

**Modification Number One  
Mitigation Banking Instrument  
Water Resources, LLC  
Lick Creek Wetland Mitigation Bank Number 2  
Greene County, Tennessee**

**May 5, 2015**

**Submitted To:**

**U.S. Army Corps of Engineers  
U.S Environmental Protection Agency  
U.S. Fish and Wildlife Service  
Natural Resources Conservation Service  
Tennessee Valley Authority  
Tennessee Department of Environment and Conservation  
Tennessee Wildlife Resources Agency**

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## **Introduction**

Construction of Lick Creek Wetland Mitigation Bank Number 2 (LCMB2) was completed on September 28, 2012. In the months following construction persistent heavy rainfall, averaging 20 inches above normal, filled all of the site's depressions and areas enclosed by berms. At the time of the Bank's first planting in early January 2013, residual flooding prevented some areas from being planted. In other places, plantings were made under less-than-ideal conditions in shallowly inundated areas up to several inches deep.

Ponded water behind the berms remained as above average rainfall continued into the summer. This apparently provided ideal conditions for cattails which became established in thick stands over about 16 acres. This standing water, and competition from cattails, decreased the survival of planted woody stems in many areas but particularly on the southern portions of the property (Water Resources 2014). Failure to meet the vegetation standards resulted in another planting in December 2013, but subsequent monitoring indicated a continuing survivorship problem.

The on-going failure to meet planted woody vegetation standards has prompted an in-depth review of its causes and has resulted in proposed changes to the site's topography, performance standards and modifications to monitoring protocols. In the past we have treated the 77.8-acre property as a uniform entity with similar edaphic features and hydrologic regimes. This approach has proven not to be feasible. Instead we are proposing to assess and manage the site based on vegetation community suitability. Those areas with the most prolonged saturation will be managed to promote the development of scrub/shrub and emergent communities, since these areas would transition into this type of community under natural conditions. Those locales with better soils and more favorable drainage will be managed to promote palustrine forested (bottomland hardwood) communities. Any supplemental plantings (beginning in 2015) will be made with these community-based management objectives in mind.

Reflecting this change in approach, the site's monitoring protocols will also be altered to better capture plant demographics within each community type. Permanent vegetation monitoring plots will be repositioned and distributed evenly within each type to insure a consistent sampling intensity.

The following document further details the history of the LCMB2 and provides recommendations for future management and monitoring of the property. At the request of the US Army Corps of Engineers (USACE), these changes have been incorporated within the general framework of a standard Mitigation Banking Instrument (MBI).

## **I. Preamble**

### **A. Project Purpose**

The wetland mitigation bank is being established to help offset unavoidable impacts to the waters of the United States authorized through the issuance of Department of the Army and the State of Tennessee permits pursuant to Sections 404 and 401 of the Clean Water Act.

## **B. Project Description**

Water Resources, LLC purchased 77.58 acres of farmland in rural western Greene County, Tennessee (36.1356 N, 83.1155 W) for the purpose of creating a wetland mitigation bank. The site is bounded to the west by Lick Creek, a major tributary to the Nolichucky River. Anecdotal information indicates that the property was in pasture and row crops since about the turn of the last century. Based on field investigations, essentially the entire site contains soils with hydric indicators. Because the area had been drained through ditching, contouring, and drain tile, presumably much of these soils are relict.

Water Resources restored hydrology to the restoration areas by removing water control structures and re-sculpting the site to more natural contours. Additionally, in order to increase the residence time of water the site's hydrologic sources (i.e. precipitation and runoff from surrounding hills, ground water seeps, and overbank flow from Lick Creek) were trapped behind a series of berms that were constructed from excess soils generated during the site grading process. On most remaining portions of the property existing wetlands were enhanced by redirecting surface flow into them to augment hydrology. A narrow forested riparian zone that lies adjacent to the creek, and along two spring fed drainages, were preserved in order to provide structural and dietetic diversity for local wildlife.

Finally the enhancement, restoration, and a portion of the preservation area were planted with a variety of trees and shrubs that are indigenous to bottomlands of the Lick Creek drainage. The entire site was also fenced to exclude livestock and to discourage trespassers.

## **C. Project Objectives**

The objective of the Bank is to reestablish an ecologically diverse bottomland hardwood forest, admixed with scrub/shrub and emergent wetland communities, in order to provide flood control, nutrient transformation, habitat for water dependent flora and fauna, and to furnish credits for sale to those approved by the Interagency Review Team (IRT).

## **D. Location and Ownership/Sponsor**

The location of the Bank is shown on Figure 1 in Appendix A. The Bank is situated approximately 16 air miles west-southwest of Greeneville, Greene County, Tennessee. Water Resources, LLC is the owner.

## **E. Mitigation Bank Review Team (IRT)**

### **1. Member Agencies**

The IRT is comprised of individuals representing the five federal agencies and two state agencies listed below:

US Army Corps of Engineers, Nashville District, Chair  
US Environmental Protection Agency, Region 4  
US Fish and Wildlife Service  
Tennessee Valley Authority  
National Resources Conservation Service  
Tennessee Dept. of Environment and Conservation  
Tennessee Wildlife Resources Agency

The establishment, use, and operation of the LCMB2 will be carried out in accordance with the following authorities:

**Federal:**

- Clean Water Act (33 USC 1251 et. seq.)
- Rivers and Harbors Act (33 USC 403)
- Fish and Wildlife Coordination Act (16 USC 661 et. seq.)
- Regulatory Programs of the U.S. Army Corps of Engineers, Final Rule (33 CFR parts 320-330)
- Guidelines for Specification of Disposal Sites for Dredged and Fill Material (40 CFR part 230)
- Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army concerning Determination of Mitigation Under the Clean Water Act, Section 404 (b)(1) Guidelines (February 6, 1990)
- Federal Guidance for the Establishment, Use, and Operation of Mitigation Banks (60 F.R. 58605 et. seq.)
- Army Corp of Engineers RGL 02-2, and RGL 01-1.

**State:**

- Water Quality Certification (40 CFR 122, 123, 124, 125, 144, 146, 403, and 503)

**2. Required Permits** (if applicable)

Since the work impacted jurisdictional waters, Water Resources obtained a Clean Water Act § 404/Nationwide 27 permit for Stream and Wetland Restoration Activities from the USACE prior to commencing construction. Also for the project, the Tennessee Department of Environment and Conservation (TDEC) issued a Water Quality Certification under its §401 authority.

## **II. Modification of the Bank**

### **A. History and Current Condition of the Bank**

The LCMB2 contains a total of 77.58 acres. It supports 60.52 acres of wetland restoration on lands already containing relict hydric soils, and 9.46 acres of wetland enhancement on lands which contain jurisdictional wetlands. The remainder of the site consists of riparian zones, waters of Lick Creek, and uplands.

#### **1. Construction**

Construction of the LCMB2 was finished on September 28, 2012. Initial site planting was completed on January 7, 2013. A spring-fed perennial creek divides the site into two well-defined tracts: the southern tract (Tract I) contains about 45 acres and the northern tract (Tract II) approximately 32 acres (Appendix A, Figure 2). Each tract was constructed independently from one another and each has somewhat different topographies. They are therefore discussed separately below.

Tract I is just under 2,400 ft long and drops about 12 ft in elevation in the direction of Lick Creek. Seven feet of the descent occurs within the first 400 ft (1.75%). The land also drops 7 ft towards the spring run creek within the upper 200 ft. Because of this bi-directional tilting, a

series of four semi-permanent ponds were constructed in the upper part of the site to retain water. Berms were also used throughout the tract in order to slow and direct water as the site flattens and then tilts to the south as it nears Lick Creek. These berms, in some cases exceeded the planned height of 6-12 inches on the upstream side for the purpose of backing water into the higher elevations.

Tract II is much flatter than Tract I. It drops just 7 ft from top of the property to Lick Creek, a distance of about 2,600 ft (0.3%). Therefore, except for an initial berm, a series of 6 inch-high ridges were adequate to detain water. However, at about 1,000 ft from Lick Creek, the tract is tilted to the southwest, draining water to the spring run. In order to prevent undesirable hydrologic losses, this area was flattened and excess soil was placed in a berm paralleling the spring run. The remaining soils were placed in berms adjoining Lick Creek and the northern property flank. This later berm inadvertently blocked water coming from the property to the north and prevented it from draining onto the LCMB2. In March 2013 the berm was breached in three locations successfully eliminating the blockage. Currently, excess standing water on Tract II is minimal, occurring primarily in four locations resulting in emergent wetlands with some cattails. It is our intent to control cattails on this part of the tract in order to enhance the emergent wetlands and eliminate it as a significant seed source in the future.

## **2. Hydrology**

The wetland bank site receives water from four sources: rainfall, overbank flow, seasonal high groundwater, and groundwater seepage. Rainfall-derived surface flow enters from at least three adjoining properties and crosses the LCMB2 before entering Lick Creek. Overbank flow from the creek can also provide large amounts of hydrology, but this is sporadic in nature and typically affects the eastern half of the Bank most heavily. FEMA flood mapping shows that essentially all of the property lies within Zone A (high risk of flooding)(Appendix A, Figure 3). Not unexpectedly, most important flood events tend to occur during the winter or early spring when the most rainfall occurs. During this time frame, groundwater levels are also at their highest. All wetland areas, for example, were completely saturated to the surface during the site's preliminary wetland determination in June 2011. Most soil test holes filled partly with water, even on raised hummocks.

## **3. Soils**

The NRCS Soil Survey indicates that the site is comprised almost entirely of silt loams or silty clay loams; about 70% Hamblin (Hb), 21% Prader (Pe), 5% Monongahela (Me), and 2% Hollywood (Hk) (NRCS 2014). The remaining portions fall within the channel of Lick Creek. The Prader Series is recognized both locally and nationally as containing inclusions of hydric Melvin soils in lowlands and depressions (NRCS 2010). According to the local NRCS agent, however, areas mapped as containing Hamblen and Staser soils have also proven to be hydric in many Greene County locations. In addition, the local NRCS agent has stated that soil scientists have found numerous errors in the most recent soil surveys and that some hydric soils may not be listed as such.

Onsite investigations by Water Resources indicate that soils containing hydric indicators (low chroma colors, iron concentrations, matrix depletions, etc.), are common almost throughout the

entire site at depths ranging from 3 to 16 inches. Agricultural plowing and hydrologic modifications have caused a pronounced mixing of soils such that some horizons which originated more deeply, and which generally contain more pronounced indicators, sometimes appear close to the surface. The reverse is also true. Soils lying closer to Lick Creek tend not to be hydric but are typically those that have been deposited during flooding and contain enough silty sand to be porous (fluvents).

#### **4. Vegetation Composition**

From a plant community perspective, the goal of the mitigation is to foster the re-establishment of two primary types of wetlands: a mid-successional palustrine forested wetland (PFO1E) (bottomland hardwood) of a type which now rarely occurs in the Lick Creek watershed because of agriculture and other local land use patterns, and a scrub/shrub wetland (PSS1E). A smaller component of the Bank will incorporate several areas of pre-existing emergent wetlands (PEM1J) and another that has been created behind a berm in the lower part of Tract II. While it is our intention to promote the establishment of these three community types within the Bank's proof-of-performance time frame, it is highly likely that in the long-term, succession will result in the site evolving into a palustrine forested system in all but the very wettest parts.

The site was first planted in January 2013 with 37,650 trees and shrubs (Appendix B, Tables 1 and 2). By the end of the first monitoring year the cumulative numbers of surviving woody stems was promising (Appendix B, Table 3). Nonetheless, densities of tree species initially approved by the IRT were low on all parts of the site (Appendix B, Table 4) and shrub densities were high only in the enhancement areas (Appendix B, Table 5). Poor initial survival of these plants was attributed to excessive precipitation so an additional 8,000 stems were set out in December 2013. This planting emphasized more water-tolerant species (Appendix B, Tables 1 and 2). However, because the constructed berms effectively trapped surface water late into the year, and because many of these areas then became heavily populated with cattails (*Typha latifolia*), planting was greatly restricted in some areas on Tract I. As a result, survival of approved species improved only marginally after the December 2013 planting (Appendix B, Tables 4 and 5).

#### **B. Mitigation Site Plan**

The presence of standing water behind many the berms on Tract I, and the resulting establishment of dense stands of cattails suggests that elevated levels of hydrology have played a major role in the retarding the survival of woody vegetation throughout much of the site. Therefore, all of the berms but one on Tract I (which is located nearest Lick Creek and provides seasonal inundation for a 3.58 acre emergent wetland), have been breached and their outfall elevations reset to promote better through-flow of surface water. A program of herbicide application has also been initiated in effort to control the occurrence of cattails. Once this has been successfully accomplished we will manage the Bank to promote the establishment of two major and one minor community types: PFO1 Tree Establishment Areas (TEA's), PSS1 Scrub/Shrub Establishment Areas (SSAE's), and PEM1 emergent wetlands respectively (Appendix A, Figure 4). The TEA's will be located on the driest portions of the site while the SSEA's will be positioned within wetter areas. Emergent wetlands will occur within seasonally

inundated depressions and slope wetlands that receive prolonged hydrologic input from hillsides lying to the south.

### 1. Berm Breaches

The network of berms on Tract I was breached in 21 locations in October 2014 (Appendix A, Figure 5). A track-hoe was used to cut 12-15 ft-wide outfalls that are 0-6 inch above existing grade as measured from the up-gradient side of each berm. Excess soils were spread thinly on the faces of existing berms so as not to noticeably increase their height or width. Although the majority of ponded water has drained from these areas, the seasonal hydrology will not be known until the end of the 2015 growing season.

### 2. Cattail Control

In early July, 2014 approximately 16 acres of cattails, located primarily on Tract I, were treated with a 2-4 percent solution of glyphosate, N-(phosphonomethyl) glycine. This was combined with a 1 percent solution of surfactant. The application was made from a four-wheel-drive ATV with motorized hand sprayers. All personnel were protected with a covering of clothing, gloves, and canister masks. Treatment was initiated during seed-set when plants were most vulnerable. Cattail survival will be re-evaluated throughout the 2015 growing season and herbicide will be reapplied as necessary.

In addition to cattail control, a large number of the invasive teasels (*Dipsacus fullonum*) were sprayed. The close proximity of planted trees and shrubs made treatment difficult and prevented complete coverage.

### 3. Tree Establishment Areas

Thus far a total of, 30.47 acres on Tracts I and II have been planted. Another 17.81 acres of TEA will be planted in late 2015/early 2016 after cattail control efforts have been completed. Fifteen species of approved trees are included the TEAs. Four species of oaks and one species of hickory constitute 50% of the total stocking density (Appendix B, Table 1). In addition, 2.6 acres of berms and transition zones have been planted with a mixture of wetland and non-wetland oaks, walnuts, and hickories. The indicator status of each is indicated below.

Hard Mast Wetland Species	Indicator Status
Shumard oak ( <i>Quercus shumardii</i> )	Fac
willow oak ( <i>Quercus phellos</i> )	Fac
swamp chestnut oak ( <i>Quercus michauxii</i> )	Facw
swamp white oak ( <i>Quercus bicolor</i> )	Facw
shellbark hickory ( <i>Carya laciniosa</i> )	Fac
sugarberry ( <i>Celtis laevigata</i> )	Facw
blackgum ( <i>Nyssa sylvatica</i> )	Fac
sweetgum ( <i>Liquidambar styraciflua</i> )	Fac
persimmon ( <i>Diospyros virginiana</i> )	Fac

<b>Approved Soft Mast Wetland Species</b>	<b>Indicator Status</b>
red maple ( <i>Acer rubrum</i> )	Fac
silver maple ( <i>Acer saccharinum</i> )	Facw

<b>Transition Zone Species</b>	<b>Indicator Status</b>
black walnut ( <i>Juglans nigra</i> )	Facu
white oak ( <i>Quercus alba</i> )	Facu
shagbark hickory ( <i>Carya ovata</i> )	Facu
bitternut hickory ( <i>Carya cordiformis</i> )	Facu

The overall goal is to have a density of at least 300 surviving, planted stems/acre at the end of the proof-of-performance period. No single planted species will constitute more than 25% of the stocking density. Therefore, no species may contribute more than 75 stems/acre toward meeting the performance standard, even if there are more than 75 stems/acre present. Since shrubs are a major component of any wetland and we planted shrubs in the TEA as described in the original MBI, we propose that 10 percent of the stocking density (30 planted stems/acre) may consist of planted shrubs.

In June 2014 sampling indicated that there were 185 approved trees/ acre within the TEAs with no one species exceeding 26 percent of the stocking density. Oaks were found to make up 66% of this density (Appendix B, Table 6). Because of this shortfall in stem counts, supplemental plantings were made in non-cattail areas during the early winter 2015. Efforts were made to install the most water-tolerant, hard mast species in the wettest sectors of the TEA. Additional plantings will be made in the future to insure adequate survival of targeted wetland species.

#### **4. Scrub/Shrub Establishment Areas**

The Scrub/Shrub Establishment Areas (SSEA) consist of 18.21 acres which are scattered throughout the site. These areas tend to exhibit seasonal inundation and protracted soil saturation well into the growing season in most years. Eight species of shrubs have been selected for planting in these areas and include the following:

<b>Approved Shrub Species</b>	<b>Indicator Status</b>
silky dogwood ( <i>Cornus amomum</i> )	Facw
stream alder ( <i>Alnus serrulata</i> )	Obl
false indigobush ( <i>Amorpha fruticosa</i> )	Facw
buttonbush ( <i>Cephalanthus occidentalis</i> )	Obl
silky willow ( <i>Salix sericea</i> )	Obl
elderberry ( <i>Sambucus canadensis</i> )	Fac
black chokeberry ( <i>Aronia melanocarpa</i> )	Fac
winterberry holly ( <i>Ilex verticillata</i> )	Facw

Proposed success criteria for shrubs will be at least 225 stems/acre at the end of the required proof-of-performance period (75% of the original stocking density of 300 stems/acre). No single planted species will constitute >40% of the overall stocking density. Therefore, no one species may contribute >90 stems/acre toward meeting the performance standard, even if there are > 90 stems/acre present.

In June 2014 sampling indicated that there are 56 approved shrubs per acre and 70 approved trees per acre for a total of 126 planted species per acre in the SSEA. No species of tree or shrubs constituted more than 16% of the stocking density (Appendix B, Table 7). Because these numbers are considerably below the desired stem counts, additional shrub plantings were made during the early winter of 2015. Nursery shortfalls in available stream alder, however, may once again result in stocking deficits in the 2015 monitoring season. These deficits will be addressed by supplemental shrub plantings in late 2015 or early 2016.

### **5. Emergent Areas**

The wettest parts of the site include 5.71 acres of ponded water that persists well into the growing season. These areas have formed behind berms which have not been breached or occur within depressions that were purposefully cut into the landscape during construction. Other ponded areas occur in depressions resulting from natural settling of soils post-construction. The edges of these areas have been planted with shrubs, but the standing water areas are being colonized mainly by obligate hydrophytes such as water plantain, common cattail, marsh primrose-willow, water-starwort, and various species of spikerushes. We have elected to preserve these areas as part of the bank site in order to promote wetland habitat diversity. Fundamental to this decision too was the fact that these seasonally inundated areas have attracted hundreds of waterfowl including wood ducks, blue and green-wing teal, gadwall, mallards, great egrets, great blue herons, green herons, snipe, etc.

In the future, surface water levels of these standing water areas will be recorded during well monitoring. Emergent vegetation will be assessed during the annual monitoring. Visual estimates of the percentages of emergent and woody vegetation cover will be made at this time

### **C. Credit Calculation and Determination of Credits**

The Water Resources LCMB2 will provide bottomland hardwood, scrub/shrub, and emergent credits that are generated by wetland restoration and wetland enhancement. Additionally, the project proposes to preserve and enhance wooded riparian buffers to protect the site's aquatic resources. Aside from these traditional mitigation approaches, it is further anticipated that a small amount of land adjacent to these buffers, as well as a number of other embedded areas may fail to convert to jurisdictional wetlands, even though they will contain planted wetland species. These lands include the berm network on the site and the riparian zone. Because they provide an important element of habitat diversity and have been planted with mainly hard mast species, they too are viewed as contributing potential credits. Such areas are called Planted Uplands.

Compensation ratios for each of the mitigation methods cited above are determined by the IRT, but are assumed to be as follows:

- **Restoration** (1:1 replacement value): One acre of restored wetland is required to generate one compensation credit.

Wetland restoration involves the manipulation of the physical, chemical, or biological characteristics of a former wetland, or highly degraded wetland, in order to return it to its natural and/or historic functions. Restoration of a wetland most commonly involves the reestablishment of hydrology to a site which has been drained.

**Enhancement** (minimum 2.5:1 replacement value): Two-and-a-half acres of enhanced wetlands are required to generate one compensation credit.

Enhancement is the manipulation of the physical, chemical, or biological characteristics of a wetland in order to improve wetland functioning. It frequently involves augmenting one or more of the functions of an existing wetland such as flood storage, sediment filtering, wildlife habitat, etc.

- **Riparian Preservation** (no replacement value)
- **Riparian Enhancement and Planted Uplands** (minimum 5:1 replacement value): Five acres of planted uplands are required to generate one compensation credit.

Some riparian zones were pasture and the banks broken down by cattle. The cattle were removed and the 50 foot wide banks have been planted with approved tree. The berms border most of the wetlands in Tract I and have provided excellent habitat for hard mast species. These species have had good survival and will provide islands of habitat diversity and a hard mast seed source in the future.

Planted uplands occur as embedded areas within the larger wetland mitigation matrix. Although initially targeted for creation or enhancement, embedded areas fail to develop a full suite of wetland attributes for one or more reasons. Their principal value is to provide islands of habitat diversity for local wildlife. Planted berms lying immediately adjacent to the mitigation wetlands may also qualify as planted uplands.

The table below shows the calculation of potential credits generated by LCMB2. Loss of 4.76 credits compared to the original MBI is primarily the result of constructed berms and preserved riparian zones.

Approach	Ratio	Wetland Type	Acreage	Credits
Wetland Restoration	1:1	PFO1	42.78	42.78
Wetland Restoration	1:1	PSS1	12.42	12.42

(Table Continued)				
Wetland Restoration	1:1	PEM1	5.32	5.32
Wetland Enhancement	2.5:1	PFO1	1.08	0.43
Wetland Enhancement	2.5:1	PSS1	8.09	3.24
Wetland Enhancement	2:5:1	PEM1	0.39	0.16
Riparian Enhancement	5:1	n/a	1.57	To be determined
Riparian Preservation	n/a	---	2.89	0.00
Uplands/Berms	5:1	---	2.59	To be determined
Lick Creek Water	n/a	n/a	0.53	0.00
<b>Totals</b>			<b>77.58</b>	<b>64.35</b>

A breakdown of the potentially marketable credits being produced is as follows: PFO1=43.21 (67%), PSS1=15.66 (24%), PEM1=5.48 (9%).

**D. Bank Development Plan**

In general, the 77.58 acre property was re-contoured to make it more level by eliminating spoil areas which were created in the past when drainage swales were cut into the farm fields. Any hydrology in these swales was controlled or eliminated by filling them. Additionally, the site had been reported to have been tile-drained in order to remove excess hydrology. These tiles were located and disrupted so as to prevent most subsurface drainage.

Other than Lick Creek, the most conspicuous hydrologic source associated with the Bank property is a perennial, spring-fed drainage that bisects the site. The upper 1,000 ft of the channel has been widened to as much as 15 ft by cattle trampling. Because it is not deeply incised at this point, it offers the possibility of providing overbank flow during periods of heavy precipitation

In addition to the spring run, three culverted drainages, associated with Mason Lodge Road, empty onto the site. The first occurs near the northeastern property corner, another originates near the middle of the tract, and a third runs parallel to the southern boundary for about 500 ft before entering the site. The northeastern culvert contributes the least amount of hydrology and

spreads out before becoming noticeably incised. This water was directed to the center of the upper northern half of the site. The middle culvert occasionally provides a moderate amount of water into a swale that at one time ran the entire 2,800 ft length of the tract. This swale, and several other lesser ones running parallel to it, were graded flat or slightly bowl-shaped and incorporated into a series of six terraces. Each terrace detains water for a period of time before draining through a breach in the terrace berm, in step-wise fashion, into the one below. Hydrology from this source will eventually drain to Lick Creek either directly or through enhanced Wetland A or B (Appendix A, Figure 2). The third culvert empties into what appears to be an ephemeral stream. In its upper part, the meandering channel is shallowly incised but then becomes dendritic in nature before becoming nearly imperceptible as it bleeds through Wetland A near the southern edge of the property. Some of that water was directed towards the middle of the site.

Overbank flow from Lick Creek occasionally floods the western end of the site. The western third is particularly vulnerable. When this occurs, water stands for a period of time and then drains back into the creek as water levels recede. Because of the size of the watershed, this process often takes several days

It is important to note that none of these manipulations will jeopardize surrounding landowners. Site topography is far too steep on the eastern and southern flanks to permit any migration of water, and the western flank directly abuts Lick Creek. Although the northern property is slightly higher in elevation than the bank site, interchange of waters will occur during flood events. A berm initially blocked water from leaving this property but three berm breaches restored site drainage. This would appear inconsequential since this property is controlled by Tennessee Wildlife Resources Agency (TWRA) as part of the Lick Creek Bottoms Wildlife Management Area. The property was purchased by that entity specifically to provide wetland and lowland habitat for wildlife.

The site has a potentially large source of seed from soft mast species that grow on a prominent hillside lying to the south (Bird Hill) and which also line the banks of Lick Creek. Typical species include green ash, boxelder, American elm, and sycamore. Because early-successional species such as these produce very large quantities of seed, planted, mid-successional, hard-mast saplings can be easily out-competed by their faster growing neighbors. This is particularly true in the main "seed rain" zone that lies within several hundred feet of the parent trees.

Because naturally-invading species can become established in vastly greater numbers than planted species, population demographics can be greatly skewed. We therefore recommend that any planted trees and shrubs lying within 200 ft of the top-of-bank of Lick Creek, or the southern property boundary, be monitored and reported on separately from the rest of the Bank. We also suggest that the success criteria in the "seed rain" zone be adjusted to permit a successful outcome to be achieved as long as this portion of the site contains at least 300 viable stems per acre for five consecutive years, and that more than 50% of the planted and naturally-invading species are considered wetland indicators.

The resultant mitigation plant communities, whether PFO, PSS, or PEM, will all be managed so that they contain less than 10% areal coverage of invasive exotic species. Such unwanted vegetation includes all species listed as a “severe” or “significant threat by the Tennessee Exotic Pest Plant Council (2014). Mechanical methods will be the preferred method of control, but in instances of broad-ranging infestation, or where infestation is by highly colonial species, unwanted vegetation may be controlled by spraying approved herbicides with back pack sprayers.

## **E. Permits and Regulations**

### **1. Cultural Resources**

A cultural resources survey, conducted in September, 2010 by Dr. Jay Franklin of East Tennessee State University, found no evidence of cultural artifacts on site. An executive summary of Dr. Franklin’s findings is presented in Appendix C.

### **2. Threatened and Endangered Species**

#### **a.) Current Certification**

In November 2011, Water Resources requested information on state and federally-listed rare, threatened and endangered species from TDEC’s Division of Natural Areas, the U.S. Fish and Wildlife Service (USFWS), and TWRA. Each of these agencies responded and has indicated that they have no records of listed species within one mile of the project boundaries (Appendix C). Additionally, plant surveys conducted by Water Resources failed to detect any state or federally-listed species.

#### **b.) Potential Use of Site by T & E Species**

Considering the fact that the proposed bank site has been drained and used for agricultural purposes for many years, it would appear unlikely that the site was suitable for terrestrial threatened or endangered species.

### **3. Jurisdictional Waters of the U.S.**

A wetland delineation was conducted by Water Resources in mid-September 2011 using protocols presented in the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (2010). On October 20, 2011 the USACE conducted an onsite jurisdictional determination and has issued its formal JD concurrence letter on December 7, 2011. A copy of this letter is located in Appendix C.

### **4. Water Quality Certification**

On March 30, 2012 TDEC issued a General Permit for Wetland Restoration and Enhancement. A copy of this permit is also located in Appendix C.

### **5. Construction Best Management Practices Plan (BMP)**

Best management practices were used, as indicated in the Stormwater Pollution Prevention Plan. TDEC issued a certificate of compliance after site construction was completed.

## **F. Financial Assurances**

**Remedial:** If requested, Water Resources will set aside 5% of the sales of all credits into a trust account to be used by the USACE in case Water Resources cannot fulfill its obligation for maintenance or any other IRT requirement. After the monitoring has been completed any remaining funds will be transferred to Water Resources one month after the proof-of-performance period is closed.

**Long-Term:** Water Resources will provide a bond or other instrument that is required for financial security. After the proof-of-performance is completed, long-term management will be transferred to TWRA along with funds for that purpose.

## **G. Site Protection Instrument:**

It is Water Resource's intent for TWRA to own the Lick Creek Property, Fee-Simple. TWRA, as represented by Mr. Rob Todd, has indicated an interest in the site. A conservation easement was approved but has not been signed by all parties. The document was modeled after the approved conservation easement for Lick Creek Wetland Bank Number 1 (Appendix D).

The IRT, and its authorized agents, shall have the right to enter the Property for the purposes of inspection and to take actions necessary to verify compliance with the conservation easement. The conservation easement shall be enforceable by any proceeding at law or in equity or administrative proceeding by the IRT, including the USACE or TDEC. Failure by any agency (or owner) to enforce any provision shall in no event be deemed a waiver of the right to do so thereafter

## **H. Adaptive Management**

The IRT accepts that all ecological restoration projects are site specific, that multiple endpoints are possible owing to the stochastic nature of ecological processes, and that human activities offsite and beyond the control of the mitigation bank may influence the course of restoration. For these reasons, the IRT and Sponsor may review the restoration strategy, objectives, and the performance standards and monitoring protocols at any time prior to full project release. Proposed changes to the Mitigation Banking Instrument (MBI) must be made in writing and must qualify as adaptive management in response to site-specific conditions and must be approved by the IRT. If approved, the conditions of the MBI may only be amended or modified with the written approval of all signatory parties. The mitigation bank must demonstrate good-faith efforts to comply with restoration requirements and cannot invoke an alleged need for adaptive management as a pretext for poor management.

## **I. Long-term Management and Catastrophic Events**

Water Resources will manage the property according to the requirements of the MBI and conservation easement until the monitoring period has been completed. After this time TWRA will manage the property and be bound by the conservation easement. Prior to transferal to TWRA Water Resources will repair any changes to the site caused by catastrophic events if those changes threaten the success of the site as a wetland bank. Otherwise, no attempt will be made to effect changes due to natural causes.

## **J. Real Estate Provisions**

The free and clear title to the property is owned by Water Resources, LLC and was included in original MBI. This title will be transferred, fee simple, to TWRA along with the conservation easement.

### **1. Subsurface and Mineral Rights (if applicable)**

The surface and subsurface mineral rights belong to Water Resources, LLC and will be transferred to TWRA.

### **2. Utility and Transportation Corridors**

The mitigation bank sponsor will not encourage the placement of a utility or transportation corridor such as to impact the mitigation bank property. In the event all or part of this property is taken by exercise of the power of Eminent Domain or acquired by purchase in lieu of condemnation, whether by public, corporate, or other authority, so as to terminate the conservation easement in whole or in part, the mitigation bank sponsor or long-term steward is responsible for replacing any wetland mitigation credits lost with in-kind wetland mitigation credits.

## **III. OPERATION OF THE BANK**

### **A. Description of Service Area**

#### **1. Service Area**

The primary service area for the LCMB2 will include all portions of USGS French Broad/Holston River Accounting Unit 060101 (USGS 1990). Specific hydrologic unit codes (HUC) and associated counties are presented in the table below.

<b>HUC Code</b>	<b>Associated Counties</b>
06010101	Hawkins, Sullivan
06010102	Johnson, Sullivan, Washington
06010103	Carter, Johnson, Unicoi
06010104	Grainger, Hamblen, Hawkins, Jefferson
06010105	Cocke, Greene
06010106	Cocke
06010107	Blount, Cocke, Jefferson, Knox, Sevier
06010108	Greene, Unicoi, Washington

The Bank will compensate for future unavoidable impacts to in-kind wetlands (bottomland hardwoods, scrub/shrub, and emergent wetlands), and to out-of kind wetlands, within the service area, on a case-by-case basis.

#### **2. Use of Proximity Factor**

Mitigation outside of the primary service area will be allowed on a case-by-case basis by using the proximity multiplier method as specified by the IRT.

**B. Access**

The IRT shall have the right to access the Protected Property for purposes of inspection, and to take actions necessary to verify compliance with the Restrictions as set out herein. Holder and USACE and TDEC shall also have the rights of visual access and view, and to enter and go upon the Protected Property for purposes of making scientific or educational observations and studies, and taking samples, in such a manner as will not disturb the quiet enjoyment of the Protected Property by Grantor. However, this Conservation Easement conveys no right of access or entry by the general public to any portion of the Protected Property.

**C. Ecological Performance Standards**

For this wetland mitigation project to be considered a success, the restored and enhanced wetlands must meet the criteria set forth in the 1987 *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), augmented with information presented in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (USACE 2012). The specific performance standards are detailed in the following table.

Mitigation Component	Success Criteria	Failure	Maintenance Action
<b>Hydrophytic Vegetation</b>	<p><b>Trees:</b> The density of planted hard-mast species, and approved soft-mast species within tree establishment areas must be <math>\geq 300</math> stems/acre. Up to 10% of the stocking density may also include wetland shrubs. This condition must be maintained for five consecutive years (or longer if determined necessary by the IRT). Also in this zone, <math>&gt;50\%</math> of the remaining naturally-invading, woody species must be wetland-adapted. The indicator status of the various taxa will follow those of the USACE National Wetland Plant List (USACE 2014).</p> <p>Within the seed rain zone the combined density of planted and naturally-invading, woody species must be <math>\geq 300</math> stems/acre. Furthermore, <math>&gt;50\%</math> of the species must be wetland-adapted.</p>	<p><b>Trees:</b> Survivorship of planted hard mast and approved soft-mast species is within tree establishment areas is <math>&lt;300</math> stems/acre and/or <math>&lt;50\%</math> of the naturally-invading species are wetland-adapted.</p> <p>Within the tree establishment/seed rain zones the total density of planted and naturally-occurring woody species is <math>&lt;300</math> stems/acre and/or <math>&lt;50\%</math> of the naturally-invading species are wetland-adapted.</p>	<p>On those portions of the Bank not meeting the tree density success criterion, additional seedlings of wetland-adapted species will be planted such that the area conforms to targeted densities.</p>
	<p><b>Shrubs:</b> Within scrub/shrub establishment areas, survivorship rates of planted shrubs must be maintained at <math>&gt;75\%</math> for three consecutive years (or longer if determined necessary by the IRT). Assuming that the preferred</p>	<p>Survivorship rates are not maintained at 225 stems/acre over the proof-of-performance monitoring period.</p>	<p>On those portions of the Bank not meeting the shrub density success criterion, additional seedlings of wetland-adapted species will be planted such that the area conforms to targeted</p>

Mitigation Component	Success Criteria	Failure	Maintenance Action
	<p>density is 300 stems/acre, the performance standard is 225 stems/acre. Because of the limited number of suitable wetland shrubs indigenous to the Lick Creek watershed, we suggest that any one planted species may be permitted to constitute up to 40% of the stocking density. Additionally, because of the expense of multiple plantings which have taken place in the past, we suggest that 100% of the surviving hard mast trees lying within the scrub/shrub establishment zones be allowed to be considered as a component of the overall stocking density.</p> <p><b>Emergent:</b> Within the emergent habitat community, success will require the establishment of a dominance of herbaceous wetland vegetation. Open water areas are permissible but these cannot comprise &gt; an average 10% of the total area present during the growing season. Cattails are also permissible but these cannot occupy &gt;25% of the area.</p>	<p>Emergent habitats fail to become colonized by a dominance of herbaceous hydrophytes. Open water areas exceed 10% of the total area during the course of the growing season. Cattail dominance exceeds &gt;25% of the total area.</p>	<p>densities. Alternative corrective actions may include modifications to ground and/or surface water hydrology to decrease the residence time of water on the site.</p> <p>On those portions of the Bank not meeting the herbaceous cover success criterion, wetland herbs, indigenous to Greene County, may be sown. Alternative corrective actions may include modifications to ground and/or surface water hydrology to increase or decrease the residence time of water. If cattails become over-abundant, these may be controlled by applying an environmentally appropriate herbicide.</p>
	<p><b>Herbs (Exclusive of Emergent Areas):</b> At the end of five years of monitoring <math>\geq 50\%</math> of the naturally-invading herbaceous plant cover must be comprised of wetland-adapted species.</p>	<p>At the end of five years, field monitoring indicates that invading wetland herbs comprise &lt;50% of herbaceous cover.</p>	<p>On those portions of the Bank not meeting the herbaceous cover success criterion, wetland herbs, indigenous to Greene County, will be sown. Alternative corrective actions may include modifications to ground and/or surface water hydrology to increase the residence time of water on the site.</p>
<p><b>Wetland Hydrology</b></p>	<p>During years with normal precipitation, inundation or saturation to within 12 in. of the soil surface must be observed for at least 5% of the growing season (the approximate equivalent of 14 consecutive days from the onset of observed biological activity in the spring until the first hard freeze).</p>	<p>Well monitoring, surface water monitoring, and other reconnaissance indicates that the site is not meeting the saturation/inundation standards.</p>	<p>Corrective action will be taken to introduce additional surface and/or ground water hydrology into areas not meeting the success criterion.</p>

Mitigation Component	Success Criteria	Failure	Maintenance Action
	Additional hydrologic features sought will include sediment deposits, drift lines, drainage patterns, water marks, etc.		
<b>Hydric Soils</b>	Soil evaluations will not take place since both active and relict hydric soils are found throughout all areas being proposed for wetland enhancement and restoration. Soil evaluations will also not be undertaken within riparian enhancement and preservation zones since the goal is not to create wetlands in these areas.	Not applicable	Not applicable

**D. Conditions of Crediting and Debiting**

Credits will be withdrawn from the mitigation bank to provide compensatory mitigation for approved permitted projects under Section 404 and 401 of the Clean Water Act. The Sponsor will coordinate with applicants for wetland and stream impacts to provide information on the service area and available credits. The responsibility for demonstrating that the LCMB2 credits constitute adequate and appropriate compensation for proposed impacts lies with the impact applicant. The presence or proposed use of the LCMB2 will not affect the requirement that a project go through the process of avoidance and minimization.

Water Resources will provide the USACE physical evidence of purchased credits with an updated credit ledger.

If at any time the number of credits debited exceeds the number released, then no further credit sales shall be permitted by the IRT until the sponsor has implemented corrective actions and achieved the success criteria so as to provide the number of credits to be greater than or equal to the number of credits debited to cover permitted impacts with this mitigation bank.

At the written request of the sponsor, the IRT will perform a compliance visit to determine whether targeted success criteria have been met.

It is understood that "in-kind" compensation for wetland resources is preferred and generally required. "Out-of-kind" compensation and compensation for impacts outside the service area should be considered for this Bank on a case-by-case basis by the regulatory agencies. In the interest of achieving functional replacement, in-kind compensation of aquatic resource impacts should generally be required.

Out-of-kind compensation may be acceptable if it is determined to be practicable and environmentally preferable to in-kind compensation (e.g., of greater ecological value to a particular region). Decisions regarding out-of-kind mitigation are typically made on a case-by-case basis during the permit evaluation process by the regulatory agencies.

**E. Schedule of Credit Availability**

The credit release schedule for the LCMB2 (as determined by the IRT) has changed. The original credit schedule was based on 69.11 credits potentially available with all credits being available for PFO1 or PSS1 type impacts. The current modified schedule is based on 64.35 credits potentially available and each credit is classified as PFO1, PSS1, or PEM1. PFO1 credits can mitigate for all impact classes, whereas PSS1 and PEM1 credits can only mitigate for PSS1 and PEM1 impacts respectively.

**Original Credit Schedule**

<b>Benchmark</b>	<b>Credits Released</b>	<b>Credits Sold</b>	<b>Credit Balance</b>
Signing of MBI and Filing of Conservation Easement	13.82	13.82	0.00
Completion of Hydrologic Modifications	10.37	1.18	9.19
Total	24.19	15.00	9.19
<b>Potential Credits Available (69.11)</b>			<b>9.19</b>

**Modified Credit Schedule <sup>a</sup>**

<b>Benchmark</b>	<b>Credits to be Released</b>		<b>Credit Categories to be Released <sup>b</sup></b>		
	Percent	Number	PFO1 67%	PSS1 24%	PEM1 9%
Completion of Planting	19	7.62	5.11	1.83	0.68
1st Modified Annual Monitoring Report	0	0.00	0.00	0.00	0.00
2nd Modified Annual Monitoring Report	16	6.43	4.31	1.54	0.58
3rd Modified Annual Monitoring Report	16	6.43	4.31	1.54	0.58
4th Modified Annual Monitoring Report	24	9.64	6.46	2.31	0.87

<sup>a</sup> Total credits assigned to the Bank are 64.35. Previous credits released are 24.19, of which, 15.0 have been sold, 9.19 remain to be sold, and 40.16 remain to be released in the assigned categories.

<sup>b</sup> Credit availability has been prorated according to the amount of acreage available within each community type.

(Table Continued)					
Final USACE Approval	25	10.04	6.73	2.41	0.90
<b>Totals</b>	<b>100</b>	<b>40.16</b>	<b>26.92</b>	<b>9.63</b>	<b>3.61</b>

**F. Maintenance Activities**

**1. Post Construction Phase**

Throughout the mitigation site’s proof-of-performance period, an in-depth monitoring effort will be made during each growing season to determine the status of planted and invasive vegetation, the condition of the soils, and hydrologic regimes (see Section IV-A Monitoring Requirements). Additionally, the general integrity of hydrologic control structures, functioning of erosion control mechanisms, and overall site condition will be assessed at this time.

Beyond the in-depth annual summer survey, a less intensive dormant season survey will be made during the proof-of-performance period. The same parameters will be evaluated, but no detailed information will be collected. The sole purpose of these inspections will be to detect physical problems which, if left unaddressed, could compromise the integrity or functioning of the mitigation site. Again, Water Resources will carry out the work.

The dormant season evaluations will consist of the following:

**a.) Invasive Species Assessment:**

A botanist will walk the entire site and identify any plants that are listed by the Tennessee Exotic Pest Plant Council as severe or significant threats (TNEPPC 2014). Special attention will be paid to cattails and exotic species that may become invasive in wetlands. Recommendations will be made as to whether herbicides or mechanical removal should be administered.

**b.) Erosion Control Assessment:**

Erosion control will consist of temporary vegetative cover and a limited amount of energy-absorbing riprap in the ditch outfalls near the southern boundary of the site. Other areas of concentrated water movement, such as lower berm slopes will also be inspected and recommendations made for corrective measures if necessary.

**c.) Hydrologic Control Assessment:**

These control measures consist of berms that help slow water moving through the constructed wetlands, drainage diversion structures, and armored outfalls at the end of drainages. These berms have been breached to allow the free flow of water down through the site towards the lowest emergent areas and then to Lick Creek. These berms will be inspected and evaluated as needed to ensure that the hydrology will allow the proper plant communities to become established. Drainage patterns will be especially monitored once the fall and winter rains begin. Any needed adjustments will be reported and made as necessary.

#### **d.) Site Disturbance:**

Since the Bank site is located on private property, and is bounded by tracts controlled by others, disturbance is always a possibility. In order to lessen the likelihood of inadvertent disturbance or encroachment from other abutting landowners, the site was fenced (except on the west side adjacent to Lick Creek). Also, signage indicating the presence of a federally-protected wetland mitigation area has been placed along the shared property lines.

If the site is disturbed, Water Resources will provide the IRT Chair with a brief letter report which summarizes the site condition and offers any appropriate remedial action.

### **IV. Monitoring and Maintenance of the Bank**

#### **A. Monitoring Requirements and Procedures**

The site has been in existence for over two years and field monitoring has taken place during each of those years. The second year monitoring data was used in preparing this document but a final monitoring report was not formally submitted upon the direction of the IRT. However, once the IRT approves of a plant community-based approach to mitigation credit assignment, monitoring will recommence. Monitoring will be conducted in year three using the criteria presented in this document. As previously, field assessments will be conducted between June 15 and July 15 and monitoring reports will be submitted to the IRT by the end of the calendar year. **We suggest that the monitoring be done for an additional four years and then the data products be reevaluated by the IRT to determine if additional inventories are warranted.**

A brief description of the recommended sampling scheme is presented below. In each instance, the sampling approach will be designed to determine if the success criteria presented in Section III C are being attained.

**Trees, Shrubs, Vines, and Other Woody Seedlings:** Monitoring plots were established two years ago in order to assess the composition, survivorship, and dominance of the planted woody seedlings, plus any other invasive woody vegetation. Fixed-area (0.1-acre) sample plots were installed within each of the mitigation zones (enhancement, creation, restoration) using a systematic random array. Some of these will now be relocated to ensure that the TEA's and the SSEA's are properly represented. Separate plots will also be relocated within the seed rain areas to capture the unique demographics that occur there. In addition, some plots will be added to better represent the changes in the site such as areas of cattail removal.

Enough plots will be installed in each location to maintain a minimum sampling intensity of 2% (see Appendix A, Figure 4). As in past years, all woody seedlings occurring within the 0.1-acre plots will be identified to species and assessed to determine whether they are living or dead. Plant demographic summaries will be presented in tabular or graphic form and will include average relative density, frequency, and cover. These statistics will then be used to determine if the success criteria presented in Section III C are being attained.

Because surface inundation persists within emergent zones well into the growing period, fixed area sampling methodologies are not appropriate for analyzing these communities. Instead the vegetation that does exist within the emergent habitat (5.48 acres) will be evaluated using subjective measurements. The percent cover of various woody and herbaceous species, as well as open water areas, will be visually estimated.

**Herbs:** Total herb-layer plant cover in 2013 was 83.00%. This is rather high given that site manipulation was completed as recently as September 2012. Of the 68 species identified, 55.88% are considered wetland-adapted according to the latest version of the National Wetland Plant List. If only the most dominant species are considered, then 75.00% are wetland indicators. Therefore, the herbs in the monitored areas to date have already met the performance standards. However, since some of site within the flooded cattail areas has not been monitored we suggest that the herb monitoring continue until it is evident that performance standards are met over the entire site.

Herbs and non-vegetated substrates have been assessed within paired 1-yard<sup>2</sup> plots at each sampling location. A subjective estimate of the percent cover occupied by each herbaceous taxon is made. Cover contributed by woody seedlings occurring within the plot is also being estimated. The remaining portion of the plot is similarly evaluated for percent cover of non-vegetated substrates, such as bare soil, bare rock, leaf litter, and the like. To prevent cover estimates from exceeding 100%, three-dimensional tallies will be avoided. Only that portion of the vegetation or substrate clearly visible from a vantage point 3 ft above the plot will be considered. Underlying portions occluded from view will not be included in the estimate. All data will be presented in tabular and/or graphic form showing average frequency, average cover, and wetland indicator status for each taxon.

It should be further noted that all 1-yard<sup>2</sup> plots are positioned immediately adjacent to the northern and southern corners of the 0.1-acre primary sampling units, but outside of these units to protect the integrity of the herb layer from inadvertent trampling during the woody seedling inventories. This is particularly important since sampling may continue for multiple years. Precise relocation of these plots in subsequent years is facilitated by the insertion of PVC stakes into the ground at opposing corners of the sampling frame.

**Water Regimes:** Field surveys will involve the evaluation of site hydrology to document that it is meeting the criteria set forth by the USACE Wetland Delineation Manual (Environmental Laboratory 1987). These evaluations will take place during the annual assessment. Hydrologic features sought will include inundation, saturation, sediment deposits, drainage patterns, water marks, drift lines, etc.

Special emphasis will be placed on the hydrology up-gradient of the breached berms. These areas are slated to be part of the TRE and will be planted with approved tree species. However, it is anticipated that some isolated pockets of will be more conducive to a scrub/shrub community. This will be determined during the 2015 growing season. Groundwater levels will also be assessed several times through the growing season using a series of 3 ft-deep

monitoring wells. The proposed location of the monitoring wells is shown on Figure 7 in Appendix A. Water Resources recommends biweekly sampling during the first two months of the growing season and monthly thereafter. According to the NRCS National Water and Climate Center website, the average growing season for Greene Co., Tennessee, for the past 30 years, has extended from April 15 through October 23 (NRCS 2011c). While these dates will be used as a general benchmark, actual sampling will begin when soils become warm enough to support biological activity, and when such activity is actually observed (USACE 2010).

**Soils:** The Greene County Soil Survey has already provided some information regarding the occurrence and distribution of pre-existing hydric soils (Edwards et al. 1958, NRCS 2011a). Cursory soil investigations were conducted by Water Resources during preliminary siting surveys and by the IRT during a site visit in August 2011. More in-depth investigations were undertaken later by Water Resources during wetland determination and delineation surveys. Since proposed mitigation actions will take place in areas that have been documented as already containing hydric and relict-hydric soils, additional soils investigations will not take place. However, hydrologic data will be considered in determining whether the soils are meeting the hydric soil criteria for inundation or saturation within 12 in. of the surface for at least 5% of the growing season.

**B. Contingency Plans/Remedial Actions:** In the event the mitigation bank or a specific phase of the Bank fails to achieve success criteria as specified in the banking instrument, the sponsor shall develop necessary contingency plans and implement appropriate remedial actions for the Bank or that phase in coordination with the IRT. Such actions have prompted the writing of this revised MBI. In the event the sponsor fails to implement necessary remedial actions within one growing season after notification by the USACE of necessary remedial action to address any failure in meeting the success criteria, the IRT (acting through the Chair) will notify sponsor and the appropriate authorizing agencies and recommend appropriate remedial actions.

If the authorizing agencies determine that the Bank is operating at a deficit, debiting by the sponsor of credits shall immediately cease, and the authorizing agencies, in consultation with the IRT and the sponsor, will determine what remedial actions are necessary to correct the situation. As determined by the IRT Chair in coordination with the IRT and the sponsor, if conditions at the bank site do not improve or continue to deteriorate within one growing season from the date that the need for remediation was first identified in writing to the sponsor by the USACE through the Chair of the IRT, the agent responsible for the financial assurances shall be directed by the USACE to transfer the amount necessary to correct the deficiency to a party acceptable to the IRT, to undertake corrective measures.

### **C. Bank Ledgers**

A report will be sent to the IRT Chair after each sale. The report will be a letter stating the transaction has been completed and a credit table will be attached that contains the following: Date of Credit Transfer, Recipient of Credits (permit number and name), Number of Credits and Type (Emergent, Scrub/Shrub or Bottomland Hardwood), and Balance of Credits.

## **D. Financial Assurances**

### **1. Performance Bond, Letter of Credit or Escrow Account Contingency, and Remedial Actions**

Water Resources, if required, will set aside 5% of the sales of all credits into an escrow account to be used by the USACE in case Water Resources cannot fulfill its obligation for maintenance or any other IRT requirement. Any funds in this account will be transferred to Water Resources one month after the proof of performance period is closed. After proof-of-performance is completed, long-term management will be transferred to TWRA.

## **V. Long-Term Management**

### **A. Long-Term Steward**

#### **1. Name Long-Term Steward Party/Parties**

TWRA has agreed to accept long-term stewardship of the Bank after the Bank has met all of the performance standards and has been released from yearly monitoring requirements.

#### **2. Responsibilities of Steward**

The long-term steward agrees to perform all work necessary to maintain the LCMB2, in perpetuity, in an ecological condition consistent with the final ecological requirements/success criteria required by the MBI. Maintenance will include any and all activities necessary to improve and sustain the ecological function of the site. Such may include, but are not limited to tree planting and application of mechanical and chemical means to control and eliminate exotic and nuisance species as described elsewhere in this document.

The steward is also responsible for long-term monitoring requirements of the site, biannual reporting as detailed below, for providing access to the site for the IRT as required for inspections and for managing and reporting on the long-term stewardship fund.

### **B. Long-Term Management Fund Endowment**

TWRA will manage the land with existing funds as part of the Lick Creek Bottoms Wildlife Management Area.

### **C. Provisions Covering the Use of the Land**

Use of the land will be restricted as detailed in the conservation easement. After the number of bank credits has been finally determined through monitoring, the land will serve the public in a manner determined by TWRA, but these must strictly adhere to the constraints of the conservation easement.

## **VI. Other Provisions**

### **A. Force Majeure Clause**

Nothing herein shall be construed to authorize proceedings against the bank sponsor for any damages to the bank property caused by acts of God such as earthquake, fire, storm, war, civil disturbance, strike, or similar causes. In the event of a force majeure event, the bank sponsor will notify the members of the IRT and work with the IRT to resolve the damages, if any,

caused by the event. However, if the acts of God do not preclude the bank sponsor from resuming bank operations without unreasonable expense, then it shall not be relieved of its obligations under this document. Any impact to future credit releases or numbers of credits available for sale shall be discussed and determined by the IRT at that time.

**B. Dispute Resolution**

Resolution of disputes about application of this Banking Instrument will be in accordance with those stated in the Federal Guidance for the Establishment, Use and Operation of Mitigation Banks (60 F.R. 58605 et seq., November, 1995).

**C. Validity, Modification, and Termination of the Banking Instrument**

This MBI will become valid upon issuance of the USACE and TDEC permits and execution of the MBI by the IRT agencies. The initial credit release is typically authorized following the recordation of the conservation easement and execution of the financial assurances requirements. This MBI may be amended, altered, released or revoked only by written agreement among the parties hereto or their heirs, assigns or successors-in-interest, which amendment will be filed in the public records of Greene County, Tennessee. Any of the IRT members may terminate their participation upon written notification to all signatory parties. Participation of the IRT members will terminate 30 days after written notification.

**D. Specific Language of the Banking Instrument will be Controlling**

To the extent that specific language in this document changes, modifies, or deletes terms and conditions contained in those documents that are incorporated into the Banking Instrument by reference, and that are not legally binding, the specific language within the Banking Instrument shall be controlling.

## VII. References

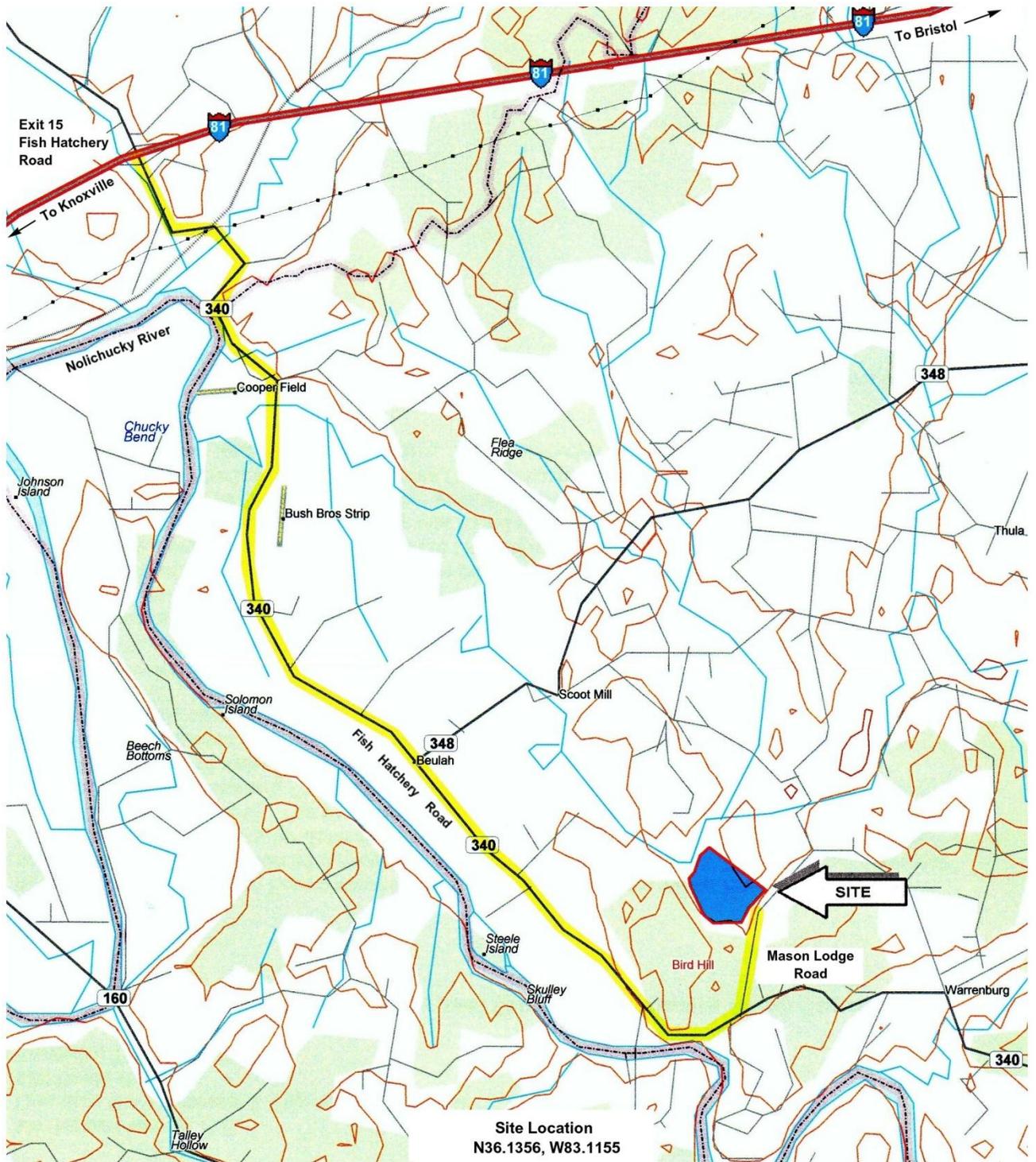
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## **Appendix A**

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### **Figures**

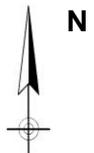
- ***Location Map***
- ***Wetland Map***
- ***FEMA Map***
- ***Vegetation Establishment Zone Map***
- ***Berm Breach Map***

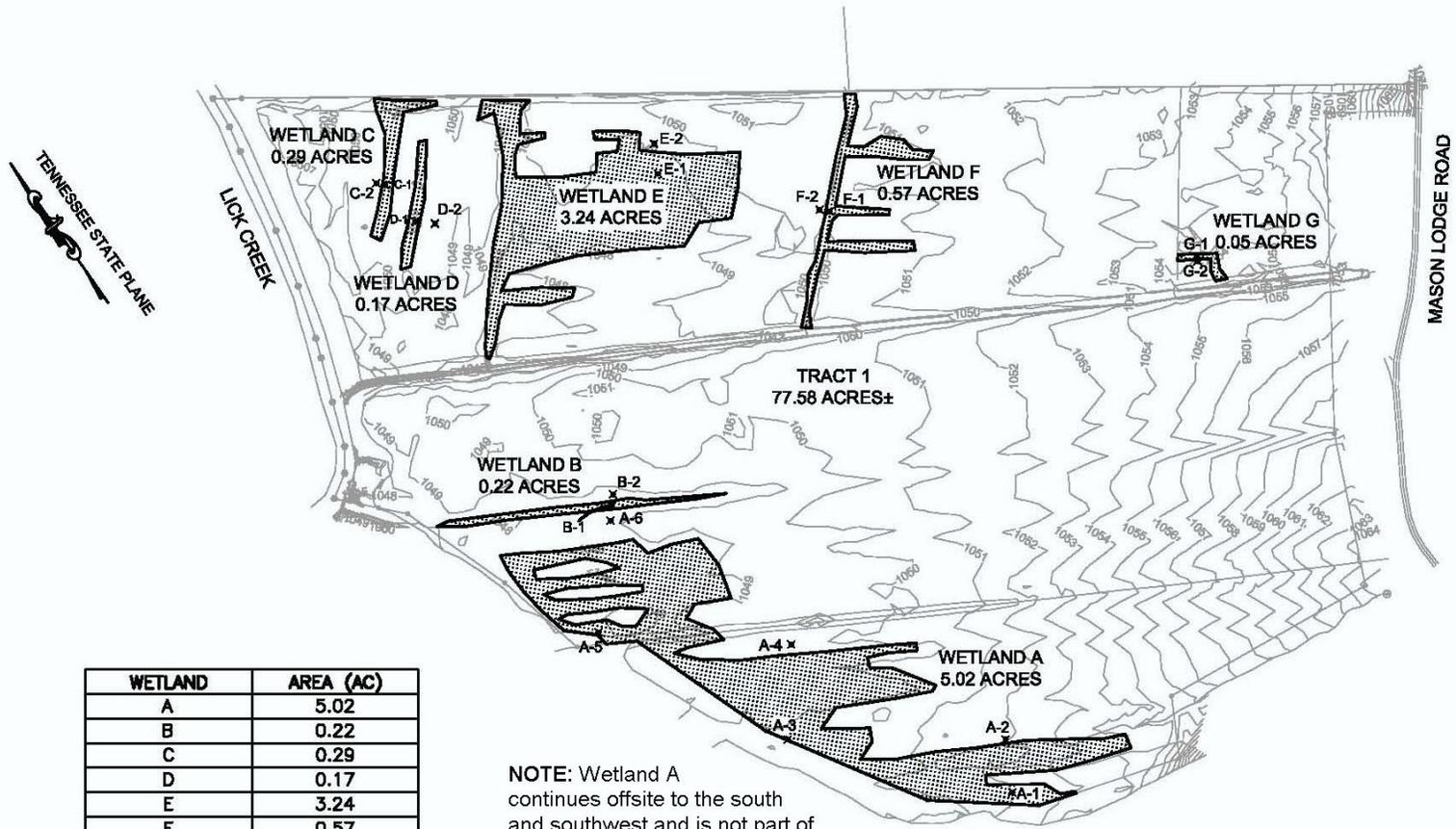


**Figure 1.** Location Map  
DeLorme 3-D TopoQuads™  
Springvale & Mohawk, TN Quads (1983)

SCALE 1 : 50,400

4,200 3,150 2,100 1,050 0 FT. 3,600





WETLAND	AREA (AC)
A	5.02
B	0.22
C	0.29
D	0.17
E	3.24
F	0.57
G	0.05
<b>TOTAL</b>	<b>9.56</b>

NOTE: Wetland A continues offsite to the south and southwest and is not part of the proposed wetland bank.

NOTES:



**Quantum Environmental & Engineering Services, LLC**  
 126 Dante Road  
 Knoxville, TN 37918  
 PHONE (865) 889-1395, FAX (865) 889-8844

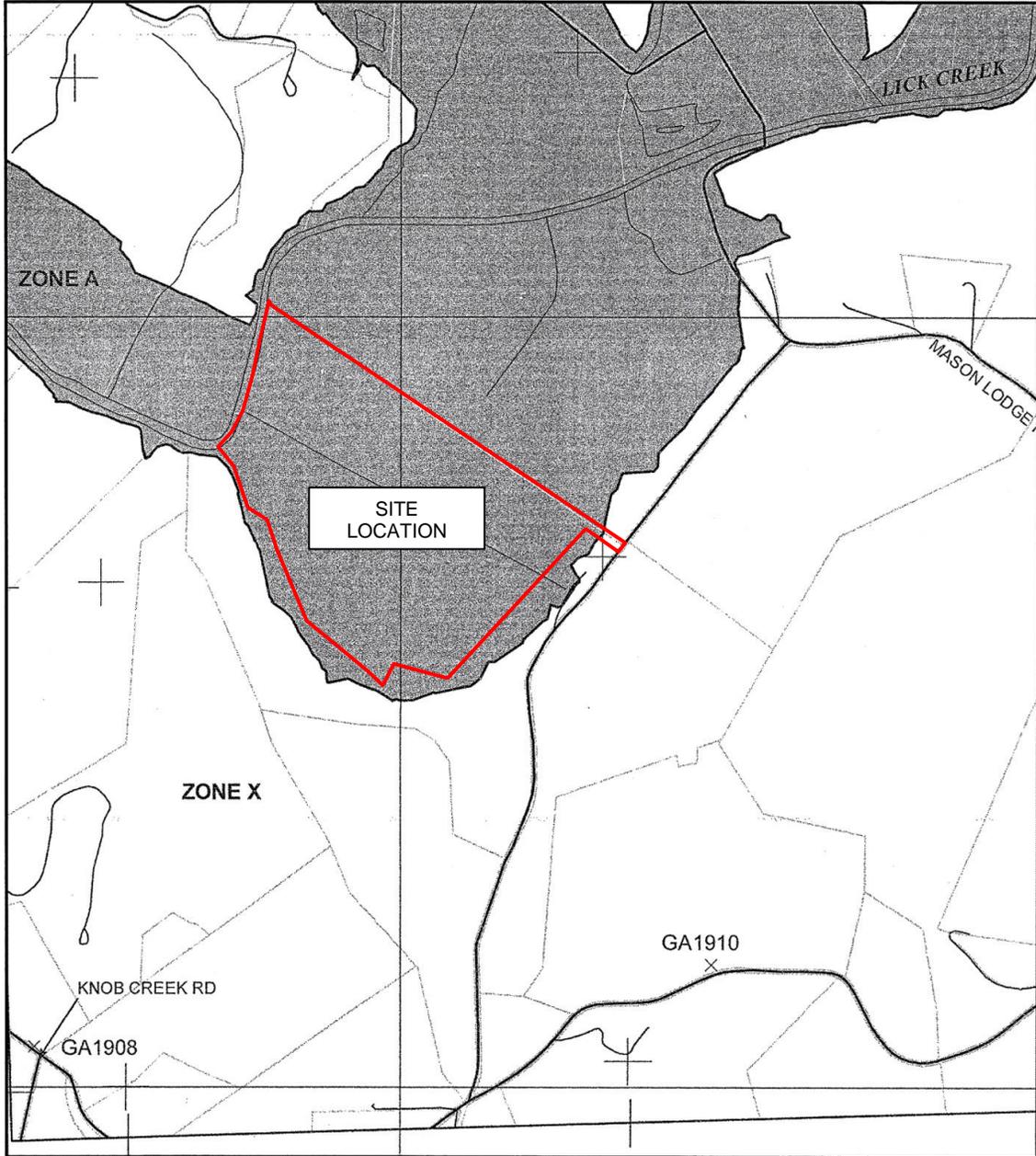
DESIGNED BY:	XXX
CHECKED BY:	XXX
CADQA BY:	XXX
DRAWN BY:	DEH
SCALE:	1"=400'
DATE:	09-26-11
REVISION NO.:	0

Water Resources, LLC  
 Knoxville, Tennessee

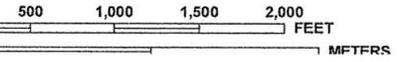
WATER RESOURCES LLC  
 LICK CREEK WETLAND BANK 2  
 GREENE COUNTY, TENNESSEE

**FIGURE- 2 WETLAND MAP**

PROJECT NO.: 500905  
 FILENAME: 500905-AR-1.DWG



MAP SCALE 1" = 1000'



PANEL 0190D

**FIRM**  
**FLOOD INSURANCE RATE MAP**  
**GREENE COUNTY,**  
**TENNESSEE**  
**AND INCORPORATED AREAS**

**PANEL 190 OF 500**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENE COUNTY	470345	0190	D

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



**MAP NUMBER**  
**47059C0190D**

**EFFECTIVE DATE**  
**JULY 3, 2006**

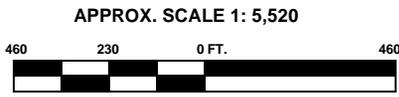
Federal Emergency Management Agency

**Figure 3. FEMA Flood Map**



- |                                                                                     |                                                      |                                                                                     |                                                      |                                                                                       |                                                             |
|-------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------|
|  | = PFO1 Tree Establishment Areas (28.17 acres)        |  | = Future PFO1 Tree Establishment Areas (15.61 acres) |  | = Groundwater Monitoring Well and Photo-Documentation Point |
|  | = PSS1 Scrub/Shrub Establishment Areas (20.51 acres) |  | = PEM1 Emergent Establishment Areas (5.71 acres)     |  | = Surface Water Monitoring and Photo-Documentation Point    |
|                                                                                     |                                                      |                                                                                     |                                                      |  | = Vegetation Sampling Plot                                  |

**Figure 4.** Lick Creek Wetland Mitigation Bank 2  
 Adaptive Management: Vegetation Establishment Zones  
 and Sampling Locations  
 Winter/Fall 2015  
 Google Earth © 2014 Google





**Figure 5.** Lick Creek Wetland Mitigation Bank 2  
Adaptive Management: Berm Breach Locations  
October 2014  
© 2014 Google

APPROX. SCALE 1 : 5,760



**Appendix B**  
**Tables**

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**Table 1.**  
**Trees Planted In Lick Creek Wetland Mitigation Bank 2**

Species	Dates Planted			Totals	Percent
	1/2013	12/2013	2/2015		
<b>Hard Mast Wetland Species</b>					
blackgum	4,650	700	2,350	7,700	19.5
willow oak	4,150	1,700	500	6,350	16.1
Shumard oak	4,150	700	500	5,350	13.5
sweetgum	4,650			4,650	11.8
swamp white oak		1,700	2,350	4,050	10.2
persimmon	1,200	700	1,400	3,300	8.3
swamp chestnut oak	1,200	700	500	2,400	6.1
shellbark hickory	1,200		500	1,700	4.3
sugarberry	1,200		500	1,700	4.3
<b>Approved Soft Mast Wetland Species</b>					
red maple			500	500	1.3
silver maple			500	500	1.3
<b>Transition Zone Species</b>					
white oak	750			750	1.9
black walnut	400			400	1.0
shagbark hickory	150			150	0.4
<b>TOTAL</b>	<b>23,700</b>	<b>6,200</b>	<b>9,600</b>	<b>39,500</b>	<b>100</b>
<b>Other Soft Mast Wetland Species</b>					
sycamore	2,350	700		3,050	<b>N/A</b>

**Table 2.  
Shrubs Planted in Lick Creek Wetland Mitigation Bank 2**

Species	Dates Planted			Totals	Percent
	1/2013	12/2013	2/2015		
elderberry	2,350	400	1,500	4,250	23.3
false indigo bush	2,900	550	750	4,200	23.0
buttonbush	3,450	150		3,600	19.7
silky willow	1,200		1,500	2,700	14.8
stream alder	1,200	150		1,350	7.4
black chokeberry	250		750	1,000	5.5
silky dogwood	0	150	750	900	4.9
winterberry holly	250			250	1.4
<b>TOTAL</b>	<b>11,600</b>	<b>1,400</b>	<b>5,250</b>	<b>18,250</b>	<b>100</b>

**Table 3.  
Lick Creek Wetland Mitigation Bank 2  
History of Surviving Planted and Invasive Woody Vegetation (Stems/Acre)<sup>a</sup>**

	Restoration		Enhancement		Seed Rain	
	Planted	Invasive	Planted	Invasive	Planted	Invasive
Year 1	196	2	290	27	150	42
Year 2	234	9	520	55	184	74

<sup>a</sup> See Tables 1 and 2 for planted woody vegetation.

<b>Table 4.</b>			
<b>Lick Creek Wetland Mitigation Bank 1</b>			
<b>History of Surviving Hard Mast and Approved Soft Mast Tree Densities (Stems/Acre) <sup>a</sup></b>			
	<b>Restoration</b>	<b>Enhancement</b>	<b>Seed Rain</b>
Year 1	136	15	42
Year 2	185	70	48

<b>Table 5.</b>			
<b>Lick Creek Wetland Mitigation Bank 2</b>			
<b>History of Surviving Planted Shrub Densities (Stems/Acre) <sup>b</sup></b>			
	<b>Restoration</b>	<b>Enhancement</b>	<b>Seed Rain</b>
Year 1	4	275	96
Year 2	2	385	136

---

<sup>a</sup> See Table 1 for a listing of hard mast and approved soft mast tree species.

<sup>b</sup> See Table 2 for planted shrub species.

**Table 6.**  
**Lick Creek Wetland Mitigation Bank 2**  
**Planted Woody Stems Surviving in Tree Establishment Areas**  
**June 2014**

<b>Shrubs</b>	<b>Stems/Acre</b>	<b>Percent</b>
silky dogwood	29	26
buttonbush	25	23
false indigobush	21	19
elderberry	20	18
witch-hazel	15	14
stream alder	0	0
black chokeberry	0	0
<b>TOTAL</b>	<b>110</b>	<b>100</b>
<b>Hard Mast Wetland Species</b>		
willow oak	48	26
sweetgum	47	26
Shumard oak	35	19
swamp white oak	34	18
blackgum	12	6
swamp chestnut oak	5	3
persimmon	2	1
sugarberry	2	1
<b>TOTAL</b>	<b>185</b>	<b>100</b>
<b>Transition Zone Species</b>		
shagbark hickory	0	0
<b>TOTAL</b>	<b>0</b>	<b>0</b>
<b>Soft Mast Wetland Species</b>		
sycamore	34	100
<b>TOTAL</b>	<b>34</b>	<b>100</b>

**Table 7.  
Lick Creek Wetland Mitigation Bank 2  
Planted Woody Stems Surviving in Scrub-Shrub Establishment Areas  
June 2014**

<b>Shrubs</b>	<b>Stems/ Acre</b>	<b>Percent</b>
false indigo bush	20	16
buttonbush	18	14
silky dogwood	18	14
winterberry holly	0	0
<b>TOTAL</b>	<b>56</b>	<b>44</b>
<b>Trees</b>		
sugarberry	2	1
persimmon	0	0
shagbark hickory	0	0
blackgum	0	0
willow oak	12	10
sycamore	12	10
sweetgum	10	8
witch-hazel	0	0
Shumard oak	20	16
black walnut	0	0
swamp chestnut	12	10
swamp white	2	1
<b>TOTAL</b>	<b>70</b>	<b>56</b>
<b>GRAND TOTAL</b>	<b>126</b>	<b>100</b>