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October 30, 2015

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

TN DEPT OF ENVIRONMENT  
AND CONSERVATION  
NOV 05 2015  
DIV OF WATER RESOURCES  
RECEIVED

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

Dear Mr. Lee:

Enclosed for your review is the fourth 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 (USCOE) 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.

Thank you again for your time and consideration regarding this project. It is a pleasure working with you and Mark Carnes at the USCOE. If you have any questions, require additional information, or would like to plan a site visit, please feel free to contact me at (615) 252-2834.

Sincerely

EnSafe Inc.

By: Ronald T. Dow, P.G.  
Project Manager

Attachment

cc: Steve Westerman, TDOC  
Mark Carnes, USCOE  
Laura Waynick, TNDGS

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## Bledsoe County Correctional Complex

1045 Horsehead Road  
Pikeville, Tennessee 37367

TN DEPT OF ENVIRONMENT  
AND CONSERVATION

NOV 05 2015

DIV OF WATER RESOURCES  
RECEIVED

# FOURTH YEAR WETLAND AND STREAM MITIGATION MONITORING REPORT

Prepared for:



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

Prepared by:

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

October 30, 2015

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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, and Paul C. Durr/Water Resources, LLC under subcontract to EnSafe.

**Monitoring Dates:** EnSafe and Water Resources completed the 2015 (Year 4) monitoring 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. Impacts to these aquatic resources were determined to be necessary to facilitate the development of a major prison expansion project. 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 (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 which 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, the 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).

**Project Location:** The mitigation site is centered approximately 1,100 feet north-northeast of the intersection of 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 (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 exceed 20% of the stocking density.

**Enhanced Wetlands** — Performance standards have been met for planted woody vegetation, herbaceous-layer vegetation, hydrology, and soils.

**Streams** — Performance standards have been conditionally met with respect to planted woody vegetation. Because it was often not possible to distinguish planted individuals from naturally occurring ones, it was especially difficult to assess performance in terms of stem density or survival. Furthermore, since many of the species develop a multi-stemmed growth form as they mature and merge together into a colony which may support hundreds of distinct stems, actual individual population densities were not possible to discern (See further discussion in Section 2, pages 4 & 5). Irrespective of these technical issues, it is clear that the mitigated stream reaches are highly stable and that the combination of planted and naturally invading colonial species are beginning to provide significant cover for these formerly degraded waterways.

**Gooseberry Transplant Area** — The granite gooseberry coverage has increased by more than 38% over last year (2,985 ft<sup>2</sup> vs. 4,128 ft<sup>2</sup>) 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. However, mowing in adjacent hay pastures has occurred in some of the stream buffer zones. This has affected the effectiveness of the buffers. Signs designating the area as a protected wetland have been installed following the incursion of mowing in restricted areas.

**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

mown 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.

**Recommendations for Additional Corrective Actions:** Herbaceous plant cover in the enhancement area continues to consistently and decisively exceed performance standards. We recommended that this performance standard has been fully met and that we discontinue monitoring that segment of the population. The respective regulatory agencies have responded favorably to this recommendation.

As previously noted, performance standards for woody vegetation in the creation area and along a number of the streams are being conditionally met (i.e. contain the target density of stems/acre but survival rates of planted species can't 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 an onsite meeting in 2016 with personnel from the USACE and TDEC to determine what steps need to be taken to satisfy the oversight agencies.

Because of the occurrence of invasive glossy false buckthorn shrubs in several of the stream mitigation zones we strongly recommend that a regimen of herbicide applications begin in the spring of 2016. The buckthorn is capable of rapidly colonizing open, moist or wet areas and supplanting desirable native vegetation. Since current population size is estimated at only a few dozen plants, control should be readily achievable, but it is likely that several treatments will be required. Two other invasive woody species (autumn-olive and multiflora rose) and one invasive grass species (reed canary grass) have also been identified on the mitigation site. Although these two shrubs 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 they would not be primary targets for control, but controlling them with herbicide applications should be given consideration. Reed canary grass is extremely tolerant of wetland conditions; it can quickly spread into wetlands and crowd out the native species.

In the near future, once it is clear that all performance standards have been attained and are sustainable, the Tennessee Department of Correction (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 would like to strongly recommend to TDOC that going forward all future site monitoring continue to be scheduled at approximately the same time each year. 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.

### **Additional Accomplishments in 2015**

On August 24, 2015 Steve Westerman (TDOC), Ron Dow and Jimmy Groton (EnSafe), and Paul Durr (Water Resources, LLC) 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 (See Appendix A). 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 due in part to heavy competition from sod-forming grasses and forbs had reduced tree seedling survival. He also noted 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. It was 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/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 feet to 50 feet on 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.

- Mr. Lee also stated that 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 Mike Lee's recommendations and seek concurrence on TDEC's recommendations. On October 7, 2015 EnSafe sent a letter to Mr. Carnes requested concurrence from USACE in regard to TDEC's recommendations.

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 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 surveyors 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, 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 in the mitigation site protects an additional 0.22 acre of wetlands. Wetland T species and additional species found between the splitter pond and the establishment (creation) area are shown in Tables 8 and 9, respectively.



## SECTION 2 — PROJECT REQUIREMENTS WETLANDS

Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
<p>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.</p> <p>The entire wetland mitigation is to be protected in perpetuity through deed restriction and signage erected to indicate the protected status of the property.</p> <p>The specific performance standards associated with the mitigation action are summarized below.</p>	<p>Vegetation demographics were determined from 0.05-acre fixed area sample plots (for woody species) and 1-yd<sup>2</sup> plots (for herbs). Sampling methods are described in the site's final Aquatic Resource Mitigation Plan.</p> <p>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.</p> <p>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.</p>	<p>Herbaceous Vegetation</p> <p>No</p>	<p>Section 3: Tables 1 &amp; 3</p> <p>Section 3: Photos 1-8, 38</p> <p>Section 4: Maps 1 &amp; 2</p>
<p><u>Creation Area:</u>                  Success will be measured as a function of wetland plant dominance and the presence of positive wetland hydrology. At the end of five years, approximately 70% of herbaceous plant cover must be comprised of wetland-adapted species and survival rates for planted woody species must be at least 75% (326 stems/ac). 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.</p>	<p>Vegetation</p> <p>Total herbaceous plant cover is 79.62%. This is a slight decrease since the 2014 monitoring effort when cover was determined to be 87.44%. Wetland-adapted species comprise 63.12% of the cover, a small but steady increase over the 2014 results. Although this falls somewhat below the targeted goal of 70% (at the end of 5 years), good progress is being made. This year 57 distinct taxa were identified (15 more than in 2014). Species diversity continues to be higher in the creation area than in the enhancement area (see next page). The dwarf sundew population continues to grow in the creation area. 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 &lt; 20 known occurrences statewide.</p>		

Performance Standards	Year 4 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
		<p>Woody species density in the creation area is 410 stems/acre which exceeds the performance standard. This is largely the result of a strong increase in the number of false indigo bush. Some of this increase is the result of the plants becoming taller and more visible, but natural regeneration is also taking place to some degree. 100% of the species are considered wetland-adapted. Two species still exceed 20% of the stocking density (buttonbush 32.93% and sweetgum 24.39%).</p>	Woody Vegetation	Conditionally Yes	
	Soils	<p>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.</p>	Soils	Yes	Section 3: Table 6
	Hydrology	<p>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.</p>	Hydrology	Yes	
<p><u>Enhancement Area:</u>                      The same performance standards described above for the creation area shall also apply for the enhancement area. However, because the enhancement area is already a jurisdictional wetland and contains hydric soils, it will not be monitored for that parameter.</p>	Vegetation	<p>Herbaceous plant cover is 81.33%, a decrease of 14.25% from 2014. This decrease is due to large accumulations of twig and leaf litter, a reflection of the luxuriant growth of herbaceous plant throughout the enhancement area. This is distributed among 46 distinct taxa, an increase of 13 species from 2014. Wetland-adapted species comprise 86.96% of the cover. In 2014 two small populations of rare sedge species that are listed as "Endangered" by TDEC's Division of Natural Areas were</p>	Herbaceous Vegetation	Yes	Section 3: Table 2 Table 4 Section 3: Photos 9-20, 35-36 Section 4: Maps 1 & 2

Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
	<p>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 known occurrences in the state. The southern long sedge is an "S2" species indicating &lt; 20 known occurrences. Both of these populations were relocated this year and are still intact.</p> <p>Combined density of planted and naturally-invasive woody species is 490 stems/acre which exceeds the performance standard. Increases in red maple have been very apparent. Some of the increase is clearly the result of natural recruitment. This is particularly evident at the south end of the site which is closer to a seed source. Sweetgum is also becoming dominant with many individuals showing good height growth. Naturally-invading swamp rose was not tallied this year because of its overwhelming success in the colonizing enhancement areas. In 2014 this species occurred at an average rate of 240 stems/acre, or the equivalent of 40% of total density. Casual observation indicates even further increases in 2015.</p>	<p>Woody Vegetation</p> <p>Yes</p>	
	<p>Soils</p> <p>Morehead-Bonair complex. This series is recognized as containing inclusions of hydric Bonair soils in low areas and depressions. Hydric soils were confirmed by the USACE during a jurisdictional determination visit to the site in November 2008.</p>	<p>Soils</p> <p>Yes</p>	
	<p>Hydrology</p> <p>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.</p>	<p>Hydrology</p> <p>Yes</p>	

Performance Standards	Year 4 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
<p><u>Upland Buffer Area:</u>                      25 ft-wide buffers, external to riparian buffers (see next page) 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/ac but no performance standards for seedling survival are stipulated.</p>	Vegetation	Total stocking density within upland buffer zones is 226.66 stems/acre. Density of planted oak species alone is more than 145 stems/acre. With the exception of a few silky dogwoods that were inadvertently placed in upland areas, the remaining species are all naturally invasive. Fewer plots were monitored in 2015 (oak plot 2 was mown and not included in the analysis).	Vegetation	Not Applicable	Section 3: Table 5  Section 3: Photos 21, 22, & 34  Section 4: Maps 1 & 2
<p><u>Gooseberry Transplant Area:</u>                      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.)</p>	Soils Hydrology Vegetation	Not Applicable Not Applicable Because of its highly colonial nature, it was not possible to make an accurate count of individual stems. Instead, 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. This year gooseberry coverage has increased by more than 38% over last year (2,985 ft <sup>2</sup> vs. 4,128 ft <sup>2</sup> ) in spite of strong competition from Japanese honeysuckle and native blackberry.	Soils Hydrology Vegetation	Not Applicable Not Applicable Not Applicable	Section 3: Photos 22 & 37
<p>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 (<a href="http://www.tnepcc.org/invasive_plants/67">http://www.tnepcc.org/invasive_plants/67</a>). 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 US 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 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 U.S. and is a major threat to natural wetlands. It out competes 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.</p>	Soils Hydrology	Not Applicable Not Applicable	Soils Hydrology	Not Applicable Not Applicable	Section 3: Photos 31-33

**STREAMS**

Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
<p>Stream mitigation will involve the enhancement of 2,660 ft of headwater tributaries to Bee Creek. Four individual segments are to be treated. Riparian shrub vegetation shall be planted 25-ft along both banks. Plantings shall be at least three rows deep along each channel staggered on 10-ft centers. Bare root or containerized stock is permissible. No one species can comprise more than 20% of the total.</p> <p>Stream mitigation areas are to be protected in perpetuity through deed restriction and signage erected to indicate the protected status of the properties.</p> <p>The performance standards for the mitigation actions are described briefly below.</p> <p><b>Enhancement of Unnamed Tributary to Bee Creek</b>  <b>Stream Segment 1 (1,793 ft):</b>                      Success will be determined by the establishment of a waterway that is stable, has a discernible bed and bank, and has typical in-stream habitat. The banks must be stable and non-eroding with adequate vegetative cover to prevent eroding sediments from entering the stream. This includes a 75% survival rate for planted trees and shrubs for five consecutive years (64 stems/100 ft of stream channel).</p>	<p>Pre-construction stream habitat conditions were documented in 2008 using EPA/TDEC habitat assessment methodologies. Post-construction conditions were determined by employing Level 1 protocols set forth by TDEC in the Stream Mitigation Guidelines for the State of Tennessee (TDEC 2004).</p> <p>Riparian zone vegetation surveys made use of staggered 200 x 25 ft fixed area sample plots spaced 200 ft apart on each of the stream segments in order to determine survivorship of planted material and establishment of naturally invading woody species.</p>	<p>Channel</p> <p>Vegetation</p>	<p>Section 3: Tables 7</p> <p>Section 3: Photos 23-27</p> <p>Section 4: Maps 1 &amp; 2</p>
	<p>Channel Conditions</p> <p>Vegetation</p>	<p>Channel</p> <p>Vegetation</p>	<p>Yes</p> <p>Conditionally Yes</p>

Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
	<p>colonial species. In 2014 swamp rose accounted for 20% of total shrub density; casual observations in 2015 indicate even higher densities this year. Since most of the shrub species are multi-stemmed and highly colonial, individual stem counts could not be made. Instead, they had to be inferred from sample averages. Several 10 ft-long clumps of silky dogwoods for example, were found to contain an average of 35 stems each. By measuring the linear extent of all silky dogwoods within a given sample plot, the total number of stems within the plot could be extrapolated. (See footnotes for Table 7 for further information). Additionally, given that it was often not possible to discern planted individuals from native ones, it was also not possible to determine survivorship levels. Irrespective of these sampling issues, it is clear that the intent of the performance standards is being met. Woody stem populations along these formerly degraded reaches are thriving, and in doing so, are providing bank stabilization, cooling shade for the creek, and dietetic diversity for local wildlife.</p>	<p>Not Applicable</p>	
<p><b>Enhancement of Unnamed Tributary to Bee Creek</b>  <b>Stream Segment 2 (224 ft):</b>          The same performance standards described above for Stream Segment 1 shall apply to this unnamed tributary.</p>	<p>Aquatic Biota</p> <p>Channel Conditions</p>	<p>Aquatic Biota</p> <p>Channel</p>	<p>Section 3: Tables 7          Section 3: Photo 28          Section 4: Maps 1 &amp; 2</p>

Performance Standards	Year 4 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
	Vegetation	<p>Combined density of planted and naturally-occurring woody species within riparian zones is estimated at 486 stems per 100 ft of stream bank length. Planted densities alone average 432 stems per 100 ft. Again, since riparian shrub counts involved highly colonial, intergrading populations, it was difficult to assess survivorship. It should also be noted that silky dogwood constitute 85% of total stem density which far exceeds the performance standard of 20%. Silky dogwood numbers increased by 293 stems/100ft over last year. However, because stream banks are stable and well vegetated with a variety of species (12), we suggest that performance standards are conditionally being met. Fish and green frogs were observed in a pool located just to the east of SR 301. A great blue heron was also seen feeding here.</p>	Vegetation	Conditionally Yes	
<p><b><u>Enhancement of Unnamed Tributary to Bee Creek</u></b>  <b><u>Stream Segment 3 (388 ft):</u></b>          The same performance standards described above for Stream Segment 1 shall apply to this unnamed tributary.</p>	Aquatic Biota	<p>Fish and green frogs were observed in a pool located just to the east of SR 301. A great blue heron was also seen feeding here.</p>	Aquatic Biota	Not Applicable	
	Channel Conditions Vegetation	<p>See comments for Stream Segment 2 above.</p> <p>Density of planted woody species is 59 stems per 100 ft of stream bank length which fails to attain the performance goal of 64 stems. Also, two of the planted species (buttonbush and elderberry) exceed the performance standard of 20% of the stocking density (33% and 32%, respectively). Stream banks are stable and well vegetated with a variety of species (10). Glossy false buckthorn, an invasive exotic species, was inadvertently planted, and is now being</p>	Channel Vegetation	Yes No	<p>Section 3: Tables 7            Section 3: Photo 29            Section 4: Maps 1 &amp; 2</p>

Performance Standards	Year 4 Monitoring and Monitoring Conditions		Performance Standards Met?		Data References (see Sections 3 & 4)
<p><b><u>Enhancement of Unnamed Tributary to Bee Creek</u></b>  <b><u>Stream Segment 4 (255 ft):</u></b>            The same performance standards described above for Segment 1 shall apply to this unnamed tributary.</p>	<p>Aquatic Biota</p> <p>Channel Conditions</p> <p>Vegetation</p>	<p>controlled with herbicide. Next year's survey will reveal if control efforts are effective.</p> <p>Fish and green frogs were observed in a pool located just to the east of SR 301.</p> <p>See comments for Stream Segment 2 above.</p> <p>Combined density of planted and naturally-occurring woody species within riparian zones is an estimated 125.5 stems per 100 ft of stream bank length. Planted densities alone average 118.5 stems per 100 ft. It should be noted that elderberry constitutes 58% of total stem density which far exceeds the performance standard of 20%. The density figures are much lower than those reported in 2014. This decrease is directly attributable to the decision not to count the dense thickets of swamp rose which had almost completely colonized the entire length of Segment 4 along both banks (351.0 stems/acre in 2014). Because stream banks are stable and well vegetated with a variety of species (10), we suggest that performance standards are conditionally being met.</p> <p>Although no aquatic organisms were detected during our non-formal survey, the pond immediately above Segment 4 supports numerous fish, frogs, aquatic insects, snapping turtles, and water-dependent birds.</p>	<p>Aquatic Biota</p> <p>Channel Conditions</p> <p>Vegetation</p>	<p>Not Applicable</p> <p>Yes</p> <p>Conditionally Yes</p>	<p>Section 3: Table 7</p> <p>Section 3: Photo 30</p> <p>Section 4: Maps 1 &amp; 2</p>
<p><b>Note:</b> Multiflora rose (<i>Rosa multiflora</i>) and autumn-olive (<i>Elaeagnus umbellata</i>) 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 (<a href="http://www.tnepcc.org/invasive_plants/67">http://www.tnepcc.org/invasive_plants/67</a>). We have also noted the establishment of a small number of glossy false buckthorns (<i>Frangula alnus</i>) along several of the mitigated stream segments.</p>	<p>Aquatic Biota</p>	<p>Not Applicable</p>	<p>Aquatic Biota</p>	<p>Not Applicable</p>	<p>Section 3: Photos 31-32, 34</p>



Performance Standards	Year 4 Monitoring and Monitoring Conditions	Performance Standards Met?	Data References (see Sections 3 & 4)
<p>Unfortunately this shrub was improperly included in the plant species mix received from the nursery and was probably confused with stream alder (<i>Alnus serrulata</i>). Though known in Tennessee from only one other county, this Eurasian species is a well-documented pest plant in other parts of the US 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 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 U.S. and is a major threat to natural wetlands. It out competes 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.</p> <p>Site mowing has encroached well into protected stream enhancement zones. Unknown numbers of planted trees and shrubs have been impacted. These zones extend 25 ft on either side of the creek channel (channel shown in red). Consideration should be given to curtailing all mowing adjacent to the mitigation site. At minimum we recommend the placement of signs along the border of the protected areas to prevent this from occurring again.</p>			

## SECTION 3 — TABLES AND PHOTOGRAPHS

Table 1. Substrate/Herbaceous Species Frequency and Average Cover Percent, BCCX Wetland Creation Area, Pikeville, TN, June 2015.

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
<b>Bare Soil 1</b>	—	<b>75.00</b>	<b>14.69</b>	<b>6.06</b>
Open Water	—	0.00	0.00	0.00
<b>Twig/Leaf Litter</b>	—	<b>100.00</b>	<b>5.69</b>	<b>1.75</b>
red maple ( <i>Acer rubrum</i> )	Fac	6.25	0.44	0.44
purple false foxglove ( <i>Agalinis purpurea</i> )	Facw	0.00	0.00	-1.06
common ragweed ( <i>Ambrosia artemisiifolia</i> )	Facu	50.00	0.50	-0.44
<b>broomsedge (<i>Andropogon virginicus</i>)</b>	<b>Facu</b>	<b>81.25</b>	<b>9.88</b>	<b>-4.63</b>
sweet vernal grass ( <i>Anthoxanthum odoratum</i> )	Facu	18.75	0.88	0.88
bearded beggar-ticks ( <i>Bidens aristosa</i> )	Facw	18.75	0.50	-1.81
devil's beggar-ticks ( <i>Bidens frondosa</i> )	Facw	0.00	0.00	-0.31
yellow-fruited sedge ( <i>Carex annectens</i> )	Facw	31.25	0.75	0.75
hirsute sedge ( <i>Carex complanata</i> )	Facu	50.00	1.31	1.31
sallow sedge ( <i>Carex lurida</i> )	Obl	6.25	0.19	0.19
Swan's sedge ( <i>Carex swanii</i> )	Facu	6.25	0.13	0.13
fox sedge ( <i>Carex vulpinoidea</i> )	Obl	0.00	0.00	-0.25
mistflower ( <i>Conoclinium coelestinum</i> )	Fac	6.25	0.13	0.00
Queen Anne's-lace ( <i>Daucus carota</i> )	Upl	43.75	0.63	0.32
<b>tapered rosette grass (<i>Dichanthelium acuminatum</i>)</b>	<b>Fac</b>	<b>93.75</b>	<b>6.81</b>	<b>6.81</b>
deer-tongue grass ( <i>Dichanthelium clandestinum</i> )	Fac	18.75	0.50	0.06
<b>cypress witch grass (<i>Dichanthelium dichotomum</i>)</b>	<b>Fac</b>	<b>68.75</b>	<b>4.75</b>	<b>-11.94</b>

1 Bolded entries indicate dominant species or substrates (i.e. cover contributions exceed 3% and frequency values are greater than 10%).

Table 1 (continued)

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
open-flower rosette grass ( <i>Dichanthelium laxiflorum</i> )	Facu	31.25	3.00	1.75
<b>broom rosette grass</b> ( <i>Dichanthelium scoparium</i> )	<b>Facw</b>	<b>37.50</b>	<b>4.69</b>	<b>-3.12</b>
smooth crab grass ( <i>Digitaria violascens</i> )	Fac	0.00	0.00	-0.19
Virginia buttonweed ( <i>Diodia virginiana</i> )	Facw	12.50	0.50	-0.94
dwarf sundew ( <i>Drosera brevifolia</i> )	Obl	6.25	0.06	-0.07
<b>slender spikerush</b> ( <i>Eleocharis tenuis</i> )	<b>Facw</b>	<b>31.25</b>	<b>3.38</b>	<b>1.69</b>
annual fleabane ( <i>Erigeron annuus</i> )	Facu	12.50	0.19	0.19
prairie fleabane ( <i>Erigeron strigosus</i> )	Facu	25.00	0.81	0.18
boneset ( <i>Eupatorium perfoliatum</i> )	Facw	25.00	0.81	0.06
late-flowering thoroughwort ( <i>Eupatorium serotinum</i> )	Fac	31.50	0.94	0.06
slender fimbry ( <i>Fimbristylis autumnalis</i> )	Facw	0.00	0.00	-0.13
purple-head sneezeweed ( <i>Helenium flexosum</i> )	Fac	31.25	1.75	-1.00
velvet grass ( <i>Holcus lanatus</i> )	Fac	12.50	1.00	1.00
orangegrass ( <i>Hypericum gentianoides</i> )	Upl	6.25	0.06	-0.38
dwarf St. John's-wort ( <i>Hypericum mutilum</i> )	Facw	0.00	0.00	-0.13
St. Andrew's-cross ( <i>Hypericum stragulum</i> )	Facu	0.00	0.00	-0.75
taper-tip rush ( <i>Juncus acuminatus</i> )	Obl	12.50	0.50	0.50
<b>greater poverty rush</b> ( <i>Juncus antheratus</i> )	<b>Facw</b>	<b>87.50</b>	<b>3.25</b>	<b>0.87</b>
soft rush ( <i>Juncus effusus</i> )	Facw	12.50	0.44	0.44
grass-leaved rush ( <i>Juncus marginatus</i> )	Facw	18.75	0.31	0.31
<b>Japanese-clover</b> ( <i>Kummerowia striata</i> )	<b>Facu</b>	<b>81.25</b>	<b>3.88</b>	<b>-7.32</b>
ox-eye daisy ( <i>Leucanthemum vulgare</i> )	Upl	6.25	0.06	0.06
annual clubmoss ( <i>Lycopodiella</i> sp.)	Facw	6.25	0.13	0.13
lance-leaf yellow loosestrife ( <i>Lysimachia lanceolata</i> )	Fac	6.25	0.19	-0.12
black medic ( <i>Medicago lupulina</i> )	Facu	6.25	0.06	0.06
beaked panic grass ( <i>Panicum anceps</i> )	Fac	0.00	0.00	-2.25

Table 1 (continued)

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
red-top panic grass ( <i>Panicum rigidulum</i> )	Facw	50.00	2.81	2.81
smooth paspalum ( <i>Paspalum laeve</i> )	Fac	0.00	0.00	-1.44
English plantain ( <i>Plantago lanceolata</i> )	Upl	18.75	0.63	0.19
<b>common cinquefoil (<i>Potentilla simplex</i>)</b>	<b>Facu</b>	<b>87.50</b>	<b>9.50</b>	<b>5.75</b>
heal-all ( <i>Prunella vulgaris</i> )	Facu	25.00	0.56	0.00
narrow-leaf mountain-mint ( <i>Pycnanthemum tenuifolium</i> )	Facw	12.50	0.19	0.19
coarse-globe beaksedge ( <i>Rhynchospora recognita</i> )	Facw	6.25	0.19	0.19
wild-petunia ( <i>Ruellia strepens</i> )	Fac	6.25	0.13	0.13
yellow foxtail grass ( <i>Setaria pumila</i> )	Fac	0.00	0.00	-0.75
tall fescue ( <i>Schedonorus arundinaceus</i> )	Facu	6.25	0.44	0.44
Georgia bulrush ( <i>Scirpus georgianus</i> )	Obl	12.50	1.13	0.50
helmet-flower ( <i>Scutellaria integrifolia</i> )	Facw	6.25	0.13	0.13
horse-nettle ( <i>Solanum carolinense</i> )	Facu	6.25	0.06	-0.50
tall goldenrod ( <i>Solidago altissima</i> )	Facu	6.25	0.13	-0.07
late goldenrod ( <i>Solidago gigantea</i> )	Facw	31.25	1.13	-0.38
gray goldenrod ( <i>Solidago nemoralis</i> )	Upl	6.25	0.19	0.00
wrinkle-leaf goldenrod ( <i>Solidago rugosa</i> )	Fac	6.25	0.13	0.13
blue-eyed-grass ( <i>Sisyrinchium angustifolium</i> )	Facw	43.75	1.25	0.56
blue-eyed-grass ( <i>Sisyrinchium atlanticum</i> )	Facw	43.75	0.81	0.81
panicked American-aster ( <i>Symphotrichum lanceolatum</i> )	Facw	12.50	0.31	0.31
downy American-aster ( <i>Symphotrichum pilosum</i> )	Fac	56.25	2.75	-1.56
American-aster ( <i>Symphotrichum</i> sp.)	---	6.25	0.94	0.94
common dandelion ( <i>Taraxacum officinale</i> )	Facu	0.00	0.00	-0.13
yellow clover ( <i>Trifolium campestre</i> )	Upl	18.75	0.25	0.25
red clover ( <i>Trifolium pratense</i> )	Facu	12.50	0.25	-0.06
unknown Asteraceae	---	37.50	2.13	2.13
unknown Cyperaceae	---	12.50	0.25	0.25
			<b>Σ= 100.00</b>	

**Table 2. Substrate/Herbaceous Species Frequency and Average Cover Percent, BCCX Wetland Enhancement Area, Pikeville, TN, June 2015.**

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
<b>Twig/Leaf Litter 2</b>	—	<b>100.00</b>	<b>18.67</b>	<b>14.25</b>
red maple ( <i>Acer rubrum</i> )	Fac	8.33	0.25	0.25
<b>small-flowered agrimony (<i>Agrimonia parviflora</i>)</b>	<b>Facw</b>	<b>25.00</b>	<b>3.88</b>	<b>3.30</b>
hog-peanut ( <i>Amphicarpaea bracteata</i> )	Fac	8.33	1.67	1.67
sweet vernal grass ( <i>Anthoxanthum odoratum</i> )	Facu	8.33	0.38	0.38
groundnut ( <i>Apios americana</i> )	Facw	8.33	2.00	0.75
bearded beggar-ticks ( <i>Bidens aristosa</i> )	Facw	8.33	0.25	0.25
yellow-fruited sedge ( <i>Carex annectens</i> )	Facw	12.50	0.42	0.42
<b>prickly bog sedge (<i>Carex atlantica</i>)</b>	<b>Facw</b>	<b>12.50</b>	<b>6.38</b>	<b>5.80</b>
hirsute sedge ( <i>Carex complanata</i> )	Facu	12.50	0.25	0.25
Frank's sedge ( <i>Carex frankii</i> )	Obl	4.17	0.29	0.29
bladder sedge ( <i>Carex intumescens</i> )	Facw	4.17	0.21	0.21
sallow sedge ( <i>Carex lurida</i> )	Obl	45.83	2.46	2.46
pointed broom sedge ( <i>Carex scoparia</i> )	Facw	41.67	1.42	1.42
fox sedge ( <i>Carex vulpinoidea</i> )	Obl	16.67	0.96	0.13
buttonbush ( <i>Cephalanthus occidentalis</i> )	Obl	4.17	0.13	0.13
mistflower ( <i>Conoclinium coelestinum</i> )	Fac	4.17	0.21	-0.37
straw-color flatsedge ( <i>Cyperus strigosus</i> )	Facw	0.00	0.00	-1.00
deer-tongue grass ( <i>Dichanthelium</i> )	Fac	4.17	0.13	0.13
deer-tongue grass ( <i>Dichanthelium</i> )	Fac	12.50	2.46	0.87

2 Bolded entries indicate dominant species or substrates (i.e. cover contributions exceed 3% and frequency values are greater than 10%).

Table 2 (continued)

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
cypress witch grass ( <i>Dichanthelium dichotomum</i> )	Fac	8.33	0.54	-1.13
broom panic grass ( <i>Dichanthelium scoparium</i> )	Facw	12.50	0.50	-0.92
Virginia buttonweed ( <i>Diodia virginiana</i> )	Facw	0.00	0.00	-0.17
slender spikerush ( <i>Eleocharis tenuis</i> )	Facw	4.17	2.71	2.71
purple-leaf willowherb ( <i>Epilobium coloratum</i> )	Facw	12.50	0.46	0.04
trumpetweed ( <i>Eutrochium fistulosum</i> )	Facw	0.00	0.00	-0.58
marsh bedstraw ( <i>Galium tinctorium</i> )	Obl	20.83	1.21	0.38
<b>velvet grass</b> <b>(<i>Holcus lanatus</i>)</b>	<b>Fac</b>	<b>79.17</b>	<b>4.83</b>	<b>4.41</b>
dwarf St. John's-wort ( <i>Hypericum mutilum</i> )	Facw	4.17	0.08	0.08
greater poverty rush ( <i>Juncus antheratus</i> )	Facw	37.50	2.08	1.25
<b>soft rush</b> <b>(<i>Juncus effusus</i>)</b>	<b>Facw</b>	<b>70.83</b>	<b>6.88</b>	<b>5.30</b>
rice cut grass ( <i>Leersia oryzoides</i> )	Obl	29.17	2.71	-4.62
marsh seedbox ( <i>Ludwigia palustris</i> )	Obl	4.17	0.08	0.08
beaked panic grass ( <i>Panicum anceps</i> )	Fac	0.00	0.00	-1.25
fall panic grass ( <i>Panicum dichotomiflorum</i> )	Facw	0.00	0.00	-0.42
<b>redtop panic grass</b> <b>(<i>Panicum rigidulum</i>)</b>	<b>Facw</b>	<b>79.17</b>	<b>17.42</b>	<b>-27.08</b>
swamp smartweed ( <i>Persicaria hydropiperoides</i> )	Obl	8.33	0.75	0.75
dotted smartweed ( <i>Persicaria punctata</i> )	Obl	0.00	0.00	-0.50
common cinquefoil ( <i>Potentilla simplex</i> )	Facu	33.33	2.13	1.96
clustered mountain-mint ( <i>Pycnanthemum muticum</i> )	Facw	20.83	0.88	0.88
Maryland meadow-beauty ( <i>Rhexia mariana</i> )	Obl	37.50	2.46	-8.29
globe beaksedge ( <i>Rhynchospora recognita</i> )	Facw	0.00	0.00	-0.42
swamp rose ( <i>Rosa palustris</i> )	Obl	4.17	0.83	-0.84
common blackberry ( <i>Rubus argutus</i> )	Facu	4.17	0.13	-0.46
tall fescue ( <i>Schedonorus arundinaceus</i> )	Facu	54.17	2.38	1.13
<b>wool-grass</b> <b>(<i>Scirpus cyperinus</i>)</b>	<b>Facw</b>	<b>12.50</b>	<b>3.67</b>	<b>-3.33</b>

Table 2 (continued)

Substrate/Herbs	Wetland Indicator Status	Percent Frequency	Average Percent Cover	Change in Average Cover Since Previous Monitoring
Georgia bulrush ( <i>Scirpus georgianus</i> )	Obl	20.83	1.50	1.08
helmet flower ( <i>Scutellaria integrifolia</i> )	Facw	8.33	0.29	-0.29
blue-eyed-grass ( <i>Sisyrinchium angustifolium</i> )	Facw	12.50	0.33	0.33
horse-nettle ( <i>Solanum carolinense</i> )	Facu	25.00	0.71	-0.54
late goldenrod ( <i>Solidago gigantea</i> )	Facw	4.17	0.21	0.21
tall ironweed ( <i>Vernonia gigantea</i> )	Fac	12.50	1.88	1.88
New York ironweed ( <i>Vernonia novaboracensis</i> )	Facw	0.00	0.00	-1.42
			$\Sigma =$ 100.00	

**Table 3. Average Density and Frequency of Planted (P) and Naturally-Invading Woody Seedlings, BCCX Wetland Creation Area, Pikeville, TN, June 2015.**

Species	Wetland Indicator Status	Average Frequency (%)	Average Density (stems/acre)	Change in Average Density Since Previous Monitoring
red maple (P in part) ( <i>Acer rubrum</i> )	Fac	100.00	60.00	5.00
common serviceberry (P) ( <i>Amelanchier arborea</i> )	Fac	50.00	15.00	0.00
false indigobush (P) ( <i>Amorpha fruticosa</i> )	Facw	75.00	75.00	55.00
buttonbush (P) ( <i>Cephalanthus occidentalis</i> )	Obl	100.00	135.00	15.00
sweetgum (P in part) ( <i>Liquidambar styraciflua</i> )	Fac	100.00	100.00	-5.00
blackgum (P) ( <i>Nyssa sylvatica</i> )	Fac	50.00	25.00	5.00
			<b>∑ = 410.00</b>	<b>+75.00</b>

**Table 4. Average Density and Frequency of Planted (P) and Naturally-Invading Woody Seedlings, BCCX Wetland Enhancement Area, Pikeville, TN, June 2015.**

Species	Wetland Indicator Status	Average Frequency (%)	Average Density (stems/acre)	Change in Average Density Since Previous Monitoring
red maple (P in part) ( <i>Acer rubrum</i> )	Fac	83.33	156.67	76.67
common serviceberry (P) ( <i>Amelanchier arborea</i> )	Fac	16.67	10.00	3.33
false indigobush (P) ( <i>Amorpha fruticosa</i> )	Facw	83.33	40.00	-3.33
black chokeberry (P) ( <i>Aronia melanocarpa</i> )	Fac	16.67	10.00	6.67
buttonbush (P) ( <i>Cephalanthus occidentalis</i> )	Obl	83.33	76.67	0.00
winterberry holly (P) ( <i>Ilex verticillata</i> )	Facw	16.67	10.00	6.67
sweetgum (P in part) ( <i>Liquidambar styraciflua</i> )	Fac	100.00	133.33	10.00
blackgum (P) ( <i>Nyssa sylvatica</i> )	Fac	33.33	20.00	13.33
Shumard oak (P) ( <i>Quercus shumardii</i> )	Fac	16.67	10.00	6.67
swamp rose ( <i>Rosa palustris</i> )	Obl	***	*** <sup>3</sup>	***
elderberry (P) ( <i>Sambucus canadensis</i> )	Fac	16.67	10.00	3.33
hardhack (P) ( <i>Spiraea tomentosa</i> )	Facw	16.67	13.33	6.67
			<b>∑ = 490.00</b>	<b>+130.00</b>

<sup>3</sup> Because of its success in colonizing enhancement areas, naturally-invading swamp rose is no longer being tallied. Last year this species occurred at an average rate of 240 stems/acre, or the equivalent of 40% of total density. Casual observation indicates even further increases this year.



**Table 5. Average Density and Frequency of Planted (P) and Naturally-Invading Woody Seedlings, BCCX Upland Buffer Areas, Pikeville, TN, June 2015. 4**

Species	Wetland Indicator Status	Average Frequency (%)	Average Density (stems/acre) 5	Change in Average Density Since Previous Monitoring
red maple ( <i>Acer rubrum</i> )	Fac	66.67	20.00	5.00
silky dogwood (P) 6 ( <i>Cornus amomum</i> )	Facw	66.67	43.33	35.83
winged euonymus ( <i>Euonymus alatus</i> )	Upl	33.33	3.33	3.33
sweetgum ( <i>Liquidambar styraciflua</i> )	Fac	33.33	3.33	3.33
black cherry ( <i>Prunus serotina</i> )	Facu	33.33	10.00	-2.50
white oak (P) ( <i>Quercus alba</i> )	Facu	100.00	50.00	10.00
red oak (P) ( <i>Quercus rubra</i> )	Facu	100.0	96.67	26.67
			<b>Σ = 226.66</b>	<b>+81.66</b>

4 Upland Buffer Area Monitoring Plot 2 was accidentally mown in 2015. It, therefore, was not included in this year's analysis.

5 Performance standards for tree survival in upland buffer areas were not stipulated by the oversight agencies.

6 On some occasions wetland species were inadvertently planted in buffer areas.

**Table 6. Soil Profile Descriptions from the BCCX Wetland Creation Area, Pikeville, TN, June 2015.**

Sample Location	Depth (Inches)	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/ Contrast	Texture, Structure, etc.
Plot C-1	0-4	10 YR 5.3	10 YR 4/6	10%	Sandy loam
	4-6	10 YR 4/2	10 YR 6/4 10 YR 5/3	20% 10%	Sandy loam, densely compacted
	6-13	2.5 Y 6/6	7.5 YR 5/6	30%	Sandy loam
	13-20	2.5 Y 6/4	7.5 YR 5/6	20%	Sandy loam
Plot C-2	0-3	10 YR 6/4	10 YR 5/3	25%	Sandy loam
	3-11	10 YR 5/2	10 YR 7/6 7.5 YR 5/6	25% 15%	Sandy loam, densely compacted
	11-20	10 YR 7/6	10 YR 5/8	30%	Sandy loam, densely compacted
Plot C-3	0-3	10 YR 5/4			Sandy loam
	3-10	10 YR 4/3	10 YR 7/6 10 YR 4/2	15% 5%	Sandy loam
	10-20	2.5 Y 7/3	10 YR 6/6	30%	Sandy loam, densely compacted
Plot C-4	0-3	10 YR 5/3	10 YR 7/2	10%	Sandy loam
	3-6	10 YR 5/2	10 YR 6/4	20%	Sandy loam
	6-11	10 YR 7/6	10 YR 5/6	25%	Sandy loam, densely compacted
	11-20	10 YR 7/6	10 YR 5/6 10 YR 6/3	25% 15%	Sandy loam, densely compacted

**Table 7. Occurrence of Planted (P) and Naturally-Invading Woody Species Within Riparian Zones. BCCX Stream Enhancement Area, Pikeville, TN, June 2015. Unnamed Tributary to Bee Creek, Stream Segment 1**

Species	Wetland Indicator Status	Average Number of Live Stems per 100 ft of Stream	Change in Average Number of Live Stems Since Previous Monitoring
red maple (P in part) ( <i>Acer rubrum</i> )	Fac	4.6	0.6
common serviceberry (P) ( <i>Amelanchier arborea</i> )	Fac	0.2	0.0
false indigobush (P) ( <i>Amorpha fruticosa</i> )	Facw	9.4	2.2
black chokeberry (P) ( <i>Aronia melanocarpa</i> )	Fac	0.4	0.0
buttonbush (P in part) ( <i>Cephalanthus occidentalis</i> )	Obl	7.2	-1.4
silky dogwood (P in part) ( <i>Cornus amomum</i> )	Facw	82.7	1.9
glossy false buckthorn (P) ( <i>Frangula alnus</i> )	Fac	2.4 <sup>7</sup>	0.0
winterberry holly (P) ( <i>Ilex verticillata</i> )	Facw	0.4	-0.4
spicebush (P) ( <i>Lindera benzoin</i> )	Fac	0.8	0.6
sweetgum (P) ( <i>Liquidambar styraciflua</i> )	Fac	4.2	-0.6
white oak (P) ( <i>Quercus alba</i> )	Facu	0.4	-0.4
Shumard oak (P) ( <i>Quercus shumardii</i> )	Fac	1.8	-0.2
multiflora rose ( <i>Rosa multiflora</i> )	Upl	84.2	0.0
swamp rose ( <i>Rosa palustris</i> )	Obl	*** <sup>8</sup>	***
black willow ( <i>Salix nigra</i> )	Obl	20.0	0.0
elderberry (P in part) ( <i>Sambucus canadensis</i> )	Fac	64.0	-4.0
hardhack (P in part) ( <i>Spiraea tomentosa</i> )	Facw	13.8	5.8
highbush blueberry (P) ( <i>Vaccinium corymbosum</i> )	Facw	0.4	0.0
		$\Sigma$ (P) = 190.3 <sup>9</sup>	7.7
		Grand $\Sigma$ = 296.9	7.7

<sup>7</sup> Glossy false buckthorn, an invasive exotic species, was inadvertently planted, and is now being controlled with herbicide. Next year's survey will reveal if control efforts are effective.

<sup>8</sup> Because of its success in aggressively colonizing stream enhancement areas, naturally-invading swamp rose is no longer being tallied. Last year this species occurred at an average rate of 73.2 stems/100ft of stream segment 1, or the equivalent of 20% of total density. Casual observation indicates even further increases this year.

<sup>9</sup> Totals presented here are for those species which were included on the planting manifest. Because a number of these same species occur naturally along the mitigated stream segments, it was frequently impossible to discern planted individuals from native ones. Also because of the highly clumped nature of some of the shrubs, it was not possible to count individual stems. Instead, an average number of stems per 10 ft of shrub length was determined and these numbers were extrapolated to determine average number of stems per 100 ft of stream (i.e. Sambucus = 50 stems/10 ft of plant length, Cornus= 35 stems/10 ft of plant length, and Spiraea= 25 stems/10 ft of plant length.)

Table 7 (continued)

**Unnamed Tributary to Bee Creek, Stream Segment 2**

Species	Wetland Indicator Status	Average Number of Live Stems per 100 ft of Stream	Change in Average Number of Live Stems Since Previous Monitoring
red maple ( <b>P in part</b> ) ( <i>Acer rubrum</i> )	Fac	2.0	0.0
false indigobush ( <b>P</b> ) ( <i>Amorpha fruticosa</i> )	Facw	2.0	1.0
black chokeberry ( <b>P</b> ) ( <i>Aronia melanocarpa</i> )	Fac	3.0	1.0
buttonush ( <b>P in part</b> ) ( <i>Cephalanthus occidentalis</i> )	Obl	3.0	-1.0
silky dogwood ( <b>P in part</b> ) ( <i>Cornus amomum</i> )	Facw	413.0	293.0
glossy false buckthorn ( <b>P</b> ) ( <i>Frangula alnus</i> )	Fac	1.0 <sup>10</sup>	0.0
Shumard oak ( <b>P</b> ) ( <i>Quercus shumardii</i> )	Fac	4.0	1.0
winged sumac ( <i>Rhus copallinum</i> )	Facu	32.0	0.0
multiflora rose ( <i>Rosa multiflora</i> )	Facu	17.0	0.0
swamp rose ( <i>Rosa palustris</i> )	Obl	*** <sup>11</sup>	***
black willow ( <i>Salix nigra</i> )	Obl	5.0	0.0
elderberry ( <b>P in part</b> ) ( <i>Sambucus canadensis</i> )	Fac	4.0	1.0
		<b>∑ (P) = 432.0 <sup>12</sup></b>	<b>296.0</b>
		<b>Grand ∑=486.0</b>	<b>296.0</b>

10 Glossy false buckthorn, an invasive exotic species, was inadvertently planted, and is now being controlled with herbicide. Next year's survey will reveal if control efforts are effective.

11 Because of its success in aggressively colonizing stream enhancement areas, naturally-invading swamp rose is no longer being tallied. Last year this species occurred at an average rate of 84 stems/100ft of stream segment 2, or the equivalent of 31% of total density. Casual observation indicates even further increases this year.

12 Totals presented here are for those species which were included on the planting manifest. Because a number of these same species occur naturally along the mitigated stream segments, it was frequently impossible to discern planted individuals from native ones. Also because of the highly clumped nature of some of the shrubs, it was not possible to count individual stems. Instead, an average number of stems per 10 ft of shrub length was determined and these numbers were extrapolated to determine average number of stems per 100 ft of stream (i.e. Sambucus = 50 stems/10 ft of plant length and Cornus= 35 stems/10 ft of plant length.)

Table 7 (continued)

Unnamed Tributary to Bee Creek, Stream Segment 3

Species	Wetland Indicator Status	Average Number of Live Stems per 100 ft of Stream	Change in Average Number of Live Stems Since Previous Monitoring
false indigobush (P) ( <i>Amorpha fruticosa</i> )	Facw	12.0	6.0
buttonush (P in part) ( <i>Cephalanthus occidentalis</i> )	Obl	20.0	-13.0
silky dogwood (P in part) ( <i>Cornus amomum</i> )	Facw	6.0	0.0
glossy false buckthorn (P) ( <i>Frangula alnus</i> )	Fac	0.0 <sup>13</sup>	-1.0
spicebush (P) ( <i>Lindera benzoin</i> )	Fac	0.0	-1.0
Shumard oak (P) ( <i>Quercus shumardii</i> )	Fac	2.0	-1.0
multiflora rose ( <i>Rosa multiflora</i> )	Facu	1.0	0.0
swamp rose ( <i>Rosa palustris</i> )	Obl	*** <sup>14</sup>	***
elderberry (P in part) ( <i>Sambucus canadensis</i> )	Fac	19.0	3.0
highbush blueberry (P) ( <i>Vaccinium corymbosum</i> )	Facw	0.0	-2.0
		<b>∑ (P) = 59.0</b>	<b>-9.0</b>
		<b>Grand ∑ = 60.0</b>	<b>-9.0</b>

13 Glossy false buckthorn, an invasive exotic species, was inadvertently planted, and is now being controlled with herbicide. Next year's survey will reveal if control efforts are effective.

14 Because of its success in aggressively colonizing stream enhancement areas, naturally-invading swamp rose is no longer being tallied.

Table 7 (continued)

Unnamed Tributary to Bee Creek, Stream Segment 4

Species	Wetland Indicator Status	Average Number of Live Stems per 100 ft of Stream	Change in Average Number of Live Stems Since Previous Monitoring
red maple ( <b>P in part</b> ) ( <i>Acer rubrum</i> )	Fac	14.0	9.0
black chokeberry ( <b>P</b> ) ( <i>Aronia melanocarpa</i> )	Fac	0.0	-3.0
buttonush ( <b>P in part</b> ) ( <i>Cephalanthus occidentalis</i> )	Obl	9.0	1.0
silky dogwood ( <b>P in part</b> ) ( <i>Cornus amomum</i> )	Facw	17.5	-2.5
glossy false buckthorn ( <b>P</b> ) ( <i>Frangula alnus</i> )	Fac	1.0 <sup>15</sup>	0.0
black cherry ( <i>Prunus serotina</i> )	Facu	4.0	0.0
white oak ( <b>P</b> ) ( <i>Quercus alba</i> )	Facu	1.0	-1.0
Shumard oak ( <b>P in part</b> ) ( <i>Quercus shumardii</i> )	Fac	3.0	-1.0
winged sumac ( <i>Rhus copallinum</i> )	Facu	1.0	1.0
multiflora rose ( <i>Rosa multiflora</i> )	Facu	2.0	0.0
swamp rose ( <i>Rosa palustris</i> )	Obl	*** <sup>16</sup>	***
elderberry ( <b>P in part</b> ) ( <i>Sambucus canadensis</i> )	Fac	73.0	18.0
		$\Sigma$ ( <b>P</b> ) = 118.5 <sup>17</sup>	20.5
		<b>Grand <math>\Sigma</math> = 125.5</b>	<b>21.5</b>

<sup>15</sup> Glossy false buckthorn, an invasive exotic species, was inadvertently planted, and is now being controlled with herbicide. Next year's survey will reveal if control efforts are effective.

<sup>16</sup> Because of its success in aggressively colonizing stream enhancement areas, naturally-invading swamp rose is no longer being tallied. Last year this species occurred at an average rate of 351 stems/100ft of stream segment 4, or the equivalent of 77% of total density. Casual observation indicates even further increases this year.

<sup>17</sup> Totals presented here are for those species which were included on the planting manifest. Because a number of these same species occur naturally along the mitigated stream segments, it was frequently impossible to discern planted individuals from native ones. Also because of the highly clumped nature of some of the shrubs, it was not possible to count individual stems. Instead, an average number of stems per 10 ft of shrub length was determined and these numbers were extrapolated to determine average number of stems per 100 ft of stream (i.e. *Sambucus* = 50 stems/10 ft of plant length and *Cornus* = 35 stems/10 ft of plant length.)

**Table 8. Wetland "T" Species List, BCCX Wetland Mitigation Area**

Scientific Name <sup>18</sup>	Common Name	Wetland Indicator
<i>Acalypha rhomboidea</i>	three-seeded mercury	Facu
<i>Acer rubrum</i>	red maple	Fac
<i>Acer saccharinum</i>	silver maple	Facw
<b><i>Agrimonia parviflora</i></b>	<b>harvest lice</b>	<b>Facw</b>
<i>Agrostis gigantea</i>	redtop	Facw
<i>Ambrosia artemisiifolia</i>	common ragweed	Facu
<i>Andropogon virginicus</i>	broom-sedge	Facu
<b><i>Asclepias incarnata</i></b>	<b>swamp milkweed</b>	<b>Obl</b>
<i>Carex crinita</i>	fringed sedge	Obl
<i>Carex frankii</i>	Frank's sedge	Obl
<i>Carex tribuloides</i>	blunt broom sedge	Facw
<i>Carex vulpinoidea</i>	fox sedge	Obl
<i>Cirsium discolor</i>	field thistle	Upl
<i>Conoclinium coelestinum</i>	blue mistflower	Fac
<i>Convolvulus arvensis</i>	field bindweed	Upl
<i>Cyperus strigosus</i>	straw-color flatsedge	Facw
<i>Desmodium sp.</i>	tick trefoil	—
<i>Dichanthelium clandestinum</i>	deer tongue grass	Fac
<i>Dichanthelium dichotomum</i>	cypress witch grass	Fac
<i>Dichanthelium scoparium</i>	broom panic grass	Facw
<i>Epilobium coloratum</i>	willow-herb	Facw
<i>Erechtites hieraciifolius</i>	American burnweed	Facu
<i>Eupatorium serotinum</i> Fac	late-flowering thoroughwort	Fac
<i>Galium tinctorium</i>	stiff marsh bedstraw	Obl
<i>Juncus antheratus</i>	greater poverty rush	Facw
<i>Juncus effusus</i>	soft rush	Facw
<b><i>Leersia oryzoides</i></b>	<b>rice cut grass</b>	<b>Obl</b>
<i>Lobelia cardinalis</i>	cardinal flower	Facw
<i>Lonicera maackii</i>	Amur bush-honeysuckle	Upl
<i>Ludwigia alternifolia</i>	seedbox	Facw
<i>Lycopus virginicus</i>	Virginia water-horehound	Obl
<i>Muhlenbergia schreberi</i>	nimblewill	Fac
<i>Panicum anceps</i>	beaked panic grass	Fac
<i>Panicum dichotomiflorum</i>	fall panic grass	Facw
<b><i>Panicum rigidulum</i></b>	<b>red-top panic grass</b>	<b>Facw</b>

<sup>18</sup> Bolded entries are dominant species.

Table 8 (continued)

Scientific Name <sup>19</sup>	Common Name	Wetland Indicator
<i>Persicaria pensylvanica</i>	Pennsylvania smartweed	Facw
<i>Persicaria punctata</i>	punctate smartweed	Obl
<b><i>Phalaris arundinacea</i></b>	<b>reed canary grass</b>	<b>Facw</b>
<i>Phytolacca americana</i>	pokeweed	Facu
<i>Potentilla simplex</i>	old field cinquefoil	Facu
<i>Pseudognaphalium obtusifolium</i>	eastern rabbit-tobacco	Upl
<i>Pycnanthemum muticum</i>	clustered mountain-mint	Facw
<i>Rhexia mariana</i>	Maryland meadow-beauty	Obl
<i>Rosa multiflora</i>	multiflora rose	Facu
<i>Rubus argutus</i>	common blackberry	Facu
<i>Rumex crispus</i>	curly dock	Fac
<i>Salix nigra</i> Obl	black willow	Obl
<i>Sambucus canadensis</i>	elderberry	Fac
<b><i>Schedonorus arundinaceus</i></b>	<b>Kentucky 31 fescue</b>	<b>Facu</b>
<i>Scirpus georgianus</i>	Georgia bulrush	Obl
<i>Scutellaria integrifolia</i>	helmet flower	Facw
<i>Setaria parviflora</i>	marsh bristle grass	Fac
<i>Solanum carolinense</i>	horse-nettle	Facu
<i>Solidago altissima</i>	tall goldenrod	Facu
<i>Solidago gigantea</i>	late goldenrod	Facw
<i>Symphotrichum pilosum</i>	oldfield American-aster	Fac
<i>Tridens flavus</i>	purpletop	Facu
<i>Vernonia gigantea</i>	tall ironweed	Fac
<i>Vernonia noveboracensis</i>	New York ironweed	Facw
<i>Vicia angustifolia</i>	garden vetch	Facu
<i>Xanthium strumarium</i>	cocklebur	Fac

<sup>19</sup> Bolded entries are dominant species.



**Table 9. Additional Species Found Between the Splitter Pond and the Establishment (Creation) Area, BCCX Wetland Mitigation Area**

Scientific Name	Common Name	Wetland Indicator
<i>Fimbristylis autumnalis</i>	slender fimbry	Facw
<i>Bidens aristosa</i>	bearded beggar-ticks	Facw
<i>Drosera brevifolia</i>	dwarf sundew	Obl
<i>Kummerowia striata</i>	Japanese-clover	Facu
<i>Rhynchospora capitellata</i>	brown beaksedge	Obl
<i>Eleocharis sp.</i>	spikerush	—
<i>Eupatorium perfoliatum</i>	boneset	Facw
<i>Digitaria ischaemum</i>	smooth crab grass	Upl
<i>Diodia virginiana</i>	Virginia buttonweed	Facw
<i>Eupatorium hyssopifolium</i>	hyssop-leaf thoroughwort	Upl
<i>Croton monanthogynus</i>	prairie-tea	Upl
<i>Bidens frondosa</i>	devil's beggar-ticks	Facw
<i>Hypericum gentianoides</i>	orange-grass	Upl
<i>Prunella vulgaris</i>	self-heal	Facu
<i>Dichanthelium laxiflorum</i>	open-flower rosette grass	Facu
<i>Trifolium pratense</i>	red clover	Facu
<i>Echinochloa muricata</i>	rough barnyard grass	Facw
<i>Juncus acuminatus</i>	taper-tip rush	Obl
<i>Sagittaria latifolia</i>	duck-potato	Obl
<i>Eleocharis obtusa</i>	blunt spikerush	Obl
<i>Ludwigia palustris</i>	marsh primrose-willow	Obl
<i>Helenium flexuosum</i>	purplehead sneezeweed	Fac

## REFERENCE PHOTOGRAPHS



Photo 1.

Creation Area, Photo Reference Point C2: North

**Dominant Vegetation:** sweetgum (Fac), red maple (Fac), broom rosette grass (Facw), broomsedge (Facu), common cinquefoil (Facu), yellow-fruited sedge (Facw)

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



Photo 2.

Creation Area, Photo Reference Point C2: South

**Dominant Vegetation:** buttonbush (Obl), cypress witch grass (Fac), broom rosette grass (Facw), soft rush (Facw), greater poverty rush (Facw), late goldenrod (Facw)

**Comments:** Wetland vegetation, in particular, has benefitted from these actions. This year, 63.15% of all species in the creation area are considered wetland indicators.



Photo 3.

Creation Area, Photo Reference Point C2: East

**Dominant Vegetation:** buttonbush (Obl), broom rosette grass (Facw), soft rush (Facw), broomsedge (Facu), Georgia bulrush (Facw) tapered rosette grass (Fac)

**Comments:** Soil accretion, especially on the northern half of the creation area, has helped to increase herb populations, but planted woody species have struggled somewhat because of low soil fertility. Although they occur at an average rate of 410 stems/acre, many are still small in stature and sometimes difficult to find in the dense herbs.



Photo 4.

Creation Area, Photo Reference Point C2: West

**Dominant Vegetation:** buttonbush (Obl), sweetgum (Fac), broom rosette grass (Facw), broomsedge (Facu), wrinkle-leaf goldenrod (Fac), taper-tip rush (Obl), tapered rosette grass (Fac)

**Comments:** Five species of rosette grasses (*Dichanthelium*) have been among the most successful natural invaders of the site. Together they account for almost 20% of total cover in the creation area.



Photo 5.

Creation Area, Photo Reference Point C4: North

**Dominant Vegetation:** red maple (Fac), Japanese-clover (Facu), bearded beggar-ticks (Facw), downy American-aster (Fac), tapered rosette grass (Fac)

**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), broomsedge (Facu), Japanese-clover (Facu), tapered rosette grass (Fac)

**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), Japanese-clover (Facu), bearded beggar-ticks (Facw), downy American-aster (Fac), purple-head sneezeweed (Fac), tapered rosette 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. Algal deposits are common on the soil surface.



Photo 8.

Creation Area, Photo Reference Point C4: West

**Dominant Vegetation:** sweetgum (Fac), broomsedge (Facu), bearded beggar-ticks (Facw), purple-head sneezeweed (Fac), cypress witch grass (Fac), Georgia bulrush (Obl)

**Comments:** Crayfish burrows were noted here as well as in several other places scattered throughout the mitigation site.



Photo 9.



Photo 10.

**Enhancement Area, Photo Reference Point E1: North**

**Dominant Vegetation:** Shumard oak (Fac), red maple (Fac), velvet grass (Fac), redbud panic grass (Facw), deer-tongue grass (Fac), cypress witch grass (Fac)

**Comments:** Dense stands of native and introduced grasses were found throughout each of the enhancement areas.

**Enhancement Area, Photo Reference Point E1: South**

**Dominant Vegetation:** sweetgum (Fac), false indigobush (Facw), velvet grass (Fac), soft rush (Facw)

**Comments:** Enhancement areas contain over 490 tree and shrub seedlings per acre but the establishment of the seedlings has proven difficult because of root competition from the sod-forming grasses. A number of planted sweetgum trees can be seen in this view.



Photo 11.



Photo 12.

**Enhancement Area, Photo Reference Point E1: East**

**Dominant Vegetation:** sweetgum (Fac), swamp rose (Obl), deer-tongue grass (Fac), cypress witch grass (Fac), redbud panic grass (Facw)

**Comments:** Residual wetland shrubs contributed considerably to woody plant densities. In some areas, native swamp rose is quickly becoming the dominant woody plant species.

**Enhancement Area, Photo Reference Point E1: West**

**Dominant Vegetation:** sweetgum (Fac), velvet grass (Fac), soft rush (Facw), deer-tongue grass (Fac)

**Comments:** Although sweetgums are prominent in this photo, red maples are more numerous occurring at the average rate of 157 stems/acre. Because of their shorter stature they are not as visible among the dense herbs.



Photo 13.

Enhancement Area, Photo Reference Point E3: North

**Dominant Vegetation:** red maple (Fac), false indigobush (Facw), velvet grass (Fac), redtop panic grass (Facw), cypress witch grass

**Comments:** Redtop panic grass is a native wetland species that produces seed in the fall. While very dominant in enhancement areas, it has not yet begun to colonize adjoining created wetlands.



Photo 14.

Enhancement Area, Photo Reference Point E3: South

**Dominant Vegetation:** red maple (Fac), buttonbush (Obl), redtop panic grass (Facw), soft rush (Facw), wool-grass (Facw), velvet grass (Fac)

**Comments:** Redtop panic grass tends to thrive in damp or wet soils with adequate sunlight. It will eventually be outcompeted by woody vegetation and more shade-tolerant herb-layer species.



Photo 15.

Enhancement Area, Photo Reference Point E3: East

**Dominant Vegetation:** red maple (Fac), buttonbush (Obl), redtop panic grass (Facw), clustered mountain-mint (Facw), cypress witch grass, rice cut grass (Obl), squarrose sedge (Facw)

**Comments:** The tall, dense vegetation on the middle and southern portions of the enhancement area provide favored habitat for white-tail deer. Despite the wetness, numerous "deer beds" were observed.



Photo 16.

Enhancement Area, Photo Reference Point E3: West

**Dominant Vegetation:** red maple (Fac), sweetgum (Fac), redtop panic grass (Facw), soft rush (Facw), velvet grass

**Comments:** Small inundated depressions, hidden by the dense herb layer, are also occasionally used by foraging snapping turtles. These turtles likely reside in an abandoned farm pond lying near the southeastern boundary of the mitigation area.



Photo 17.



Photo 18.

Enhancement Area, Photo Reference Point E5: North

**Dominant Vegetation:** soft rush (Facw), prickly bog sedge (Facw), sallow sedge (Obl)

**Comments:** This part of the enhancement area is wettest location on the mitigation site. It is either shallowly inundated or saturated to the surface year round.

Enhancement Area, Photo Reference Point E5: South

**Dominant Vegetation:** prickly bog sedge (Facw), redbtop panic grass (Facw), soft rush (Facw), sallow sedge (Obl), clustered mountain-mint (Facw)

**Comments:** Because of this wetness, planted trees have failed to become established to any great extent. Shrubs such as buttonbush and false indigobush, however, are doing well in some places.



Photo 19.



Photo 20.

Enhancement Area, Photo Reference Point E5: East

**Dominant Vegetation:** prickly bog sedge (Facw), slender spikerush (Facw), redbtop panic grass (Facw), soft rush (Facw), pointed broom sedge (Facw), red maple (Fac)

**Comments:** A number of surviving red maples can be seen in the background.

Enhancement Area, Photo Reference Point E5: West

**Dominant Vegetation:** buttonbush (Obl), false indigobush (Facw), prickly bog sedge (Facw), soft rush (Facw), redbtop panic grass (Facw)

**Comments:** This general area supports an occurrence of the state-endangered brown bog sedge (see photo 35).



**Photo 21.** **Upland Buffer Zones:** Twenty-five ft-wide buffers, external to riparian buffers, were planted with upland oak species in order to provide extra protection to the restored streams. Current oak survivorship averages about 145 stems/acre. Other planted and naturally-invading woody species contribute an additional 80 stems/acre.



**Photo 22.** **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 38% increase in areal coverage since the last monitoring period. We are also encouraged by the fact that many of the plants are producing fruit. Hopefully this will add new plants to the population.

***Stream Enhancement  
Photo Reference Points***

(Photo-reference points were taken at the start of each 200 ft-long monitoring plot looking downstream)





Photo 23.



Photo 24.

**Stream 1 Enhancement Area, Photo Reference Point 1:**

**Dominant Vegetation:** redbtop panic grass (Facw), soft rush (Facw), rice cut grass (Obl), velvet grass (Fac)

**Comments:** At its upper end, Stream 1 bisects a portion of one of the site's wetland enhancement areas. Because of extreme wetness, planted woody vegetation is small in stature and somewhat scattered.

**Stream 1 Enhancement Area, Photo Reference Point 2:**

**Dominant Vegetation:** elderberry (Fac), redbtop panic grass (Facw), soft rush (Facw), swamp rose (Obl)

**Comments:** One of the site's elderberries is visible here. It has expanded greatly in size since it was originally planted in December 2010. The dense riparian vegetation hides the channel from view.



Photo 25.



Photo 26.

**Stream 1 Enhancement Area, Photo Reference Point 3:**

**Dominant Vegetation:** silky dogwood (Facw), deer-tongue grass (Fac), swamp rose (Obl)

**Comments:** As was often the case, this site contains both planted and naturally-occurring silky dogwood. Distinguishing between the two was not always possible in some areas.

**Stream 1 Enhancement Area, Photo Reference Point 4:**

**Dominant Vegetation:** silky dogwood (Facw), deer-tongue grass (Fac)

**Comments:** Also, because of the colonial nature of many of the planted shrubs, it was very difficult to determine whether performance standards were being met given the high number of live stems present. Counting individual stems was impractical so counts were based on average number of live sprouts per 10 ft of plant length. Silky dogwoods, for example, were found to contain an average of 35 sprouts per 10 ft of shrub length.



Photo 27.



Photo 28.

**Stream 1 Enhancement Area, Photo Reference Point 5:**

**Dominant Vegetation:** silky dogwood (Facw), rice cut grass (Obl), soft rush (Facw), deer-tongue grass (Fac), black willow (Obl), swamp rose (Obl)

**Comments:** Regardless of the technical aspects of determining stem counts and survival rates of planted vegetation, the overall goal of providing a stable, non eroding channel and floristically diverse riparian zone appears to have been realized.

**Stream 2 Enhancement Area, Photo Reference Point 1:**

**Dominant Vegetation:** winged sumac (Facu), black willow (Obl), rice cut grass (Obl), soft rush (Facw)

**Comments:** Stream Segment 2 is also well-stabilized and supports a high density of herbs as well as planted and naturally invasive woody species. The plunge pool in the foreground lies just downstream of two culverts which pass beneath SR 301. It gives a much exaggerated impression of the size of the waterway.



Photo 29.



Photo 30.

**Stream 3 Enhancement Area 3 , Photo Reference Point 1:**

**Dominant Vegetation:** elderberry (Fac), buttonbush (Obl), rice cut grass (Obl), soft rush (Facw)

**Comments:** By contrast, Stream Segment 3 had the lowest density at 60 stems/100 ft of stream. Unfortunately, some of this was caused by accidental mowing in the riparian zone. This can be seen in the left of the photo. Coordination with prison officials will be necessary to prevent this from recurring.

**Stream 1 Enhancement Area 4, Photo Reference Point 1:**

**Dominant Vegetation:** swamp rose (Obl), elderberry (Fac), small-flowered agrimony (Fac), soft rush (Facw)

**Comments:** Unlike the others, Stream 4 was completely dry at the time of the survey. Upper sections have had poor survival of planted woody vegetation but this is being offset by the establishment of very dense stands of planted and naturally-occurring shrubs in the lower half.

*Photo Supplement*



Photo 31.



Photo 32.

**Photo Supplement, Wetland Enhancement Area Maintenance:**

**Comments:** During one of the planting efforts, one of the nursery suppliers improperly included glossy false buckthorn among the wetland plants provided. Unfortunately this species has proven to be a noxious weed in other parts of the US. Although only a few dozen were planted, they pose a major threat to the success of the mitigation. Approximately 25 plants were identified this year and treated with an environmentally appropriate herbicide. (This photo was taken in the fall of 2014.)

**Photo Supplement, Wetland Enhancement Area Maintenance:**

**Comments:** Other problem species include autumn-olive (shown here) and multiflora rose. While not invaders of wetlands, they are beginning to encroach into stream enhancement areas. These were treated with herbicide in conjunction with false buckthorn. A routine maintenance program will circumvent the need for a more extensive herbicide spraying regimen in the future.



Photo 33.



Photo 34.

**Photo Supplement, Wetland Enhancement Area Maintenance:**

**Comments:** Another major threat to the mitigation area is the establishment of reed canary grass. This aggressive invader of open wetlands is thought to contain a mixture of native, European, and agronomic strains. Five small populations have been found and were treated in October 2015..

**Photo Supplement, Stream Enhancement Area Maintenance:**

**Comments:** Site mowing has encroached well into protected stream enhancement zones. Unknown numbers of planted trees and shrubs have been impacted. These zones extend 25 ft on either side of the creek channel (channel shown in red). Consideration should be given to curtailing all mowing adjacent to the mitigation site. At minimum we recommend the placement of signs along the border of the protected areas to prevent this from occurring again.



Photo 35.



Photo 36.

**Photo Supplement, Rare Plants:**

**Comments:** The BCCX wetland mitigation property is noteworthy since it contains four species of plants that are very rare in TN. This means that long-term protection of the site is important for the people of the state. The rarest is the grass-like brown bog sedge. It is listed by TDEC as "endangered" and there are fewer than five known occurrences statewide. (This species, as well as the three others shown on this page were first reported last year and reconfirmed as being present in 2015).

**Photo Supplement, Rare Plants:**

**Comments:** Also "endangered" is the southern long sedge. Other than Bledsoe County, it has been documented from only one other TN county (Lincoln).



Photo 37.

**Photo Supplement, Rare Plants:**

**Comments:** The granite gooseberry is listed as "threatened". While relatively common in the immediately vicinity of BCCX, there are five or fewer other known populations in the state. Approximately 20 shrubs were "rescued" from destruction during construction of the BCCX expansion and transplanted to the wetland mitigation area. (See comments under Photo 22.)



Photo 38.

**Photo Supplement, Rare Plants:**

**Comments:** The latest addition to the rare plant list is the tiny dwarf sundew; a state "threatened" species. Sundews inhabit nitrogen poor soils and supplement their nutrient intake by capturing insect prey. This is done by trapping insects with sticky hairs that coat the leaf surface (see insert) and then dissolving the prey with specialized enzymes. The nutrients from the insect are then absorbed through the leaves.



Photo 39

**Photo Supplement, Wetland Enhancement Area Maintenance:**

**Comments:** Reed canary grass in Wetland T at BCCX mitigation area on October 5, 2015 prior to herbicide treatment. View to north.

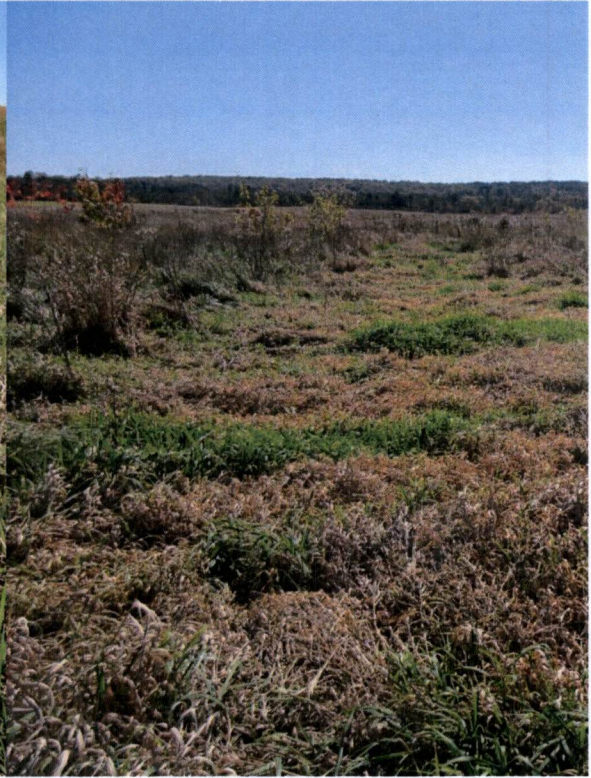


Photo 40

**Photo Supplement, Wetland Enhancement Area Maintenance:**

**Comments:** Reed canary grass in Wetland T at BCCX mitigation area on October 19, 2015 approximately two weeks after herbicide treatment. View to south.



Photo 41

**Photo Supplement, Wetland Enhancement Area Maintenance:**

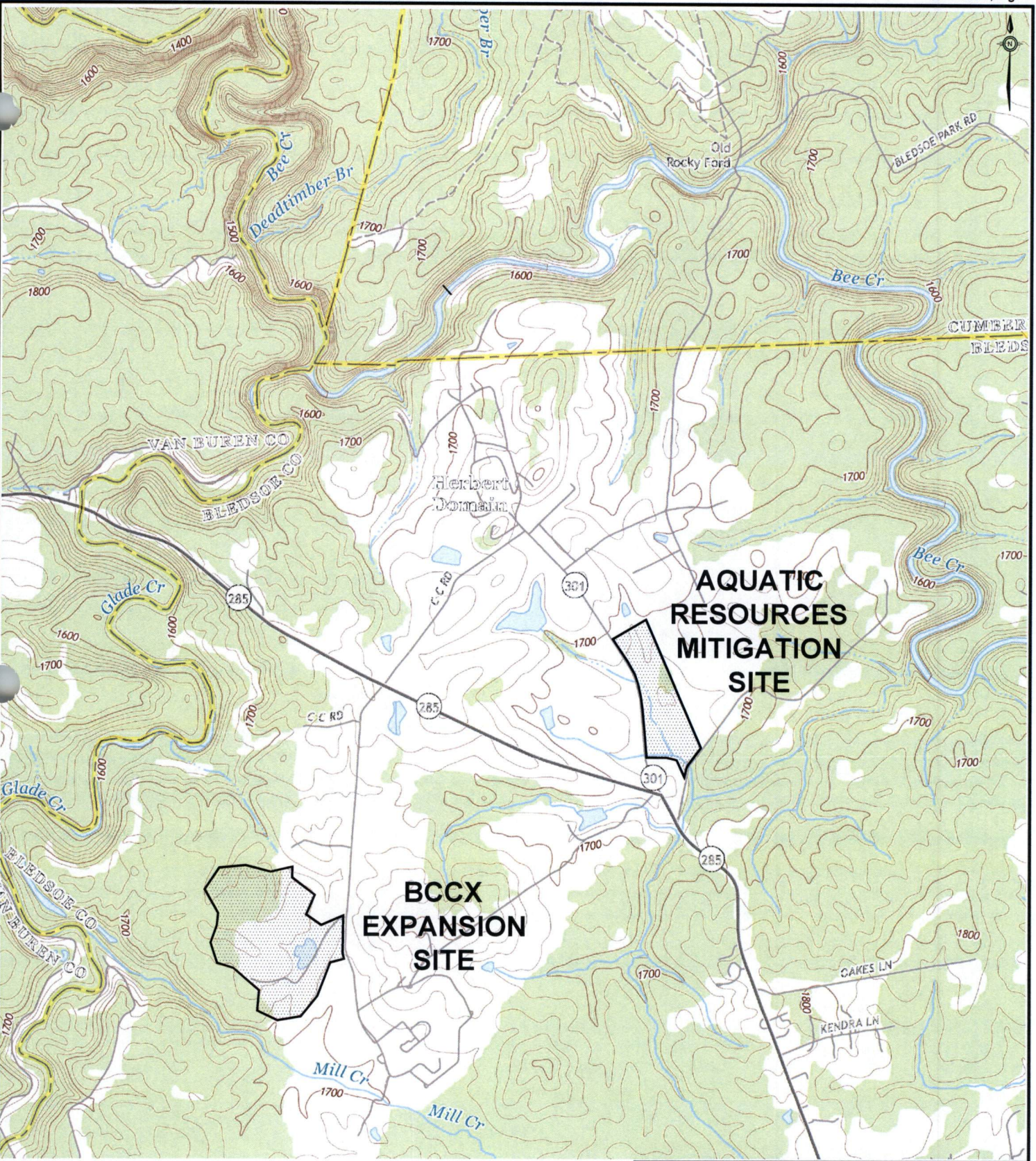
**Comments:** Pre-clearing signpost location adjacent to buried natural gas line in State Route 301 right-of-way. Site was precleared for utilities by Tennessee 811 on October 16, 2015.

Photo 42

**Photo Supplement, Wetland Enhancement Area Maintenance:**

**Comments:** Sign marking protective zone around BCCX mitigation area. Stream 1 riparian zone in background.





**NOTES**

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

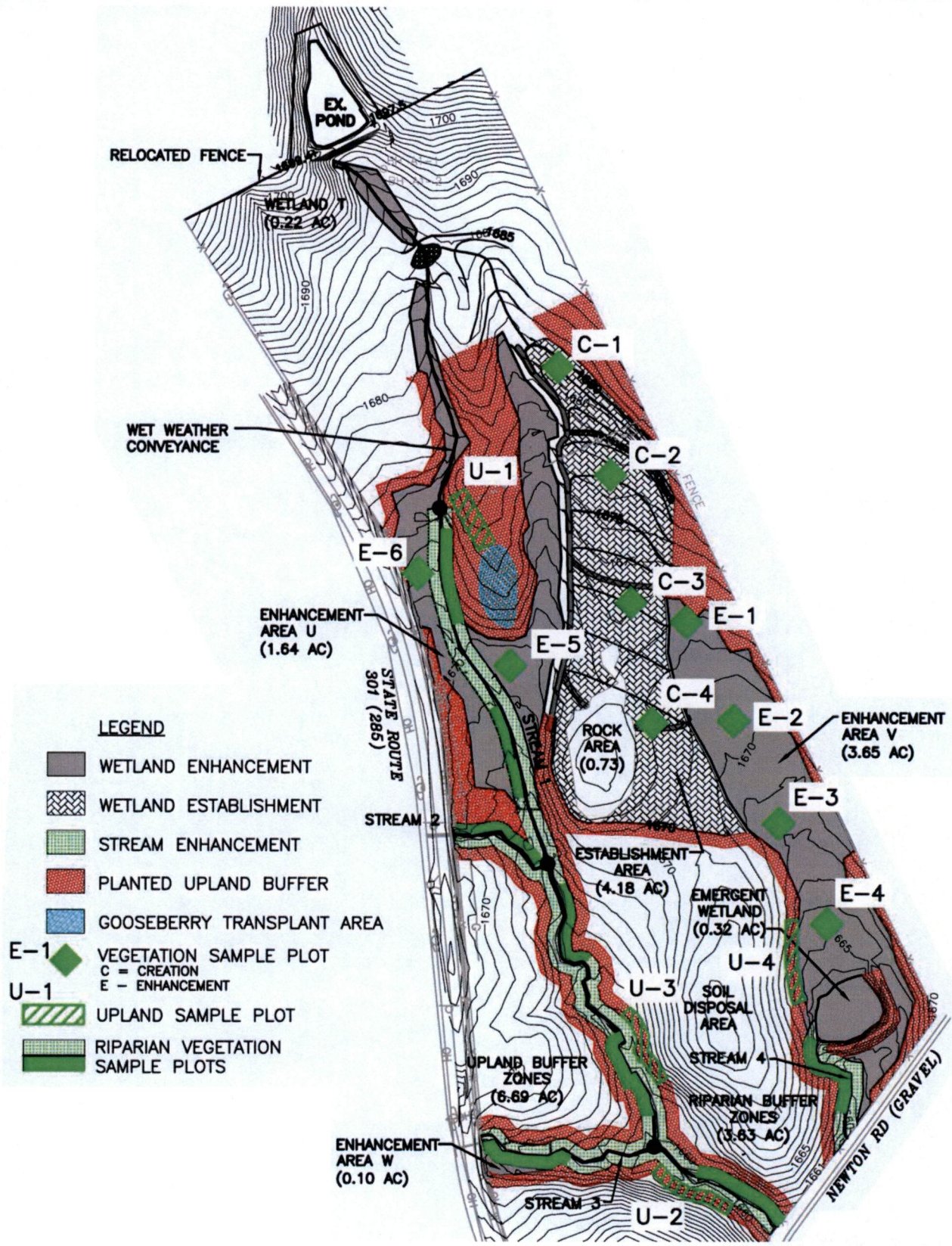
FIGURE 1  
 SITE LOCATION MAP  
 BLEDSOE COUNTY CORRECTIONAL COMPLEX  
 PIKEVILLE, TENNESSEE



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

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**LEGEND**

- WETLAND ENHANCEMENT
- WETLAND ESTABLISHMENT
- STREAM ENHANCEMENT
- PLANTED UPLAND BUFFER
- GOOSEBERRY TRANSPLANT AREA
- VEGETATION SAMPLE PLOT
- UPLAND SAMPLE PLOT
- RIPARIAN VEGETATION SAMPLE PLOTS

E-1  
 U-1

C = CREATION  
 E = ENHANCEMENT

**NOTES**

1. AREA OF MITIGATION SITE IS 30.38 ACRES

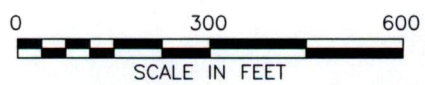
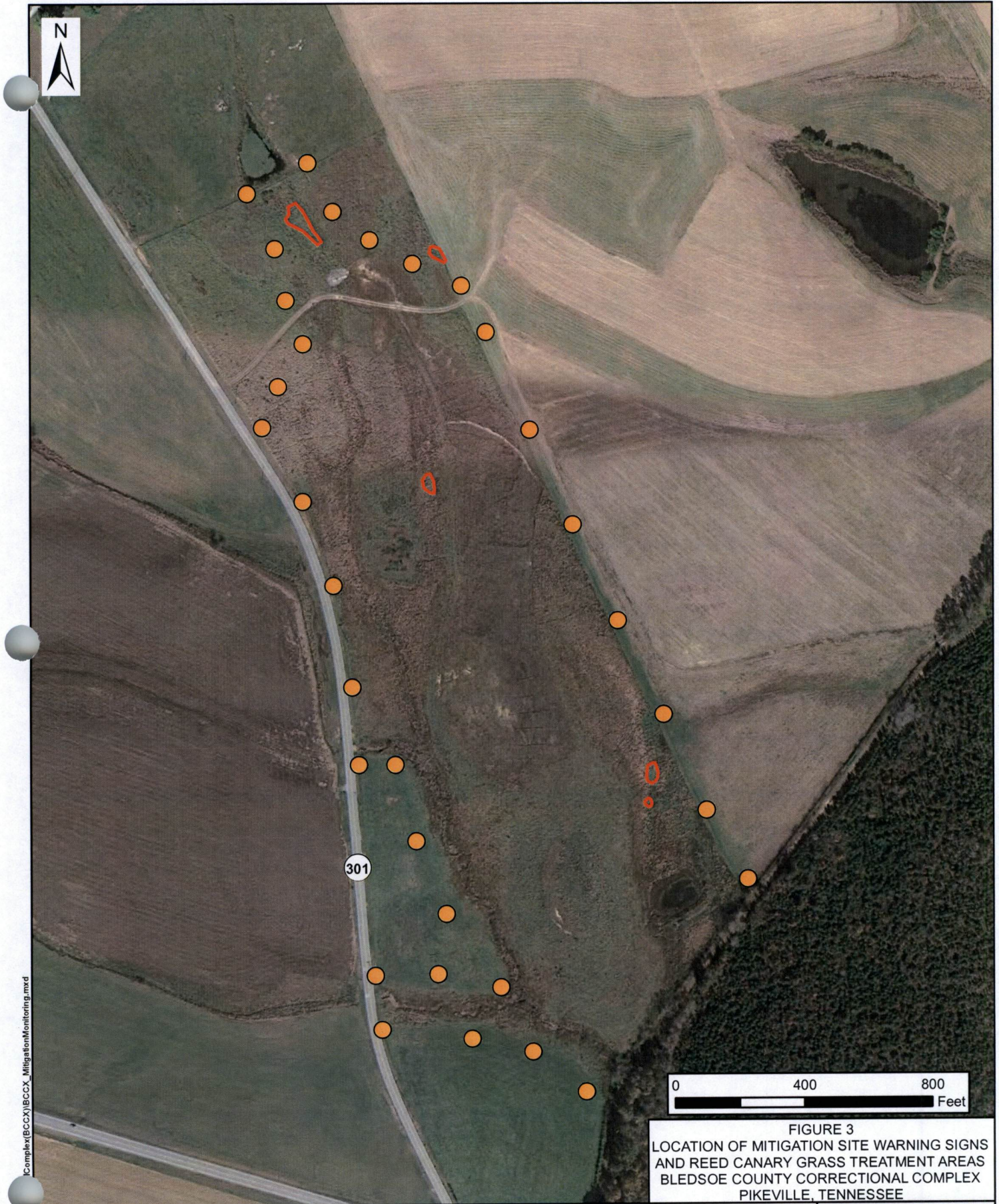


FIGURE 2  
 STREAM & WETLAND MONITORING MAP  
 BLEDSOE COUNTY CORRECTIONAL COMPLEX  
 PIKEVILLE, TENNESSEE

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

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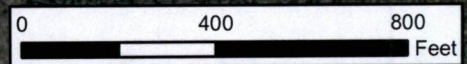




FIGURE 3  
LOCATION OF MITIGATION SITE WARNING SIGNS  
AND REED CANARY GRASS TREATMENT AREAS  
BLEDSOE COUNTY CORRECTIONAL COMPLEX  
PIKEVILLE, TENNESSEE

**Legend**

-  Reed Canary Grass Treatment Area
-  Location of Warning Signs

REQUESTED BY: J. Groton  
DRAWN BY: cnowalk  
DATE: 10/27/2015  
PROJECT NO: 0888816090



## SECTION 5 — CONCLUSIONS

### Wetland Mitigation

**Summary Statement:** Corrective actions in 2015 included installing 32 signs to protect the boundaries of the stream and wetland mitigation area. EnSafe 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 was formally included within the mitigation area, protecting an additional 0.22 acre of wetlands at the site.

Past corrective actions taken during the early winter 2013 involved the replanting of 5,650 wetland-adapted trees and shrubs, and also the installation of more than 2,500 feet of coir log erosion dams. These measures helped move the mitigation site forward towards meeting its principal goals 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 which call for a 70% coverage of wetland-adapted herbs have not yet been met within the creation area. Wetland herbs currently constitute 63.15% of the plant cover. We are optimistic however that the trend continues moving in the right direction since last year cover of hydrophytes was about 61.9%. We are also pleased to report that dwarf sundew, a state listed “threatened” species, continues to occupy part of the creation area. Planted woody density has been conditionally met with overall site density averaging 410 stems per acre. This is largely the result of a strong increase in the number of false indigo bush. Some of this increase is the result of the plants becoming taller and more visible, but natural regeneration is also taking place to some degree. While planted survival exceeds the required 326 stems per acre, performance standards stipulate that no one species can comprise more than 20% of the total. Two species, buttonbush and sweetgum, both exceed this threshold. Despite this “conditional” result, we remain pleased given the fact that during the first monitoring effort, three years ago, stem density was only 65 stems per acre.

Vegetation performance standards for enhancement areas have easily been attained. 86.96% of enhancement area herbs are wetland indicators and herbaceous diversity has increased from 33 to 46 taxa since 2014. Local populations of the state-endangered brown bog sedge and southern long sedge are intact and continue to flourish in the enhancement area. Woody species density in the enhancement area is 490 stems/acre which exceeds the performance standard. Increases in red maple have been very apparent and some of the increase is clearly the result of natural recruitment. This is particularly evident at the south end of the site which is closer to a seed source. Sweetgum and red maple are also becoming dominant with many individuals showing good height growth. Naturally-occurring swamp rose is thriving in some parts of the enhancement area and continues to provide substantial cover. Because stems are becoming so numerous, we recommend that future evaluations of this species be curtailed.

In August 28, 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 herbaceous and woody plants was no longer required. Concurrence from USACE on TDEC's recommendations is pending.

**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. Indeed, residual hydric soils with depleted matrices (NRCS Field Indicator 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 conversion of the native soils seems to be occurring. As a consequence, we recommend no actions at this time. The rates at which soils evolve hydric indicators 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. Additional 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, 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. This year's monitoring indicates that stream mitigation efforts have been largely successful. In August 28, 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 is pending.

**Channel Conditions:** The four enhanced tributaries to Bee Creek each continue to exhibit stable geometries. No problems with erosion were observed despite some very significant rainfall events that have occurred since mitigation was undertaken in 2010.

**Vegetation:** The relative lack of disturbance has allowed vegetated riparian zones to thrive. The addition of newly planted seedlings, combined with the sprouting from latent root systems of highly colonial species such as swamp rose and silky dogwood, have resulted in robust populations of woody stems in many streamside areas. Because the distinction between planted and naturally-invading species could not consistently be made, it was not possible to determine planted tree survival rates. Nonetheless, observed densities continue to exceed the performance standards in all cases. Since riparian vegetation is functioning to stabilize the

embankments and is beginning to provide shade and cover, we do not recommend any additional plantings. Glossy false buckthorn that was inadvertently planted in some of these areas should be controlled with herbicide since it is a well-documented invasive species.

Upland buffer zones lying adjacent to the stream and wetland mitigation have no specific performance requirements. They currently support, on average, a total of 140 stems per acre, but survival is sporadic. Drought conditions which occurred the summer after planting, along with competition with aggressive pasture grasses, has killed off a significant number of planted red and white oaks. Current density of oaks stands at 110 stems/acre. These are being supplemented in some areas by natural seed rain coming from adjoining forested areas. Red maple, eastern red cedar, and black cherry, for example are now contributing an average of 15 stems per acre. Multiflora rose and autumn-olive are also beginning to appear in the buffer zones. Because they are invasive, alien species, consideration might be given to chemical control.

### **Granite Gooseberry Transplant Area**

Granite gooseberry transplant efforts continue to appear to be successful thus far. Transplant populations of this rare, state-threatened shrub have increased in areal extent every year since they were planted in March 2009. Gooseberry coverage has increased by more than 38% 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.

### **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**

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.

Continue quantitative monitoring of herbaceous and woody plants in the creation area.

Discontinue quantitative monitoring of herbaceous and woody plants in the enhancement areas but continue qualitative monitoring of woody plants in these areas.

Discontinue quantitative monitoring of woody plants in all stream mitigation areas; continue qualitative monitoring of woody plants in these areas.

Continue to monitor populations of invasive pest plants like glossy buckthorn, autumn olive, Japanese honeysuckle, multiflora rose, and reed canary grass in or adjacent to the mitigation area. Implement herbicide treatments or other measures to control as needed.

Monitor the buffer zones around Streams 1, 2, and 3 and make sure BCCX facility staff are cooperating with mowing restriction. Also monitor condition of all signs to ensure they are in place and visible.

Conduct year 5 monitoring in mid-June 2016. This is the optimum time to identify grasslike plants (grasses, sedges, and rushes) at the site. This would also ensure continuity in terms of comparisons to the 2015 monitoring results.

**Appendix A**  
**Division of Water Resources Recommendation Letter**





STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
DIVISION OF WATER RESOURCES  
William R. Snodgrass Tennessee Tower  
312 Rosa L. Parks Avenue, 11<sup>th</sup> Floor  
Nashville, Tennessee 37243-1102

| August-27, 2015

Mr. Steven Westerman, Director  
Facilities, Planning and Construction  
Tennessee Department of Correction  
Rachel Jackson Building  
320 Sixth Avenue North  
Nashville, TN 37243-0645

RE: NRS 09.009- Bledsoe County Correctional Complex  
Compensatory stream and wetland mitigation compliance

Dear Mr. Westerman:

The division conducted a review with you of the compensatory mitigation site on August 24, 2015 to determine compliance with permit NRS. 09.009. While site performance appears generally favorable, several areas were observed to be in non-compliance. These are listed below. Also included are activities which the division recommends in order to bring the mitigation area into full compliance.

**Tree/Shrub Survival and Unauthorized Mowing**

Tree and shrub survival remains low along Stream3 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 requirements that no one species exceed 20% of the total. Please note that the division shall allow some inclusion of volunteer tree species in determining tree/shrub performance criteria.

To bring these riparian zones into compliance, it is not feasible to replant because of the heavy growth of herbaceous species. Therefore, the division request that the buffer areas be increased from 25- feet to 50- feet on both sides of Stream 3, west side of Stream 1 and south side of Stream 2.

Signs shall be installed at least every 300 feet along these areas clearly stating that no mowing or disturbance is allowed. Prior to the placement of signs, these areas must be flagged so that the proper locations of the signs occur.

In addition to the unauthorized mowing of buffer areas along Streams 1, 2, and 3, upper segments of Wetland Enhancement Area U have also been impacted. In order to bring these areas into compliance mowing should cease immediately and signs should also be erected in the manner described above.

The division believes that 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. In addition, some treatment or control of the reed canary grass shall occur. A brief discussion of the plant community composition within Wetland T should be provided in next year's monitoring report.

You are hereby authorized to proceed with these remedial activities.

If you have any questions regarding this correspondence or the regulatory authority of this office please contact me at (615) 532-0712 or [mike.lee@tn.gov](mailto:mike.lee@tn.gov).

Thank you for the opportunity to review the site and provide these comments.

Sincerely,



Mike Lee  
Natural Resources Unit

CC: File Copy.  
Mark Carnes-COE/ Nashville  
Ron Dow- EnSafe/ Nashville  
Jimmy Groton, EnSafe/ Knoxville  
Paul Durr, Water Resources LLC/ Knoxville