Whitley Buffer Mitigation Site
Annual Vegetation Monitoring Report
2008 Growing Season

Year 3 Monitoring Report

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1.0 SUMMARY

The Whitley Buffer Mitigation Site is located in central Johnston County, NC, approximately four miles southeast of the town of Smithfield, NC, along NCSR 1007 (Brogden Road). It is located within cataloging unit 03020201 and DENR sub-basin 03-04-02 of the Neuse River Basin.

There are approximately 3,448 linear feet of streams within the 27.5 acres of the Whitley Buffer Mitigation Site. The site is part of a farm that is used for row crops, hog production and pastureland for cattle and horses. Prior to buffer restoration, the streams on the project site were channelized, and riparian vegetation was cleared in the field areas such that cattle grazing pastures extended up to the top of the stream banks

The restoration area encompasses 27.5 acres of streamside edge and floodplain along Marsh Branch and an unnamed tributary of Polecat Branch. The riparian buffer restoration project has provided numerous ecological benefits within the Neuse River basin. While many of these benefits, such as improved bank stability and restoration of habitat, are limited to the project area, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects.

Prior land use and clearing had already removed the majority of the native floodplain vegetative communities along Marsh Swamp and within the associated floodplain. However, prior to plant community restoration, remaining invasive vegetation such as privet (*Ligustrum sinense*), which existed in small quantities along the stream banks, was cleared by bush-hogging and mowing. Cleared areas were then disked to further prepare the soil conditions for planting. Bare-root seedlings of native tree species were planted at a density of 680 stems per acre on 8-foot centers. Planting was completed in March 2006.

The monitoring results for 2008 (Year 3) documented an average of 560 surviving stems per acre, with a range of 440 to 640 stems per acre. The site has achieved the interim vegetative success criteria of 320 stems per acre at the end of Year 3 of monitoring and is on tract to achieve the final vegetative success criteria of 260 stems per acre at the end of Year 5.

2.0 INTRODUCTION

A total of 27.5 acres of buffer were restored on the Whitley Mitigation Site. The primary objectives of the buffer restoration, as specified in the Restoration Plan are as follows: "the reforestation of cleared floodplain vegetation along Marsh Branch and a tributary to Polecat Branch within the conservation easement with native species to: i) maintain and increase channel bank stability; ii) reduce sedimentation; iii) filter and reduce pollutants; and iv) provide increased habitat for aquatic and terrestrial wildlife." The project involved the restoration of riparian buffers at least 50 feet in width in areas that historically supported hardwood forest bottomland ecosystems.

The target natural community type for the restored buffer is a "coastal plain bottomland hardwood forest" (Schafale and Weakley, 1990). Restoration of floodplain forest and stream-side habitat allows for development and expansion of characteristic vegetative species across the landscape. The design at the Whitley Buffer Mitigation Site was to restore a small stream swamp community adjacent to the Marsh Branch and the farm ditches that bisect the property. The species composition planted on site was selected based on the vegetation description for the "coastal plain small stream swamp". In addition to planting the buffer area, permanent fencing was installed to keep the cattle out of the buffer area.

To monitor the vegetation on the mitigation site, approximately 2% or 0.5 acres of the site is being sampled over five growing seasons. Twelve vegetation-monitoring plots that are 10m x 10m in size have been established on the site. The plots are randomly located to represent the range of conditions that exist on the site.

After construction of the mitigation site in March 2006, the following tree species were planted. The species were selected based on the natural communities types discussed above.

Table 1. **Tree Species Planted in 2006**

ID	Scientific Name	Common Name	FAC Status
1	*Quercus michauxii*	Swamp Chestnut Oak	FACW-
2	*Quercus phellos*	Coastal Willow Oak	FACW-
3	*Fraxinus pennsylvanica*	Green Ash	FACW
4	*Betula nigra*	River Birch	FACW
5	*Platanus occidentalis*	Sycamore	FACW-
6	*Taxodium distichum*	Bald cypress	OBL
7	*Quercus lyrata*	Overcup Oak	OBL
8	*Nyssa biflora*	Swamp Tupelo	OBL

3.0 VEGETATION MONITORING

3.1 Success Criteria

The interim measure of vegetative success for the Whitley Buffer Mitigation Site is the survival of at least 320 3-year old planted trees per acre at the end of Year 3 of the monitoring period. The final vegetative success criteria will be the survival of 260 5-year old planted trees per acre at the end of Year 5 of the monitoring period.

Up to 20% of the site species composition may be comprised of invaders. Remedial action may be required should these (i.e. loblolly pine, red maple, sweet gum, etc.) present a problem and exceed 20% composition.

3.2 Description of Species and Monitoring Protocol

The following monitoring protocol was designed to predict vegetative survivability. Twelve plots were established on the Whitley Buffer Mitigation Site, to monitor approximately 2% of

the site. The twelve plots are established within the stream restoration buffer to represent the range of conditions that exist on the site. The plots are randomly located and randomly oriented within the stream buffer restoration area.

Plot construction involved using metal fence posts at each of the four corners to clearly and permanently establish the area that was to be sampled. Then ropes were hung connecting all four corners to help in determining if trees close to the plot boundary were inside or outside of the plot. Trees right on the boundary and trees just outside of the boundary that appear to have greater than 50% of their canopy inside the boundary were counted inside the plot. A piece of white PVC pipe ten feet tall was placed over the metal post on one corner to facilitate visual location of the plot throughout the five-year monitoring period.

All of the planted stems inside the plot were flagged with orange flagging and marked with a three foot tall piece of half inch PVC to mark them as the planted stems (vs. any colonizers) and to help in locating them in the future. Each stem was then tagged with a permanent numbered aluminum tag.

3.3 Results of Vegetation Monitoring

The following tables present stem counts for each of the monitoring plots. Each planted tree species is identified across the top row, and each plot is identified down the left column. The numbers on the top row correlate to the ID column of the previous table. Trees are flagged in the field on an as needed basis before the flags degrade. Flags are utilized, because they will not interfere with the growth of the tree. Volunteers are also flagged during this process.

Table 2. 2008 Vegetation Monitoring Plot Species Composition

Plot	1	2	3	4	5	6	7	8	Total	Stem per acre
1	8	0	1	2	4	0	0	0	15	600
2	2	0	0	2	3	7	1	0	15	600
3	5	0	0	2	5	1	0	0	13	520
4	2	1	3	0	3	1	1	0	11	440
5	5	1	0	0	5	1	2	0	14	560
6	0	0	1	4	6	2	0	0	13	520
7	2	0	0	5	7	0	1	0	15	600
8	1	1	0	7	2	0	5	0	16	640
9	3	0	2	3	3	0	2	0	13	520
10	2	0	3	3	2	4	2	0	16	640
11	2	0	3	0	3	1	1	2	12	480
12	0	2	1	2	2	1	7	0	15	600

Average Stems/Acre: 560
Range of Stems/Acre: 440-640

Volunteer species will also be monitored throughout the five-year monitoring period. Below is a table of the most commonly found woody volunteer species.

Table 3. Volunteers within the Buffer Area

ID	Species	Common Name	FAC Status
A	*Liquidambar styraciflua*	Sweetgum	FAC+
B	*Acer rubrum*	Red Maple	FAC
C	*Pinus taeda*	Loblolly Pine	FAC

Not many volunteer woody species were observed in the vegetation plots. This site was previously an active pasture and the grasses were quick to recover, forming dense ground cover. If volunteer stems do become apparent, they will be flagged and added to the overall stems per acre assessment of the site.

3.4 Vegetation Observations

After construction of the mitigation site, a permanent ground cover seed mixture of Virginia wild rye (*Elymus virginicus*), switch grass (*Panicum virgatum*), and fox sedge (*Carex vulpinoidea*) was broadcast on the site at a rate of 10 pounds per acre. These species are present on the site. Hydrophytic herbaceous vegetation, including rush, (*Juncus effusus*), spike-rush (*Eleocharis obtusa*), Boxseed (*Ludwigia sp.*), and sedge (*Carex sp.*), are observed across the site, particularly in areas of periodic inundation. The presence of these herbaceous wetland plants helps to confirm the presence of wetland hydrology on the site

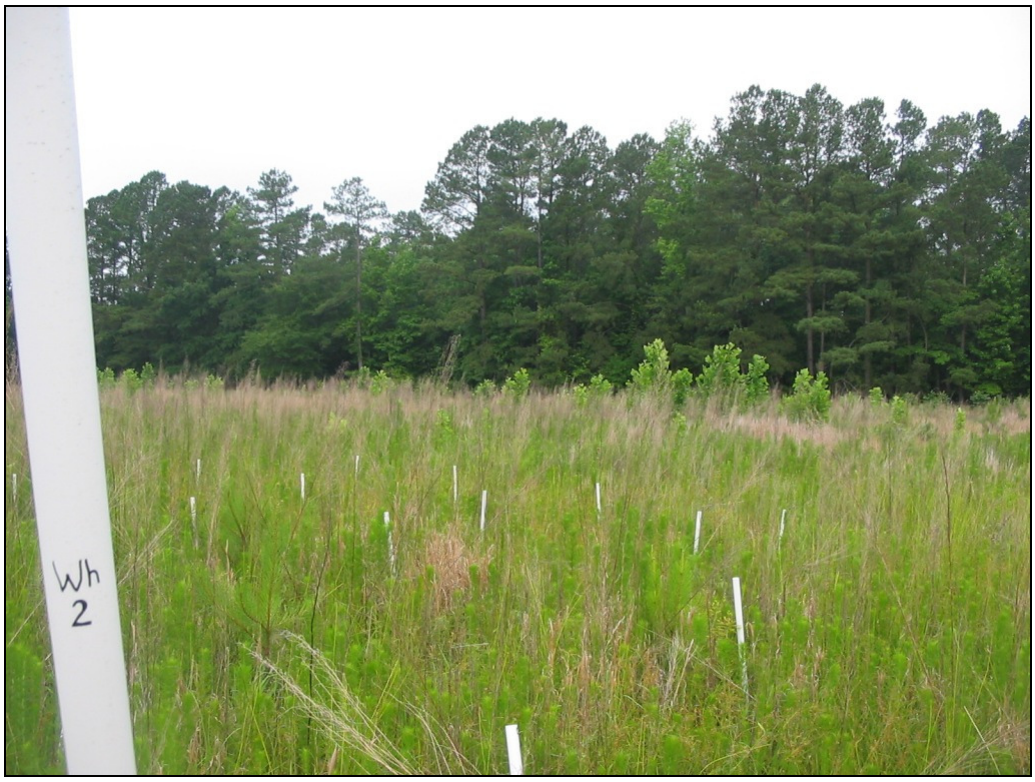
There are weedy species occurring on the site, though none seem to be posing any problems for the woody or herbaceous hydrophytic vegetation. Weedy species on site includes various pasture grasses, goldenrod (*Solidago spp.*), dogfennel (*Eupatorium capillifolium*), horsenettle (*Solanum spp.*), and broomsedge (*Andropogon spp.*). Any threatening weedy vegetation found in the future will be documented and discussed in the monitoring reports.

3.5 Conclusions

The 2008 vegetation monitoring data reflects that the overall site has achieved the interim vegetative success criteria of 320 trees per acre by the end of Year 3 and is on a trajectory to achieve the final vegetative success criteria of 260 trees per acre by the end of Year 5.

Appendix A. 2008 Site Photos

Whitley Vegetation Plot 1



Whitley Vegetation Plot 2

Whitley Vegetation Plot 3

Whitley Vegetation Plot 4

Whitley Vegetation Plot 5

Whitley Vegetation Plot 6

Whitley Vegetation Plot 7

Whitley Vegetation Plot 8

Whitley Vegetation Plot 9

Whitley Vegetation Plot 10

Whitley Vegetation Plot 11

Whitley Vegetation Plot 12