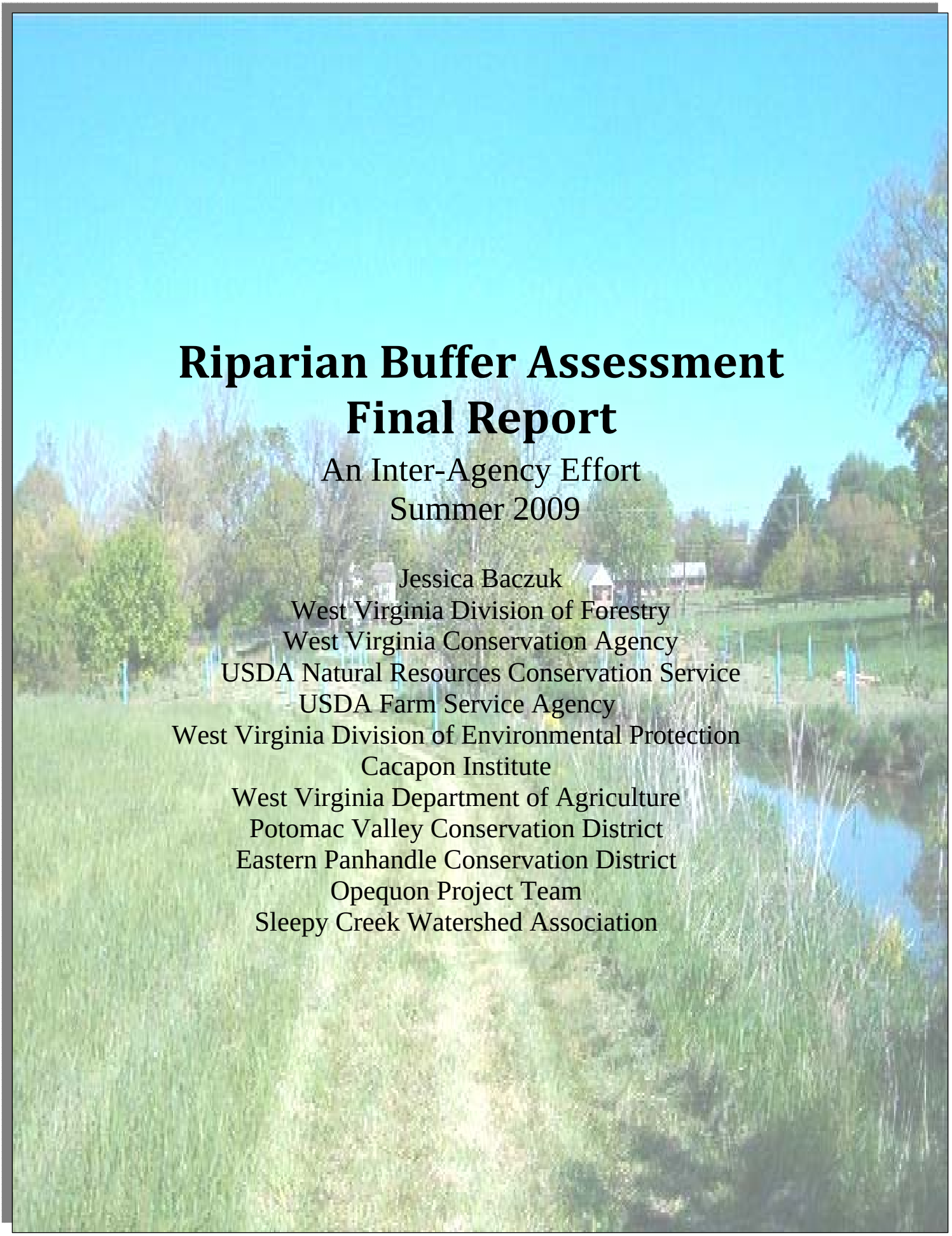

Riparian Buffer Assessment Final Report

An Inter-Agency Effort
Summer 2009

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Abstract

Since 2005, 17 demonstration riparian buffers have been planted in the Eastern Panhandle and Potomac Valley Conservations Districts. During the summer of 2009, an assessment of these buffers was performed by WV Chesapeake Bay summer intern, Jessica Baczuk. All funding for this project was provided by the Chesapeake Bay Program, with the help of the West Virginia Conservation Agency. Due to a lack of initial planting data, only 11 buffers were analyzed statistically for species mortality and survival rates.

Introduction

A working forested riparian buffer is one of the most essential components of a clean and functioning stream ecosystem. Riparian forest buffers provide stream bank stabilization against erosion, and improve fish and wildlife habitat by supplying food, cover, and thermal protection. Additionally, buffers reduce non-point source pollution by filtering out and trapping sediment, and by converting excessive nutrients into biomass. Finally, forested riparian buffers trap chemicals by both sediment filtering and plant up-take. To decrease West Virginia's sediment and nutrient impact on the Chesapeake Bay, forested riparian buffers were planted throughout the Eastern Panhandle and Potomac Valley Conservation Districts. The purpose of this assessment was to evaluate demonstration buffers planted in the last 5 years for survival rate, relative growth of planted trees, protection success, and general functionality of the buffer. Seventeen buffers were studied from June 2009 to August 2009. Data from this study will be used to draw conclusions about the success of current planting practices and will aid partners in designing future plantings. The assessments were completed by the Sleepy Creek Project Intern, with the help of the West Virginia Division of Forestry (WVDOF), the West Virginia Conservation Agency (WVCA), the West Virginia Department of Environmental Protection (WVDEP), West Virginia Department of Agriculture (WVDA), the Cacapon Institute, the Opequon Creek Project Team (OCPT), and the Sleepy Creek Watershed Association (SCWA).

Assessment Methods

On every site, the UTM coordinates were recorded as well as notes regarding the soils present and observations about the general appearance of the riparian buffer. Other notes, if available, were noted including landowner comments, shelter height used, site recommendations, etc. For several sites, the original planting plan was available before the assessment. On these sites, the plan was used to determine the original species count and spacing. Survival rates were computed using the original planting values. Where the

original plan was not available, ocular estimation of the spacing was used and the ratio of live to dead trees/shrubs was used to determine survival rates.

Following documentation of the above items and review of the planting plan, when available, the evaluation team walked the entire site in a systematic pattern looking for originally planted tree/shrub sites. The plant spacing was used to approximate the location of dead trees/shrubs where their shelters were no longer visible. Each tree or shrub, both dead and alive, was tallied by species. If the tree/shrub was dead or was alive but had apparent damage, the cause, if determinable, was also tallied (i.e. deer browse, insect damage, rodent damage, poor planting technique, competition, etc.) Any trees/tubes missing or not found, were tallied as dead. To measure the relative growth of living trees/shrubs, height above the top of the shelter was also tallied in inches.

Survival and mortality rates were calculated for each site as a percentage. Distribution of damage/death by cause was also calculated in percentages. These data and the sites' species composition were arranged in graphs and data tables. Because of data collection difficulty, relative growth was not captured in the final data. Discussion of this difficulty can be found in the summary.

Site Overviews

Below is a summary of the individual sites. They are listed in chronological order from oldest to most recent planting dates.

Meza

County- Hampshire
Latitude/Longitude- 39.17626°N/-78.51866°W
HUC 12 Watershed- Mill Branch Cacapon River
Stream- Cacapon River
Land use- Demonstration Site
Planting Date- Spring 2005
Planted By- Consultant
Planting Size- 35ft wide (320 trees and shrubs)
Supplier- Unknown
Funded By/Responsible Party- WVCA &WVDEP & Cacapon Institute
Tree Protection/Weed Control- 2ft &4ft plastic breakaway tubes & double strand electric fencing on half/matting

The Meza site near Yellow Spring is a documented riparian study and demonstration area done through the Cacapon Institute (CI). This ongoing project attempts to evaluate the effects of temporary electric fencing on tree and shrub

establishment, health, and vigor. The fencing involved the installation of a double or triple perimeter of single strand electric fence 24" to 30" above the ground. (See http://www.cacaponinstitute.org/WVPTS/deerfence.htm#The_following_graph for more information)

Both the control plots and experimental plots were evaluated for this project. While the site is currently being observed for the Cacapon Institute's research, the riparian assessment performed for this paper did not specifically take into account the effect of the fence. It should be noted however, when the site was evaluated in August 2007 as part of the CI study, browse damage was found due to herbaceous vegetation shorting the electric charger. Since then, the fence has been shown to successfully reduce the frequency and intensity of deer browse in the test plots when the correct voltage is being used.

Initially, 320 trees and shrubs were planted. When assessed on June 30, 2009, 171 trees and shrubs were recorded (53.5% survival). Carla Hardy (WVCA), Neil Gilles (CI), and others from the WVDOF helped Jessica with this site's assessment (Figures 13 & 14).

Roach

County- Berkeley
Latitude/Longitude- 39.450227°N/
-78.000251°W
HUC 12 Watershed- Tuscarora Creek
Stream- Tuscarora Creek
Land use- Demonstration Site
Planting Date- April 2006
Planted By- Volunteers and Opequon Creek Project Team (OCPT)
Planting Size- 35ft wide
(415 trees and shrubs)
Supplier- Unknown
Funded By/Responsible Party- WV CBPO State Implementation Grant/WV CB Implementation Committee
Tree Protection/Weed Control- 4ft Blue-X tubes/Mulch

This planting was one of the first riparian plantings to be done by the OCPT. Trees were protected using 4-foot blue-X tubes. Combined, 415 trees and shrubs were planted initially. On August 13, 2009, only 80 trees and shrubs (29% survival) were recorded (Figure 17&18). Pines and oaks had survival rates of 18% and 9%, respectively, while tulip-poplar had only 8% survive. Conversely, sweet gum and silky dogwood each had greater than 40% survive which helped to raise the average survival rate of the site.

The main cause of mortality was species herbaceous competition and shading, since most trees and shrubs were surrounded by 6ft high weeds. Part of this site was also overwhelmed by Tree of Heaven (*Ailanthus altissima*), as it was not eradicated prior to planting.

Wardensville

County- Hardy
Latitude/Longitude- 39.100054°N/ -78.566891°W
HUC 12 Watershed- Sperry Run North River
Stream- Waites Run
Land use- Demonstration Site/Pasture
Planting Date- Spring 2006
Planted By- Private Contractor
Planting Size- 1250ft long (both sides)/35ft wide (752 trees and shrubs)
Supplier- Contracted
Funded By/Responsible Party- USDA CREP/ WVDOF
Tree Protection/Weed Control- 2ft &4ft green breakaway/ Matting/ Bird Netting

At the Wardensville site a total of 752 trees and shrubs were originally planted. On June 5, 2009, 278 trees and shrubs (47% survival) were recorded with the help of Jim Bowen (WVDOF), Carla Hardy (WVCA), Neil Gilles (Cacapon Institute) and other members of the WVDOF (Figure 23&24). Evergreens experienced the highest mortality (6% survival). The most likely cause was herbaceous competition and shading. It was also speculated that the visapore matting contributed to higher temperatures consequently killing the seedlings. However, if the outlying data from the pines is removed, the average survival rate jumps to 60% for the remaining species. Of those, hawthorn and black willow did the best, perhaps because their individual silvicultural characteristics make them better adapted to the site. Finally, some volunteer sycamores were found whose numbers, when added to those of the surviving planted individuals, helped to balance the mortality.

The mortality which did occur on the other species may be accounted for by groundhog damage in some areas and herbicide spraying along the road. Additionally, many of the wooden stakes which support the tree shelters were rotted. When these fail and the shelters fall, the rate of morality increases greatly.

Jacko

County- Berkeley
Latitude/Longitude- 39.49916°N/-77.90025°W
HUC 12 Watershed- Hoke Run Opequon Creek
Stream- Opequon Creek
Land use- Hay Field
Planting Date- April/May 2007
Planted By- Volunteers & OCPT
Planting Size- 400ft long (right side)/60ft wide (140 trees and shrubs)
Supplier- Unknown
Funded By/Responsible Party- WVSP/OCPT
Tree Protection/Weed Control- 4ft red tubes on hardwood trees/Mulch

At the site, 140 bare root trees and shrubs were initially planted. Holes were pre-augured, and trees were mulched and watered. Four foot brown tubes were installed on all except for the white pine. According to the landowner, 20% mortality occurred in the first year due to dry conditions. Subsequent floods destroyed some of the tubes which led to deer damage and increased mortality. The landowner speculated that other mortality was caused by poor planting technique including potential root desiccation. Only 90 trees (64% survival) were recorded on June 16, 2009 during this assessment (Figure 11&12). By landowner accounts, deer browse seemed the predominant cause of mortality for the white pine. Deer browse was heavy on the sheltered trees as well. Only a few trees had growth above the top of the 4 foot tube. Additionally, many of the oaks, while alive, were showing signs of a chlorophyll deficiency. The netting on the tops of the tubes was deteriorating.

Dawson

County- Morgan
Latitude/Longitude- 39.483443°N/-78.266828°W
HUC 12 Watershed- Upper Sleepy Creek
Stream- Sleepy Creek
Land use- Hay field
Planting Date- May 2007
Planted By- Volunteers & SCWA
Planting Size- 400ft long (left side)/35ft wide (113 trees and shrubs)
Plant Supplier- Clear Ridge Nursery, INC (Union Bridge, MD)
Funded By/Responsible Party- WV Stream Partners/SCWA
Protection/Weed Control- 4ft Blue-X on trees only/Mulch and biodegradable mats

Of the 113 trees and shrubs planted, 85 (75% survival) trees and shrubs were recorded on July 13, 2009 (Figure 7&8). The species that had no mortality were sweet gum, redbud, alder, and red maple. Black willow had 84% survival, as well. Four foot blue-X tubes were used for protection on the trees only. All seedlings were purchased in containers and holes were pre-augured before planting. Thirty-two percent of the species planted were browsed by deer, and many of the trees had insect damage from Japanese beetles.

Staubert

County- Morgan
Latitude/Longitude- 39.57882°N/-78.19521°W
HUC 12 Watershed- Middle Sleepy Creek
Stream- Sleepy Creek
Land use- Woods
Planting Date- May 2007
Planted By- Volunteer
Planting Size- 35ft wide (45 trees and shrubs)
Supplier- Clear Ridge Nursery, INC (Union Bridge, MD)
Funded By/Responsible Party- WVCA &SCWA
Tree Protection/Weed Control- Cages (originally used, but missing during assessment)/mulch

Forty-five trees and shrubs were planted by hand at the Staubert site. Although the trees/shrubs were originally protected by cages and/tubes, these protection devises were not present during the assessment on July 13, 2009 (Figure 19&20). Twenty-two trees and shrubs were reported (51% mortality), and they were shaded by established trees. Many planted trees could not be found but may have blended in with the landscape. The site was quite shady and it is possible that some of the mortality was due to lack of sunlight and flooding. None of the oaks survived or could be found and, unlike the previous assessments, black willow did not do well here. There were many volunteer plants that had sprouted, however.

Morgan's Grove Park

County- Jefferson
Latitude/Longitude- 39.416739°N/-77.816731°W
HUC 12 Watershed- Rattlesnake Run Potomac River
Stream- Town Run
Land use- Park
Planting Date- March 2008
Planted By- Volunteers

Planting Size- 800ft long (both sides)/35ft wide
(658 trees and shrubs)
Supplier- Clear Ridge Nursery, INC (Union Bridge, MD)
Funded By/Responsible Party- WV CBPO State Implementation Grant/WVCA
Protection/Weed Control- 4ft Blue-X tubes on trees only/Mulch

This planting consisted of container tree/shrub seedlings planted in pre-augured holes. Deer presence was reported as light so no protection was used for shrubs. The main perceived danger at the time of planting was from mowing and the public. The planting experienced 1 ½ growing seasons before this assessment. Out of the 658 trees and shrubs, 335 were reported (51% survival) on July 10, 2009 (Figure 15&16). Six percent of the trees and shrubs died due to herbaceous competition from grasses and weeds. In particular, the elderberry and serviceberry exhibited the lowest survival among the shrubs and the silver maple only had 28% survival. The oaks fared the best on this planting. All of the hazelnuts survived probably due to 3 gallon containers. Despite a low survival % overall, this planting looked good due to the growth of the plants that survived.

Webber

County- Berkeley
Latitude/Longitude- 39.36667°N/-78.10072°W
HUC 12 Watershed- Mill Creek
Stream- Mill Creek
Land use- Residential
Planting Date- April 2008
Planted By- Volunteers &OCPT
Planting Size- 270ft long (left side)/35ft wide (144 trees and shrubs)
Supplier- EPCD Tree Sale & Clear Ridge Nursery, INC (Union Bridge, MD)
Funded By/Responsible Party- WVSP/OCPT
Tree Protection/Weed Control- 4ft Blue-X tubes/Mulch

The Webber site was a rare residential planting on part lawn and part horse pasture although the plants were excluded from livestock by fencing. The planting of 144 trees, protected by blue-X tubes, and shrubs, had a 44% survival rate recorded on June 25, 2009 (Figure 25&26). Seventeen percent of the planting was deer browsed, and some of the trees and shrubs could not be found along the bank next to the horse fencing. It is possible that some of these were unfound due to thick vegetation. The trees/shrubs placed in the lawn area were doing well. They did not appear to have been browsed by deer and were able to grow well above the height of the shelter. Sycamore, swamp white oak, and silver maple all had 100 % survival. There was an abundance of dogwood and elderberry along the creek. Some of the blue tubes were missing due to high water.

Vila

County- Jefferson
Latitude/Longitude- 39.26546°N/-78.03095°W
HUC 12 Watershed- Turkey Run Opequon Creek
Stream- Opequon Creek
Land use- Hay Field
Planting Date- April 2008
Planted By- Volunteers & OCPT
Planting Size- 1300ft long (right side)/35ft wide (394 trees and shrubs)
Supplier- Clear Ridge Nursery, INC (Union Bridge, MD)
Funded By/Responsible Party- WV CBPO State Implementation Grant/OCPT
Tree Protection/Weed Control- 4ft Blue-X tubes/Mulch

Originally, 394 trees and shrubs were planted. Following planting, the site was reported to have flooded at least twice in the first month. Many blue-X tubes on the lower end on the creek were lost or had bent metal stakes. A total of 186 trees and shrubs (47% survival) were recorded on July 14, 2009 (Figure 21&22). Forty-four percent of the trees had been browsed by deer, but this did not seem to have drastic adverse effects of survival (avg. 74%). Swamp white oak and red oak had a very high survival (92% and 100%, respectively). Although red maple showed 100% survival, it is possible that some of these were actually misidentified silver maple. Most of the shrubs were not found due to brushy overgrowth. This accounted for a shrub survival rate of only 5%. It was difficult to access deer browse on the shrubs.

Buckles

County- Jefferson
Latitude/Longitude- 39.350494°N/-77.850323°W
HUC 12 Subwatershed- Elks Run
Stream- Elks Run
Land use- Pasture
Planting Date- May 2008
Planted By- Local volunteers and Chesapeake Bay Foundation (CBF)
Planting Size- 6000ft long (both sides)/35ft wide (860 trees and shrubs)
Plant Supplier- Clear Ridge Nursery, INC (Union Bridge, MD) and CBF farm
Funded By/Responsible Party- United States Department of Agriculture (USDA) Conservation Reserve Enhancement Program (CREP)/CBF
Tree Protection/Weed Control- 3 Strand Electric Fencing protection from cattle/Mulch. (No deer/rodent protection installed)

This planting was done with larger container stock, making it impractical to install tubes or cages. The holes were pre-augured and the planting was done by experienced volunteers from the CBF. Out of the 909 trees and shrubs initially planted, 828 were recorded (91% survival) on June 15, 2009 (Figure 3&4). The assessment was completed 1 ½ growing seasons after the planting. Small rodent damage, either by bark girdling (voles) or root damage, was one of the two predominant causes for mortality (7%). The second cause was natural (5%) probably due to some water stress amid heavy grass competition.

There was certainly deer present in the planting area. Deer rubbing damage was high on the white pine, although most survived. Other rubbing damage occurred on the red maple and tulip poplar. Browse damage was light. Shrub survivability overall was high. Sycamore and swamp white oak survival was strong again and red maple, although showing deer rubbing damage, survived at 100%.

Foulds/Dawson

County- Morgan
Latitude/Longitude- 39.483468°N/-78.26683°W
HUC 12 Watershed- Upper Sleepy Creek
Stream- Sleepy Creek
Land use- Hay field
Planting Date- October 2008
Planted By- Volunteers & SCWA
Planting Size- 256ft long (left side)/35ft wide (140 trees and shrubs)
Supplier- Clear Ridge Nursery, INC (Union Bridge, MD)
Funded By/Responsible Party- WVSP/SCWA
Tree Protection/Weed Control- 4ft Blue-X, /Mulch

The Foulds/Dawson site was planted by experienced volunteers. The holes were pre- augured and container seedlings were used. This planting was one of the more recent ones and had a 99% survival rate at the time of our assessment. 140 trees and shrubs were planted, and 138 were recorded in outstanding condition on July 13, 2009 (Figure 9&10). Japanese beetle (*Popillia japonica*) damage to all of the Sycamore trees, similar to what was found at the nearby Dawson site was a major source of damage. Also noted was some deer browse, but on only selected species of trees

Conley

County- Berkeley
Latitude/Longitude- 39.35313°N/-78.10969°W
HUC 12 Subwatershed- Mill Creek
Stream- Mill Creek
Land use- Residential
Planting Date- October 2008
Planted By- Volunteers & OCPT
Planting Size- 388ft long (right side)/35ft wide
(166 trees and shrubs)
Plant Supplier- Unknown
Funded By/Responsible Party- The Freeman Foundation
Protection/Weed Control- 4ft Blue-X tubes on trees only/Mulch

At the Conley site, 166 trees and shrubs were planted. During the assessment on June 25, 2009, 146 trees and shrubs were recorded, a survival rate of 88% (Figure 5&6). Tulip poplar had the lowest survival rate (60%) of the tree species, while, among the shrubs, Red osier dogwood was the lowest (73%). Insect (5%) and deer browse (4%) were the two main causes of damage on site. Oak trees were most damaged by the deer. Also many of the metal stakes were bent from high water, which probably contributed to the mortality rates observed.

Fritts and Vickers Farms

These two CREP plantings in Jefferson County were assessed; however initial planting data was not available. The Fritts planting was done in fall of 2005 at the headwaters of Cattail Run. This was a project coordinated by the Chesapeake Bay Foundation, and planted with volunteers. This was a container planting in augered holes. Overall survival was low but many volunteer plants have become established. Some of the successful species recorded were green ash, silver maple and dogwood sp. Some of these survivors were 8-10 feet tall. The farm itself is now managed by an absentee landowner who is doing no maintenance on the buffer. The east side of the planting had

cattle damage. There were a lot of missing green tubes and many of the oak stakes were broken. There was heavy competition from herbaceous vegetation.

The Vickers planting was done in Spring 08 on Rocky Marsh Run at the headwaters near the spring on Locust Grove Farm. This planting was done by a contractor that planted bare root stock and used two and four foot tubes and black matting. 440 planting sites were found and survival was moderate. Cattle damage was noted here as well, as part of the fence was constructed after the planting. Very few of the one-year white pine survived. Not enough data was provided to accurately assess this planting.

Summary

There are several items to focus on which will be covered in the following paragraphs. In trying to let the figures speak for themselves, it is difficult not to bring some subjectivity into the discussion. It is also not possible to bring other environmental/physical factors into some of the results, such as the drought in the summer of 2007 that may have affected the Jacko planting or that ½ of the Meza site was not protected by the electric fence which doomed it to failure. Each individual site should continue to attempt to establish a functioning buffer of native plants by using lessons learned from this study.

We now turn our attention to the Total's Worksheet that lists all the names of the buffers on one sheet with its companion bar graph (Figure 1), and the Species Totals Worksheet with its bar graph (Figure 2) The first focus of the Totals Worksheet is the survival percent. The four highest survival totals were planted on farms by volunteers planting container plants in augered holes. There were four bare root plantings of which two of these had the lowest survival. (Roach and Wardensville) The other two bare root plantings can possibly attribute their success to augering, (Jacko) and electric fence. (Meza) Collectively, the survival on all the container plantings was 74%, while the survival of the bare root plantings was 38%. A point to note was the overall survival of 61% of the West Virginia buffer plantings on this assessment.

The single greatest challenge to every riparian planting in West Virginia is deer browse/rub. Every planting took this into account by a variety of means. No one of these means was totally effective. Even the electric fence had failure but this method could prove to be the best protection in the future. Four foot Blue-X tubes continue to be the choice on many plantings mainly because the supplier offers the desired native plants in containers. These tubes did not appear to stand up to floods, often with the metal stakes easily bent or the tubes washing downstream. The 5-foot green tubes withstand high water better but they were used only on the Fritts planting. Although no initial planting data was available, many of these tubes were laying on the ground due to the stakes rotting.

Deer damage from the Total's Worksheet showed a wide range of percentages from zero at Morgan Grove Park and Foulds/Dawson, to 32% on the adjoining Dawson farm and 44% at the Vila farm. Most deer browse resulted in stunted growth. Overall mortality from deer was light and appeared to be from the violent rubbing process. The Wardensville planting did have some cages installed which were 7 feet in diameter but no specific survival percentages were noted.

Clearly the highest cause of mortality was "natural" at 14% overall. These causes result from flooding, drought, or poor soils. Also if the tree was dead inside the tube it was recorded as "natural". (It was difficult to determine poor planting techniques.) Natural causes are usually issues that cannot be controlled. No statistics were taken as to the effectiveness of different colored tubes. Two-foot tubes were used to deter small rodent damage and were not a deer solution.

Another cause of mortality was competition from other vegetation. During the assessment this was sometimes a judgment call. Competition is a factor that can be controlled by mowing, weed whacking, or herbicides. We found that these practices were seldom done by any landowner. (Only Webber and Jacko engaged in some weed control.) Practices to control weeds should be encouraged twice each summer during the first few critical years. None of the sites reported using herbicides before or after the planting.

Of all the plantings, only the Buckles site did not have any animal protection besides the cattle fence. It was thought that planting bigger stock would be attempted, and that the deer would not be a major problem as the buffer is between two pastures. The site was also not mowed before the planting which may have contributed to the highest rodent/vole damage of all the sites. Two-foot tubes would have helped on this planting. This site, although planted recently, had on immediate impact on stream aesthetics.

The "Species Total" worksheet and bar graph on Figure 2 shows the species with blue bar indicating survival. The most successful tree species (>85%) are not surprising as they are well adapted to riparian areas. Most of the oaks did well but the success of swamp white oak cannot be overlooked. White and chestnut oak do not do as well in wet areas. Red maple also survived well on these plantings right alongside sycamore. Other trees species were hovering between 30-50% survival. Silver maple, a wet area natural, failed miserably at 14%.

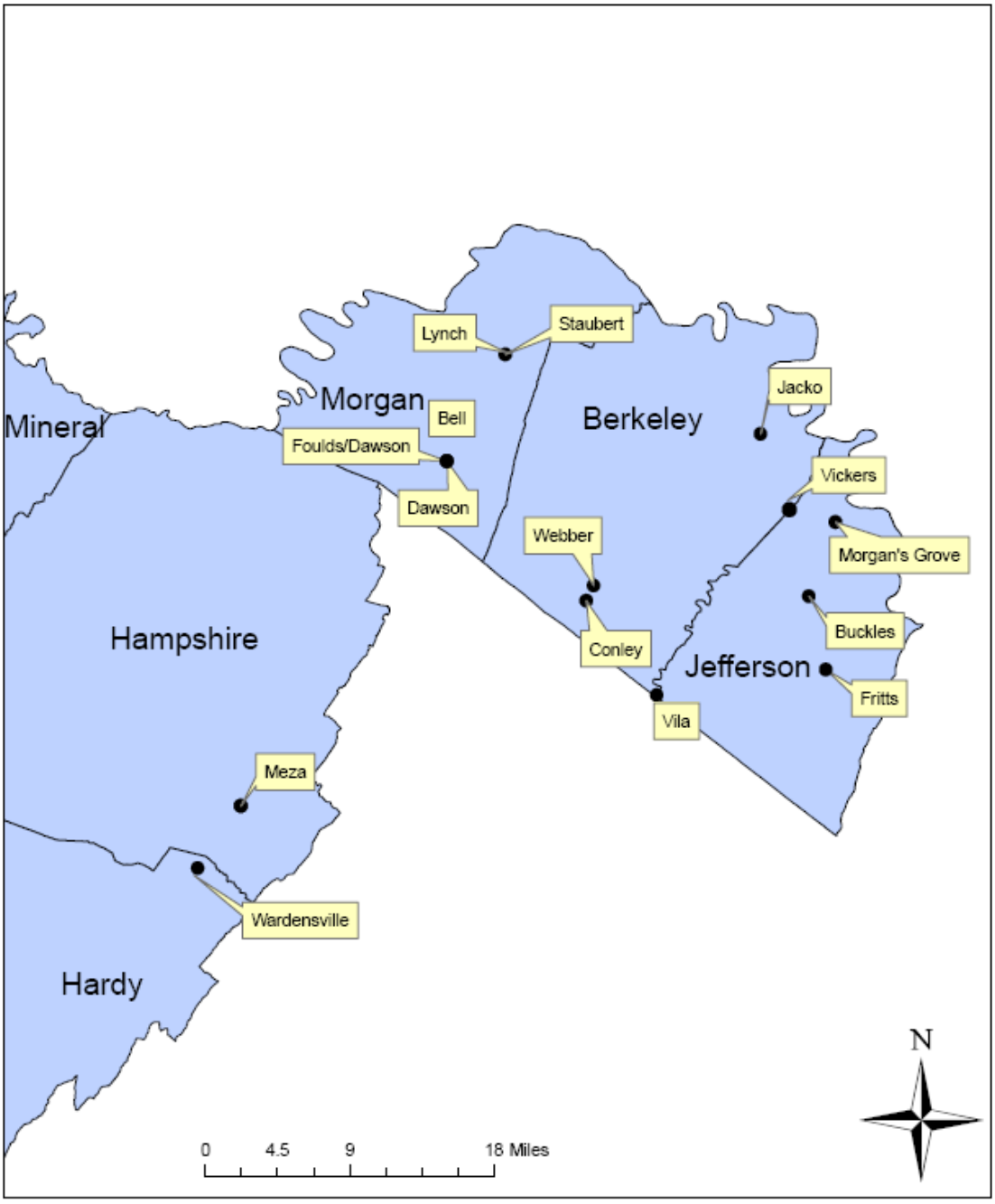
The evergreens were even worse. Planting spruces and firs in these riparian areas should be avoided due to these paltry numbers. White pine is best suited for wet areas and clearly showed the best evergreen survival at 47%. Unless caged, even these are damaged heavily by deer.

As for the shrubs, winterberry proved the most equipped for these plantings surviving at 88%. The gray dogwood and highbush blueberry lumped together from the Buckles planting survived at 87% combined. Other dogwoods did not fare so well. Another high survivor shrub that has become a hard mast addition to riparian plantings is hazelnut at 68%. Viburnum survived at 62%. Elderberry, a popular shrub has very poor numbers. Serviceberry did not do well on many plantings. The chokeberries also did not perform well. These high failures on shrubs may be due to the fact that no deer protection is being offered to them.

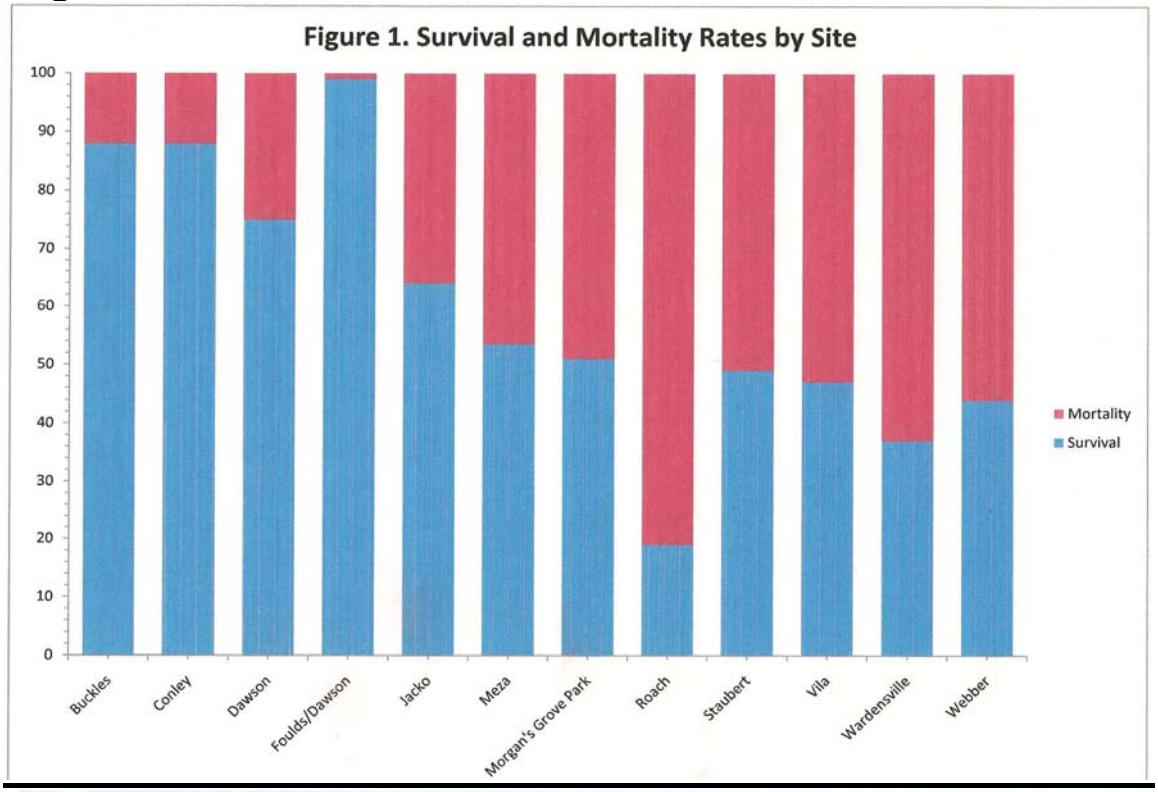
The time of year really adversely affected the effectiveness of this study. The presence of tall herbaceous vegetation made locating the existing trees/shrubs, regardless of vitality, especially difficult. As a result, the survival rates reported, though they may represent survival trends, probably do not capture the actual numbers present on the ground. A better time of year to repeat this study, understanding that it was limited by the internship program, is early spring right after bud-break. During this time of year, it is easy to identify which trees are still alive, and the herbaceous vegetation has not yet had time to grow above the heights of the tree/shrub shelters. Thus, the researcher will have an easier time identifying the location of the plants.

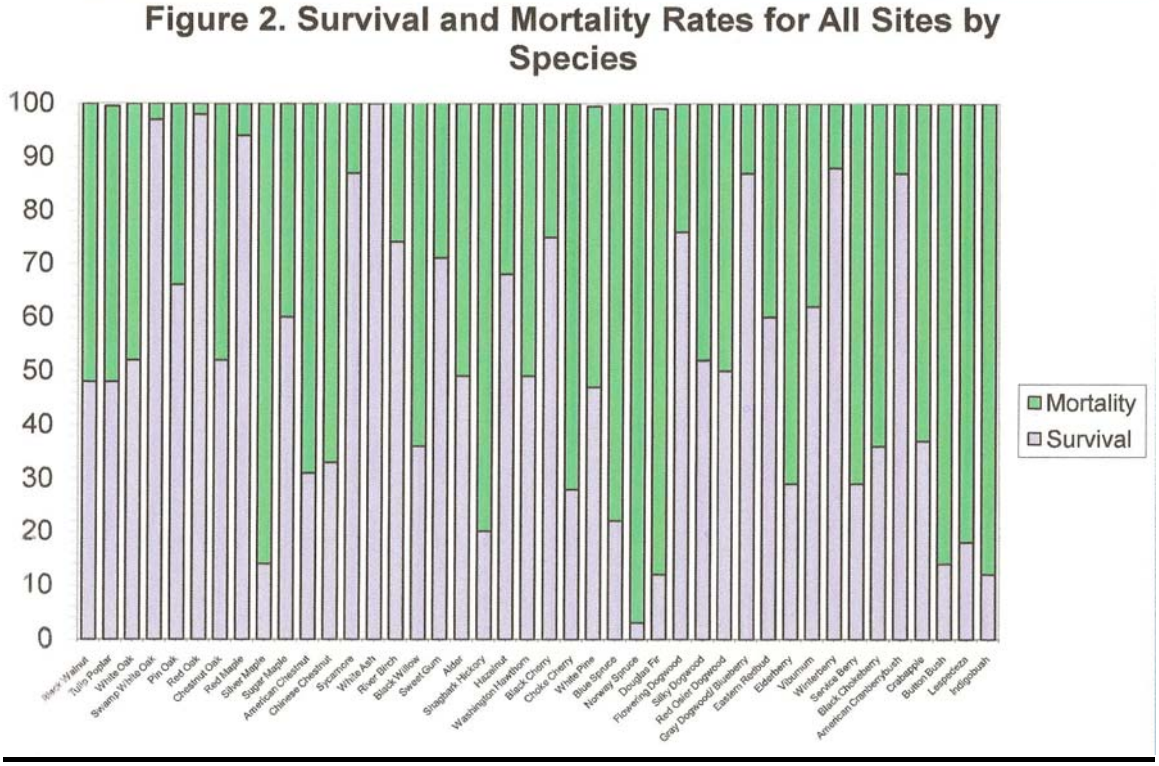
Relative growth was another part of the initial data collection which should be changed in a repeated study. The problem with using the heights above the tubes as a measure of growth is, unless you also measure the distance below the tube height for smaller seedlings, the average growth value assumes that all the trees were at or above the top of the shelter. This gives an inflated snapshot of the amount of growth which is actually present and is why this data was not included in the final presentation. Therefore, it is recommended that both heights above the top of the shelter (taken in positive inches) and the heights below the shelter (recorded as negative inches) be measured. Should this study be repeated over time, the average height will continue to get bigger as those trees below the shelter grow up towards it, thus giving a smaller negative measurement.

Riparian Buffer Assessment Locations



Figures and Charts Follow





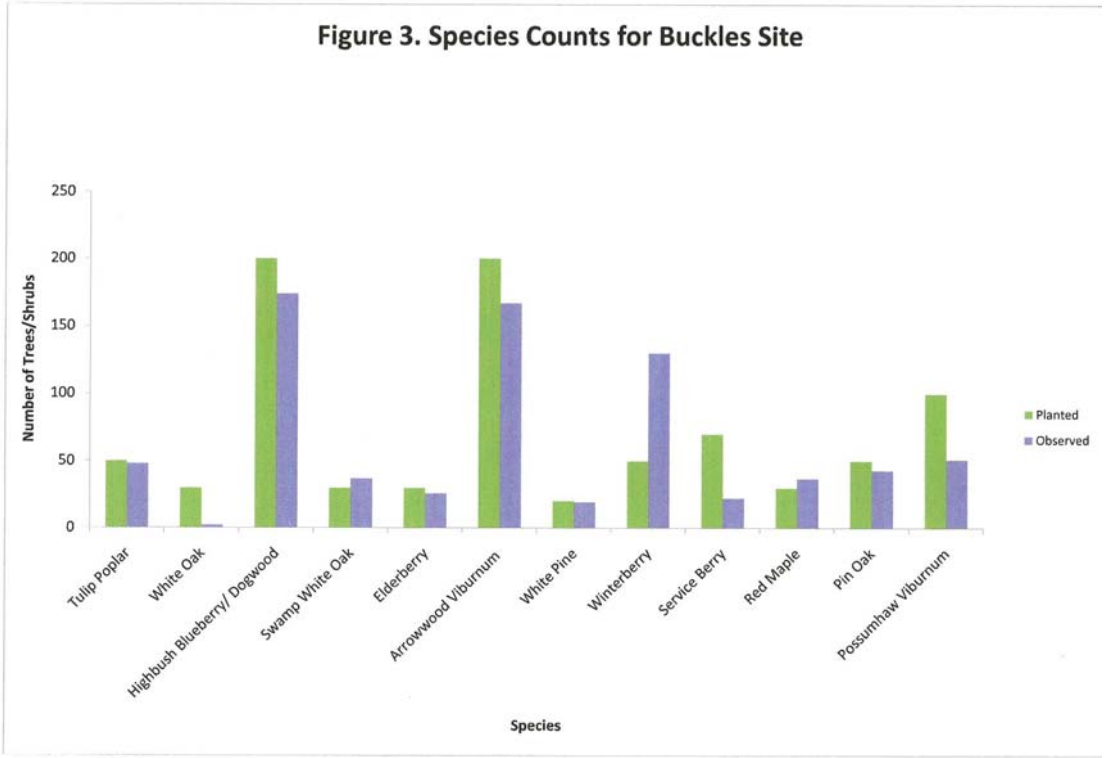


Figure 3. Species Counts for Buckles Site
Number of Trees/Shrubs
250
200
150
100
50
0
Tulip Poplar
White Oak
Highbush Blueberry/ Dogwood
Swamp White Oak
Elderberry
Arrowwood Viburnum
White Pine
Winterberry
Service Berry
Red Maple
Pin Oak
Possumhaw Viburnum
Species
Planted
Observed

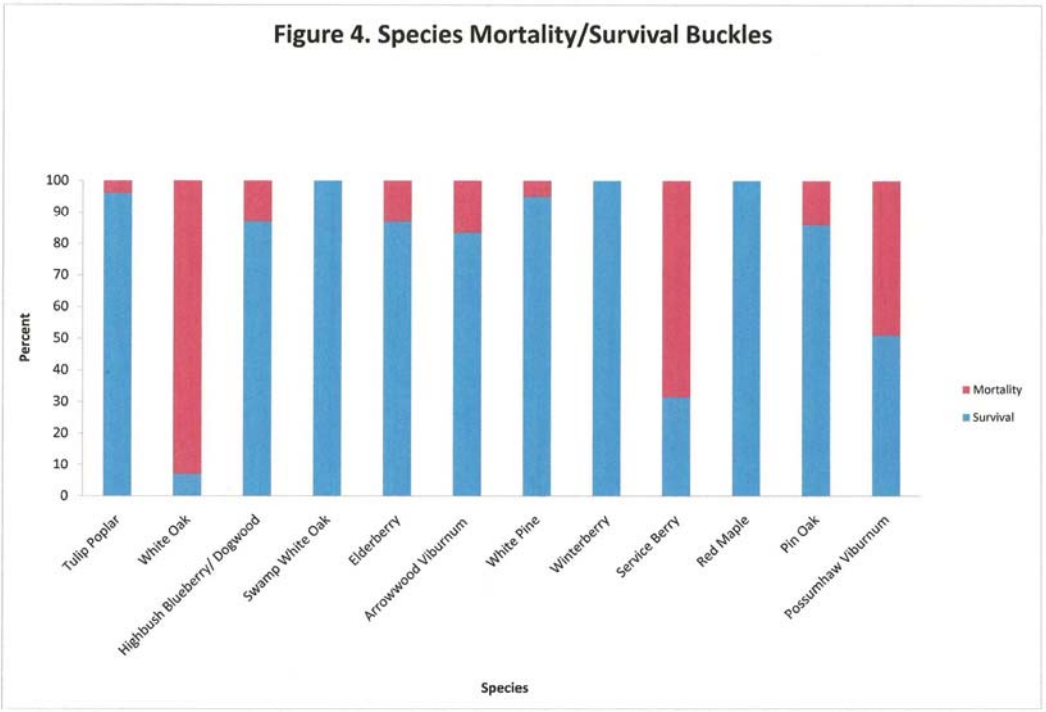


Figure 4. Species Mortality/Survival Buckles
Percent
100
90
80
70
60
50
40
30
20
10
0
Tulip Poplar
White Oak
Highbush Blueberry/ Dogwood
Swamp White Oak
Elderberry
Arrowwood Viburnum
White Pine
Winterberry
Service Berry
Red Maple
Pin Oak
Possumhaw Viburnum
Species
Mortality
Survival

Jessica Baczuk

SPECIES SURVIVAL WORKSHEET

Buffer Name: Buckles

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage
							Small rodent	Vole	Insect	Competition	Human	Natural*	
Black Walnut		11	-	-	-	-	-	-	-	-	-	8	-
Tulip Poplar	50	48	-	-	96	4	10	3	-	-	4	5	3%
White Oak	30	2	-	6	7	93	-	-	-	-	-	-	-
Highbush Blueberry/ Dogw	200	174	-	-	87	**13**	3	9	-	-	2	9	-
Swamp White Oak	30	37	-	-	100	**0**	1	-	-	-	-	-	-
Sycamore		30	-	2.7	-	-	1	2	-	-	-	-	3%
Elderberry	30	26	-	-	87	13	-	-	-	-	-	-	-
Arrowwood Viburnum	200	167	-	-	83.5	16.5	-	-	-	-	-	1	-
Unknown #1		31	-	-	-	-	2	-	-	-	-	2	-
White Pine	20	19	-	-	95	5	-	-	-	-	-	7	15%
Winterberry	50	130	-	-	100	0	5	2	-	-	1	3	-
Willow		1	-	-	-	-	-	-	-	-	-	-	-
Service Berry	70	22	-	-	31.5	68.5	-	-	-	-	-	-	-
Red Maple	30	37	-	-	100	**0**	11	-	-	-	-	1	13%
Pin Oak	50	43	-	-	86	**14**	3	-	-	-	-	1	2%
Possumhaw Viburnum	100	51	-	-	51	49	2	-	-	-	-	1	-
Unknown Dead	-	16	-	-	-	100	7	-	-	-	-	5	25%
Totals	**860**	**756**	**-**	**0.5**	**88**	**12**	**45**	**16**	**-**	**-**	**7**	**43**	**2%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Mountain Laurel or fedderbush??

Figure 5. Species Counts for Conley Site

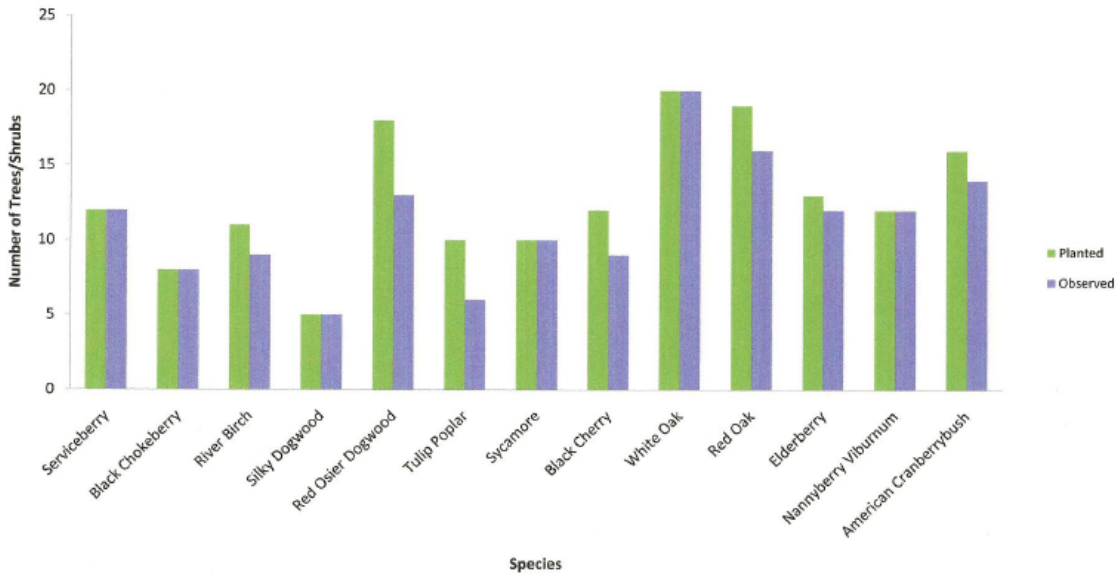
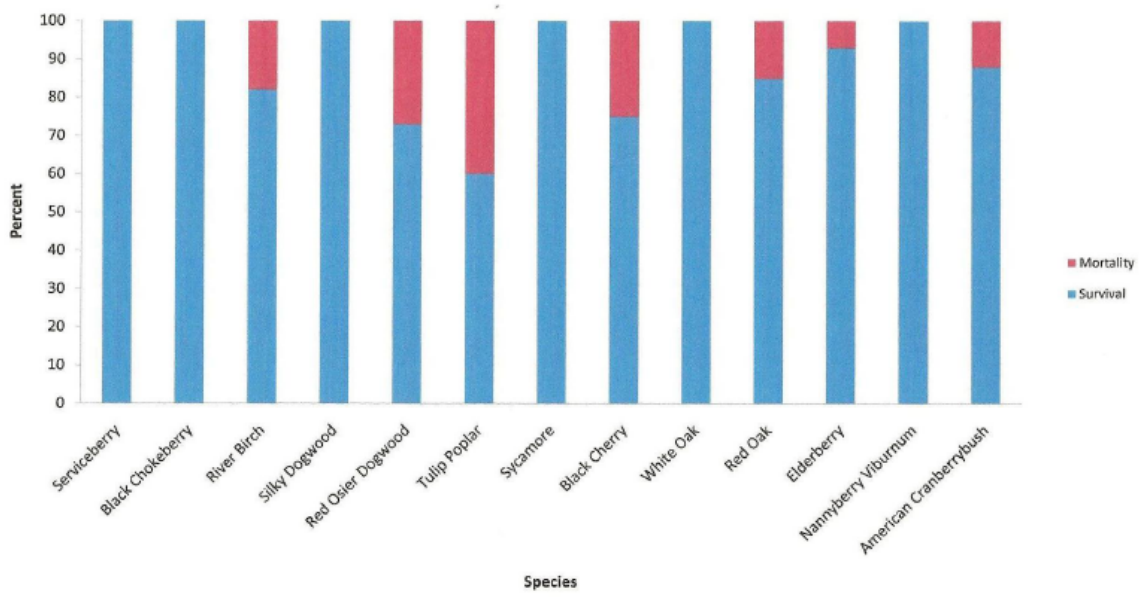


Figure 6. Species Mortality/Survival Conley



SPECIES SURVIVAL WORKSHEET

Buffer Name: Conley

Species	# Planted	# Observed	Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Damage **
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Serviceberry	12	12	4	11.6	100	0	-	-	-	-	-	-	-
Black Chokeberry	8	8	-	10	100	0	-	-	-	-	-	-	-
River Birch	11	9	4	6.8	82	18	-	-	2	-	-	-	-
Silky Dogwood	5	5	4	6.7	100	0	-	-	1	-	-	-	-
Red Osier Dogwood	18	13	-	2	73	27	-	-	-	-	-	-	-
Tulip Poplar	10	6	4	14.8	60	40	-	-	-	-	-	-	-
Sycamore	10	10	4	11.5	100	0	-	-	2	-	-	-	1%
Black Cherry	12	9	4	4.5	75	25	-	-	-	-	-	-	-
White Oak	20	20	4	8.3	100	0	-	-	1	-	-	-	20%
Red Oak	19	16	4	10.7	85	15	-	-	-	-	-	-	12%
Elderberry	13	12	-	3	93	7	-	-	-	-	-	-	-
Nannyberry Viburnum	12	12	-	3	100	0	-	-	1	-	-	-	-
American Cranberrybush	16	14	-	7.3	88	12	-	-	-	-	-	-	-
Unknown Dead	-	4	4	-	0	100	-	-	-	-	-	4	-
Totals/Averages	**166**	**146**	**-**	**8.3**	**88**	**12**	**-**	**-**	**7**	**-**	**-**	**4**	**4%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

* flooding, drought, poor soils etc

** Note browse or rubbing damage as a %

Figure 7. Species Counts for Dawson Site

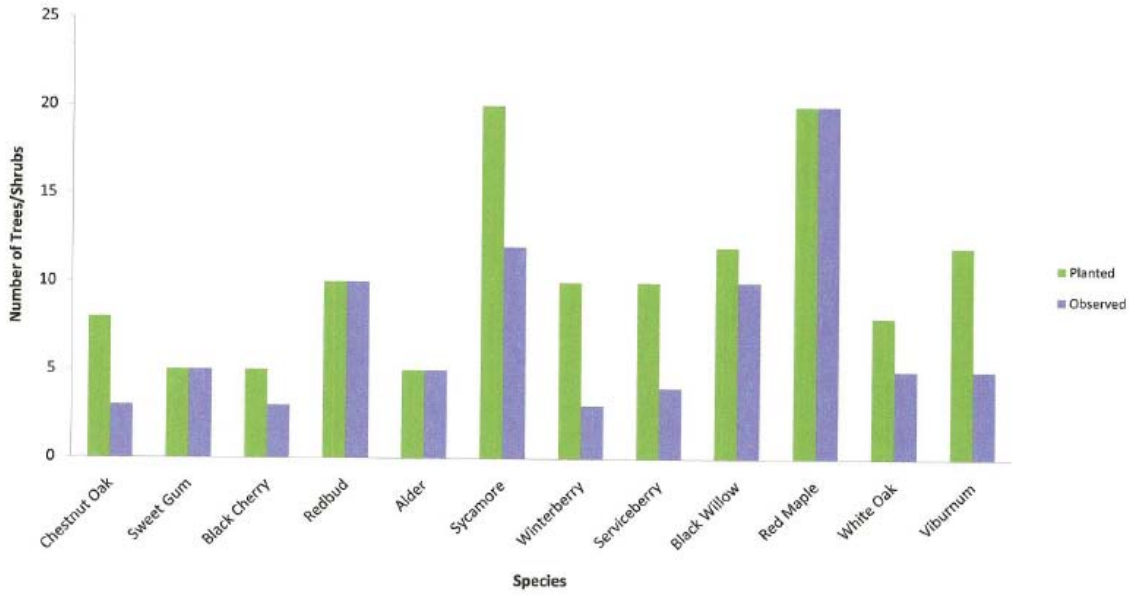
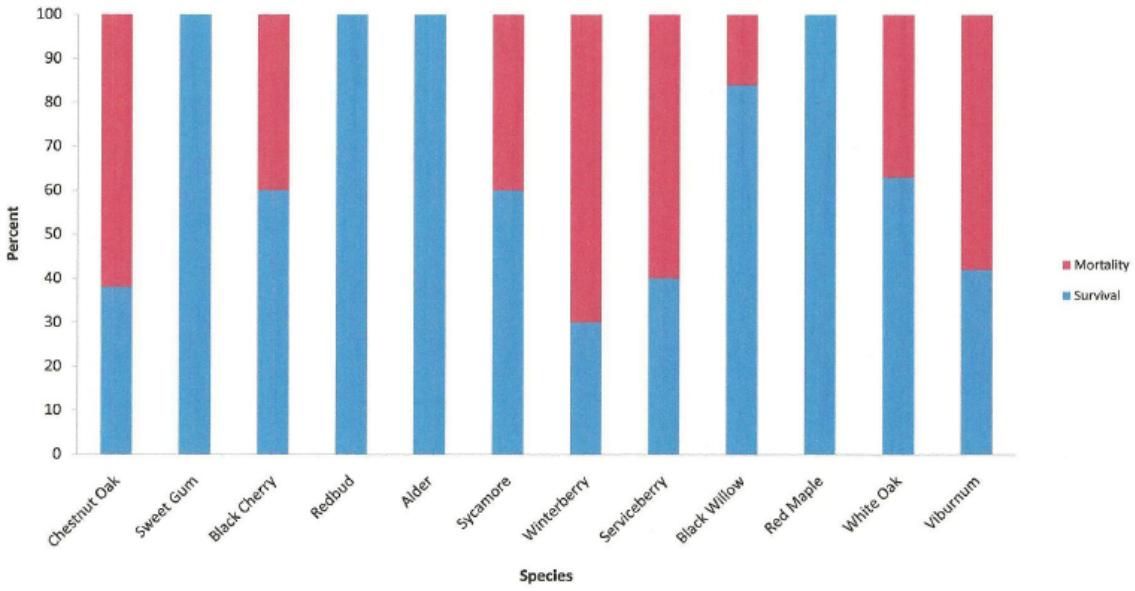


Figure 8. Species Mortality/Survival Dawson



SPECIES SURVIVAL WORKSHEET

Buffer Name: Dawson

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Chestnut Oak	8	3	4	0.6	38	62	-	-	-	-	-	-	
Sweet Gum	5	5	4	3.6	100	0	-	-	-	-	-	-	40%
Black Cherry	5	3	4	6	60	40	-	-	-	-	-	-	33%
Redbud	10	10	4	0.6	100	0	-	-	-	-	-	-	30%
Alder	5	5	4	4.8	100	0	-	-	-	-	-	-	60%
Sycamore	20	12	4	0.25	60	40	-	-	-	-	-	-	42%
Winterberry	10	3	4	1	30	70	-	-	-	-	-	-	30%
Serviceberry	10	4	4	4.5	40	60	-	-	-	-	-	-	
Black Willow	12	10	4	-	84	16	-	-	-	-	-	-	10%
Red Maple	20	20	4	-	100	0	-	-	-	-	-	-	50%
White Oak	8	5	4	-	63	37	-	-	-	-	-	-	
Viburnum	12	5	4	1.2	42	58	-	-	-	-	-	-	20%
Unknown Dead	-	28	-	-	-	100					1	27	
Totals	**113**	**85**	**-**	**1.8**	**75**	**25**	**-**	**-**	**-**	**-**	**1**	**27**	**32%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Everything browsed, Japanese beetles were present.

Figure 9. Species Counts for Foulds/Dawson Site

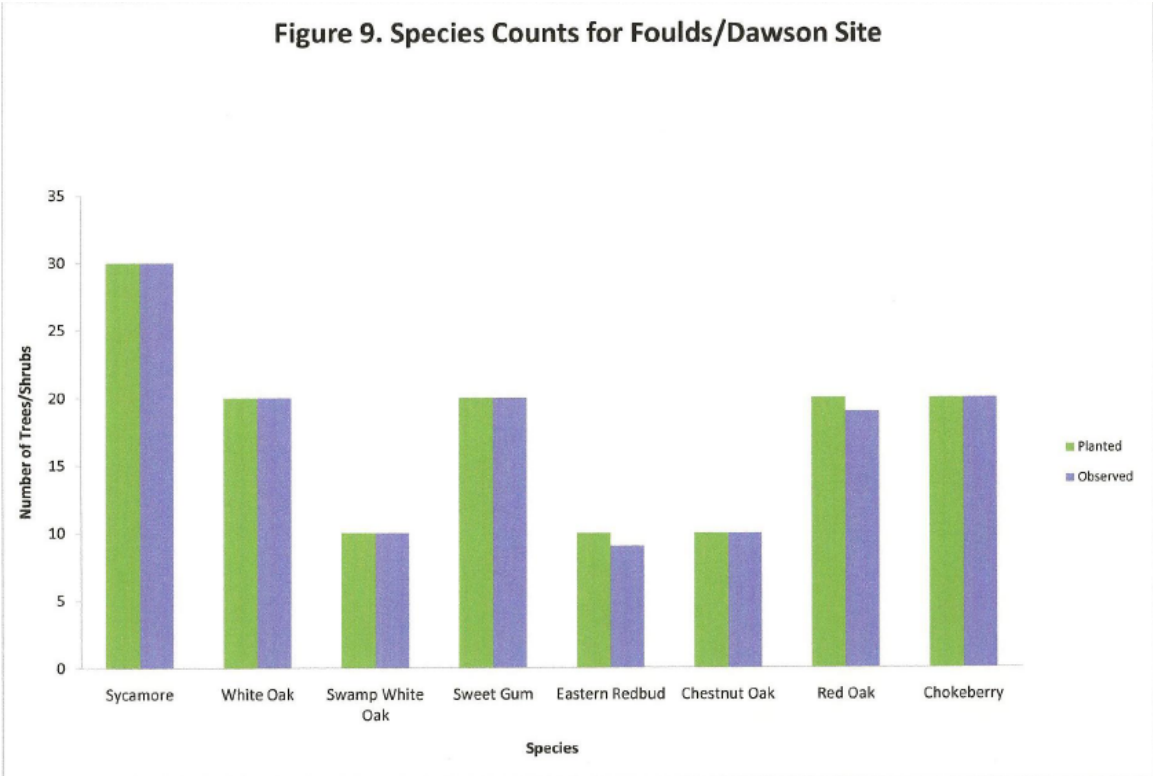
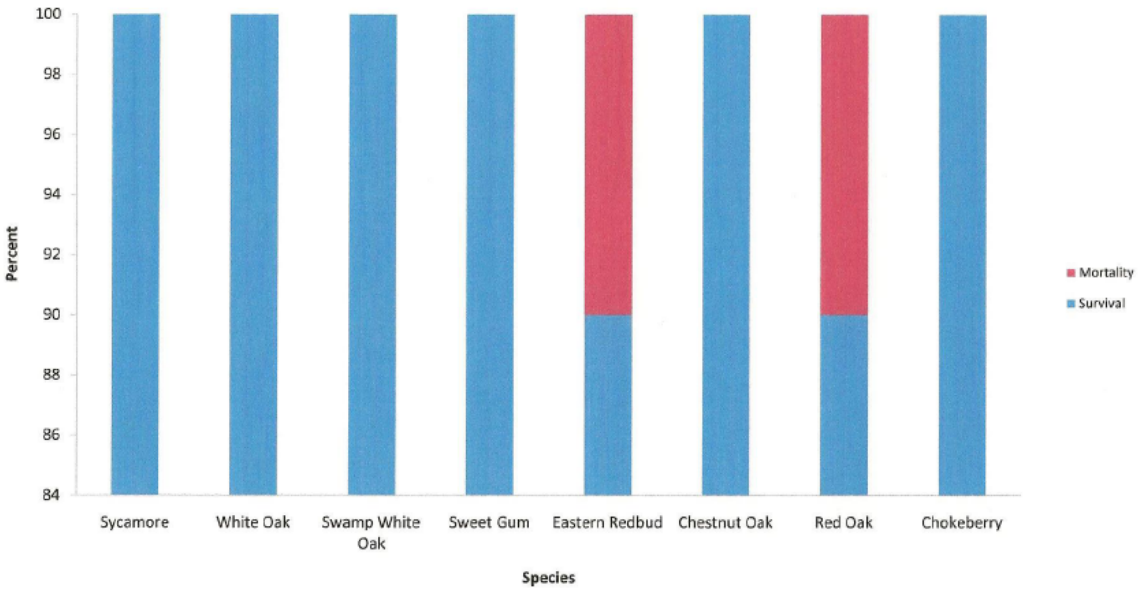


Figure 10. Species Mortality/Survival Foulds/Dawson



SPECIES SURVIVAL WORKSHEET

Buffer Name: Foulds/Dawson

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Sycamore	30	30	4	-	100	0	-	-	15	-	-	-	-
White Oak	20	20	4	-	100	0	-	-	-	-	-	-	100%
Swamp White Oak	10	10	4	-	100	0	-	-	-	-	-	-	-
Sweet Gum	20	20	4	-	100	0	-	-	-	-	-	-	-
Eastern Redbud	10	9	4	-	90	10	-	-	-	-	-	-	100%
Chestnut Oak	10	10	4	-	100	0	-	-	-	-	-	-	100%
Red Oak	20	19	4	-	90	10	-	-	-	-	-	-	100%
Chokeberry	20	20	4	-	100	0	-	-	-	-	-	-	-
Unknown Dead	-	2	4	-	-	100	-	-	-	-	1	1	-
Totals	**140**	**138**	-	-	**99**	**1**	-	-	**15**	-	**1**	**1**	-

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Figure 11. Species Counts for Jacko Site

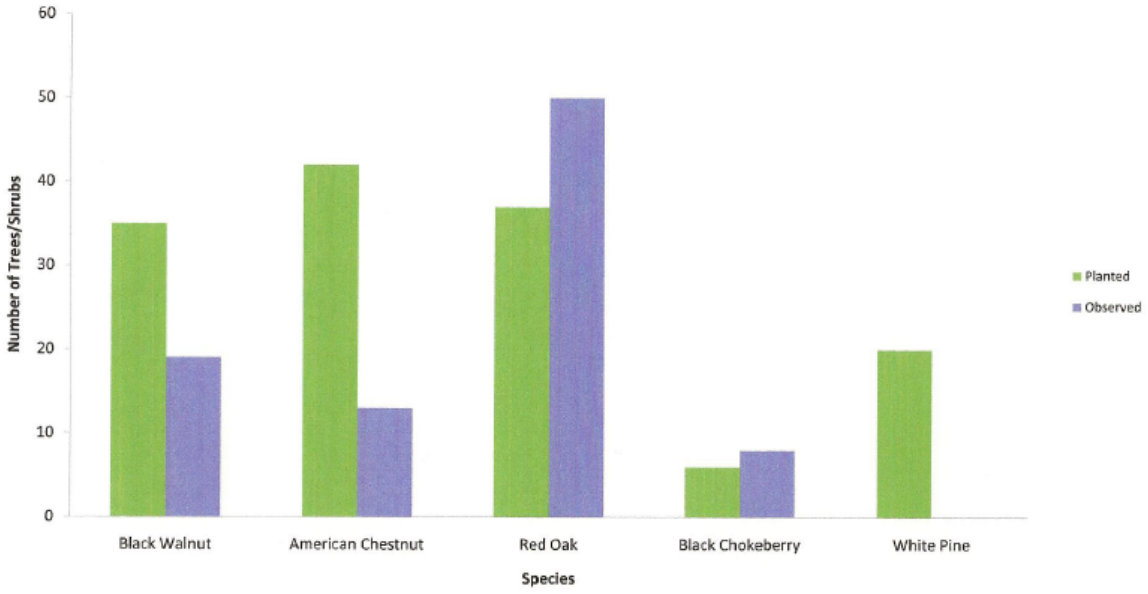
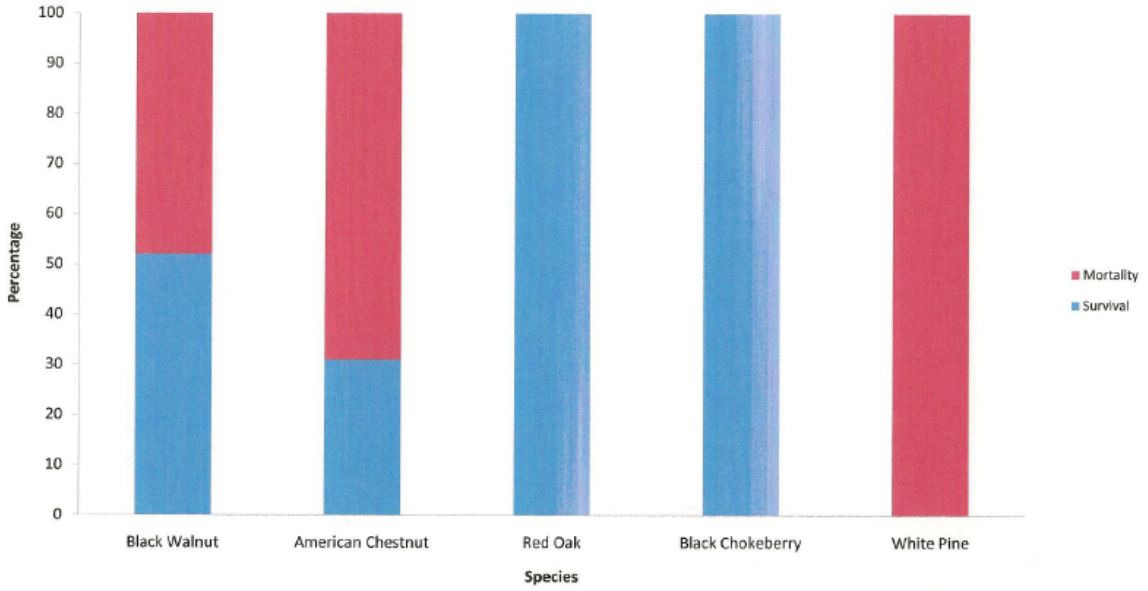


Figure 12. Species Mortality/Survival Jacko



SPECIES SURVIVAL WORKSHEET

Buffer Name: Jacko

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Black Walnut	35	19	4	-	52	48	-	-	-	-	-	1	-
American Chestnut	42	13	4	-	31	69	-	-	-	-	-	-	-
Red Oak	37	50	4	0.3	100	0	-	-	-	5	-	9	-
Black Chokeberry	6	8	4	1	100	0	-	-	-	-	-	2	-
White Pine	20	0	-	-	0	100	-	-	-	-	-	-	100%
Unknown Dead	-	50	4	-	-	100	-	-	-	-	7	47	-
Totals	**140**	**90**	-	**0.2**	**64**	**36**	-	-	-	**5**	**7**	**59**	**13%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Netting- deteriorating; Landowner said that many plants were not planted properly; the Red Oaks and pin Oaks were found to have a chlorophyll deficiency; Deer browsing was found on most walnuts and red oaks; flooding occurred at the site

Figure 13. Species Counts for Meza Site

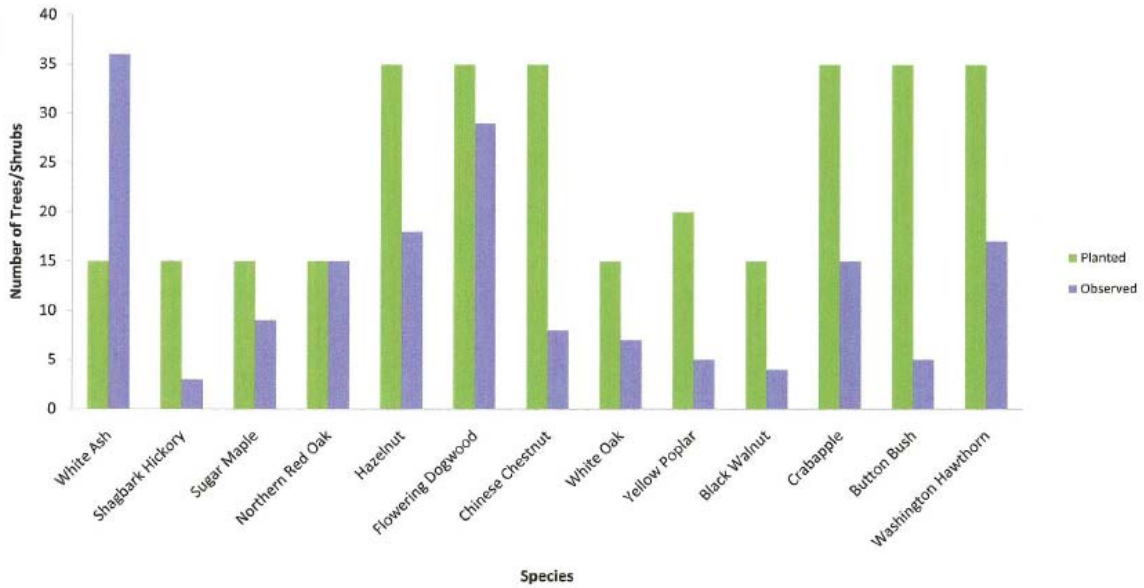
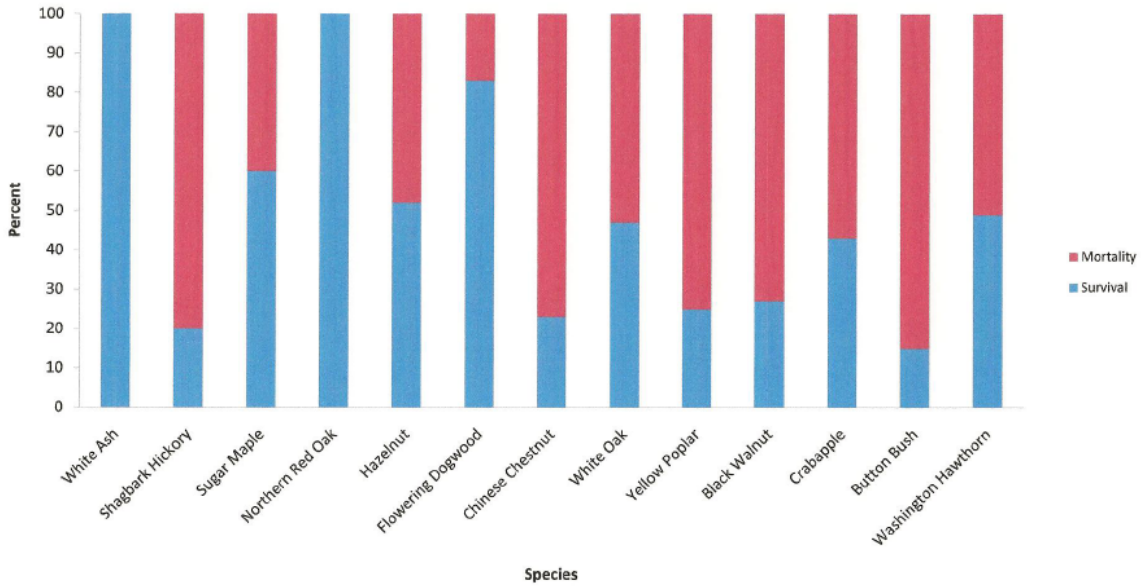


Figure 14. Species Mortality/Survival Meza



SPECIES SURVIVAL WORKSHEET

Buffer Name: Meza

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
White Ash	15	36	2	16.1	100	0	-	-	-	-	-	-	2%
Shagbark Hickory	15	3	2	0	20	80	-	-	-	-	-	-	-
Sugar Maple	15	9	2	27	60	40	-	-	-	-	-	-	-
Northern Red Oak	15	15	4	2.6	100	0	-	-	-	-	-	-	-
Hazelnut	35	18	2	16.1	52	48	-	-	-	-	-	-	5%
Flowering Dogwood	35	29	2	16.3	83	17	-	-	-	-	-	-	3%
Chinese Chestnut	35	8	2	9.1	23	77	-	-	-	-	-	-	-
White Oak	15	7	4	21.1	47	53	-	-	-	-	-	-	-
Yellow Poplar	20	5	2	6.8	25	75	-	-	-	-	-	-	20%
Black Walnut	15	4	2	24	27	73	-	-	-	-	-	-	-
Crabapple	35	15	2	34.1	43	57	-	-	-	-	-	-	-
Button Bush	35	5	1	13.6	15	85	-	-	-	-	-	-	-
Washington Hawthorn	35	17	2	18.5	49	51	-	-	-	-	-	-	11%
Unknown Dead	-	49	-	-	-	100	-	-	-	-	-	49	-
Totals	**320**	**171**	**-**	**15.7**	**53.5**	**46.5**	-	-	-	-	-	**49**	**3%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Figure 15. Species Counts for Morgan's Grove Park Site

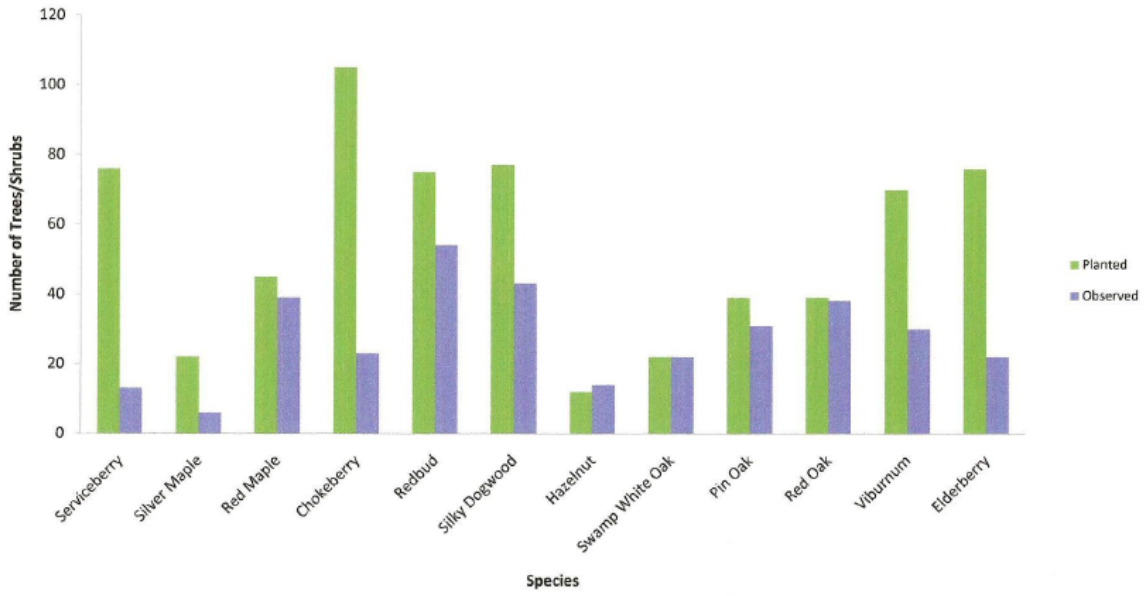
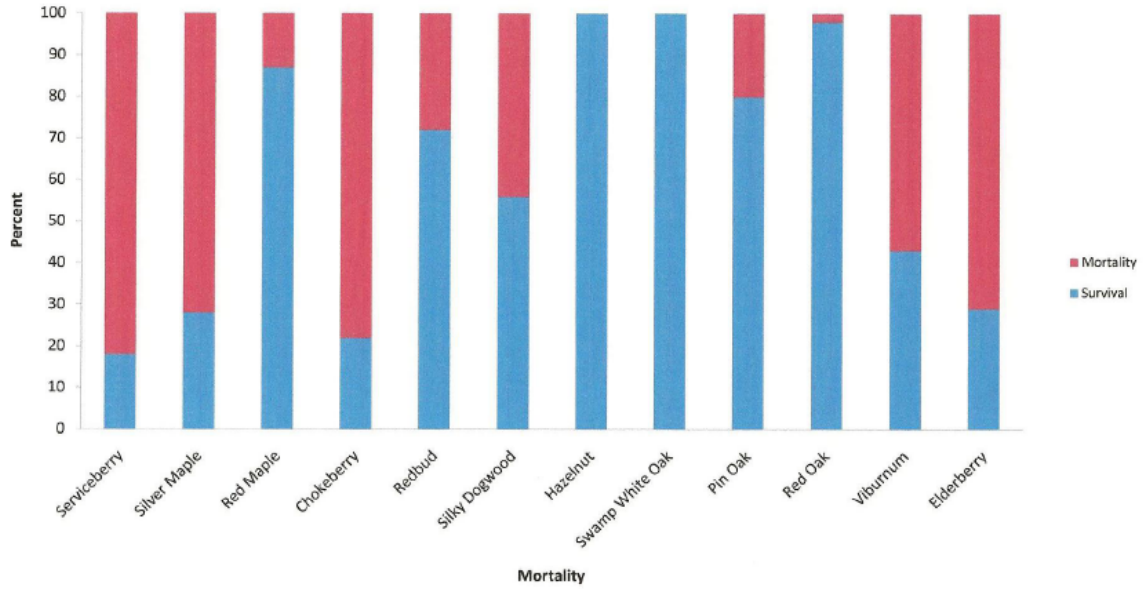


Figure 16. Species Mortality/Survival Morgan's Grove Park



SPECIES SURVIVAL WORKSHEET

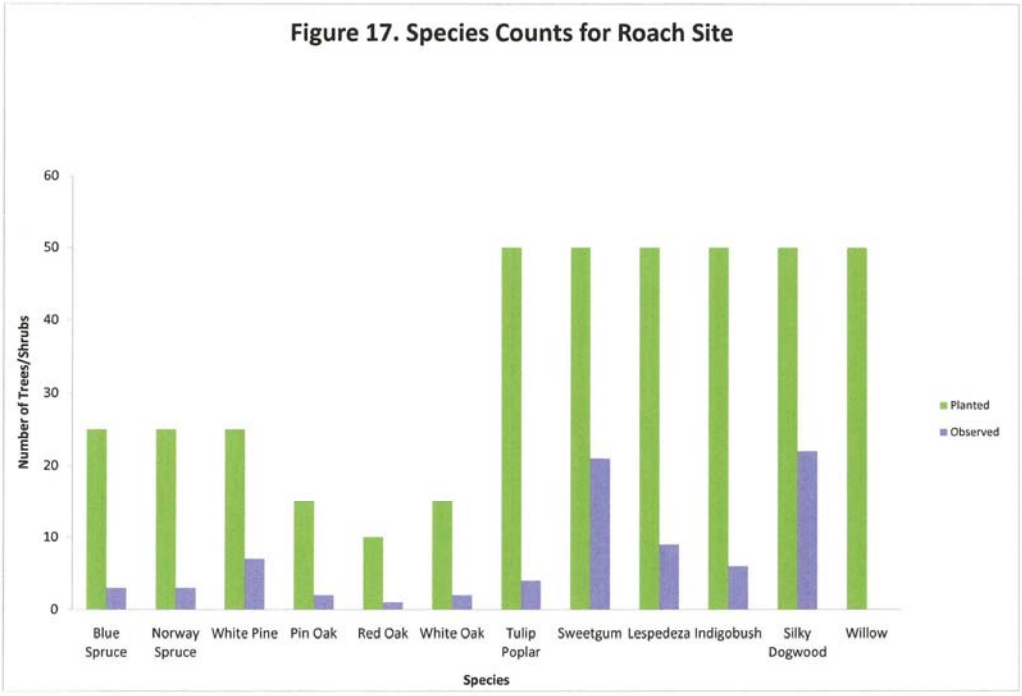
Buffer Name: Morgan's Grove

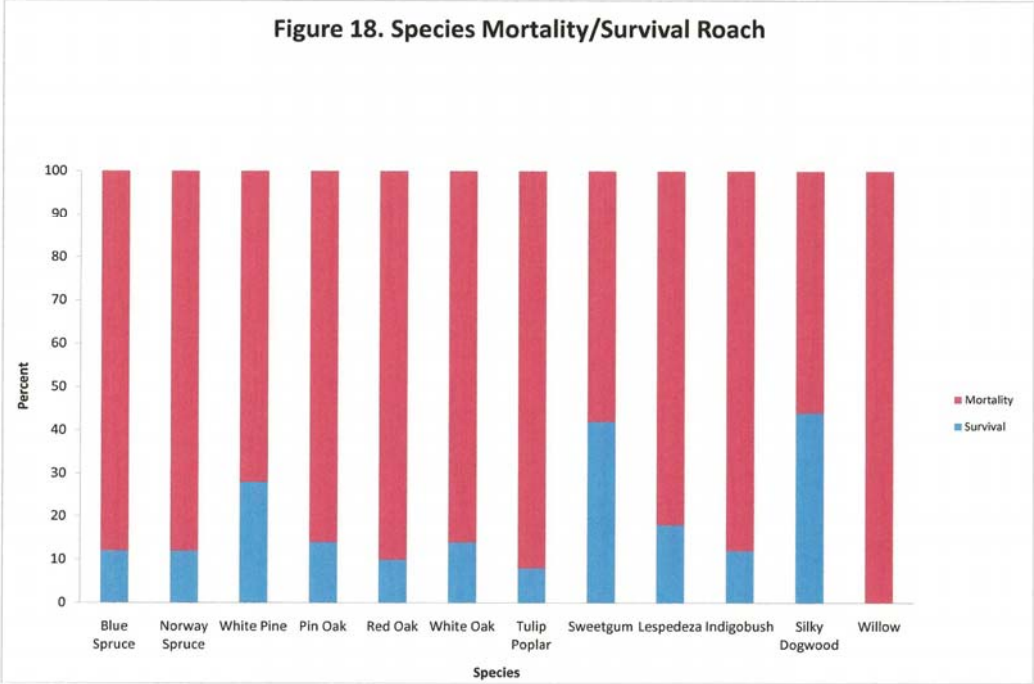
Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Serviceberry	76	13	-	-	18	82	-	-	-	-	-	-	-
Silver Maple	22	6	4	-	28	72	-	-	-	-	-	-	-
Red Maple	45	39	4	-	87	13	-	-	-	-	-	-	-
Chokeberry	105	23	-	-	22	78	-	-	-	-	-	-	-
Redbud	75	54	4	-	72	28	-	-	-	-	-	-	-
Silky Dogwood	77	43	4	-	56	**44**	-	-	1	-	-	-	-
Hazelnut	12	14	4	-	100	0	-	-	1	-	-	-	-
Swamp White Oak	22	22	4	-	100	**0**	-	-	2	-	-	-	-
Pin Oak	39	31	4	-	80	**20**	-	-	1	-	-	-	-
Red Oak	39	38	4	-	98	2	-	-	3	-	-	-	-
Viburnum	70	30	-	-	43	57	-	-	-	-	-	-	-
Elderberry	76	22	-	-	29	71	-	-	-	-	-	-	-
Unknown Dead	-	33		-	-	-	-	-	-	33	-	-	-
Totals	**658**	**335**	**-**	**-**	**51**	**49**	-	-	**8**	**33**	-	-	-

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Netting- AWFUL-Deteriorating, 2 Trees were lost to fence construction, Cattle damage on most trees-loss of tubes and matting

Figure 17. Species Counts for Roach Site





SPECIES SURVIVAL WORKSHEET

Buffer Name: Roach

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Beaver	Insect	Competition	Human	Natural*	
Blue Spruce	25	3	-	-	12	88	-	-	-	-	-	-	-
Norway Spruce	25	3	-	18	12	88	-	-	-	-	-	-	-
White Pine	25	7	-	-	28	72	-	-	-	-	-	-	14%
Pin Oak	15	2	-	-	14	86	-	-	-	-	-	-	-
Red Oak	10	1	-	24	10	90	-	-	-	-	-	-	-
White Oak	15	2	-	24	14	86	-	-	-	-	-	-	-
Tulip Poplar	50	4	-	-	8	92	-	-	-	-	-	-	100%
Sweetgum	50	21	-	36	42	58	-	-	-	-	-	-	-
Lespedeza	50	9	-	-	18	82	-	-	-	-	-	-	-
Indigobush	50	6	-	-	12	88	-	-	-	-	-	-	-
Silky Dogwood	50	22	-	12	44	56	-	-	-	-	-	-	14%
Willow	50	0	-	-	0	100	-	-	-	-	-	-	-
Unknown Dead	-	7	-	-	-	100	-	-	-	7	-	-	-
Totals	**415**	**80**	**-**	**-**	**19**	**81**	**-**	**-**	**-**	**7**	**-**	**-**	**9%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Far side of planting doing well, still tubed; Dogwoods need to be caged- lots of browse; Wooden stakes are rotting; Tree of Heaven in many patches; Major competition brought on by thistle, tree of heaven, and honeysuckle; Lots of volunteer Box Elder, Walnut, Pear, Ash, and Black Locust

Figure 19. Species Counts for Staubert Site

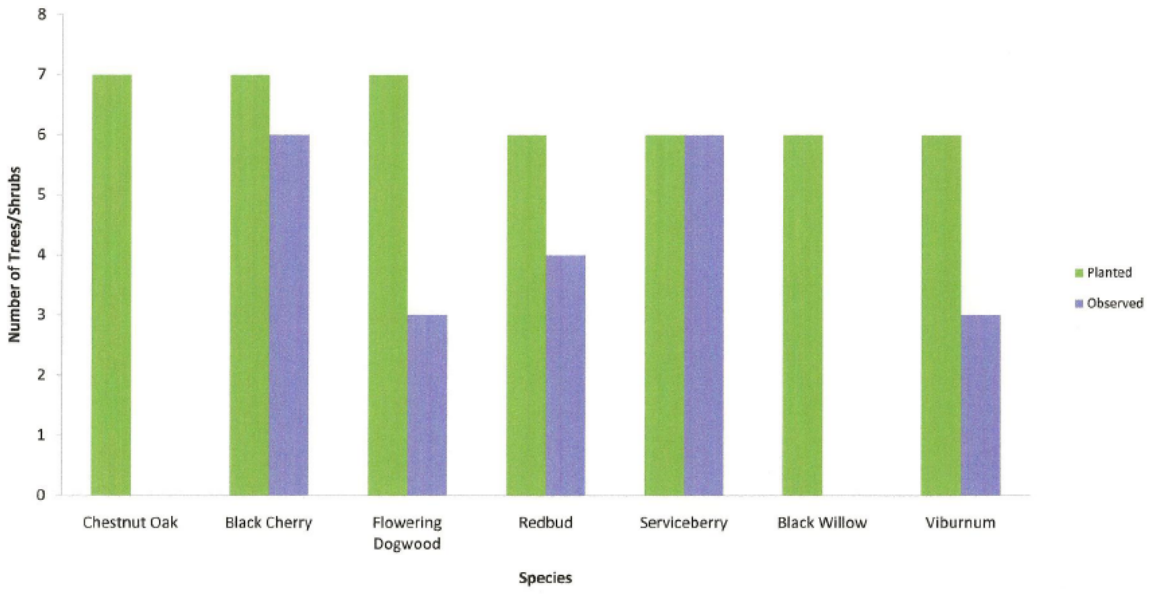
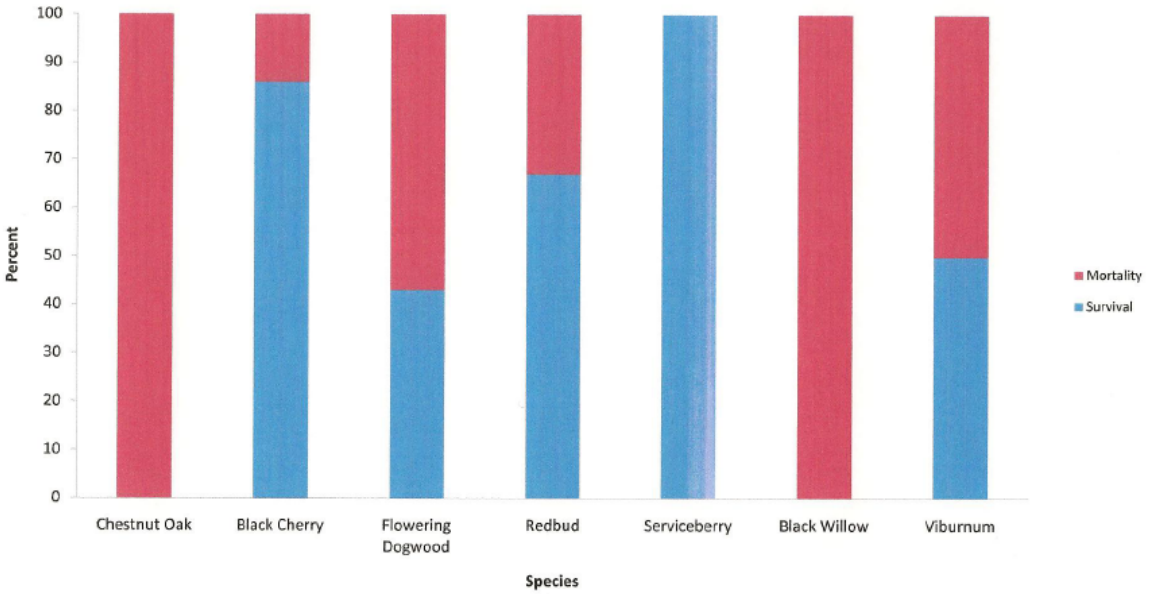


Figure 20. Species Mortality/Survival Staubert



SPECIES SURVIVAL WORKSHEET

Buffer Name: Staubert

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Chestnut Oak	7	0	-	-	0	100	-	-	-	-	-	-	-
Black Cherry	7	6	-	-	86	14	-	-	-	-	-	-	-
Flowering Dogwood	7	3	-	-	43	57	-	-	-	-	-	-	-
Redbud	6	4	-	-	67	33	-	-	-	-	-	-	-
Serviceberry	6	6	-	-	100	0	-	-	-	-	-	-	-
Black Willow	6	0	-	-	0	100	-	-	-	-	-	-	-
Viburnum	6	3	-	-	50	50	-	-	-	-	-	-	-
Unknown Dead	-	23	-	-	0	100	-	-	-	-	-	23	-
Totals	**45**	**22**	-	-	**49**	**51**	-	-	-	-	-	**23**	-

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Everything browsed, bad competition.

Figure 21. Species Counts for Vila Site

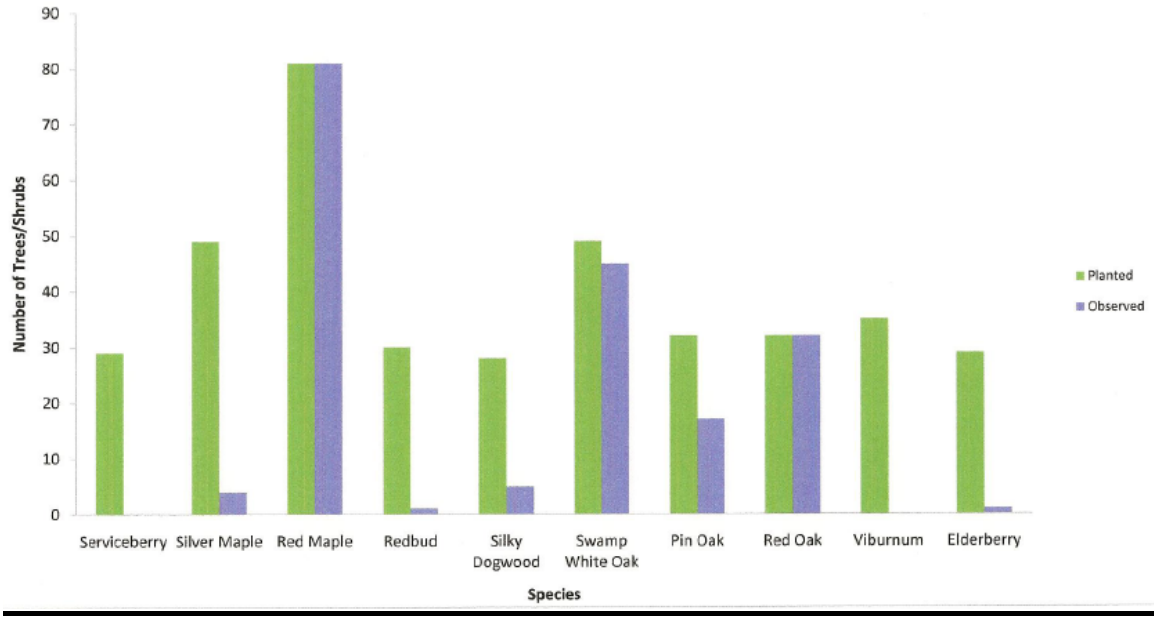
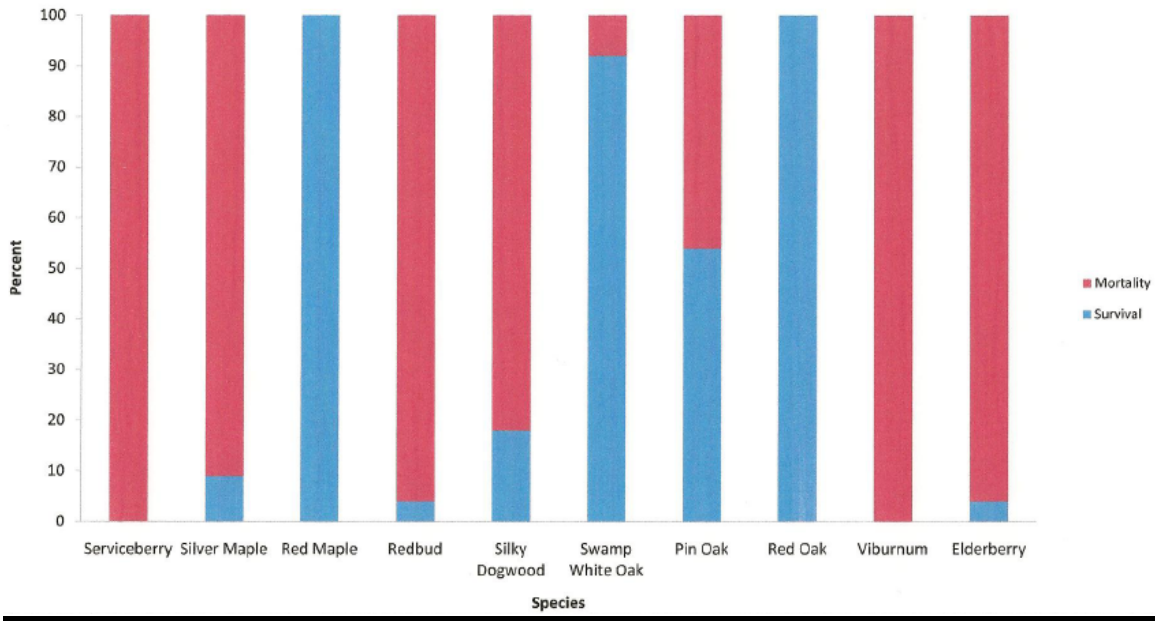


Figure 22. Species Mortality/Survival Vila



SPECIES SURVIVAL WORKSHEET

Buffer Name: Vila

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Serviceberry	29	0	-	-	0	100	-	-	-	-	-	-	-
Silver Maple	49	4	4	-	9	91	-	-	-	-	-	-	-
Red Maple	81	81	4	3.8	100	**0**	-		1	-	-	-	59%
Redbud	30	1	4	-	4	96	-	-	-	-	-	-	-
Silky Dogwood	28	5	-	-	18	**82**	-	-	-	-	-	-	-
Swamp White Oak	49	45	4	12.9	92	**8**	-	-	4	-	-	-	3%
Pin Oak	32	17	4	16.6	54	**46**	-	-	-	-	-	-	100%
Red Oak	32	32	4	9.3	100	0	-	-	3	-	-	-	50%
Viburnum	35	0	-	-	0	100	-	-	-	-	-	-	-
Elderberry	29	1	-	-	4	96	-	-	-	-	-	-	-
Unknown Dead	-	45	4	-	-	-	-	-	-	45	-	-	-
Totals	**394**	**186**	**-**	**-**	**47**	**53**	**-**	**-**	**8**	**45**	**-**	**-**	**44%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Competition is evident. Blue-X tubes do not survive high water! Shrubs were not counted due to height of vegetation where they were planted.

Figure 23. Species Counts for Wardensville Site

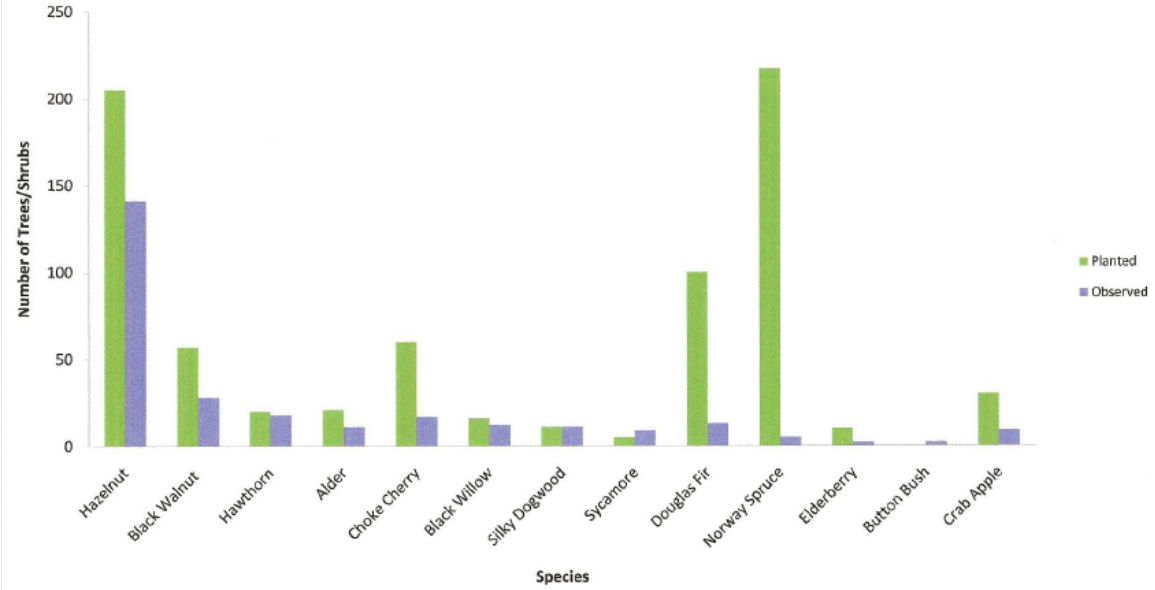
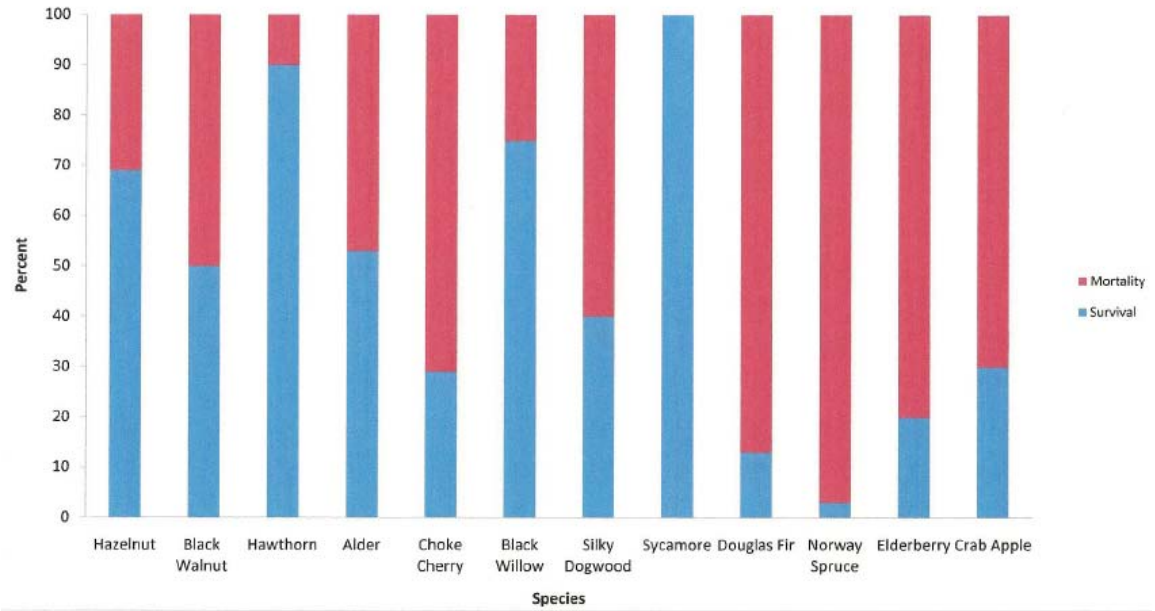


Figure 24. Species Mortality/Percent Wardensville



SPECIES SURVIVAL WORKSHEET

Buffer Name: Wardensville WVU Experimental Farm

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Beaver	Insect	Competition	Human	Natural*	
Hazelnut	205	141	2	4.8	69	31	3	-	-	6	-	9	-
Black Walnut	57	28	-	8.4	50	50	-	-	-	-	-	-	-
Hawthorn	20	18	4	9.52	90	10	-	-	-	-	-	3	-
Alder	21	11	4	16.1	53	47	-	-	-	-	-	-	-
Choke Cherry	60	17	4	15.6	29	71	-	-	-	-	-	-	11%
Black Willow	16	12	4	59.5	75	25	-	-	-	-	-	-	-
Silky Dogwood	11	11	2	3.7	40	60	-	-	-	-	-	-	16%
Sycamore	5	9	2	34.8	100	0	-	-	-	-	-	1	-
Douglas Fir	100	13	-	21.6	13	87	-	-	-	-	-	2	-
Norway Spruce	217	5	-	26.4	3	97	-	-	-	-	-	2	-
Elderberry	10	2	2	24	20	80	-	-	-	-	-	-	-
Button Bush	0	2	2	2.4	-	-	-	-	-	-	-	-	-
Crab Apple	30	9	-	13.1	30	70	-	-	-	-	-	-	-
Unknown Dead	-	62	-	-	0	100	3	-	-	7	1	51	-
Totals	**752**	**278**	**-**	**18.4**	**37**	**63**	**6**	**-**	**-**	**13**	**1**	**68**	**1%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Stakes need to be replaced on many tubes. Black walnut recruits, 4 bald cyprus, and 17 chinese chestnuts were on site, but not measured. The douglas fir trees are total height, no tubes. The Human damage is due to herbicide being sprayed on the fence line.

Figure 25. Species Count for Webber Site

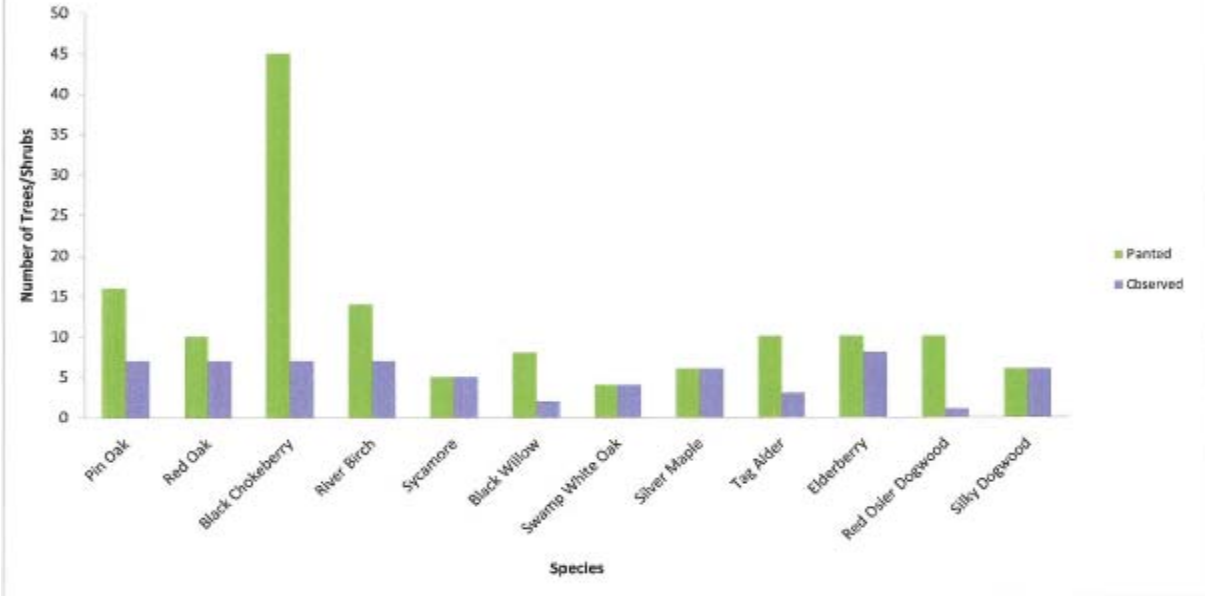
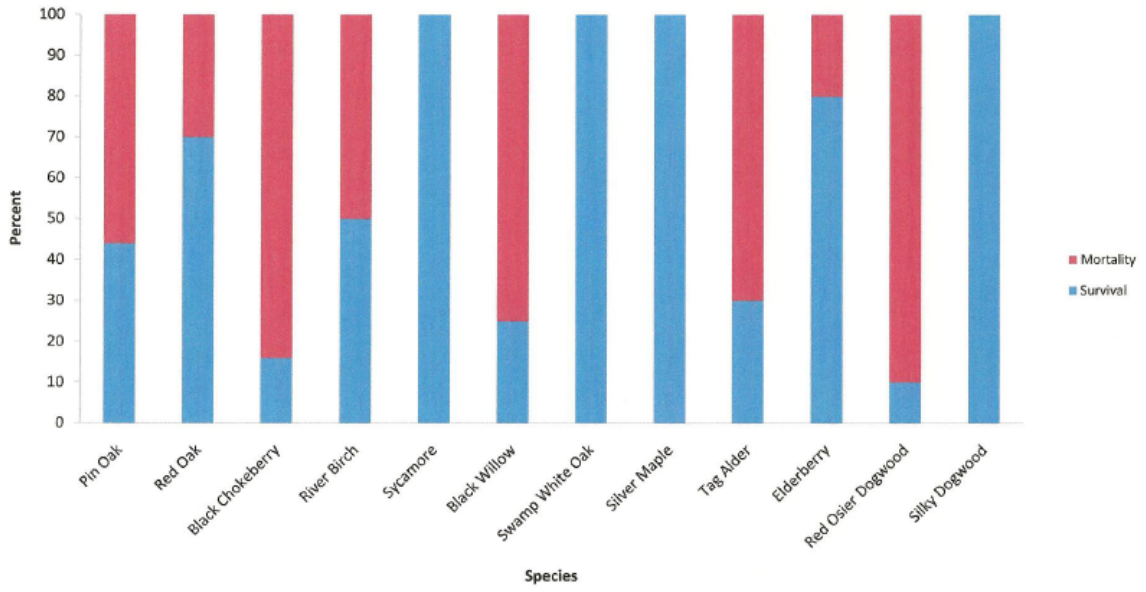


Figure 26. Species Mortality/Survival Webber



SPECIES SURVIVAL WORKSHEET

Buffer Name: Webber

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	List Mortality Number						Deer Damage**
							Small rodent	Cattle	Insect	Competition	Human	Natural*	
Pin Oak	16	7	4	3.5	44	**56**	-	-	-	-	-	-	14%
Red Oak	10	7	4	8.7	70	**30**	-	-	-	-	-	-	14%
Black Chokeberry	45	7	4	1.5	16	84	-	-	-	-	-	-	28%
River Birch	14	7	4	5.5	50	50	-	-	-	-	-	-	-
Sycamore	5	5	4	0.8	100	0	-	-	2	-	-	-	-
Black Willow	8	2	4	6	25	75	-	-	-	-	-	-	50%
Swamp White Oak	4	4	4	8	100	**0**	-	-	-	-	-	-	-
Silver Maple	6	6	4	20	100	0	-	-	1	-	-	-	-
Tag Alder	10	3	4	7.3	30	70	-	-	-	-	-	-	33%
Elderberry	10	8	4	8	80	20	-	-	-	-	-	-	12%
Red Osier Dogwood	10	1	4	0	10	90	-	-	-	-	-	-	-
Silky Dogwood	6	6	4	2.2	100	**0**	-	-	-	-	-	-	50%
Unkown Dead	-	5	-	-	-	100	-	-	-	3	-	1	20%
Totals	**144**	**63**	**-**	**5.9**	**44**	**56**	**-**	**-**	**3**	**3**	**-**	**1**	**17%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

Mulch needed surrounding trees and shrubs in back yard. Overgrowth along bank may be providing competition for many plants. All trees without tubes had major deer damage.

WORKSHEET

Species Totals

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	Damage					
							Small rodent	Vole	Insect	Competition	Human	Natural*
Black Walnut	107	51	-	-	48	52	-	-	-	-	-	9
Tulip Poplar	130	63	-	-	48	52	10	3	-	-	4	5
White Oak	108	56	-	-	52	48	-	-	1	-	-	-
Swamp White Oak	115	111	-	-	97	3	1	-	6	-	-	-
Pin Oak	152	100	-	-	66	34	3	-	1	-	-	1
Red Oak	182	178	-	-	98	2	-	-	6	5	-	9
Chestnut Oak	25	13	-	-	52	48	-	-	-	-	-	-
Red Maple	176	165	-	-	94	6	11	-	1	-	-	1
Silver Maple	71	10	-	-	14	86	-	-	1	-	-	-
Sugar Maple	15	9	-	-	60	40	-	-	-	-	-	-
American Chestnut	42	13	-	-	31	69	-	-	-	-	-	-
Chinese Chestnut	35	8	-	-	33	77	-	-	-	-	-	-
Sycamore	60	52	-	-	87	13	1	2	19	-	-	-
White Ash	15	15	-	-	100	-	-	-	-	-	-	-
River Birch	25	16	-	-	74	36	-	-	2	-	-	-
Black Willow	92	24	-	-	36	74	-	-	-	-	-	-
Sweet Gum	75	46	-	-	71	39	-	-	-	-	-	-
Alder	39	19	-	-	49	51	-	-	-	-	-	-
Shagbark Hickory	15	3	-	-	20	80	-	-	-	-	-	-
Hazelnut	205	139	-	-	68	32	3	-	1	6	-	9
Washington Hawthorn	35	17	-	-	49	51	-	-	-	-	-	3
Black Cherry	12	9	-	-	75	25	-	-	-	-	-	-
Choke Cherry	60	17	-	-	28	72	-	-	-	-	-	-
White Pine	40	19	-	-	47	53	-	-	-	-	-	7
Blue Spruce	25	3	-	-	22	88	-	-	-	-	-	-
Norway Spruce	242	8	-	-	3	97	-	-	-	-	-	2
Douglas Fir	100	13	-	-	12	87	-	-	-	-	-	2
Flowering Dogwood	42	32	-	-	76	24	-	-	-	-	-	-
Silky Dogwood	177	92	-	-	52	48	-	-	2	-	-	-
Red Osier Dogwood	28	14	-	-	50	50	-	-	-	-	-	-
Gray Dogwood/ Blueberry	200	174	-	-	87	13	3	9	-	-	2	9
Eastern Redbud	131	78	-	-	60	40	-	-	-	-	-	-
Elderberry	128	37	-	-	29	71	-	-	-	-	-	-
Viburnum	435	268	-	-	62	38	2	-	1	-	-	-
Winterberry	60	53	-	-	88	12	5	2	-	-	-	-
Service Berry	203	57	-	-	29	72	-	-	-	-	-	-
Black Chokeberry	184	64	-	-	36	64	-	-	-	-	-	2
American Cranberrybush	16	14	-	-	87	13	-	-	-	-	-	-
Crabapple	65	24	-	-	37	63	-	-	-	-	-	-
Button Bush	35	5	-	-	14	86	-	-	-	-	-	-
Lespedeza	50	9	-	-	18	82	-	-	-	-	-	-
Indigobush	50	6	-	-	12	88	-	-	-	-	-	-
Unknown Dead	-	324	-	-	-	-	48	16	-	95	17	246

SPECIES SURVIVAL WORKSHEET

Totals

Species	# Planted	# Observed	Tube Height (ft)	Average Growth (Inches)	Survival # (percent)	Mortality # (percent)	Damage						Deer Damage**
							Small rodent	Vole	Insect	Competition	Human	Natural*	
Buckles	860	756	-	-	88	12	45	16			7	43	2%
Conley	166	146	-	8.3	88	12	-	-	7	-	-	4	4%
Dawson	113	85	-	1.8	75	25	-	-	-	-	1	27	32%
Foulds/Dawson	140	138	-	-	99	1	-	-	15	-	1	1	-
Jacko	140	90	-	0.2	64	36	-	-	-	5	7	59	13%
Meza	320	171	-	15.7	53.5	46.5	-	-	-	-	-	49	3%
Morgan's Grove Park	658	335	-	-	51	49	-	-	8	33	-	-	-
Roach	415	80	-	-	19	81	-	-	-	7	-	-	9%
Staubert	45	22	-	-	49	51	-	-	-	-	-	23	-
Vila	394	186	-	-	47	53	-	-	8	45	-	-	44%
Wardensville	752	278	-	18.4	37	63	6	-	-	13	1	68	1%
Webber	144	63	-	5.9	44	56	-	-	3	3	-	1	17%
Totals/Averages	**4147**	**2350**	**-**	**-**	**61**	**39**	**1%**	**-**	**2%**	**5%**	**1%**	**14%**	**7%**

Comments, (Include Landowner comments or any other maintanance work done since the planting.)

* flooding, drought, poor soils etc

** Note browse or rubbing damage as a %

Discussion

Based upon the results of the assessment, our committee makes a few recommendations concerning future riparian plantings. When larger trees and shrubs are planted, tree cages are optimum for protection. Tubes tend to inhibit growth, whereas cages provide space and protection for new growth. If tree tubes are unavoidable, the tubes need to be removed as soon as the trees become restricted. Lastly, never tube small trees. They do not survive well in 4ft tubes.

The property owner should properly maintain all buffers for the first two years as allowable by the program they are participating in. This includes mowing all surrounding grass and weeds, so that smaller trees and shrubs are not competing. It should also be the property owners' responsibility to provide mulch for the planting, since it is likely to disappear over time. An alternative for weed suppression would be the weed matting.

There were many occurrences of the wooden stakes that support the tree tubes rotting away. Metal stakes are more expensive, but are not going to disintegrate after a few years. To discuss the finding made in this presentation, contact Carla Hardy at chardy@wvca.us or Herb Peddicord at Herb.F.Peddicord@wv.gov. A special thank you goes out to Herb Peddicord and Emma Pemberton for their time and expertise in carrying out this task.