Found Between the Splitter Pond and the Creation Area, BCCX Wetland Mitigation Area

Scientific Name	Common Name	Wetland Indicator
Fimbristylis autumnalis	Slender fimbry	Facw
Bidens aristosa	Bearded beggar-ticks	Facw
*Drosera brevifolia**	Dwarf sundew	Obl
Kummerowia striata	Japanese-clover	Facu
Rhynchospora capitellata	Brown beaksedge	Obl
Eleocharis sp.	Spikerush	—
Eupatorium perfoliatum	Boneset	Facw
Digitaria ischaemum	Smooth crab grass	Upl
Diodia virginiana	Virginia buttonweed	Facw
Eupatorium hyssopifolium	Hyssop-leaf thoroughwort	Upl
Croton monanthogynus	Prairie-tea	Upl
Bidens frondosa	Devil's beggar-ticks	Facw
Hypericum gentianoides	Orange-grass	Upl
Prunella vulgaris	Self-heal	Facu
Dichanthelium laxiflorum	Open-flower rosette grass	Facu
Trifolium pratense	Red clover	Facu
Echinochloa muricata	Rough barnyard grass	Facw
Juncus acuminatus	Taper-tip rush	Obl
Sagittaria latifolia	Duck-potato	Obl
Eleocharis obtusa	Blunt spikerush	Obl
Ludwigia palustris	Marsh primrose-willow	Obl
Helenium flexuosum	Purplehead sneezeweed	Fac

* *Drosera brevifolia* was not found at the site in 2016 (see discussion in Section 2)

Note: Fac = Facultative, Facw = Facultative Wetland, Facu = Facultative Upland, Obl = Obligate Wetland, Upl = Obligate Upland

WETLAND CREATION AREA
PHOTO REFERENCE POINTS

Photo 1.

Creation Area, Photo Reference Point C2: North

Dominant Vegetation: sweetgum (Fac), red maple (Fac), broom rosette grass (Facw), greater poverty rush (Facw), common cinquefoil (Facu)

Comments: Corrective actions such as installing coir logs has helped a great deal to trap eroding soils and by doing so, provided a growth medium for planted and naturally invading vegetation.

Photo 2.

Creation Area, Photo Reference Point C2: South

Dominant Vegetation: buttonbush (Obl), sweetgum (Fac), broom rosette grass (Facw), soft rush (Facw), greater poverty rush (Facw), Georgia bulrush (Obl)

Comments: Wetland vegetation, in particular, has benefitted from these corrective actions. This year more than 67% of all species in the Creation Area are considered wetland indicators.

Photo 3.

Creation Area, Photo Reference Point C2: East

Dominant Vegetation: red maple (Fac), buttonbush (Obl), deer-tongue grass (Fac), soft rush (Facw), Georgia bulrush (Facw)

Comments: Soil accretion, especially on the northern half of the Creation Area, has helped to increase herbaceous populations, but planted woody species have struggled somewhat because of low soil fertility. Despite this they occur at an average rate of 520 stems/acre, which greatly exceeds the performance standard of 326 stems/acre.

Photo 4.

Creation Area, Photo Reference Point C2: West

Dominant Vegetation: buttonbush (Obl), sweetgum (Fac), broom rosette grass (Facw), greater poverty rush (Facw), purplehead sneezeweed (Fac)

Comments: The 520-stem/acre average density of woody plants represents a nearly 27% increase since last year. This increase has resulted partly from the influx of new seedlings coming from local seed sources as well as an increase in the size of the planted species, which makes them easier to find among the dense herbs.

Photo 5.

Creation Area, Photo Reference Point C4: North

Dominant Vegetation: red maple (Fac), buttonbush (Obl), false indigobush (Facw), tapered rosette grass (Fac), greater poverty rush (Facw)

Comments: Stunted vegetation in this part of the site is primarily the result of low soil fertility, but seasonal ponding of concave surfaces also plays a role.

Photo 6.

Creation Area, Photo Reference Point C4: South

Dominant Vegetation: sweetgum (Fac), purplehead sneezeweed (Fac), tapered rosette grass (Fac), Georgia bulrush (Obl)

Comments: Parts of the Creation Area are wet in winter through early summer. By mid-summer and fall they dry significantly. Such locations typically contain a mixture of wetland and non-wetland species.

Photo 7.

Creation Area, Photo Reference Point C4: East

Dominant Vegetation: sweetgum (Fac), buttonbush (Obl), soft rush (Facw), tapered rosette grass (Fac), common cinquefoil (Facu), deer-tongue grass (Fac)

Comments: A shallow, relatively impervious fragipan restricts rooting in this area. It also traps water at the surface. After heavy rains this area can become ponded. Cyanobacteria (*Nostoc* sp.) deposits are common on the soil surface.

Photo 8.

Creation Area, Photo Reference Point C4: West

Dominant Vegetation: sweetgum (Fac), broomsedge (Facu), purplehead sneezeweed (Fac), soft rush (Facw), slender spikerush (Facw)

Comments: This area is a favorite hunting ground of marsh hawks. Both male and female hawks have been observed preying on small rodents and songbirds.

PHOTO SUPPLEMENT

WETLAND ENHANCEMENT AREAS
STREAM ENHANCEMENT AREAS
UPLAND BUFFER AREAS
WETLAND ADDITION
REED CANARY GRASS CONTROL AREAS
GOOSEBERRY TRANSPLANT AREA

Photo 9.

Enhancement Areas: Former wetland fields and pastures were enhanced by planting tree and shrub seedlings at the rate of 435 trees/acre. The most dominant woody species include sweetgum and red maple, but blackgum and wetland oaks are also frequently observed. These Enhancement Areas, along with the rest of the mitigation site will be protected from future disturbance by placing them under a deed restriction or conservation easement. Because they have consistently met or exceeded performance standards in all phases (i.e., vegetation, soils, hydrology), TDEC and USACE are no longer requiring monitoring of these sites.

Photo 10.

Enhancement Areas: On the wettest parts of the Enhancement Areas, planted wetland shrubs such as buttonbush, elderberry, and false indigobush are more commonly encountered than trees. Dense stands of rushes and sedges are responsible for retarding the establishment of trees.

Photo 11.

Stream 1 Enhancement Area: Like the Wetland Enhancement Areas, Stream Enhancement Areas have been determined by TDEC and USACE to have attained an acceptable level of performance. Consequently, they are no longer being monitored for plant demographics or channel morphology. This view of Stream 1 shows the degree to which vegetation has become established. No signs of stream erosion have been detected, largely because of the dense cover.

Photo 12.

Stream 2 Enhancement Area: The riparian zone around Stream 2 is also very stable. This view looking downstream demonstrates how quickly the vegetation has recovered after the cessation of agricultural activities. Typical woody plants include black willow, silky dogwood, and winged sumac, while dominant herbs are rice cut grass and soft rush.

Photo 13.

Stream 3 Enhancement Area: Stream 3 is similar in composition to Stream 2, although the amount of woody plant development is somewhat less. Again, the dominant herbs are rice cut grass and soft rush, while the shrub layer is composed largely of buttonbush, silky dogwood, and elderberry.

Photo 14.

Stream 4 Enhancement Area: Stream 4 is positioned at the extreme southeastern corner of the mitigation site and lies below the discharge point of a farm pond. Embankments are completely vegetated with a mixture of herbs such as deer-tongue grass, harvest-lice, and clustered mountain mint. The shrub layer is very strongly dominated by swamp rose, which last year occurred at the rate of over 350 stems/100 feet of stream length.

Photo 15.

Upland Buffers: The site's mitigation plan called for the establishment of 25-foot-wide upland buffers around all mitigated streams and wetlands. These areas were then planted with a mixture of oaks. Competition from residual pasture grasses and heavy deer browsing has slowed growth, but stem densities of oaks combined with naturally invading hardwoods has consistently exceeded 225 stems/acre.

Photo 16.

Upland Buffers: In order to compensate for the failure to establish enough woody plants (and also the proper species ratios) in some areas, TDEC requested that the buffer zones around the west side of Stream 1, the south side of Stream 2, and both sides of Stream 3 be expanded from 25 to 50 feet. Also because of mowing incursions into the buffer zones, TDEC asked that signs be erected to prevent mowing in this area permanently. This view is looking north along SR 301 at an upland buffer lying adjacent to Stream 1 and Enhancement Area U.

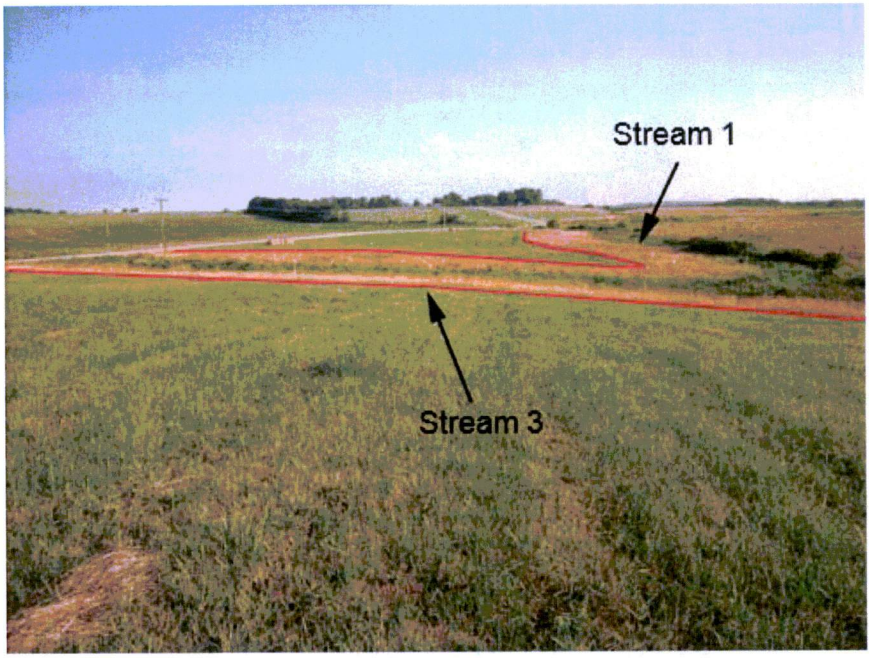


Photo 17.

Upland Buffers: This long view of the site looking northward along the western flank of the site shows the protected riparian buffers for Streams 1 and 3 outlined in red. This includes the expanded buffers requested by TDEC. Close-up views of the buffers can be seen in Photos 11-14.

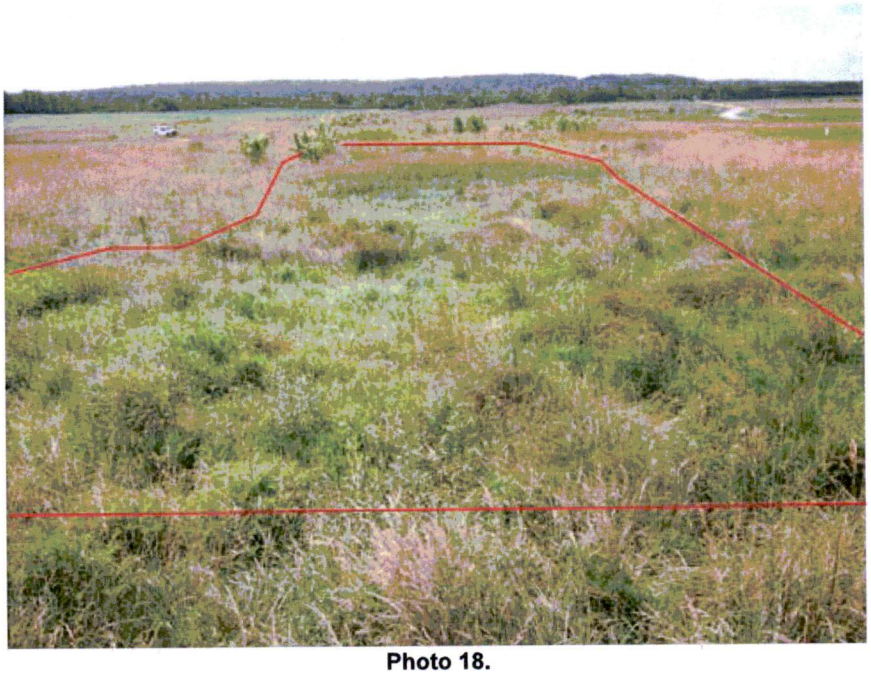


Photo 18.

Wetland Addition: As another way to compensate for the failure to establish enough woody vegetation in some locales, TDEC requested that a seepage wetland lying immediately to the north of the mitigation property also be incorporated into the mitigation effort and protected in perpetuity from future disturbance. This view of the wetland addition is looking southward. Its approximate boundaries are outlined in red. Total wetland area is approximately 0.6 acre.

Photo 19.

Reed Canary Grass Control: Non-native strains of reed canary grass are aggressive invaders of open wetland areas. If left unchecked, they could jeopardize the success of wetland mitigation efforts. As of 2015, nine small populations of reed canary grass had been identified. With the consent of TDOC, EnSafe began an herbicide spraying regimen designed to bring reed canary grass under control and prevent its future spread.

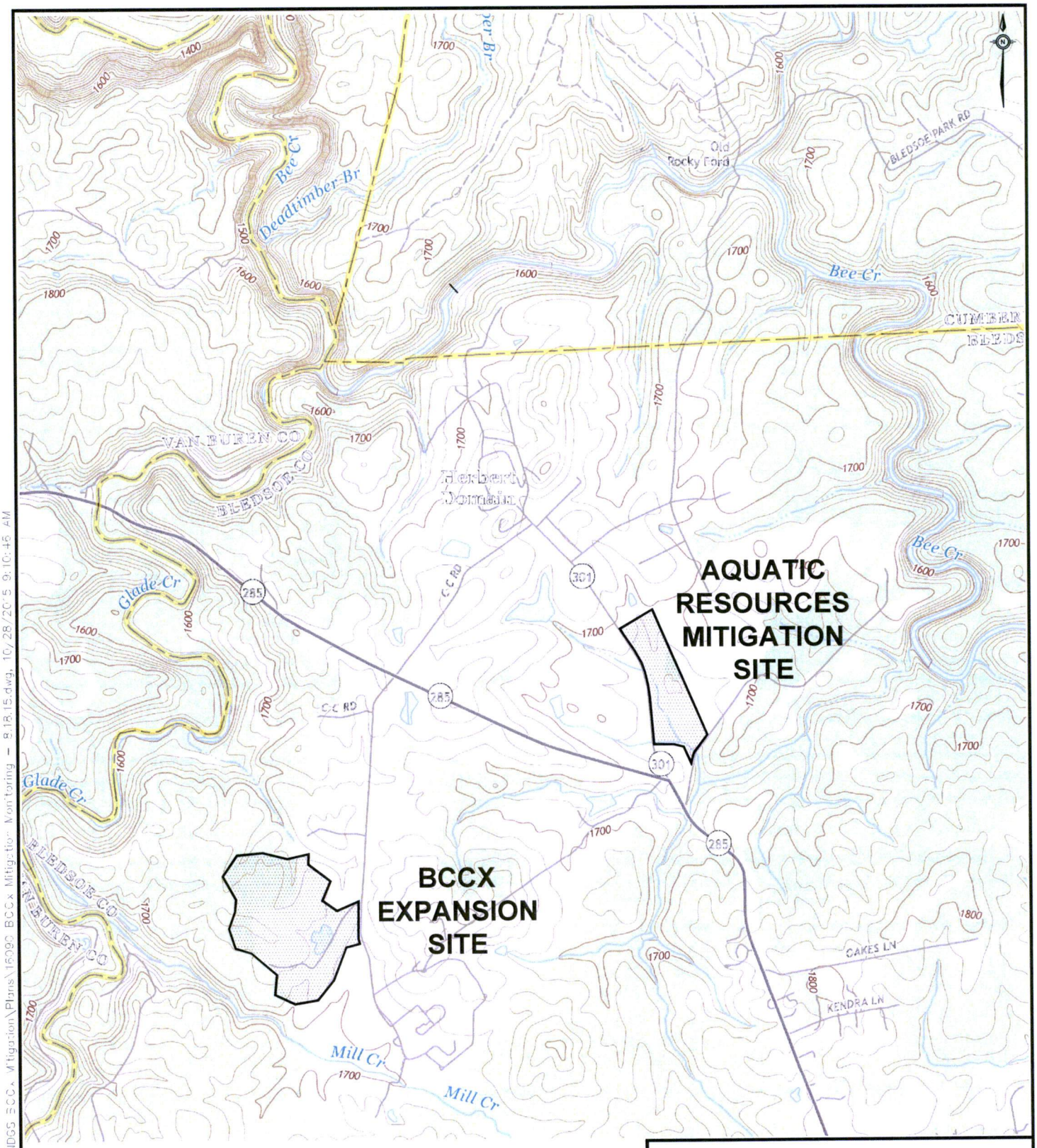
Photo 20.

Reed Canary Grass Control: This small patch was treated with herbicide in the early summer 2016. Follow-up monitoring showed that some plants continued to survive, so they were treated again in late August. Experience has shown that after reed canary grass is eliminated, native wetland herbs quickly become reestablished. Complete elimination, however, almost always requires repeated herbicide applications.

Photo 21.

Gooseberry Transplant Area: Rare granite gooseberry shrubs, rescued from the prison construction site and transplanted to the Mitigation Area in 2009, have survived and thus far appear to be doing relatively well. Although Japanese honeysuckle vines and native blackberries are strongly competing with some of the shrubs, they continue to expand. This year we documented a robust 59% increase in areal coverage since the last monitoring period (4,128 ft^2 to 6,555 ft^2).

SECTION 4 — FIGURES



NOTES

1. SOURCE – U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE OF: HERBERT DOMAIN, BILLINGSLEY GAP, SAMPSON, LONEWOOD, TN 2013

0 2000 4000
SCALE IN FEET

FIGURE 1
SITE LOCATION MAP
BLEDSOE COUNTY CORRECTIONAL COMPLEX
PIKEVILLE, TENNESSEE

REQUESTED BY:	JG
DRAWN BY:	JDL
DWG DATE:	18AUG2015
PROJECT:	0888816090

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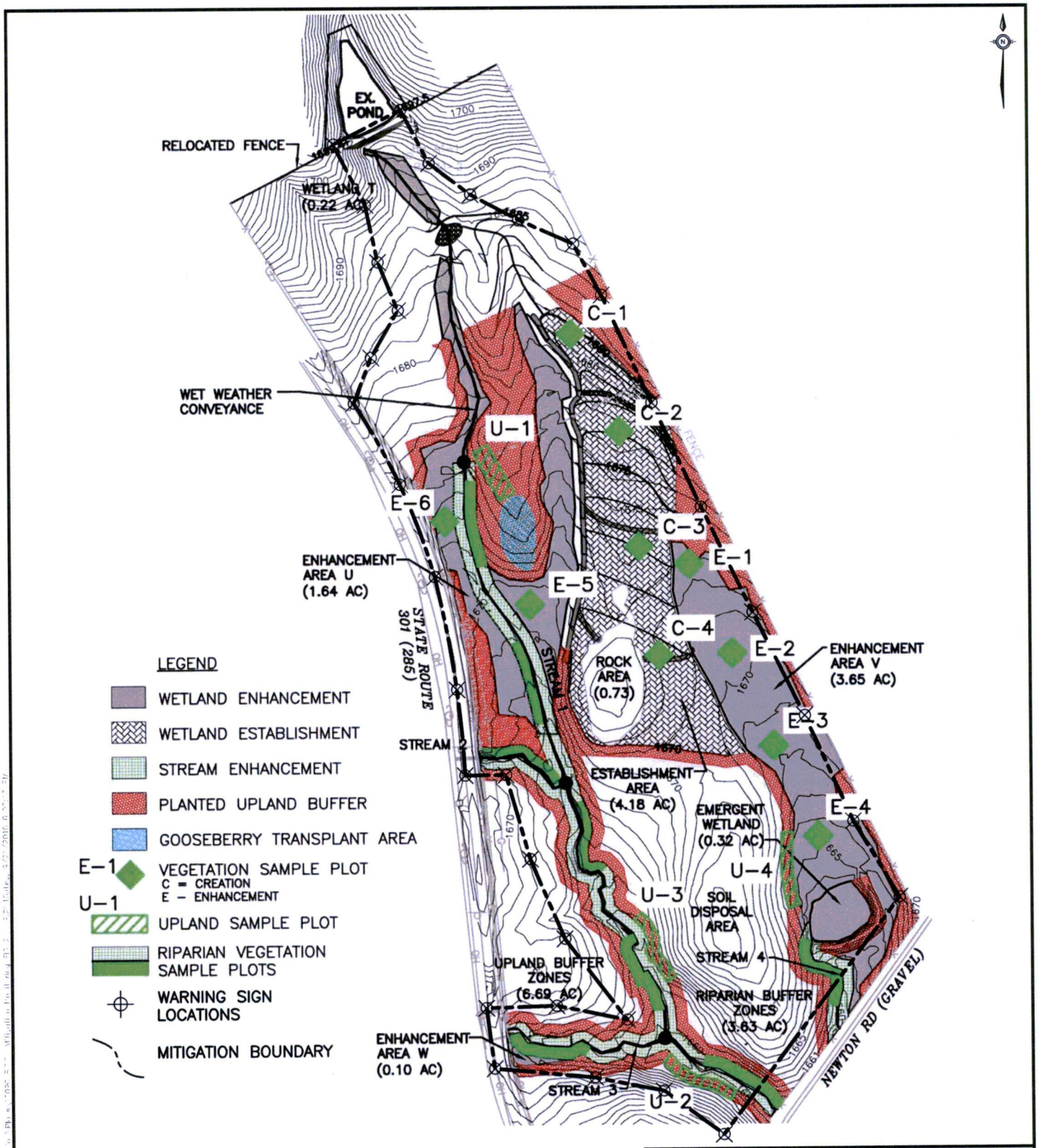

NOTES

1. AREA OF MITIGATION SITE IS 30.38 ACRES

FIGURE 2
STREAM & WETLAND MONITORING MAP
BLEDSOE COUNTY CORRECTIONAL COMPLEX
PIKEVILLE, TENNESSEE

REQUESTED BY:	JG
DRAWN BY:	JDL
DWG DATE:	21SEP2016
PROJECT:	0888816090

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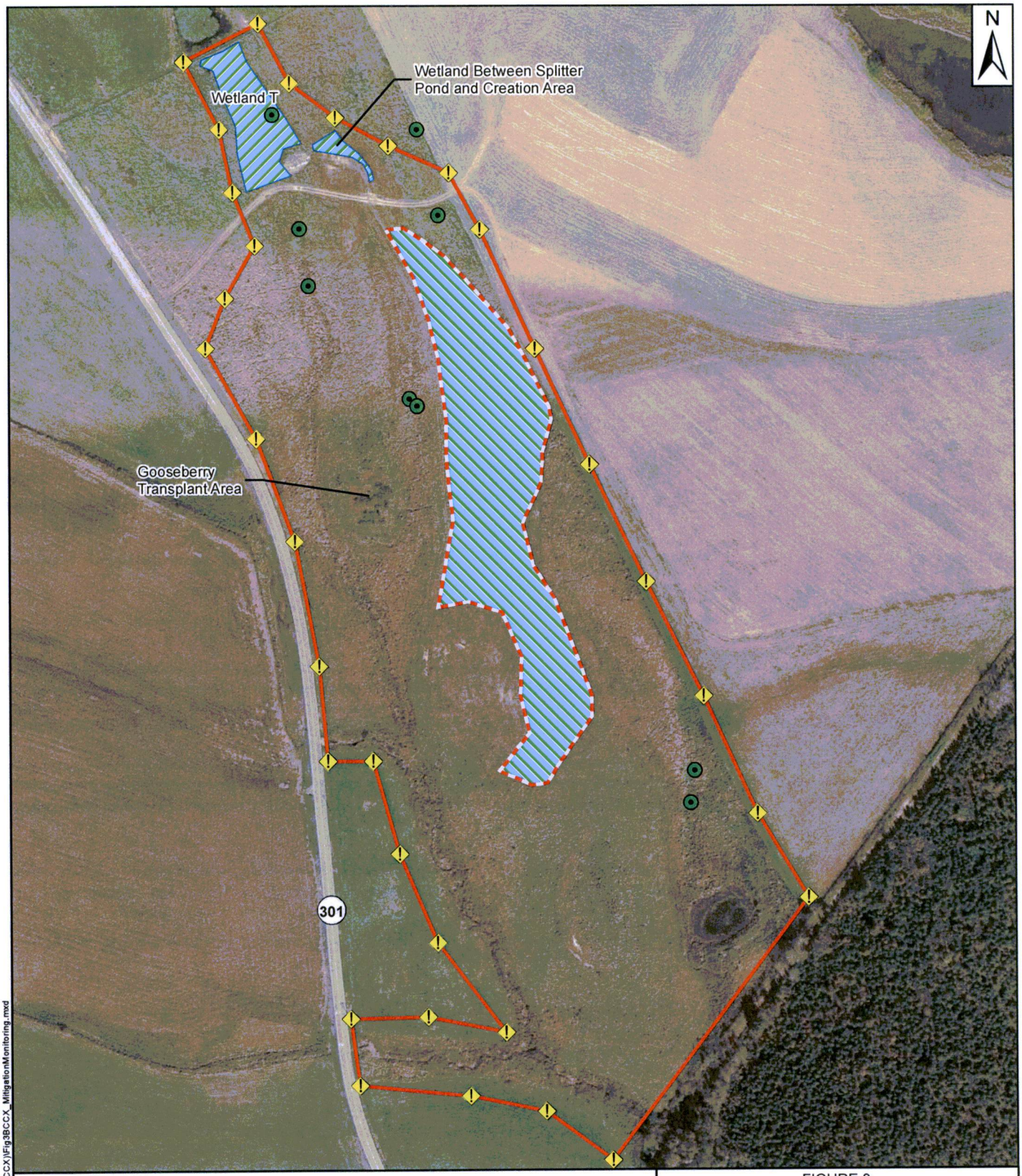

Legend

- No Mow Sign Location
- Reed Canary Grass Treatment Area
- Wetland
- Wetland Creation Area
- Mitigation Area Boundary

0 275 550 Feet

FIGURE 3
LOCATION OF MITIGATION SITE WARNING SIGNS AND REED CANARY GRASS TREATMENT AREAS
BLEDSOE COUNTY CORRECTIONAL COMPLEX
PIKEVILLE, TENNESSEE

REQUESTED BY: J. Groton	
DRAWN BY: MSenne	
DATE: 9/20/2016	
PROJECT NO: 0888816090	

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Service Layer Credits: Google Earth Pro Imagery - 10/22/2014

X:\DGS\BledsoeCoCorrectionalComplex\(BCCX)\Fig3BCCX_MitigationMonitoring.mxd

SECTION 5 — CONCLUSIONS

Wetland Mitigation

Summary Statement: Corrective actions in 2016 involved continued herbicide treatments of reed canary grass infestations in June and August at nine locations at the site: one area in Wetland T, six areas in the Wetland Enhancement Area, and two areas in upland buffers near the Wetland Creation Area. Invasive species control also included spot treatments of glossy false buckthorn, autumn-olive, multiflora rose, Callery pear, Chinese privet, tree-of-heaven, sericea lespedeza, and other woody and semi-woody invasive plants encountered within the Mitigation Area. Pedestrian surveys around the site perimeter verified that mowing crews are continuing to comply with no-mow zones. Vegetation within these buffer areas is growing and beginning to develop into higher-quality habitat.

Corrective actions in 2015 included installing 32 signs to protect the boundaries of the stream and wetland Mitigation Area. EnSafe Inc. installed the signs to clearly identify the Mitigation Area as an area free from mowing, trespassing, and other human disturbance. Signs were placed at least 50 feet from the channel of Streams 1, 2, and 3. The average distance between signs was estimated to be 182 feet. EnSafe also treated glossy buckthorn trees that were inadvertently planted at the site and five reed canary grass patches with a combined area of approximately 0.16 acre. In addition, Wetland T and the wetland between the splitter pond and the Creation Area were formally included within the Mitigation Area, protecting an additional 0.62 acre and 0.07 acre of wetlands at the site, respectively.

Past corrective actions taken during the early winter 2013 involved the replanting of 5,650 wetland-adapted trees and shrubs, as well as the installation of more than 2,500 feet of coir log erosion dams. These measures helped move the mitigation site towards meeting its principal goal of replacing historic wetlands and streams by making available a diversity of habitats for water-dependent plants and animals. The mitigation is also providing a variety of important functions, such as water storage capacity, soil stabilization, sediment trapping, and groundwater recharge.

Vegetation: Performance standards calling for a 70% coverage of wetland-adapted herbs have not yet been met within the Creation Area. Wetland herbs currently constitute 67.27% of the plant cover, an increase of 4.12% from the 2015 data. We continue to be optimistic that the trend will continue moving in the right direction; hydrophyte cover was 63.15% in 2015 and about 61.9% in 2014.

We were disappointed that we were unable to locate dwarf sundew, a state-listed Threatened species that was discovered growing in the Creation Area and the area between the splitter pond and the Creation Area. Repeated searches in June and August were unable to locate this plant in 2016. Unusually low rainfall during the spring and summer may have contributed to the plant's absence this year.

Planted woody density has been conditionally met with overall site density averaging 520 stems/ acre, an increase of 110 stems per acre in 2016. Most of this increase probably results from the plants becoming taller and more visible, but natural regeneration is also taking place. While planted survival exceeds the required 326 stems/acre, performance standards stipulate that no

one species can comprise more than 20% of the total. Two species, buttonbush and sweetgum, continue to exceed this threshold. Despite this "conditional" result, we remain pleased given the fact that during the first monitoring effort, 4 years ago, stem density was only 65 stems/acre.

Vegetation performance standards for Enhancement Areas were attained in 2015, and regulators released these areas from further monitoring requirements. Local populations of the state-listed Endangered brown bog sedge and southern long sedge continue to flourish in the Enhancement Areas.

Soils: Soils in the Creation Area have been mapped by the Natural Resources Conservation Service (NRCS) as containing Lily loam and Morehead-Bonair complex. The latter contains inclusions of hydric Bonair soils in low-lying areas and depressions. Indeed, residual hydric soils with depleted matrices (NRCS Field Indictor of Hydric Soil, F3) were confirmed in 75% of the samples. Creation Areas have been exposed to conditions of augmented hydrology for only a short period of time but are already showing signs of developing hydric characteristics. Although performance standards for soils have not been met within all Creation Areas, a gradual conversion of the native soils seems to be occurring. As a consequence, we recommend no actions at this time. The rates at which hydric indicators evolve in soils vary widely, but hydrologic modification should only be considered if indicators of hydric soil morphology are not observed in converted areas after the fifth year of monitoring.

Hydrology: Shallow groundwater monitoring wells were not required as a condition of this permit. Positive wetland hydrology is, therefore, inferred from the successful establishment of wetland vegetation and a variety of primary and secondary hydrologic indicators that are evident in both the Creation and Enhancement Areas. As has been seen, wetland plant dominance occurs throughout the site. Hydrologic indicators observed this year in either the Creation or Enhancement Areas include scattered occurrences of soil saturation and inundation, sediment and drift deposits, surface soil cracks, algal crust, drainage patterns, crayfish burrows, geomorphic position, and a shallow aquitard.

Stream Mitigation

Summary Statement: Principal performance goals for the onsite stream segments are to maintain stable, non-eroding embankments and to establish sustainable vegetated riparian and upland buffers for long-term protection. In a letter dated August 27, 2015, Mike Lee (TDEC Division of Water Resources) concurred that mitigation goals in the Enhancement Areas had been met and that further quantitative monitoring of woody plants was no longer required. Concurrence from USACE on TDEC's recommendations was received on June 3, 2016. In October 2015 TDOC increased the width of buffer zones adjacent to streams and wetlands to a minimum of 50-foot no-mow zones as previously described.

Granite Gooseberry Transplant Area

Granite gooseberry transplant efforts continue to appear to be successful thus far. Transplant populations of this rare, state-listed Threatened shrub have increased in areal extent every year since they were planted in March 2009. Gooseberry coverage has increased by more than 59% over last year, despite strong competition from Japanese honeysuckle vines and native blackberry. Because these plants are so entwined, there is very little that can be done to remove

them. Despite their rarity, granite gooseberries are tenacious, and it is possible that some of the plants will survive over the long term. In 2016 several large invasive autumn-olive and tree-of-heaven were removed from the gooseberry restoration area; the stumps were treated with herbicide to prevent sprouting again.

Mitigation Site Additions

Apart from the expansion of the oak/riparian zones and installation of signage to protect them from mowing, TDEC also requested that TDOC take several other actions. TDEC requested the addition of Wetland T (abutting the northern boundary of the mitigation site) to the Mitigation Area. This wetland and surrounding buffer total approximately 0.62 acre. TDEC also requested the inclusion of the splitter pond and wetland drainage channel leading from the splitter pond to the north end of the Creation Area. This encompasses another 0.07 acre. In October 2015 signage was placed around the perimeter of both areas and the rest of the site to protect them from future disturbance. The entire Mitigation Area now consists of approximately 31.12 acres of streams, wetlands, and uplands. Mowers in 2016 complied with the no-mow zones around the site perimeter.

Long-term Site Protection

The permittee's commitment to protect the site in perpetuity via deed restriction has yet to be fulfilled. This has been delayed until such time that the permittee is certain that all performance standards have been reached and are sustainable. Because the property is state-owned, there are no immediate outside threats to the Mitigation Area. Signage designating the mitigation site as protected property was installed around the mitigation site perimeter in October 2015.

Recommendations

Based on a thorough analysis of the monitoring data from 2016 and previous years, EnSafe makes the following recommendations regarding future activities at the BCCX Mitigation area:

- After submission of the Fifth-Year Monitoring Report (2016 growing season), request from the regulators a No Further Action finding. If necessary, meet with regulators to discuss the site history, findings of past monitoring events, current project status, and other pertinent details. Conduct a final delineation of the site (including Wetland T) only if required.

- Contract with a land surveyor to have the boundaries of the Mitigation Area determined. Obtain a final boundary survey map with a written description of the boundaries.

- Work with the regulators and TDOC administration and solicitors to determine, and then put in place, the appropriate type of permanent protection mechanism for the property (i.e., deed restriction, conservation easement).

- Until the mitigation is closed out, continue to control invasive plants such as glossy buckthorn, multiflora rose, sericea lespedeza, and reed canary grass throughout the site.

- Until the mitigation is closed out, continue qualitative monitoring of herbaceous and woody plants in the Wetland Creation Area, the Wetland Enhancement Areas, and Stream Mitigation Areas.

- Continue to engage with regulators and TDOC staff in regard to future monitoring, maintenance, and management of the mitigation site. Keep regulators and TDOC staff aware of the conditions present at the site so they can make informed decisions about future actions at the site.

- Monitor the buffer zones around the Mitigation Area perimeter to make sure that BCCX facility staff are cooperating with mowing restrictions. Also monitor the condition of all signs to ensure they are in place, free from damage, and visible.