

# **Monitoring Report – 2009**

**Third Evaluation of Five**

## **Reconstruction of Route 66**

**Middlefield, Connecticut**

**ConnDOT Project Number: 81-80**

**U.S. Army Corps of Engineers Permit 199201685**

**Prepared by the Connecticut Department of Transportation  
Bureau of Policy and Planning  
Office of Environmental Planning**

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## **TABLE OF CONTENTS**

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<b>Project Overview</b>	<b>2</b>
<b>Project Summary</b>	<b>2</b>
<b>Location and Directions to Mitigation Sites</b>	<b>2</b>
<b>Start and Completion Dates for Mitigation</b>	<b>2</b>
<b>Performance Standards Are/Are Not Being Met</b>	<b>3</b>
<b>Dates of Corrective or Maintenance Activities Conducted Since Last Report</b>	<b>3</b>
<b>Recommendations for Additional Remedial Actions</b>	<b>5</b>
 <b>Requirements</b>	 <b>5</b>
<b>Success Standards</b>	<b>6</b>
<b>Vegetative Density and Diversity and Plant Survival Rates</b>	<b>6</b>
<b>Aerial Cover of Native Species</b>	<b>12</b>
<b>Invasive Species in Mitigation and Impact Areas</b>	<b>14</b>
<b>Mitigation Site Stabilization</b>	<b>18</b>
 <b>Additional Items for Narrative Discussion</b>	 <b>18</b>
 <b>Summary Data</b>	 <b>19</b>
 <b>Maps</b>	 <b>20</b>
 <b>Conclusions</b>	 <b>22</b>
 <b>List of Required Appendices</b>	 <b>22</b>
<b>Appendix A: Mitigation Special Conditions from Permit Checklist for Review of Mitigation Plan</b>	
 <b>Appendix B: As Built Planting Plans</b>	
 <b>Appendix C: Volunteer Species List</b>	
 <b>Appendix D: Mitigation Photographs</b>	
 <b>Appendix E: Army Corps of Engineers Delineation Data Sheets</b>	

## **i. PROJECT OVERVIEW**

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Army Corps of Engineers Permit No.: 199201685

CT Department of Environmental Protection (DEP) Permit No.: IW-96-131

Mitigation Site Names: White Oak, Reservoir North and Reservoir South (Route 66, Middlefield)

Monitoring Report: 3 of 5

Name and Contact Information for Permittee: Connecticut Department of Transportation; Edgar T. Hurle, Transportation Planning Director; 860-594-2005

Party Responsible for Conducting Monitoring and Dates of Inspection: CT DOT Office of Environmental Planning (OEP) inspected the site on July 15, August 12, and November 4, 2009.

Project Summary: The reconstruction of State Route 66 in Middlefield, Connecticut was initiated primarily as a safety improvement project resulting from concerns regarding roadway geometry, insufficient roadway capacity, and a long history of fatal accidents. To this end, the project consists of widening a 2.1-mile stretch of Route 66 from two to four lanes and realigning a portion of it to improve stopping sight distances, alleviate a dangerous S-curve, and moderate roadway grades.

The reconstruction described above resulted in the permanent loss of 1.67 acres of wetlands within 16 sites. Approximately forty linear feet of perennial stream was also impacted as a result of the project. These impacts were primarily to palustrine-forested wetlands. The most typical functions of the impacted wetlands included wildlife habitat, production export, flood flow alteration, groundwater recharge/discharge, sediment/toxicant/pathogen retention, finfish habitat, and nutrient removal/retention/transformation. It should be noted, however, that most of the impacted wetlands had limited functions and values as a result of their small size and/or limited diversity, and that many of these areas were small drainage ditches that had been created during the construction of the original roadway.

Mitigation for these impacts consists of four created wetlands totaling 2.53 acres, a creation ratio of 1.5:1. These are the 1.0-acre White Oak, 1.16-acre North Reservoir, 0.28-acre South Reservoir, and 0.09-acre Central sites. The constructed wetlands were designed to replace like functions and values to an equal or greater degree.

Location and Directions to Mitigation Sites: All four mitigation areas are located along Route 66 in Middlefield. The Central site is located immediately behind the detention basin on the south side of Route 66 approximately 1500 feet east of the intersection of Routes 66 and 147. The White Oak site abuts the Mount Higby Reservoir on the same side of Route 66 approximately 500 feet south of the Central site. This is the only one of the four sites that is not visible from the road. The North Reservoir site abuts the Mount Higby Reservoir on the north side of Route 66 approximately 500 feet east of the Central site. The South Reservoir site abuts the eastern limit of the Mount Higby Reservoir on the south side of Route 66 and is located just southwest of a second detention basin located approximately 150 feet from the edge of the road. The Latitude/Longitude coordinates of the mitigation sites are provided below in decimal format.

Reservoir North: 41.53855 72.72538

Reservoir South: 41.53840 72.72036

White Oaks: 41.53512 72.72681

Central: 41.53682 72.72671

Start and Completion Dates for Mitigation:

According to CT DOT records, mitigation began in the summer of 2004 with over excavation, placement of organic soils, and seeding culminating in the fall of 2004. The contractor hired All Seasons to conduct the

planting, and the initial planting of the North mitigation site in September and October 2004, while the remaining three sites were planted in April and May of 2005. An October 2005 inventory of the plantings and subsequent meetings revealed that a substantial number of the original plantings had died within the CT DOT-required one-year guarantee period. On November 3, 2006, All Seasons planted 12 replacement shrubs in the Central mitigation site and 1,688 replacement shrubs in the North mitigation site to compensate for these losses, thus completing the creation phase of the mitigation site. Maintenance and monitoring is now ongoing.

Performance Standards are/are not being met: As of the close of the 2009 monitoring season, portions of the mitigation areas still fall short of the ACOE's 35% plant survival requirement per cell and/or the DEP's 85% total plant survival requirement. All sites now meet or exceed the ACOE's species diversity standards. It is likely that several factors have played a part in the loss of plantings that has led to the current shortfall. In general, the most significant factors appear to be a high initial mortality rate among plantings and undesirable mowing activities. Replacement plantings were installed; however, the number of replacement plantings apparently did not match the number of plantings that did not survive the first season. While OEP expects the sites will eventually meet most or all of the vegetation goals set forth by the ACOE regardless, it is unlikely the sites will meet DEP's significantly higher standards. It should be noted that the original planting densities were quite high, enough so that it is unlikely that all the plantings would have survived even in the absence of other stressors simply based on the space that each plant would have required to flourish. Finally, analysis of aerial photography indicates that at least some of the failed plantings on Reservoir North were likely planted outside of the limits of the mitigation area. Again, this may have been a response to the lack of space allotted for the large number of plantings installed on this site. These concerns are discussed in detail in Section II of this report.

Some portions of the mitigation areas also do not yet have hydric soils; however, the majority of these areas have the hydrology necessary to develop hydric soils over time. Where this may not be the case is in the far eastern portion of Reservoir North, the area of greatest concern as far as both vegetation and soils criteria. From the failure of the plantings to thrive in this area as well as from the surrounding topography, it appears that this portion of Reservoir North was not excavated deep enough to develop a hydric soil profile. As noted above, however, OEP recently reviewed aerial photographs of this site in an attempt to determine whether portions of what was formerly thought to be failed mitigation are in fact upland that was planted beyond the limits of the mitigation area. It is difficult to determine the exact boundaries or acreage of the mitigation area via aerial photography; however, the available mapping seems to indicate that, while a portion of the failed plantings is within the 1.16-acres of mitigation, the plantings in the far eastern portion of the site are outside of it.

Invasive species are largely being contained, and significant reductions in their numbers have been achieved in the last several years; however there are still several invasive species standards set by the ACOE that are not presently being met. Diligent monitoring and control efforts are needed to ensure attainment of these standards. Mitigation success standards are discussed in detail in Section II below.

Dates of Corrective or Maintenance Activities Conducted Since Last Report: Purple loosestrife, autumn olive (*Elaeagnus umbellata*), multiflora rose, (*Rosa multiflora*) Oriental bittersweet (*Celastrus orbiculata*), wineberry (*Rubus phoenicolasius*) and phragmites (*Phragmites australis*) have now all been found to varying degrees on-site. While time did not allow during the 2009 site inspections for any sizeable removal efforts, substantial progress with the woody species autumn olive, multiflora rose and Oriental bittersweet was made during removal efforts in 2008, and a field day will be scheduled prior to or concurrent with the spring 2010 monitoring for further removal. Areas of concern that were newly identified during the November 2009 site inspection include the formerly mowed portions of Reservoir South and White Oak, where the dominant woody species that have colonized are invasive.

While it has become apparent that most of the original plantings in the formerly mowed sections of Reservoir South and White Oak are either dead or compromised to the point where they are unlikely to recover, it is OEP's hope that the cessation of mowing and management of invasive species will allow native herbaceous and woody species to colonize this area. This is also true of Reservoir North, although the portion of this site affected by mowing has not colonized with any invasive species to date. This is probably due to lengthier periods of inundation within the mowing limits on Reservoir North as compared to affected sections of the other mitigation sites. Mechanical removal, while tedious, is the only feasible option for the control of species for which no biological controls are available since chemical controls are not permissible in such close proximity to the reservoir.

Control of purple loosestrife (*Lythrum salicaria*) is one of the most crucial components of mitigation maintenance activities if these mitigation areas in general, and Reservoir South in particular, are to be successful. Field investigations in the spring of 2008 and in the summer and fall of 2009 showed significantly increased evidence of feeding of *Galerucella* beetles from previous years, and the number of adults observed during the beetles' active season increased substantially. During the summer 2009 site inspections, OEP found adult *Galerucella* beetles at the Reservoir South (where they were originally released), Reservoir North and White Oak sites. They were also found at every impact site where purple loosestrife was identified with the singular exception of Impact Site 16. While the stand of purple loosestrife identified on Impact Site 16 is considered too small to sustain a separate beetle release, its proximity to other stands where beetles are already established makes it highly likely that the beetles will migrate there on their own. As a result of the observations described above, it was determined that the numbers of *Galerucella* presently within the mitigation areas and along the project corridor are enough to be effective at controlling purple loosestrife, and thus no additional releases are proposed at this time. It should be noted that the amount of purple loosestrife in the White Oak site did appear to have increased slightly from 2008 to 2009, however, there are obvious signs of beetle activity on this site and many plants were extensively damaged. It is expected that the percent cover of purple loosestrife in this area will decrease now that it is clear the beetles have become established here; however, OEP will continue to monitor *Galerucella* numbers and the presence and general health of purple loosestrife throughout the mitigation and impact areas and will assess each year whether or not an additional release is necessary. No additional areas of loosestrife or evidence of beetle activity were located during the fall 2009 site inspection, though it should be noted that only the mitigation areas and not the impact areas are examined during the fall inspections.

One of the main concerns at all four mitigation sites is the extensive damage to woody plantings from seasonal mowing activities. During OEP's summer of 2007 inventory aimed at assessing the success of the mitigation plantings, OEP staff observed extensive damage to plantings at all four mitigation sites as a result of lawn mowing operations. In July of 2007 and again in April of 2008, OEP contacted the City of Middletown Water and Sewer Department (MWS) to bring the problem to light and to request that the affected areas be staked to provide a clear visual cue for maintenance crews. On April 18, 2008, the Water Company responded and scheduled to meet with OEP in field on May 8, 2008. During this meeting, which was attended by three representatives of the City of Middletown Water Department, clear mowing limits were established and staked. Also discussed was the possibility of OEP acquiring signage to replace or supplement the staking so that the intended purpose of demarcating the limits of mowing is clear to all who maintain this area in the future.

While some portions of the mitigation areas immediately benefited as a result of DOT's communications and on-site meeting with representatives from the MWS, many of the stakes were found to be missing during the September 2008 site inspection, and mowing of plantings was continuing to occur at the Reservoir North and White Oak sites, and to a lesser degree at the Central site beyond the limits established during the meeting. It should be noted that OEP spoke with both the MWS and the DOT's Maintenance Department, and both parties indicated that they are not involved with mowing activities at the Central site. During this same site visit, OEP staff was unable to locate a number of the plantings impacted previously by mowing. OEP contacted

Superintendent of Water Resources Treatment and Supply, Donald Fisco, to make him aware of the ongoing mowing activities. As a result of this communication, OEP received a letter dated December 11, 2008 from the City of Middletown's Environmental Resource Specialist, James Sipperly, suggesting a second field meeting and offering further suggestions for the protection of the mitigation sites into the future. On March 12, 2009, Mr. Sipperly met OEP staff in the field to discuss mowing limits and signage. Also during this site visit, DOT Maintenance installed signs for the Reservoir South and Central sites. OEP was able to obtain signs for these two sites because DOT still owns these properties; however, there are presently no signs for the White Oak or Reservoir North sites, and it is not within DOT's power to install such signs on property it no longer owns. Mr. Sipperly offered to look into whether the Town could provide the remaining signs.

Following Mr. Sipperly's visits to the mitigation sites and subsequent follow-up with mowing crews, OEP judged during its inspections earlier in the year that all unnecessary mowing in and adjacent to the sites had ceased and that the formerly mowed areas were beginning to colonize with new vegetation. While this is still largely the case, photographs from the November 2009 site inspection do not appear to show a full year's growth in a limited portion of the White Oaks site. This has led OEP to assume these areas were mowed at some point during the 2009 growing season. It should again be noted that this area is not extensive and that it no longer contains plantings thought to be viable regardless of whether mowing continues. This contested area consists of a linear swath immediately north of the access strip that the MWS maintains along the southern length of the mitigation area. In essence, OEP maintains that the access strip has been widened to the north to the point of encroaching into the wetland creation and its associated plantings.

Recommendations for Additional Remedial Actions: It is the OEP's intention to continue to monitor the presence and general health of purple loosestrife within Reservoir South and throughout the mitigation areas. If it becomes necessary to do so, OEP will release additional *Galerucella*, though the proliferation of beetles on this site appears to indicate that this will not be needed in the near future. OEP will also continue to monitor for the presence of other invasive species such as autumn olive and multiflora rose, and will work to the best of its ability to remove plants that encroach upon the mitigation area. While these plants are not well represented on the sites at present, this is largely a result of the mowing activities that have now all but ceased. As a result, these species are expected to become more of a nuisance on the site.

With regard to mowing activities, Mr. Sipperly and OEP staff continue to correspond periodically so that each may keep the other apprised of any developments on site. Most recently, discussions have centered on MWS's 2009 mowing schedule, whether or not mowing in fact occurred beyond the agreed-upon limits and, if so, how to proceed. As discussed above, there now remains only a very narrow band of contested area at the White Oak site. Plantings in these areas, if OEP could locate them at all, have little to no live growth left and are unlikely to recover regardless.

## ii. REQUIREMENTS

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The Special Conditions sections of both Department of the Army permit 199201685, issued January 24, 2003, and DEP Inland Wetlands and Watercourses permit IW-96-131, issued January 13, 2002, state that mitigation must be performed in accordance with the final approved mitigation plan as well as with the Army Corps Checklist for Review of Mitigation Plan. The CT DOT's December 12, 2002 Mitigation Plan sets forth that for each of the first five full growing seasons following construction of the mitigation sites, the sites shall be monitored biannually, with annual monitoring reports being submitted to the ACOE and biannual reports being submitted to the DEP. The requirements set out in these documents are included below for each site, as are the four appendices required by the ACOE Mitigation Checklist.

## **SUCCESS STANDARDS**

### **(1). Vegetative Density and Diversity and Plant Survival Rates:**

- ACOE mitigation standards require that the site have at least 500 trees and shrubs per acre, of which at least 350 per acre are trees for proposed forested cover types, that are healthy and vigorous and are at least 18" tall in 75% of each planned woody zone AND at least the following number [numbers are listed for each site below based on the original number of species planted] of non-exotic species including planted and volunteer species. Volunteer species should support functions consistent with the design goals. To count a species, it must be well represented on the site (e.g., at least 50 individuals of that species per acre).
- The DEP Inland Wetlands permit states that "A plant survival rate of less than 75% the first year, 80% the second year, and 85% the third, fourth and fifth year will automatically require two additional years of monitoring and remedial action to be taken which may include but not necessarily be limited to, replanting of dead or dying stock, substituting different plant species, or adjusting grading at the site to provide appropriate topography. Such remedial action may not be required if sufficient volunteer plants with good wildlife habitat value are well established."
- DEP also requires that an inventory of herbaceous vegetation be conducted once per year and include both seeded and volunteer species with approximate abundance levels.

All four mitigation wetlands were designed and planted as emergent marsh surrounded by a perimeter of shrub swamp. All four wetlands were also seeded with a wetland mix that included eighteen herbaceous species intended to supplement the plantings. The Reservoir North wetland plantings consisted of seven species of shrubs and seven species of emergent vegetation, the Reservoir South wetland was planted with five species of shrubs and five species of emergent vegetation, the White Oak wetland was planted with eight species of shrubs and seven species of emergent vegetation, and the Central wetland was planted with six species of shrubs and seven species of emergent vegetation. A large percentage of the original plantings did not survive, particularly in the Reservoir North wetland, and a portion of these were replaced in the fall of 2006.

OEP conducted a thorough inventory of the living woody plantings in July of 2009. A brief description of dominant woody vegetation at each of the four sites follows. Only those species meeting the ACOE's 50 individuals per acre criterion are listed. Also noted below is whether the number of dominant species meets the ACOE species diversity requirement (i.e. the minimum number of species that must be well represented, calculated based on the original number of species planted).

- **Reservoir North:** Shadbush (*Amelanchier Canadensis*), silky dogwood (*Cornus amomum*), buttonbush (*Cephalanthus occidentalis*), highbush blueberry (*Vaccinium corymbosum*) and arrow-wood (*Viburnum dentatum*) are dominant. This meets the diversity requirement of five successful woody species for this site based on the original planting of seven woody species. While red maple (*Acer rubrum*) is also present in significant numbers on site due to volunteerism, until recently the majority of these plants were kept in check by mowing activities and as a result are not much bigger than seedlings.
- **Reservoir South:** Common winterberry (*Ilex verticillata*), silky dogwood, arrow-wood and buttonbush are dominant. Therefore, this site contains all four of the woody species needed in numbers greater than 50 per acre to meet the vegetation success standards based on the original planting of five woody species.
- **White Oak:** Pussy willow (*Salix discolor*), arrow-wood, silky dogwood, common winterberry and highbush blueberry are dominant. Additionally, red maple is a frequent volunteer species in this area; however, the individual plants are far too small at this point to be considered significant. Eight species were originally planted on this site, although only five of these were planted in densities of 50 or more individuals per acre. Still, the five successful species match the requirement associated with eight original plantings and surpass



the four that would be required if the calculation were based only upon the five species planted above the threshold density.

- Central: silky dogwood, highbush blueberry, arrow-wood, and winterberry are dominant. Based on the original planting of six woody species, the four dominants remaining match the ACOE diversity requirement.

As of the close of the 2009 monitoring season, many areas still fall short of both ACOE and DEP standards for plant densities and survival rates. The ACOE requirement of at least 350 trees per acre for proposed forested cover types is not applicable to any of the mitigation areas since no forested wetland was proposed. Presently, if calculated based upon raw wetland acreage rather than acreage of wooded wetland, only the Central mitigation site meets the ACOE vegetation success standard (i.e. at least 500 trees and shrubs per acre). None of the sites meets the DEP required 85% plant survival rate.

It is likely that several factors have played a part in this loss of plantings. While the most significant factors appear to be a high initial mortality rate among plantings, particularly those at Reservoir North, and undesirable mowing activities, OEP has also observed evidence of deer and other animal browse. Following the first growing season, DOT had to undergo lengthy negotiations with All Seasons to secure replacement plantings in accordance with the contract. Still, the replacement plantings were not in kind, and the result was a reduction in numbers as well as diversity of species on the site in comparison to what was proposed. While OEP does expect that the mitigation sites will eventually meet most or all of the vegetation goals set forth by ACOE regardless, it is unlikely they will meet DEP's significantly higher standards.

It should be noted that the original planting densities were quite high, enough so that it is unlikely that all the plantings would have survived in the absence of other stressors simply because each plant would not have had the space it required to flourish. Further, the original planting densities were both far higher than one would observe in the surrounding natural wetlands or most any other wooded wetland system, and far higher than the USDA recommends.

Finally, analysis of aerial photography indicates that at least some of the plantings on Reservoir North are outside of the limits of the mitigation area. Again, this may have been in response to a lack of space for the large number planted, with the result being that species planted here, primarily arrow-wood and silky dogwood, are suited for wetter conditions than those in which they were planted. It is highly likely that the planting densities on all sites and the placement of plants above the true wetland boundary at Reservoir North are the two most significant contributors to the high overall plant mortality rate.

In support of OEP's position regarding the excessive planting densities, DOT records indicate that the subcontractor originally installed 10,349 plantings at the 1.16-acre Reservoir North site. Of these, 4,385 plantings were herbaceous and 5,964 were woody. This represents a planting density of 8,922 plants per acre (or one plant per every 4.9 s.f.), 5,141 per-acre of which are woody plantings. If the herbaceous plantings are discounted entirely, the planting density is still one plant for every 8.5 s.f., which translates to a distance between woody plantings of 3.3 ft on center. It should further be noted that there are substantial portions of all four sites that consist of open water and/or emergent marsh, neither of which have any appreciable number of woody plants. Therefore, while a spacing of 3.3 feet on center is already too dense for most woody plant species according to the USDA, this number is in reality a substantial overestimate of how much space each plant would have had in Reservoir North (see Table 1 below).

The USDA's online plant database lists maximum planting densities for many species. The maximum recommended planting densities for all seven woody species in Reservoir North are well below the actual planting density of 5,141 plants per acre. Silky dogwood has the highest maximum recommended density of



the seven species at 4800 plants per acre, while the maximums for all remaining species are under 3000 plants per acre, and three species (shadblow, elderberry and highbush blueberry) are 1800 plants per acre or less. Coincidentally, highbush blueberry was the best represented among all the species with 2,699 plants installed (2,327 plants per acre). In other words, were DOT to have installed only the 2,699 blueberries at Reservoir North, the densities would still have exceeded by 37% the upper limits recommended by the USDA.

**TABLE 1**

	Acreage	Woody Plantings	Herbaceous Plantings	Woody Plants/Ac.	Herbaceous Plants/Ac.	Feet on Center (woody plants only)	% Woody Plants	% Herbaceous Plants
Reservoir North	1.16	5,964	4,385	5,141	3,780	3.3	57.6	42.4
Reservoir South	0.28	360	6,560	1,286	23,429	6.6	5.2	94.8
White Oak	1.0	977	11,133	977	11,133	7.5	8.1	91.9
Central	0.09	275	2,148	3,056	23,867	4.3	11.3	88.7

Calculating only woody plantings in this way, the numbers for Reservoir South, White Oak, and Central are somewhat less striking. All three of these sites also have larger percentages of their total acreage as open water and/or emergent marsh, however, and consequently have much higher percentages of herbaceous plantings thus far unaccounted for in the calculations (see “% Herbaceous Plants” in Table 1 above). The higher these percentages, the more skewed these calculations become in terms of woody plant densities appearing to be less than what they truly are.

To illustrate this point, a separate calculation was employed utilizing conservative estimates of the portion of each site represented by open water and/or emergent marsh to determine approximate plant densities in the remaining acreage of wooded wetland (see Table 2 below). OEP used the following ratios of wooded wetland to combined emergent marsh/open water for these calculations: 2:1 for Reservoir North (0.77 acre wooded), 1:3 for White Oak (0.25 acre wooded) and 1:2 for Reservoir South (0.09 acre wooded) and Central (0.03 acre wooded). Using these estimates, the woody plant densities (plants per acre) in the remaining wooded wetlands are as follows: 7,712 for Reservoir North, 3,857 for Reservoir South, 3,908 for White Oak and 9,167 for Central. Even using conservative estimates of non-woody wetland acreage, the planting densities are striking. In the interest of transparency, it should be noted that the demarcating line between emergent marsh and shrub swamp is a bit blurred on the Central site and that a substantial number of woody plantings were installed within what is primarily emergent marsh. However, since the estimated acreages of combined open water and emergent marsh are conservative, and since this assertion is supported by the combined facts that much of the site is non-traversable year-round and that almost 90% of the plantings on this site were herbaceous, the calculations for this site are still considered useful.

**TABLE 2**

	Acreage	Estimated Ratio Wooded: non-wooded	Estimated Acreage Wooded	Woody Plantings	Estimated Woody Plants/ Wooded Ac.	Estimated Feet on Center (distance between stems) of woody plants in wooded wetland
Reservoir North	1.16	2:1	0.773	5,964	7,712	2.7
Reservoir South	0.28	1:2	0.093	360	3,857	3.8
White Oak	1.0	1:3	0.250	977	3,908	3.8
Central	0.09	1:2	0.030	275	9,167	2.5

In addition to masking the true planting densities of woody species, the substantial portions of each site planned as emergent marsh with little or no shrub cover also make it more difficult to meet the stated ACOE goal of 500 woody plants per acre since this standard does not appear to take into account wetland plant community types. In fact, OEP calculates as of the 2009 plant inventory that this goal would be met for all but the Reservoir North site if the amount of open water and emergent marsh were factored in to the calculations. That is, if the rough acreage of open water and emergent marsh was subtracted from the total acreage for each site before determining how many plants amount to 500 per acre for each site.

Following the initial die-off of a large number of plants, probably the single largest obstacle to the success of the remaining and replanted woody vegetation at all four sites has been mowing activities that have extended well into the planted areas. Many of these plantings are difficult to locate among the herbaceous species because they have been cut back so substantially. Aside from impacted plantings not meeting the ACOE 18" height or 75% cover requirements as a result, repeated mowing has clearly reduced the health and vigor of these plants as well, and many that were located during the most recent site visit were either dead or appeared to stand little chance of survival. After multiple communications back and forth between OEP and MWS and several joint meetings in the field spanning from July 2007 to March 2009, the mowing issue is largely resolved (see Section I for further details regarding dates of corrective or maintenance and present status). Unfortunately, as discussed, it is unlikely at this point that the plantings in many of these mowed areas will recover. While OEP had previously been encouraged by the fact that many of the plants continued to send up new shoots after each mowing, more recently it seems that most of these plants have ceased to do so.

As stated above, between the recovery of some of the mowed plantings and the proliferation of volunteer species such as red maple, it is likely that most or all of the woody vegetation goals set forth by the Army Corps for the mitigation sites will eventually be met. Also as stated above, the percent survival requirements set forth by the DEP are not likely to be met due to the sheer numbers involved in the initial planting effort.

In addition to woody plantings, DEP requires monitoring of herbaceous species in the mitigation areas. The chart below is an inventory of all herbaceous species identified at the four mitigation sites in 2009. For each site, plants are listed by their common and scientific names with an assessment of their relative abundance. Relative abundance is broken into three categories: Dominant (D), Established (E) and Trace (T). A 'Dominant' label indicates that a species was among the most common in the subject mitigation area. This was determined by assessing whether the species represented at least 20% of the ground cover. Species designated as 'Established' had more than just a few individual plants but represented less than 20% of the ground cover. 'Trace' species had no more than a few individual plants identified. In order to facilitate review, additions/amendments since the 2008 end-of-year report are in bold face. Also in bold are invasive species for which an estimate of percent cover has been added at Army Corps' request.

#### Reservoir North Mitigation Wetland

Common name	Scientific Name	Relative Abundance (% Cover)
redtop	<i>Agrostis alba</i>	established
<b>bentgrass</b>	<b><i>Agrostis sp.</i></b>	<b>established</b>
<b>northern water plantain</b>	<b><i>Alisma triviale</i></b>	<b>established</b>
<b>swamp milkweed</b>	<b><i>Asclepias incarnate</i></b>	<b>trace</b>
aster	<i>Aster sp.</i>	established
nodding bur marigold	<i>Bidens caernua</i>	established
<b>devil's beggarticks</b>	<b><i>Bidens frondosa</i></b>	<b>established</b>
lake sedge	<i>Carex lacustris</i>	established
barnyard grass	<i>Echinochloa crusgalli</i>	dominant
American waterwort	<i>Elatine americana</i>	established

spike rush	<i>Eleocharis spp.</i>	established
fireweed	<i>Erechtites hieracifolia</i>	established
spotted joe-pye-weed	<i>Eupatoriadelphus maculatus</i>	established
bush-clover	<i>Lespedeza sp.</i>	Trace
bird'sfoot trefoil	<i>Lotus corniculatus</i>	established
<b>purple loosestrife*</b>	<b><i>Lythrum salicaria*</i></b>	<b>trace (&lt;3%)</b>
wild mint	<i>Mentha arvensis</i>	trace
arrow-arum	<i>Peltandra virginica</i>	established
ditch stonecrop	<i>Penthorum sedoides</i>	established
<b>Timothy</b>	<b><i>Phleum pratense</i></b>	<b>established</b>
tearthumb	<i>Polygonum sp.</i>	established
big-leaved arrowhead	<i>Sagittaria latifolia</i>	established
<b>little bluestem</b>	<b><i>Schizachyrium scoparium</i></b>	<b>established</b>
wool-grass	<i>Scirpus cyperinus</i>	dominant
soft-stem bullrush	<i>Scirpus validus</i>	dominant
yellow foxtail	<i>Setaria glauca</i>	established
goldenrod	<i>Solidago sp.</i>	established
bur-reed	<i>Sparganium americanum</i>	trace
giant bur-reed	<i>Sparganium eurycarpum</i>	established
red clover	<i>Trifolium pretense</i>	trace
<b>cattail**</b>	<b><i>Typha latifolia</i></b>	<b>established (approx. 15%)</b>

### Reservoir South Mitigation Wetland

Common name	Scientific Name	Relative Abundance
common yarrow	<i>Achillea millefolium</i>	<b>established</b>
water-plantain	<i>Alisma subcordatum</i>	trace
common burdock	<i>Arctium minus</i>	established
<b>common milkweed</b>	<b><i>Asclepias syriaca</i></b>	<b>trace</b>
<b>swamp milkweed</b>	<b><i>Asclepias incarnate</i></b>	<b>trace</b>
asters	<i>Aster spp.</i>	established
wild sensitive plant	<i>Cassia nictitans</i>	<b>trace (dominant in vicinity)</b>
<b>Asiatic bittersweet*</b>	<b><i>Celastrus orbiculata*</i></b>	<b>trace</b>
umbrella-sedge	<i>Cyperus strigosus</i>	established
Queen Anne's lace	<i>Daucus carota</i>	trace
three way sedge	<i>Dulichium arundinaceu</i>	trace
barnyard grass	<i>Echinochloa crus-galli</i>	dominant
<b>autumn olive*</b>	<b><i>Elaeagnus umbellata*</i></b>	<b>trace</b>
spike-rush	<i>Eleocharis spp.</i>	established
fireweed	<i>Erechtites hieracifolia</i>	established
spotted joe-pye-weed	<i>Eupatoriadelphus maculatus</i>	established
common boneset	<i>Eupatorium perfoliatum</i>	trace
bedstraw	<i>Galium sp.</i>	established
<b>spotted touch-me-not</b>	<b><i>Impatiens capensis</i></b>	<b>trace</b>
soft rush	<i>Juncus effusus</i>	established
<b>bird'sfoot trefoil</b>	<b><i>Lotus orbiculatus</i></b>	<b>established</b>
<b>purple loosestrife*</b>	<b><i>Lythrum salicaria</i></b>	<b>established- control in progress (&lt;10%)</b>
arrow-arum	<i>Peltandra virginica</i>	established
<b>common reed*</b>	<b><i>Phragmites australis*</i></b>	<b>trace (&lt;3%)</b>
<b>English plantain</b>	<b><i>Plantago lanceolata</i></b>	<b>established</b>

tearthumb	<i>Polygonum sp.</i>	established
common cinquefoil	<i>Potentilla simplex</i>	established
<b>common selfheal</b>	<b><i>Prunella vulgaris</i></b>	<b>trace</b>
<b>multiflora rose*</b>	<b><i>Rosa multiflora*</i></b>	<b>established</b>
<b>blackberry</b>	<b><i>Rubus sp.</i></b>	<b>established</b>
<b>wineberry<sup>P</sup></b>	<b><i>Rubus phoenicolasius<sup>P</sup></i></b>	<b>trace</b>
dark green bulrush	<i>Scirpus atrovirens</i>	trace
wool-grass	<i>Scirpus cyperinus</i>	established
soft-stem bullrush	<i>Scirpus validus</i>	trace
yellow foxtail	<i>Setaria glauca</i>	established
<b>bladder campion</b>	<b><i>Silene latifolia</i></b>	<b>trace</b>
Carolina horsenettle	<i>Solanum carolinense</i>	<b>trace</b>
goldenrod	<i>Solidago spp.</i>	established
bur-reed	<i>Sparganium americanum</i>	trace
<b>cattail**</b>	<b><i>Typha latifolia</i></b>	<b>dominant (approx. 50%)</b>
blue vervain	<i>Verbena hastata</i>	trace
<b>summer grape</b>	<b><i>Vitis aestivalis</i></b>	<b>trace</b>

### White Oak Mitigation Wetland

Common name	Scientific Name	Relative Abundance
<b>red maple</b>	<b><i>Acer rubrum</i></b>	<b>established</b>
<b>common yarrow</b>	<b><i>Achillea millefolium</i></b>	<b>trace</b>
<b>bentgrass</b>	<b><i>Agrostis sp.</i></b>	<b>established</b>
<b>swamp milkweed</b>	<b><i>Asclepias incarnate</i></b>	<b>established</b>
tussock sedge	<i>Carex stricta</i>	established
wild sensitive plant	<i>Cassia nictitans</i>	trace
yellow nutsedge	<i>Cyperus esculentus</i>	established
umbrella-sedge	<i>Cyperus strigosus</i>	established
American waterwort	<i>Elatine americana</i>	established
spike rush	<i>Eleocharis spp.</i>	established
spotted joe-pye-weed	<i>Eupatoriadelphus maculatus</i>	established
common boneset	<i>Eupatorium perfoliatum</i>	established
<b>St. Johnswort</b>	<b><i>Hypericum sp.</i></b>	<b>established</b>
toadflax	<i>Linaria vulgaris</i>	trace
<b>bird's-foot trefoil</b>	<b><i>Lotus orbiculatus</i></b>	<b>established</b>
<b>purple loosestrife*</b>	<b><i>Lythrum salicaria</i></b>	<b>established- control in progress (&lt;3%)</b>
square stem monkey flower	<i>Mimulus ringens</i>	trace
arrow-arum	<i>Peltandra virginica</i>	dominant
<b>Timothy</b>	<b><i>Phleum pratense</i></b>	<b>trace</b>
<b>common reed*</b>	<b><i>Phragmites australis</i></b>	<b>trace- controlled (&lt;3%)</b>
dark green bulrush	<i>Scirpus atrovireau</i>	established
wool-grass	<i>Scirpus cyperinus</i>	dominant
soft-stem bullrush	<i>Scirpus validus</i>	established
yellow foxtail	<i>Setaria glauca</i>	established
Carolina horsenettle	<i>Solanum carolinense</i>	established
goldenrod	<i>Solidago spp.</i>	established
bur-reed	<i>Sparganium americanum</i>	established
giant bur-reed	<i>Sparganium eurycarpum</i>	dominant
<b>cattail**</b>	<b><i>Typha latifolia</i></b>	<b>dominant (approx. 20%)</b>

common mullein	<i>Verbascum thapsus</i>	trace
blue vervain	<i>Verbena hastata</i>	established

### Central Mitigation Wetland

Common name	Scientific Name	Relative Abundance
nodding bur marigold	<i>Bidens cernua</i>	established
fox sedge	<i>Carex vulpinoidea</i>	dominant
<b>barnyard grass</b>	<b><i>Echinochloa crus-galli</i></b>	<b>established</b>
soft rush	<i>Juncus effusus</i>	dominant
arrow-arum	<i>Peltandra virginica</i>	established
arrowleaf tearthumb	<i>Polygonum sagittatum</i>	established
wool-grass	<i>Scirpus cyperinus</i>	established
soft-stem bullrush	<i>Scirpus validus</i>	established
yellow foxtail	<i>Setaria glauca</i>	established
<b>goldenrod</b>	<b><i>Solidago sp.</i></b>	<b>established</b>
bur-reed	<i>Sparganium americanum</i>	established
<b>cattail**</b>	<b><i>Typha latifolia</i></b>	<b>Established (approx. 15%)</b>

\* Denotes species listed on the 2004 Connecticut Invasive Plant List

\*\* Denotes species listed as invasive in the ACOE permit, but not on the 2004 Connecticut Invasive Plant List

**Dominant-** Among most common species in mitigation area (i.e. 20% or greater of any vegetative layer)

**Established-** Species is not dominant, but more than a few individuals present in impact/mitigation area

**Trace-** No more than a few individual plants present in impact/mitigation area

- (2). ACOE requires that each mitigation site have at least 80% aerial cover, excluding planned open water or bare soil areas, by non-invasive species; that planned emergent areas on each mitigation site have at least 80% cover by noninvasive hydrophytes; and that planned scrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species. For the purpose of this success standard, invasive species of hydrophytes are:

Cattails – *Typha latifolia*, *Typha angustifolia*, *Typha glauca*

Common Reed – *Phragmites australis*

Purple Loosestrife—*Lythrum salicaria*; and

Buckthorn—*Rhamnus frangula*

Reservoir North does appear to have 80% vegetative cover in non-planned open water areas, and at least 60% cover in scrub-shrub areas by non-invasive hydrophytes, with at least 15% of these being woody species. It is of note, however, that the woody plantings in the eastern portion of the site are severely stressed and not likely to thrive in the long term. Purple loosestrife is present on the site in very small numbers, and control efforts undertaken thus far are described elsewhere in this report. The only invasive found in significant numbers on this site was cattail, which does appear to account for at least 20% of the planned emergent areas of the site. While cattail is well established on this site, it is of note that many other herbaceous species are also successful in this wetland.

Reservoir South has less than 80% aerial cover by non-invasive species in the non-planned open water areas and less than 80% aerial cover by non-invasive hydrophytes in the planned emergent marsh. The reason the site falls short of both of these standards is that cattail, purple loosestrife and common reed collectively represent greater than 20% of the total aerial cover of the site and of the emergent marsh as well. Cattail is far more abundant than purple loosestrife, and common reed is limited to only a few individuals. As with Reservoir North, a number of desirable native species are also abundant at this site,

including arrow arum (*Peltandra virginica*), barnyard grass (*Echinochloa crusgalli*), and various sedges and rushes. With regard to purple loosestrife, efforts are underway (as described above) to use biological controls to manage the species in this area. Since purple loosestrife is dominant along much of the edge of the reservoir, a large seed bank exists immediately adjacent to the created wetland. It is therefore expected that purple loosestrife will be an ongoing concern for some time at this site. Now that mowing activities have ceased at Reservoir South, the site has well over 60% aerial cover in scrub-shrub portions of the site, and the woody planting density is sufficient with at least 15% aerial cover by woody species.

The White Oak site has achieved over 80% aerial cover throughout the site by non-invasive hydrophytes, and in the planned scrub-shrub areas at least 15% of the vegetation is woody plantings. Despite minimal coverage by invasive species, the site may fall somewhat short of the 60% non-invasive plant cover criteria for scrub-shrub zones because of mowing activities that affected plant survival and growth. Cattail, common reed, and purple loosestrife are present on the site; however, they collectively represent less than 20% of the plant cover in the emergent marsh. Of these three species, only the cattail is present in significant numbers. Additionally, many other submerged, emergent, and other herbaceous species are successfully established in the mitigation area, including blue vervain (*Verbena hastata*), joe-pye-weed (*Eupatorium maculatus*), arrow arum, tussock sedge (*Carex stricta*), giant burreed (*Sparganium eurycarpum*), soft stem bulrush, wool grass, and the volunteer species American Waterwort (*Elatine americana*) and Spike Rush (*Eleocharis spp.*). Despite their small numbers on the site, common reed and purple loosestrife's status as very aggressive, non-native species makes monitoring and control of these species critical. In previous years, removal of common reed has been necessary within the mitigation site and the adjacent wetlands that were supporting a pre-existing infestation. Because of these efforts, common reed accounts for less than 2% of the emergent vegetative cover for this site. Purple loosestrife accounts for a similarly small percentage of the emergent vegetation because of the success of competing species and biological controls.

Cattail within the Central mitigation area may account for greater than 20% of the aerial cover, thus causing the site to fall short of the criteria of 80% vegetative coverage with non-invasive hydrophytes both within the emergent marsh area and on the site as a whole. While cattail are abundant on this site, many other desirable submerged, emergent, and other herbaceous species are successfully established in the mitigation area as well, including a number of sedge (*Carex sp.*) species, soft rush (*Juncus effusus*), and nodding bur marigold (*Bidens cernua*). The scrub-shrub cover on this site is limited to the fringe of the emergent marsh. Despite the presence of a sufficient diversity and density of healthy native plantings and the absence of all woody invasive species from the site, it does not quite meet the 60% aerial cover and 15% woody cover standards in planned scrub-shrub areas. This is a result of a sufficient number of woody plantings thriving within what is predominantly emergent marsh, while the narrow outer fringe of this wetland that was planned as scrub-shrub has been completely mowed. Where mowing was cut back early on, the plantings did well. Further upslope, it appears that the plantings were mowed until more recently. As a result, the narrow strip of plantings along the eastern outer perimeter of the wetland was substantially harmed. Again, this is a small portion of the entire site, and its significance is perhaps overstated in the above calculations because the distinction between what is primarily shrub swamp and what is primarily emergent marsh is blurred by the presence of both plant communities thriving in the moderate to lower elevations of the site.

While OEP understands the Army Corps of Engineers' concerns about cattails' ability to form monocultures at the expense of other native species, the mitigation sites presently support a diverse and well-established emergent herbaceous vegetation community. Further, due to close proximity to the reservoir, the only available control option for cattail is mechanical removal. Removal will be completely ineffective without excavating the plants' underground root systems, which would necessarily affect all other established emergent species and their root systems as well. Accordingly, undertaking to mechanically remove the cattail would serve to knock back all the emergent species in the vicinity, with the likely result that the more sensitive

desirable native species will suffer the greatest losses over time. Further, OEP is very concerned that two non-native invasive emergents in the area, purple loosestrife and common reed, are the most likely to supplant the cattail if control is in fact successful. Given that cattail is native and provides a benefit to native wildlife, OEP does not agree that control efforts for this species would have a positive outcome from an ecological standpoint.

(3). Invasive Species in Mitigation and Impact Areas:

- ACOE requires that Common Reed (*Phragmites australis*), Purple Loosestrife (*Lythrum salicaria*), Russian and Autumn Olive (*Elaeagnus* spp.), Buckthorn (*Rhamnus frangula*), and/or Multiflora rose (*Rosa multiflora*) plants at the mitigation sites be controlled.
- In accordance with CT DEP's special condition #4 of the permit requirements, DOT is required to report on the advance and establishment of invasive plant species on the Connecticut List of Widespread and Invasive Species not only within the four mitigation areas, but within wetlands immediately adjacent to disturbed areas at the site as well. In June of 2008, in accordance with this requirement, OEP examined the 16 various sized wetland impact areas along Route 66 and the four mitigation sites to obtain a full inventory of invasive species in these areas. All invasive and potentially invasive species identified for each site are listed with an estimate of their relative abundance in the charts below. Additions/amendments since the 2008 end-of-year report are in bold face.

### IMPACT SITE 1

Common name	Scientific Name	Relative Abundance
tree of heaven	<i>Ailanthus altissima</i>	E- does not extend beyond toe slope
garlic mustard	<i>Alliaria petiolata</i>	E- does not extend beyond toe slope
Canada thistle <sup>P</sup>	<i>Cirsium arvense</i>	T- does not extend beyond toe slope
purple loosestrife	<i>Lythrum salicaria</i>	T
common reed	<i>Phragmites australis</i>	E- apparently pre-existing in adjacent areas
Japanese knotweed	<i>Polygonum cuspidatum</i>	E- does not extend beyond toe slope
black locust	<i>Robinia pseudoacacia</i>	T- mowed, not present beyond toe slope
rugosa rose <sup>P</sup>	<i>Rosa rugosa</i>	T- 1 mature plant above toe slope

### IMPACT SITE 2

Common name	Scientific Name	Relative Abundance
tree of heaven	<i>Ailanthus altissima</i>	E- several saplings, none beyond toe slope
garlic mustard	<i>Alliaria petiolata</i>	E- limited to mowed ROW
black locust	<i>Robinia pseudoacacia</i>	T- 1 sapling & smaller seedlings limited to toe slope
multiflora rose	<i>Rosa multiflora</i>	E- does not extend beyond toe slope
wineberry <sup>P</sup>	<i>Rubus phoenicolasius</i>	D

### IMPACT SITE 3

Common name	Scientific Name	Relative Abundance
garlic mustard	<i>Alliaria petiolata</i>	E- limited to mowed ROW
autumn olive	<i>Elaeagnus umbellata</i>	T
purple loosestrife	<i>Lythrum salicaria</i>	T
multiflora rose	<i>Rosa multiflora</i>	D
wineberry <sup>P</sup>	<i>Rubus phoenicolasius</i>	D
bittersweet nightshade <sup>P</sup>	<i>Solanum dulcamara</i>	T



#### IMPACT SITE 4

Common name	Scientific Name	Relative Abundance
garlic mustard	<i>Alliaria petiolata</i>	T
Oriental bittersweet	<i>Celastrus orbiculata</i>	T
autumn olive	<i>Elaeagnus umbellata</i>	Not Found (2008 population eradicated)
Japanese knotweed	<i>Polygonum cuspidatum</i>	E- concentrated at fence/top of slope
black locust	<i>Robinia pseudoacacia</i>	E- seedlings only in mowed ROW
multiflora rose	<i>Rosa multiflora</i>	T
wineberry <sup>P</sup>	<i>Rubus phoenicolasius</i>	T

#### IMPACT SITE 5

Common name	Scientific Name	Relative Abundance
common reed	<i>Phragmites australis</i>	W- in nearby wetland, apparently pre-existing
Japanese knotweed	<i>Polygonum cuspidatum</i>	T
wineberry <sup>P</sup>	<i>Rubus phoenicolasius</i>	D

#### IMPACT SITE 6

Common name	Scientific Name	Relative Abundance
black locust	<i>Robinia pseudoacacia</i>	T

#### IMPACT SITE 7

Common name	Scientific Name	Relative Abundance
multiflora rose	<i>Rosa multiflora</i>	E
Japanese barberry	<i>Berberis thunbergii</i>	E

#### IMPACT SITE 8

Common name	Scientific Name	Relative Abundance
Canada thistle <sup>P</sup>	<i>Cirsium arvense</i>	E- does not extend beyond toe of slope
purple loosestrife	<i>Lythrum salicaria</i>	E- Galerucella adults & eggs found
black locust	<i>Robinia pseudoacacia</i>	E- several individuals <4', not beyond toe slope
wineberry	<i>Rubus phoenicolasius</i>	W- 1 individual on downed tree beyond toe slope

#### IMPACT SITE 9

Common name	Scientific Name	Relative Abundance
wineberry <sup>P</sup>	<i>Rubus phoenicolasius</i>	D

#### IMPACT SITE 10

Common name	Scientific Name	Relative Abundance
N.A.	-	-

#### IMPACT SITE 11

Common name	Scientific Name	Relative Abundance
wineberry <sup>P</sup>	<i>Rubus phoenicolasius</i>	D
Oriental bittersweet	<i>Celastrus orbiculata</i>	T
multiflora rose	<i>Rosa multiflora</i>	T

### IMPACT SITE 12

Common name	Scientific Name	Relative Abundance
wineberry <sup>P</sup>	<i>Rubus phoenicolasius</i>	E
autumn olive	<i>Elaeagnus umbellata</i>	T
purple loosestrife	<i>Lythrum salicaria</i>	E
Japanese knotweed	<i>P. cuspidatum</i>	E
black locust	<i>Robinia pseudoacacia</i>	T

### IMPACT SITE 13

Common name	Scientific Name	Relative Abundance
common reed	<i>Phragmites australis</i>	T- large, pre-existing stand appears to be mostly beyond fill/disturbance limits
multiflora rose	<i>Rosa multiflora</i>	D
autumn olive	<i>Elaeagnus umbellata</i>	T
spotted knapweed	<i>Centaurea biebersteineii</i>	E

### IMPACT SITE 14

Common name	Scientific Name	Relative Abundance
spotted knapweed	<i>Centaurea biebersteineii</i>	T
garlic mustard	<i>Alliaria petiolata</i>	E
autumn olive	<i>Elaeagnus umbellata</i>	T
purple loosestrife	<i>Lythrum salicaria</i>	E
multiflora rose	<i>Rosa multiflora</i>	T
common reed	<i>Phragmites australis</i>	T- large, pre-existing stand appears to be mostly beyond fill/disturbance limits

### IMPACT SITE 15

Common name	Scientific Name	Relative Abundance
garlic mustard	<i>Alliaria petiolata</i>	E- does not extend beyond toe of slope
purple loosestrife	<i>Lythrum salicaria</i>	E
multiflora rose	<i>Rosa multiflora</i>	E
Oriental bittersweet	<i>Celastrus orbiculata</i>	E
autumn olive	<i>Elaeagnus umbellata</i>	T- too large to pull
Canada thistle <sup>P</sup>	<i>Cirsium arvense</i>	E

### IMPACT SITE 16

Common name	Scientific Name	Relative Abundance
multiflora rose	<i>Rosa multiflora</i>	E- none beyond toe slope, mowed beyond toe
shrub honeysuckle (hollow pith)	<i>Lonicera sp.</i>	E- none beyond toe slope, mowed beyond toe
purple loosestrife	<i>Lythrum salicaria</i>	E
common buckthorn	<i>Rhamnus cathartica</i>	E- none beyond toe slope, mowed beyond toe
spotted knapweed	<i>Centaurea biebersteineii</i>	T- none beyond toe slope, mowed beyond toe
ground ivy <sup>P</sup>	<i>Glechoma hederacea</i>	E

### RESERVOIR NORTH MITIGATION

Common name	Scientific Name	Relative Abundance
autumn olive	<i>Elaeagnus umbellata</i>	T
purple loosestrife	<i>Lythrum salicaria</i>	T

### RESERVOIR SOUTH MITIGATION

Common name	Scientific Name	Relative Abundance
purple loosestrife	<i>Lythrum salicaria</i>	<b>D</b> - being mitigated with beetles
autumn olive	<i>Elaeagnus umbellata</i>	<b>W</b> - pre-existing nearby, not in mitigation
multiflora rose	<i>Rosa multiflora</i>	<b>W</b> - pre-existing nearby, not in mitigation
Oriental bittersweet	<i>Celastrus orbiculata</i>	<b>W</b> - pre-existing nearby, not in mitigation

### WHITE OAK MITIGATION

Common name	Scientific Name	Relative Abundance
purple loosestrife	<i>Lythrum salicaria</i>	<b>T</b>
common reed	<i>Phragmites australis</i>	<b>T</b>
multiflora rose	<i>Rosa multiflora</i>	<b>T</b>

### CENTRAL MITIGATION

Common name	Scientific Name	Relative Abundance
N.A.	-	-

<sup>P</sup> indicates Potentially Invasive (all other plants listed are considered invasive in CT) according to the 2004 CT Invasive Plant List

**D**- Dominant (among most common species in impact/mitigation area, (i.e. 20% or greater of any vegetative layer))

**E**- Established (species is not dominant, but more than a few individuals present in impact/mitigation area)

**T**- Trace (no more than a few individual plants present in impact/mitigation area)

**W**-Watch (present in adjacent areas, often pre-existing, but not present in impact/mitigation area)

As noted above, all invasive species in the mitigation areas, with the exception of purple loosestrife in Reservoir South, are present in very small numbers. OEP has been and plans to continue spot removing and monitoring autumn olive and other invasive woody species so they do not spread, particularly now that mowing activities were curbed. With regard to purple loosestrife, it is OEP's intention to assess continually whether this species is expanding its range in any of the monitored sites and to assess whether *Galerucella* beetles continue to be an effective control mechanism. Common reed is presently limited to a few individuals in Reservoir South and a very small patch (less than 2% of emergent vegetation) in White Oak. Common reed is well established in the wetlands adjacent to White Oak, so its lack of resurgence since initial control efforts were undertaken is encouraging and suggests that other established species are keeping its numbers in check. Monitoring will continue to determine if additional control efforts are necessary. Since chemical control is not allowable in proximity to the reservoir, OEP will investigate the practicality of seed top removal at the appropriate time of year. If access to the small infestation is possible without equipment, OEP will undertake a removal effort. If this is not possible, it will be important to weigh the benefits of removal against any negative impacts to the now-established community of competing native vegetation.

Although there were a fair number of invasive species present on or immediately adjacent to the 16 wetland impact sites, very few of these were dominant species on any of the sites. It appears that the combination of mowing within the right of way and the continued existence of diverse, healthy plant communities beyond the mowing have served to keep invasive species in check and to keep them mostly to the limits of the fill slope. It is also important to note that most if not all of these species were present within the project corridor prior to the start of work. With regard to purple loosestrife, one of the more aggressive species, Adult *Galerucella* beetles as well as their eggs have now been found at all but one impact site with purple loosestrife. While this one site is too small to conduct a beetle release, its proximity to other stands makes it likely that beetle populations in this area will eventually colonize this one remaining stand. During plant inventories, individual woody

invasive plants small enough to remove by hand have been continuously pulled by OEP staff within both the mitigation and impact areas during inspections.

- (4). ACOE requires that all slopes, soils, substrates, and constructed features within and adjacent to the mitigation sites be stabilized.

This requirement has been met. All soils, substrates, and constructed features within the four mitigation areas are stabilized, and all erosion and sediment control measures utilized during construction have been removed.

### **ADDITIONAL ITEMS FOR NARRATIVE DISCUSSION**

- Soils data should be collected after construction and every alternate year for the monitoring period:

Soils data sheets were completed for the four mitigation sites in July of 2009. These are attached. Some portions of the mitigation areas do not yet have hydric soils. As noted above, the eastern portion of Reservoir North may not have a water table close enough to the soil surface to support healthy populations of the hydrophytic species planted or to develop hydric soils. Aside from this exception, however, the mitigation areas appear to have the hydrology necessary to develop a hydric soil profile over time.

- What fish and wildlife use the sites and what do they use it for?

In Reservoir North, white-tailed deer (*Odocoileus virginianus*) sign were noted, and it is likely that the deer use the wetland as a food source. An adult killdeer (*Charadrius vociferous*) was observed feigning a broken wing during the May 2008 site inspection, a behavior that is typical of a parent protecting a nearby nest. In a previous year, a juvenile gray treefrog (*Hyla versicolor*) was observed, and it is likely that open water portions of Reservoir North serve as gray tree frog mating habitat.

A large number of American toad (*Bufo americanus*) tadpoles are observed in the standing water portion of Reservoir South each spring. In both 2007 and 2008, an adult gray tree frog was found in the outlet structure of the water quality basin adjacent to Reservoir South; an indicator that this species likely also breeds in the open water sections of this wetland, and an adult painted turtle (*Chrysemys picta picta*) was observed sunning itself on the riprap channel that leads from the basin to the wetland itself. Canada goose (*Branta canadensis*) sign was also noted in this area, which likely serves as a food source and cover for this species.

Numerous green frogs (*Rana clamitans melanota*) were noted in the White Oak wetland, as was sign of white-tailed deer and Canada goose. It is likely that these species use this wetland for food and cover. Snapping turtle (*Chelydra serpentina*), great blue heron (*Ardea herodias*), and red-tailed hawk (*Buteo jamaicensis*) have also been observed here in previous years.

Monarch butterflies are repeatedly noted in the Central wetland in the warmer months. Although Monarchs require milkweed in order to breed, they feed on the nectar of many different flower species. Therefore, it is likely that this wetland serves as a food source for these butterflies. White-tail deer and Canada goose sign have also been observed on site.

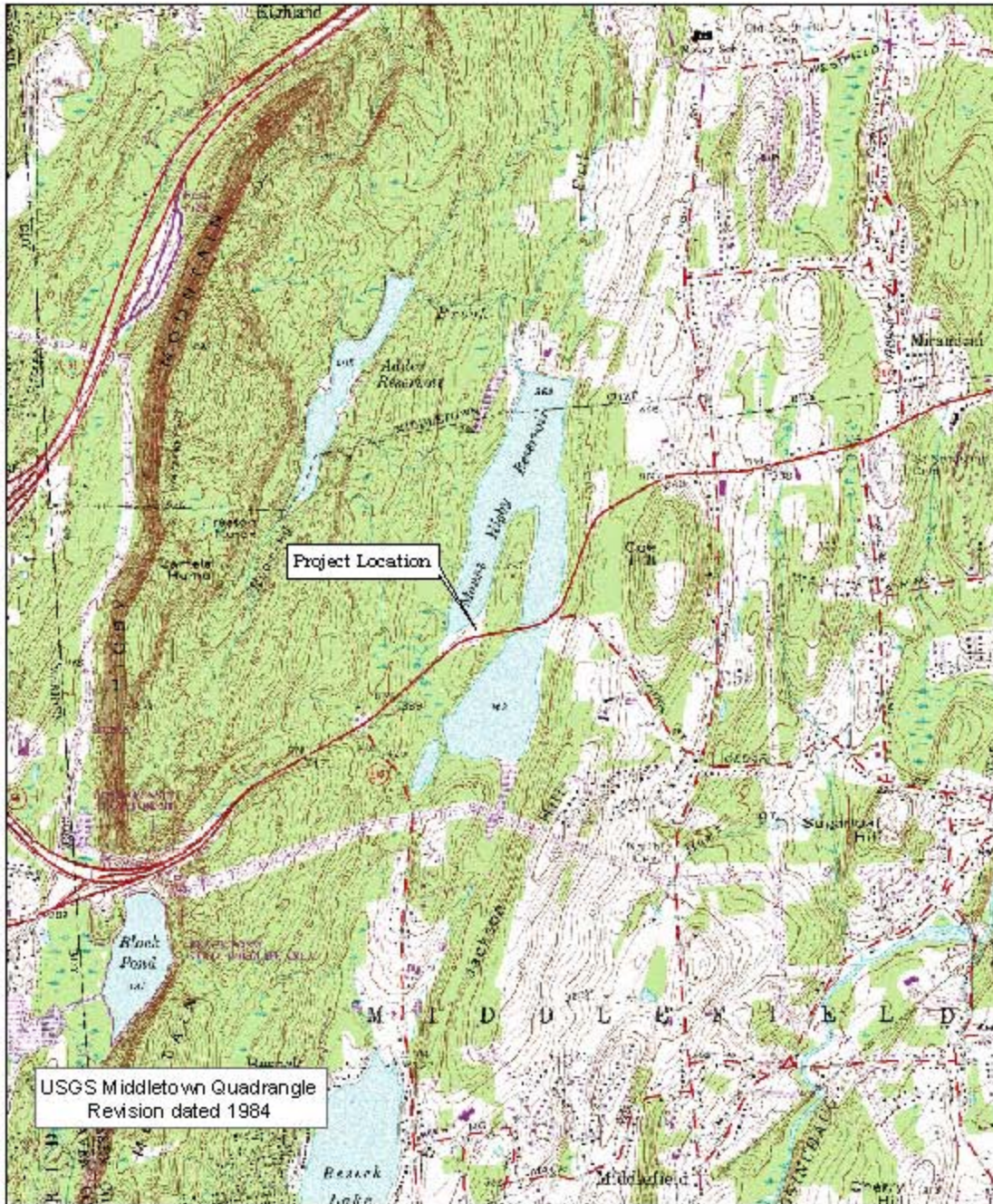
### **iii. SUMMARY DATA**

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As noted above, all four mitigation wetlands have been impacted previously by mowing activities, a problem which OEP and City of Middletown Water and Sewer Department (MWS) staff have been consistently working to alleviate and which has all but been resolved. Unfortunately, while some of the plantings are beginning to recover and gain some height, most plantings in areas where mowing activities continued into late 2008 and possibly 2009 appear unlikely to survive at this point. While the mowed areas have always been a small portion of the mitigation sites, their locations in the higher areas of the mitigation sites has meant that percent survival and percent cover of woody vegetation has suffered unduly. Whether because these plantings have not yet recovered or because they will not recover, these areas still generally do not meet the density standards that have been set forth. The diversity standards for the sites have all been met. Soils will also continue to be monitored, as some but not all portions of the mitigation wetlands possess the required hydric soils. As with most mitigation projects, the presence of invasive species is one of the most challenging issues to date. All reasonable efforts will be made to minimize their numbers on the site.

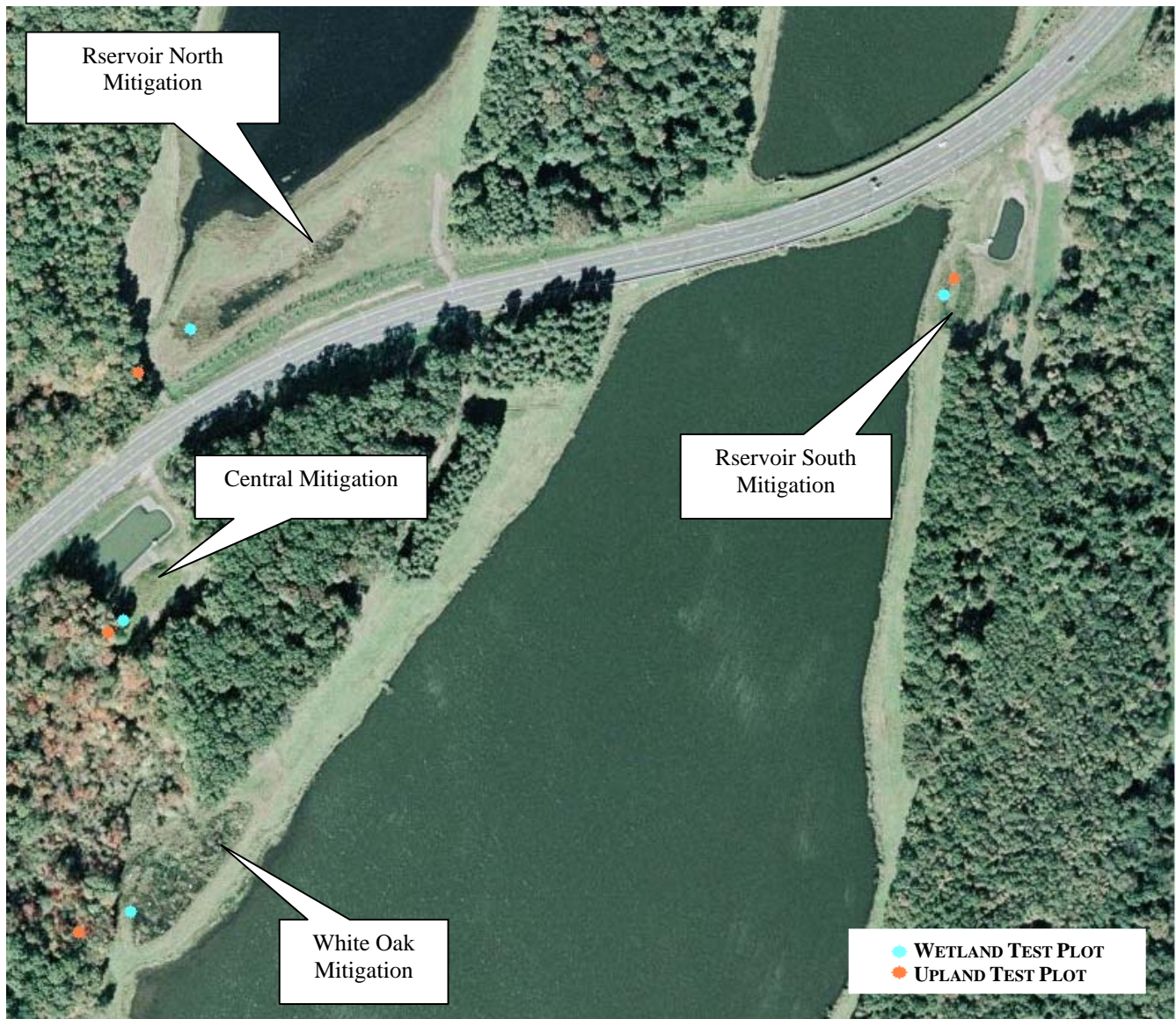
#### iv. MAPS

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#### iv. MAPS



SOURCE: MICROSOFT VIRTUAL EARTH, 2008 MICROSOFT CORPORATION.  
IMAGE COURTESY OF USGS



## **v. CONCLUSIONS**

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While the mitigation areas do not presently meet all the standards set forth in the mitigation guidance, progress is being made. The health of plantings and native volunteer species, as well as the status of undesirable plant species will continue to be monitored, and appropriate actions will be devised and taken as necessary to ensure success. Particularly with respect to achieving the percent cover standards set forth, several years may be required to attain this goal as a result of the past mowing impacts that have set the growth of plantings back substantially. Soils on the site not meeting the criteria for classification as hydric will continue to be monitored with the anticipation that the hydrology in most of these areas is sufficient for the formation of hydric soils over time.

### **REQUIRED APPENDICES**

Appendix A: a copy of this permit's mitigation special conditions and Summary of the mitigation goals

Appendix B: an as-built planting plan showing the location and extent of the designed plant community types (e.g. shrub swamp). Within each community type the plan shall show the species planted. This is only needed in the first monitoring report unless there are additional plantings of different species in subsequent years.

Appendix C: A vegetative species list of volunteer species in each plant community type. The volunteer species list should, at a minimum, include those that cover at least 5% of their vegetative layer.

Appendix D: Representative photos for each mitigation site taken from the same location for each monitoring event.

Appendix E: Army Corps of Engineers Delineation Data Sheets

## DEPARTMENT OF THE ARMY PERMIT

CONNECTICUT DEPARTMENT OF TRANSPORTATION PO BOX 317546  
2800 BERLIN TURNPIKE NEWINGTON CONNECTICUT 06131-7546

Permittee 2800 BERLIN TURNPIKE NE

Permit No. 199201685

Issuing Office New England District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

**Project Description :**

to place fill in 1.67 acres of wetlands/waters (16 sites) in association with the reconstruction/widening of approximately 2.1 miles of State Route 66 in Middlefield, CT. This project involves realignment and widening of the existing Route 66 from its current two-lane roadway to four lanes. Local intersecting roads will be reconstructed as necessary to provide a safe and efficient intersection with the reconstructed/widened Route 66. The purpose of the project is to address safety improvement needs and traffic congestion on Route 66.

## PROJECT DESCRIPTION CONTINUED ON PAGE 4

**Project Location:**

U.S. Route 66 from the terminus of I-691 to a point approximately 1200 LF east of Jackson Hill Road in Middlefield, Connecticut.

**Permit Conditions:**

**General Conditions:**

1. The time limit for completing the work authorized ends on December 31, 2008. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

**Special Conditions:**

1. The permittee shall ensure that a copy of this permit is at the work site whenever work is being performed and that all personnel performing work at the site of the work authorized by this permit are fully aware of the terms and conditions of the permit. This permit, including its drawings and any appendices and other attachments, shall be made a part of any and all contracts and sub-contracts for work which affects areas of Corps of Engineers jurisdiction at the site of the work authorized by this permit. This shall be achieved by including the entire permit in the specifications for work.

(Special Conditions continued on Page 4)

**Further Information:**

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1416).

2. Limits of this authorization.

- a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.
- b. This permit does not grant any property rights or exclusive privileges.
- c. This permit does not authorize any injury to the property or rights of others.
- d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

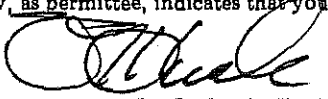
b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

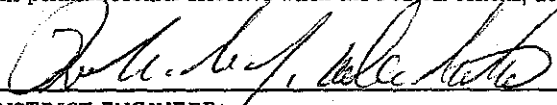
6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

  
\_\_\_\_\_  
(PERMITTEE)

3/12/2003  
\_\_\_\_\_  
(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

  
\_\_\_\_\_  
(DISTRICT ENGINEER)

Thomas L. Koning  
Colonel, Corps of Engineers

1/24/03  
\_\_\_\_\_  
(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

\_\_\_\_\_  
(TRANSFEE)

\_\_\_\_\_  
(DATE)

## PROJECT DESCRIPTION CONTINUED FROM PAGE 1

A mitigation plan is proposed to compensate for the loss of wetlands functions and values that would result from construction of the Route 66 reconstruction and widening project. Four (4) sites, as identified below and located on the attached plans (sheets 36,37,38,39,40,41 of 41), have been identified for wetland creation and enhancement. Approximately 2.53 acres of wetlands areas will be established from the four sites.

- Reservoir North Mitigation Area
- Reservoir South Mitigation Area
- White Oak Mitigation Area
- Central Mitigation Area

This authorization is made in accordance with the attached project plans entitled:

"RECONSTRUCTION OF ROUTE 66 – MIDDLEFIELD, CT STATE PROJECT NO. 81-80" in forty-one (41) sheets, and dated as follows:

sheets 1,41 dated "JULY 19, 1996, revised 7/20/01, 3/5/02"  
sheets 2 dated "JULY 19, 1996, revised 7/06/98, 7/20/01"  
sheets 3,4,5,10,12,19,28,34,37,39 dated "JULY 19, 1996, revised 7/20/01"  
sheets 6,7,8,9,11,13-21,23,24B,27,29,30,32,33,35,36,38,40 dated "JULY 19, 1996"  
sheet 22 dated "JULY 19, 1996, revised 7/06/98, 8/5/98, 7/20/01"  
sheets 24A dated "JULY 19, 1996, revised 7/06/98, 8/05/98"  
sheets 25 dated "JULY 19, 1996, revised 7/06/98, 7/20/01, 9/02 "  
sheets 26 dated "JULY 19, 1996, revised 7/06/98"  
sheets 31A dated "JULY 19, 1996, revised 7/20/01, 9/20/02"  
sheets 31B,31C,31D dated "7/20/01"

## SPECIAL CONDITIONS CONTINUED FROM PAGE 2

special condition 1 cont'd:

If the permit is issued after the construction specifications but before receipt of bids or quotes, the entire permit shall be included as an addendum to the specifications. If the permit is issued after receipt of bids or quotes, the entire permit shall be included in the contract or sub-contract as a change order. The term "entire permit" includes permit amendments. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions of the entire permit, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps jurisdiction.

2. Adequate sedimentation and erosion control devices, such as geotextile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize adverse impacts on waters and wetlands during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

3. No temporary fill (e.g. access roads, cofferdams) in any waters or wetlands is authorized by this permit.

4. Mitigation shall be performed in accordance with a revised final mitigation plan which shall be submitted within 90 days of permit issuance and which shall not be implemented until the Corps of Engineers approves it in writing. The final mitigation plan shall be based on the draft mitigation plan entitled "MITIGATION PLAN Reconstruction of State Route 66 Middlefield, Connecticut (State Project # 80-81) (USACE File No. 199201685) prepared by the Connecticut Department of Transportation", and dated "December 12, 2002". The draft mitigation plan shall be modified to reflect changes necessary to ensure appropriate final design elevations at the constructed wetlands areas.

# APPENDIX A

## U.S. ARMY CORPS OF ENGINEERS, NEW ENGLAND DISTRICT REGULATORY DIVISION

### CHECKLIST FOR REVIEW OF MITIGATION PLAN

Project: CTDOT Rt. 66 reconstruction File No: 199201685 PM: Lee  
City: Middlefield State: CT  
Plan Title, Preparer, Date: "Mitigation Plan" dated 12/12/02 and prepared by CTDOT

**NOTE: This mitigation was reviewed previously. New comments are in bold.**

#### TABLE OF CONTENTS

- A. General Information
- B. Hydrology
- C. Grading Plan
- D. Topsoil
- E. Planting Plan
- F. Coarse Woody Debris and Other Features
- G. Erosion Controls
- H. Invasive and Noxious Species
- I. Off-Road Vehicle Use
- J. Preservation
- K. Monitoring Plan
- L. Assessment Plan
- M. Other Comments

#### A. General Information:

1. [OK] Mitigation plan is submitted as one complete document.
2. Site location:
  - a. [OK] Map – Include a map depicting the geographic relationship between the impact site(s) and the proposed mitigation site(s), and a vicinity map of greater than or equal to a scale of 1 inch equals 2,000 feet.
  - b. [OK] Latitude/Longitude of mitigation site(s) in decimal format (for GIS use).  
*See p.8 of plan*
3. Impact area:



- a. [OK] Describe wetland acreage at each impact site and length of any streams at the impact sites.

**1.67 ac (see Table 1 on p. 5 for area-by-area information) and 40 l.f. of stream.**

- b. [OK] Describe wetland classes (e.g., Cowardin, et. al. - see footnote 1 on page 4, HGM, etc.) at each impact site.

**1.22 ac PFO, 0.05 ac PFO/ROW, 0.20 ac PSS/PFO, 0.12 ac PEM, and 0.05 ac PSS/PEM.**

- c. [OK] Describe both site specific and landscape level wetland functions and values at each impact site. For wildlife habitat, provide indicator species for the habitat type such as forest-dwelling migratory birds or mole salamanders and/or woodfrogs for a vernal pool.

**Only landscape level functions were provided: wildlife habitat, production export, floodflow alteration, groundwater recharge/discharge, and stormwater conveyance were the principal functions. Other landscape level functions noted: sediment/toxicant/pathogen retention, finfish habitat, and nutrient removal/retention/transformation. Two values were noted: aesthetic and recreational.**

**The text states that the impact areas "have relatively insignificant functions and values due to their small size and/or limited diversity..." It is my experience that once a new toe of slope is established, the "relatively insignificant functions and values" migrates outward so the formerly decent wetlands are degraded to about what the current wetlands are like. Therefore, this should not be a reason to back off of efforts to 'reach higher' with the mitigation to get the landscape level functions. This would help reduce secondary and cumulative impacts.**

- d. [OK] Describe type and purpose of work at each impact site.  
**Roadway realignment (see Table 1).**

4. Mitigation area:

- a. [OK] Describe wetland acreage proposed at each mitigation site.

**2.53 ac creation TOTAL**

**Reservoir North - 1.16 ac**

**In the previous checklist, concern was expressed about the location of this area close to the road. DOT noted that there is an 80-100' buffer. This is still very close to the road.**

**Reservoir South - 0.28 ac - NOTE: Plan shows a portion (very small) is actually enhancement**

*White Oaks – 1.0 ac – NOTE: Plan shows a portion (maybe 0.1 ac) is actually enhancement*  
*Central – 0.09 ac*

b. [ ] Describe wetland classes proposed at each mitigation site.  
*All 4 sites are proposed to be PEM/PSS with the rationale that, although the area impacted was more than 75% PFO, “it was determined that quick replacement of functions and values was needed, and establishment of PEM/PSS wetlands is much faster than for forested wetlands. The quick establishment of a thick ground cover is also thought to discourage the growth of invasive species. Also, the variable nature of the water table in the Reservoir North site would not be conducive to planting of trees.”*

*This is contrary to recommendations from the National Research Council on mitigation. Since wetlands with a PFO goal will clearly not meet that designation for many years—probably decades, the goal should be PFO with the recognition that sites will, of necessity, begin as PEM, if evaluated strictly, then eventually become PSS (perhaps within 5 years), and finally to PFO long after the monitoring period is over. What is important is to establish appropriate conditions for PFO and to obtain a precursor to that wetland type.* }

*Since the Reservoir North site probably cannot support PFO because of the hydrology, the other sites should be entirely geared towards PFO precursor conditions.*

c. [OK] Describe both site specific and landscape level functions and values proposed at each mitigation site.

*The Central site is apparently designed to treat/renovate stormwater but won't be maintained as a retention/detention basin would be. However, great emphasis was placed on pages 1 and 3 on measures to do that with the retention ponds. Although mitigation sites other than retention basins frequently can perform that function, the design should not have that as its focus when impacts affected other functions. This same comment applies to all four sites.*

5. [OK] Design Constraints - Project, landscape features, or public issues that control or otherwise influence the design of the mitigation area. (State if none.)

6. [OK] The following language is included in the narrative portion of the mitigation plan:

➔ A wetland scientist will be on-site to monitor construction of the wetland mitigation areas to ensure compliance with the mitigation plan.

7. [OK] The following language is included in the narrative portion of the mitigation plan:

➔ Compensatory mitigation shall be initiated not later than 90 days after project initiation and completed not later than the completion of the permitted project

***The plan explains why this cannot be the case. The explanation is acceptable assuming that in fact the mitigation construction would be completed before the permitted project is completed.***

8. [OK] The party responsible for planning, accomplishing, and maintaining the mitigation project is specified.

***Connecticut DOT is responsible for all aspects of the project.***

#### **B. Hydrology:**

1. [ ] The expected seasonal depth, duration, and timing of both inundation and saturation must be described for each of the proposed habitat zones in the mitigation area (particularly related to root zone of the proposed plantings). If shallow monitoring wells are used to develop this rationale, the observations must be correlated to local soil morphologies, rooting depths, water marks or other local evidence of flooding, ponding or saturation, and reflect rainfall conditions during monitoring.

***As stated previously, the well data is inadequate (just one year).***

***However, if taken at its face value, I still have concerns about 2 of the 4 sites. See comments under "Grading."***

2. [OK] Plan indicates if system is groundwater or surface water (provide source, e.g., overland flow, stream or river overflow) driven and provides substantiation (e.g., well data, adjacent wetland conditions, stream gauge data, precipitation data).

**p. 8**

3. [N/A] If vernal pool creation attempts are included as part of the mitigation plan, indicates evidence that adequate hydrology will be provided to support at least one obligate vernal pool species (mole salamanders, woodfrogs, or fairy shrimp).

C. Grading Plan:

1. Plan View:

a. [OK] Plan provides existing and proposed grading plans for mitigation area. Existing contours to at least 2' intervals. Proposed contours to 1' intervals in the wetlands portion of the mitigation with spot elevations for intermediate elevations. All other areas may have 2' contours.

b. [OK] Where microtopographic variation is planned, the proposed maximum differences in elevation should be specified. The plan does not need to show the locations of each pit and mound as long as a typical cross-section and approximate number of pits and mounds is given for each zone.

***Detailed in Appendix D, Item #0949XXX-Wetland Microtopography. Only proposed for White Oak and North Reservoir sites. Plan proposes +/-6". See comments below under "Other" for comments on this.***

c. [OK] The scale should be in the range of 1"=20' to 1"=100', depending on the size of the site.

d. [ ] All items on the plan must be legible (i.e., no smaller than a 9 font) **on 8 ½ x 11" sheets**. Large size sheets may be encouraged for clarity but only as a supplement to the letter-sized sheets.

***Plans (8 ½ x 11") are barely legible. Need larger font which won't become illegible upon duplication.***

2. Section View:

[ ] Plan provides representative cross sections showing the existing and proposed grading plan, expected range of shallow groundwater table elevations or surface water level consistently expected.

***Not in 8 ½ x 11" package. They need to extend to the reservoir for all the sites except the Central site and into the existing wetland to the NW for the White Oaks site.***

3. [ ] Other - Specific staff recommendations related to grading.  
***White Oak and Reservoir South sites: it seems unlikely that the species listed for planting—shrubs and herbaceous species—will all be able to survive in the same hydrology with just +/-6" microtopographic relief.***

***If the hydrology data is assumed to be adequate (the reservoir elevation data is good; the well data is for too short a period of time), the***

*following are comments on grading, taking into account the likely hydrology and the project impacts.*

#### *Reservoir North:*

*The reservoir varies from 363.0' to 363.4' during the April-June period in the years of 1991 through 1996 (after the elevation of the reservoir was changed). MW#4 (NE end of site) shows water table elevations from an average of 365.12' in April to 363.42' in June with a low point of 362.59' in September. MW#5 (SW end of site) shows water table elevations from an average of 364.23' in April to 362.95' in June with a low point of 362.32 in August.*

*The site will be VERY wet in the spring with water tables at the SW end above the surface so water will flow to the low spot, filling it several feet. The water will stay at least 2 ½' deep at the 361' proposed elevation at least through June.*

*Recommendations: Raise lowest elevation by 2', raise SW elevation currently at 364.0' to 364.5', raise 363' to 364' and 361' and 362' to 363.5'. Use pit and mound topography throughout with +/-6" at 364.5' and +/-12" for rest. Mounds should not be sculpted, just place topsoil very roughly so mounds vary from a few inches to a few feet in diameter. Plant trees and shrubs on tops of mounds and herbaceous species in pits between the mounds.*

#### *Reservoir South*

*The reservoir varies from 363.0' to 363.4' during the April-June period in the years of 1991 through 1996 (after the elevation of the reservoir was changed). MW#3 shows water table elevations averaging 365.74' in April to 362.80' in June with the lowest point at 361.49' in August. On the west side of the site, the highest elevation will be 364'. Therefore, water will be overflowing into the reservoir in April and May which will keep the maximum depth at 3'. Essentially the entire basin will be at least 2 ½' under water through June and the bottom will not be exposed until the end of the summer.*

*Recommendations: raise lowest bottom elevation to 364.0' and rest of bottom to 364.5'. Increase berm to 364.5'. Add microtopography of +/-6" throughout.*

#### *Central*

*There is no monitoring well data for this site but, since it is between Reservoir North and White Oak, the well data in combination with the*

*reservoir elevations are helpful. However, there is no mention of any adjacent wetlands and, if they exist nearby, what their elevations are. Grades are probably OK to support woody vegetation (if DOT adds microtopography) but it will essentially be a vegetated waterbody.*

#### White Oak

*The reservoir varies from 363.0' to 363.4' during the April-June period in the years of 1991 through 1996 (after the elevation of the reservoir was changed). MW#1, in the SW part of the site, shows water table elevations averaging 364.24' in April to 363.20' in June with the lowest point at 362.64' in August. MW#2, in the NE part of the site, shows water table elevations averaging 364.90' in April to 363.63' in June with the lowest point at 363.01 in August. This is a very stable water table. The proposed 364.0' elevation will be under 0.9' of water in April, 0.7' in May, and 0.4' above the water table in June.*

*Recommendation: The basic elevation for this site is acceptable if mounds (no pits) are added of 6-15" on which woody plants can be placed.*

#### **D. Topsoil:**

1. [OK] Proposed source of topsoil in mitigation area.
2. [OK] Twelve inches of natural or manmade topsoil, depending on site conditions, in all wetland mitigation areas.
3. [OK] Natural topsoil proposed to be used for the creation/restoration/enhancement of wetlands consists of at least 4-12%, with the percentage specified, organic carbon content (by weight) (or 9-20% organic matter content). Manmade topsoil used for the creation/restoration/enhancement of wetlands consists of a mixture of equal volumes of organic and mineral materials. This may be accomplished by adding a specific depth of organic material and disking it in to twice that depth.

**Excellent!**

4. [OK] Plan identifies subsurface soil conditions (sand, clay, bedrock, etc.).
5. [OK] The following language is included in the mitigation plan, either in the drawings or in the narrative portion of the plan:



At least 12 inches of natural or manmade topsoil shall be installed in wetland mitigation areas. Natural topsoil shall consist of at least [from

item D.3] organic carbon content (or organic matter content if that is the measure proposed) by weight.

***Language on p. 9, Section D is acceptable.***

#### **E. Planting Plan:**

Planting may or may not be appropriate for a mitigation site, as determined through consultation with the Corps. When planting is proposed as part of the plan, the guidelines noted below should be followed.

1. [OK] Plans use scientific names.
2. [OK] Plant materials are native and indigenous to the area of the site(s). Native planting stock from the immediate vicinity of the project is ideal. Whenever possible, plants should be salvaged from wetlands and uplands cleared by the project. In some circumstances, local "scavenging" of wetlands may be permissible, but care is necessary to avoid jeopardizing established natural habitats or to unintentionally transplant invasive species. Be aware that state or local permits may be required to "scavenge" natural wetlands for planting stock. No cultivars shall be used.
3. [OK] Vegetation community types or zones are classified in accordance with Cowardin, et al. (1979)<sup>1</sup> or other similar classification system.
4. [OK] Plan View - shows proposed locations of planted stock. This may be illustrated with areas of uniform species composition ("polygons" in GIS usage) and the number of plants or rate of seeding within the polygon. The scale should be in the range of 1"=20' to 1"=100', depending on the size of the site.
5. [OK] More than 50% of the plantings in each zone are structural determinants for the community type designated for that zone with emphasis on species unlikely to "volunteer".
6. [OK] Woody stock is proposed to be planted in densities not less than 600 trees and shrubs per acre, including at least 400 trees per acre in forested cover types.
7. [OK] Where uniform coverage is anticipated, herbaceous stock is proposed to be planted in densities not less than the equivalent of 3 feet on center for species which spread with underground roots; 2 feet for species which form clumps.

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<sup>1</sup> Cowardin, et. al. (1979) "Classification of wetlands and deepwater habitats of the United States," Office of Biological Services, FWS/OBS-79/31, December 1979.



8. [OK] Seed mix composition is provided. The list of species does not include any species in the attached list of invasives.

9. [OK] Section View – shows representative cross section plans showing vegetative community (e.g., forested, shrub swamp, etc.) zones. Show on same plan as C.2. information.

10. [OK] During the first few years, while the designed wetland vegetative zones become established, they are susceptible to colonization by invasive species. A number of plants are known to be especially troublesome in this regard. The following language is included in the mitigation plan, either in the plan view or in the narrative portion of the plan:

➔ To reduce the immediate threat and minimize the long-term potential of degradation, the species included on the invasive plant species list in the current Corps mitigation “Introduction: Performance Standards and Supplemental Information” are not included as planting stock in the overall project. Only plant materials native and indigenous to the region shall be used (with the exception of [specify]). Species not specified in the mitigation plan shall not be used without written approval from the Corps.

11. [OK] The following language is included in the mitigation plan, either in the drawings or in the narrative portion of the plan:

➔ During planting, a qualified wetland professional may relocate up to 50 percent of the plants in each community type if as-built site conditions would pose an unreasonable threat to the survival of plantings installed according to the mitigation plan. The plantings shall be relocated to locations with suitable hydrology and soils and where appropriate structural context with other plantings can be maintained.

12. [ ] Other - Specific staff recommendations related to planting.  
***Concerns remain about the disconnect between impacts and proposed mitigation community types. Accepting that the Reservoir North site hydrology is not conducive to forested wetland, the remaining site should be all forested wetland precursors. That does not obviate the possibility of having emergent vegetation in the lower spaces in and around the woody species, just as it occurs in “natural” forested and scrub shrub wetlands. The desire for a ‘quick fix’ should not override the need to attempt in-kind compensation to the extent possible.***

***What does the first sentence in the third paragraph under E mean?  
(temporary....established)***

*See comments under Grading which, if addressed, would change the planting scheme.*

**Reservoir North:**

*Cephalanthus is proposed to be planted at elevation 361-362' and 364-365 (with Viburnum dentatum)'. That is quite a range! Although it is a lesser range Carex lacustris is proposed for 361' and 363'.*

*Consider a dense buffer planting at least 20' wide of evergreen and deciduous species between the road and the site.*

**Central:**

*Viburnum dentatum is proposed for an area which extended from the bottom of the basin (364') to about 367'. It is unlikely to tolerate that range in hydrology.*

**F. Coarse Woody Debris and Other Features:**

[OK] Coarse woody debris includes such materials as logs, stumps, smaller branches, and standing snags. Placement of this material is inappropriate in tidal or floodplain environments. As much as possible, these materials will be in various stages of decomposition and salvaged from natural areas cleared for the other elements of the project. The following language is included in the mitigation plan, either in the drawings or in the narrative portion of the plan:

➔ A supply of dead and dying woody debris shall cover at least 2% of the ground throughout the mitigation sites after the completion of construction of the mitigation sites. These materials should not include species shown on the attached list of invasive species.

**G. Erosion Controls:**

[OK] The following language is included in the mitigation plan, either in the drawings or in the narrative portion of the plan:

➔ Temporary devices and structures to control erosion and sedimentation in and around mitigation sites shall be properly maintained at all times. The devices and structures shall be disassembled and properly disposed of no later than November 1 three full growing seasons after planting. Sediment collected by these devices will be removed and placed upland in a manner that prevents its erosion and transport to a waterway or wetland.

## H. Invasive and Noxious Species:

Projects should avoid introducing or increasing the risk of invasion by unwanted plants (such as those listed in H.3. below) or animals (such as zebra mussels). Soils disturbed by projects are very susceptible to invasion by undesirable species. Be particularly alert to the risk of invasion on exposed mineral soils. Exposed mineral soils may result from excavation or filling. Noxious species often get a foothold along project drainage features where the dynamics of erosion and accretion prevail. Along saltmarshes, be especially alert to the project's influence on freshwater runoff. Frequently, *Phragmites australis* invasion is an unanticipated consequence of freshwater intrusion into the saltmarsh.

1. [OK] Risk -- the discussion includes an assessment of the potential for invasion of the wetland by the species listed in H.3 or other problematic species.

***White Oak site - Phragmites present***

2. [OK] Constraints - identifies regulatory and ecological constraints that influence the design of any plan to control invasive plants and animals by biological, mechanical, or chemical measures.

***Near water supply reservoir so chemicals may be limited.***

3. [OK] Control Plan - describes the strategy to control, or recognize and respond to the invasion of the mitigation site by Common Reed (*Phragmites australis*) and Purple Loosestrife (*Lythrum salicaria*). Any other species identified as a problem at the site should also have a control plan. Controls may be mechanical (pulling, mowing, or excavating on-site), chemical (herbiciding), and biological (planting fast-growing trees and shrubs for shading or releasing herbivorous insects).

## I. Off-Road Vehicle Use:

1. [OK] No off-road vehicle use in immediate vicinity, or if so, control measures addressed.
2. [N/A] If there is a potential for off-road vehicle access at the site, the mitigation plan shows the locations of barriers placed at access points to the mitigation sites to prevent vehicles from damaging the sites.

## J. Preservation:

[N/A] If preservation is part of the Corps mitigation package, the following language is included:

***All sites are on CTDOT ROW or City of Middletown Water Department land. The latter are protected from development and access.***



Compensatory mitigation sites that are to be set aside for conservation, shall be protected in perpetuity from future development. Before recording this document, a draft copy of the conservation easement or deed restriction must be sent to the Corps of Engineers. Once the Corps approves this document in writing, the permittee shall execute and record it with the Registry of Deeds for the Town of \_\_\_\_\_ and the State of \_\_\_\_\_ within 180 days of the date of permit issuance. A copy of the executed and recorded document must then be sent to the Corps of Engineers within 90 days of the date it was recorded. The conservation easement or deed restriction shall enable the site or sites to be protected in perpetuity from any future development. The conservation easement or deed restriction shall expressly allow for the creation, restoration, remediation and monitoring activities required by this permit on the site or sites. It shall prohibit all other filling, clearing and other disturbances (including vehicle access) on these sites except for activities explicitly authorized by the Corps of Engineers in these approved documents.

#### **K. Monitoring Plan:**

Once the final mitigation plan is incorporated into the permit, the permit will require full implementation of the mitigation plan, including remedial measures during the first five growing seasons to ensure success. Typically, sites proposed to be emergent-only wetlands will be monitored for five years and sites proposed to be scrub-shrub and/or forested wetlands will be monitored for five to ten years, as extended periods for monitoring may be appropriate in some cases. Unsuccessful mitigation does not, in and of itself, constitute permit non-compliance. Failure to implement the plan and remedial measures, however, does.

[OK] The following language is included in the narrative portion of the mitigation plan:

***Note that the vernal pool language does not need to be included.***



#### **MONITORING**

If mitigation construction is initiated in, or continues throughout the year, but is not completed by December 31 of any given year, the permittee will provide the Corps, Policy Analysis and Technical Support Branch, a letter providing the date mitigation work began and the work completed as of December 31. The letter should be sent no later than January 31 of the following year. The letter must include the Corps permit number.

For each of the first FIVE full growing seasons following construction of the mitigation site(s), the site(s) shall be monitored and monitoring reports shall be submitted to the Corps, Regulatory Division, Policy Analysis and Technical Support Branch, no later than December 15 of the year being monitored. Failure to submit monitoring reports constitutes permit non-compliance. Each report coversheet shall indicate the report number (Monitoring Report 1 of 5, for example). The reports shall answer the following four success-standard questions and shall address in narrative format the items listed after the four questions. The reports shall also include the four monitoring-report appendices listed below. The first year of monitoring shall be the first year that the site has been through a full growing season after completion of construction and planting. For these special conditions, a growing season starts no later than May 31. However, if there are problems that need to be addressed and if the measures to correct them require prior approval from the Corps, the permittee shall contact the Corps by phone (1-800-362-4367 in MA or 1-800-343-4789 in ME, VT, NH, CT, RI) or letter as soon as the need for corrective action is discovered.

Remedial measures shall be implemented to attain the four success standards described below within FIVE growing seasons after completion of construction of the mitigation site(s). Measures requiring earth movement or changes in hydrology shall not be implemented without written approval from the Corps.

1) Does the site have at least 500 trees and shrubs per acre, of which at least 350 per acre are trees for proposed forested cover types, that are healthy and vigorous and are at least 18" tall in 75% of each planned woody zone AND at least the following number of non-exotic species including planted and volunteer species? Volunteer species should support functions consistent with the design goals. To count a species, it must be well represented on the site (e.g., at least 50 individuals of that species per acre).

# species planted	minimum # species required (volunteer and planted)
2	2
3	3
4	3
5	4
6	4
7	5
8	5
9 or more	6

Vegetative zones consist of areas proposed for various types of wetlands (shrub swamp, forested swamp, etc.). The performance standards for density can be assessed using either total inventory or quadrat sampling methods, depending upon the size and complexity of the site.

2) Does each mitigation site have at least 80% areal cover, excluding planned open water areas or planned bare soil areas (such as for turtle nesting), by noninvasive species? Do planned emergent areas on each mitigation site have at least 80% cover by noninvasive hydrophytes? Do planned shrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species? For the purpose of this success standard, invasive species of hydrophytes are:

Cattails -- *Typha latifolia*, *Typha angustifolia*, *Typha glauca*;  
Common Reed -- *Phragmites australis*;  
Purple Loosestrife -- *Lythrum salicaria*; and  
Reed Canary Grass -- *Phalaris arundinacea*  
Buckthorn -- *Rhamnus frangula*.

3) Are Common Reed (*Phragmites australis*), Purple Loosestrife (*Lythrum salicaria*), Russian and Autumn Olive (*Eleagnus* spp.), Buckthorn (*Rhamnus frangula*), and/or Multiflora Rose (*Rosa multiflora*) plants at the mitigation site(s) being controlled?

4) Are all slopes, soils, substrates, and constructed features within and adjacent to the mitigation site(s) stabilized?

Items for narrative discussion:

Describe the monitoring inspections that occurred since the last report.

Soils data, commensurate with the requirements of the soils portion of the 1987 Delineation Manual New England District data form, should be collected after construction and every alternate year throughout the monitoring period. If monitoring wells or gauges were installed as part of the project, this hydrology data should be submitted annually.

Concisely describe remedial actions done during the monitoring year to meet the four success standards – actions such as removing debris, replanting, controlling invasive plant species (with biological, herbicidal, or mechanical methods), regrading the site, applying

additional topsoil or soil amendments, adjusting site hydrology, etc. Also describe any other remedial actions done at each site.

Report the status of all erosion control measures on the compensation site(s). Are they in place and functioning? If temporary measures are no longer needed, have they been removed?

Give visual estimates of (1) percent vegetative cover for each mitigation site and (2) percent cover of the invasive species listed under Success Standard No. 2, above, in each mitigation site.

What fish and wildlife use the site(s) and what do they use it for (nesting, feeding, shelter, etc.)?

By species planted, describe the general health and vigor of the surviving plants, the prognosis for their future survival and a diagnosis of the cause(s) of morbidity or mortality.

What remedial measures are recommended to achieve or maintain achievement of the four success standards and otherwise improve the extent to which the mitigation site(s) replace the functions and values lost because of project impacts?

#### IF MITIGATION INCLUDES VERNAL POOL CREATION ATTEMPT(S):

Does the vernal pool creation attempt(s) take into account the critical need for unobstructed access to and from the pool, as well as an adequate extent of upland habitat to ensure success?

Pool(s) are monitored for obligate and facultative vernal pool species weekly for four weeks from the beginning of the vernal pool activity in the spring (will vary throughout New England) and then biweekly until the end of July for the entire monitoring period. The period of monitoring is specified. Data identify frog species, salamander genera, and the presence/absence of fairy shrimp. Macroinvertebrates can be to the order.

In addition, photographs of the pool(s) taken monthly during the pool monitoring period (March/April-July) from a set location(s) will be included. Photographs will include panoramas of surrounding habitat.

Other data required: pH and temperature of water at beginning and end of each monitoring cycle; pool depth at deepest point(s) (or state if >3' to nearest inch or centimeter; substrate of pool(s) (dead leaves, herbaceous vegetation, bare soil—organic or mineral, etc.); plant species noted in and around the perimeter of the pool(s).

If the state has a vernal pool register, the pool(s) is registered prior to the final monitoring report submission.

#### MONITORING-REPORT APPENDICES:

Appendix A -- A copy of this permit's mitigation special conditions and summary of the mitigation goals.

Appendix B -- An as-built planting plan showing the location and extent of the designed plant community types (e.g., shrub swamp). Within each community type the plan shall show the species planted. This is only needed in the first monitoring report unless there are additional plantings of different species in subsequent years.

Appendix C -- A vegetative species list of volunteer species in each plant community type. The volunteer species list should, at a minimum, include those that cover at least 5% of their vegetative layer.

Appendix D -- Representative photos of each mitigation site taken from the same locations for each monitoring event.

#### L. Assessment Plan:

[OK] The following language is included in the narrative portion of the mitigation plan:



#### ASSESSMENT

Following completion of the construction of the mitigation site(s), a post-construction assessment of the condition of the mitigation site(s) shall be performed after the first five growing seasons or by the end of the monitoring period, whichever is later. "Growing season" in this context begins no later than May 31<sup>st</sup>. To ensure objectivity, the person(s) who prepared the annual monitoring reports shall not perform this assessment without written approval from the Corps. The assessment report shall be submitted to the Corps by December 15 of the year the assessment is conducted.

The post-construction assessment shall include the four assessment appendices listed below and shall:

Summarize the original or modified mitigation goals and discuss the level of attainment of these goals at each mitigation site (include vernal pool creation if that is a component of the mitigation).



Describe significant problems and solutions during construction and maintenance (monitoring) of the mitigation site(s).

Identify agency procedures or policies that encumbered implementation of the mitigation plan. Specifically note procedures or policies that contributed to less success or less effectiveness than anticipated in the mitigation plan.

Recommend measures to improve the efficiency, reduce the cost, or improve the effectiveness of similar projects in the future.

#### ASSESSMENT APPENDICES:

Appendix A -- Summary of the results of a functions and values assessment of the mitigation site(s), using the same methodology used to determine the functions and values of the impacted wetlands.

Appendix B -- Calculation of the area of wetlands in each mitigation site using the 1987 Wetlands Delineation Manual (Technical Report Y-87-1). Supporting documents shall include (1) a scaled drawing showing the wetland boundaries and representative transects and (2) datasheets for corresponding data points along each transect.

Appendix C -- Comparison of the area and extent of delineated constructed wetlands (from Appendix B) with the area and extent of created wetlands proposed in the mitigation plan. This comparison shall be made on a scaled drawing or as an overlay on the as-built plan. This plan shall also show the major vegetation community types.

Appendix D -- Photos of each mitigation site taken from the same locations as the monitoring photos, including photos of vernal pools, if applicable.

#### M. Other Comments:

*I still have some concerns about mitigation close (80-100') to a roadway, in this case the Reservoir North site especially, because of the inevitable degradation resulting from the proximity to the road.*

*As stated under Section A above, replacing forested wetlands with some open water, emergent marsh, and bit of scrub-shrub may address water quality functions, most of which are already addressed by the stormwater management plan but they do not address the wildlife habitat function since that function is closely tied to the wetland type lost. Admittedly the PFO lost is a degraded strip next to the highway but there will be new degradation occurring in higher quality (better*

*functioning) wetlands at the new toe of slope. The cumulative impact of long strips of wetland losses along roads can be substantial in a watershed even though the impact to the individual wetlands may seem minimal.*

ERS Scientist: Ruth M. Ladd Date Plan Reviewed: January 21, 2003

## APPENDIX C: VOLUNTEER SPECIES LIST

\* denotes species listed as invasive on the 2004 Connecticut Invasive Plant List

<sup>P</sup> denotes species listed as potentially invasive on the 2004 Connecticut Invasive Plant List

\*\* denotes species listed as invasive in the ACOE permit, but not on the 2004 Connecticut Invasive Plant List

### Reservoir North Mitigation Wetland

Common name	Scientific Name
red maple	<i>Acer rubrum</i>
bentgrass	<i>Agrostis sp.</i>
northern water plantain	<i>Alisma triviale</i>
swamp milkweed	<i>Asclepias incarnate</i>
aster	<i>Aster sp.</i>
devil's beggartick	<i>Bidens frondosa</i>
* autumn olive	<i>Elaeagnus umbellata</i>
spike rush	<i>Eleocharis spp.</i>
fireweed	<i>Erechtites hieracifolia</i>
bush-clover	<i>Lespedeza sp.</i>
bird'sfoot trefoil	<i>Lotus orbiculatus</i>
* purple loosestrife	<i>Lythrum salicaria</i>
wild mint	<i>Mentha arvensis</i>
Timothy	<i>Phleum pratense</i>
tearthumb	<i>Polygonum sp.</i>
little bluestem	<i>Schizachyrium scoparium</i>
yellow foxtail	<i>Setaria glauca</i>
goldenrod	<i>Solidago sp.</i>
** cattail	<i>Typha latifolia</i>

### White Oak Mitigation Wetland

Common name	Scientific Name
red maple	<i>Acer rubrum</i>
common yarrow	<i>Achillea millefolium</i>
bentgrass	<i>Agrostis sp.</i>
swamp milkweed	<i>Asclepias incarnate</i>
wild sensitive plant	<i>Cassia nictitans</i>
American waterwort	<i>Elatine americana</i>
spike rush	<i>Eleocharis spp.</i>
St. Johnswort	<i>Hypericum sp.</i>
toadflax	<i>Linaria vulgaris</i>
bird's-foot trefoil	<i>Lotus orbiculatus</i>
* purple loosestrife	<i>Lythrum salicaria</i>
square stem monkey flow	<i>Mimulus ringens</i>
Timothy	<i>Phleum pratense</i>
* common reed	<i>Phragmites australis</i>
* multiflora rose	<i>Rosa multiflora</i>
yellow foxtail	<i>Setaria glauca</i>
Carolina horsenettle	<i>Solanum carolinense</i>
goldenrod	<i>Solidago spp.</i>
** cattail	<i>Typha latifolia</i>
common mullein	<i>Verbascum thapsus</i>

### Reservoir South Mitigation Wetland

Common name	Scientific Name
red maple	<i>Acer rubrum</i>
common yarrow	<i>Achillea millefolium</i>
water-plantain	<i>Alisma subcordatum</i>
common burdock	<i>Arctium minus</i>
common milkweed	<i>Asclepias syriaca</i>
swamp milkweed	<i>Asclepias incarnate</i>
asters	<i>Aster spp.</i>
wild sensitive plant	<i>Cassia nictitans</i>
* Asiatic bittersweet	<i>Celastrus orbiculata</i>
Queen Anne's lace	<i>Daucus carota</i>
barnyard grass	<i>Echinochloa crus-galli</i>
* autumn olive	<i>Elaeagnus umbellata</i>
fireweed	<i>Erechtites hieracifolia</i>
bedstraw	<i>Galium sp.</i>
spotted touch-me-not	<i>Impatiens capensis</i>
bird'sfoot trefoil	<i>Lotus orbiculatus</i>
* purple loosestrife	<i>Lythrum salicaria</i>
* common reed	<i>Phragmites australis</i>
English plantain	<i>Plantago lanceolata</i>
tearthumb	<i>Polygonum sp.</i>
common cinquefoil	<i>Potentilla simplex</i>
common selfheal	<i>Prunella vulgaris</i>
* multiflora rose	<i>Rosa multiflora</i>
blackberry	<i>Rubus sp.</i>
<sup>P</sup> wineberry	<i>Rubus phoenicolasius</i>
yellow foxtail	<i>Setaria glauca</i>
bladder campion	<i>Silene latifolia</i>
Carolina horsenettle	<i>Solanum carolinense</i>
goldenrod	<i>Solidago spp.</i>
steeplebush	<i>Spiraea tomentosa</i>
** cattail	<i>Typha latifolia</i>
summer grape	<i>Vitis aestivalis</i>

### Central Mitigation Wetland

Common name	Scientific Name
red maple	<i>Acer rubrum</i>
barnyard grass	<i>Echinochloa crus-galli</i>
arrowleaf tearthumb	<i>Polygonum sagittatum</i>
yellow foxtail	<i>Setaria glauca</i>
goldenrod	<i>Solidago sp.</i>
** cattail	<i>Typha latifolia</i>

## APPENDIX D



RESERVOIR NORTH MITIGATION SITE- VIEW TO ENE (FALL 2009)



RESERVOIR NORTH MITIGATION SITE- VIEW TO WSW (FALL 2009)



APPENDIX D



RESERVOIR NORTH- VIEW TO NORTH,  
OPEN WATER SECTION FRINGED BY EMERGENTS (FALL 2009)



RESERVOIR SOUTH MITIGATION SITE- VIEW TO SOUTHWEST (FALL 2009)



## APPENDIX D



RESERVOIR SOUTH MITIGATION SITE- VIEW TO SOUTHWEST (FALL 2009)



WHITE OAK MITIGATION SITE- VIEW TO SOUTHWEST (FALL 2009)



APPENDIX D



WHITE OAK MITIGATION SITE- VIEW TO NORTHWEST (FALL 2009)



WHITE OAK MITIGATION SITE- VIEW TO NORTHEAST, CONTESTED  
MOWING LIMITS (FALL 2009)



APPENDIX D



CENTRAL MITIGATION SITE- VIEW TO WEST (FALL 2009)



CENTRAL MITIGATION SITE- VIEW TO WSW (FALL 2009)



# APPENDIX E

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Res. North

PLOT: TP-WET

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

Dominance  
Ratio

Percent  
Dominance

D  
O  
M

NWI Status

TREE N.A.

SAPLING N.A.

SHRUB silky dogwood

*Cornus amomum*

5/5

100

Y

FACW\*

HERBACEOUS wool grass

*Scirpus cyperinus*

40/100

40

Y

FACW+\*

lake sedge

*Carex lacustris*

25/100

25

Y

OBL\*

giant burreed

*Sparganium eurycarpum*

20/100

20

Y

OBL\*

silky dogwood

*Cornus amomum*

5/100

5

N

FACW\*

bottlebrush sedge

*Carex hystericina*

5/100

5

N

OBL\*

grass, sp. unknown

5/100

5

N

-

VINE N.A.

## HYDROPHYTES

## NON-HYDROPHYTES

2

2

0

0

OBL

FACW

FAC

\*OTHER

0

0

0

FAC-

FACU

UPL

Hydrophytes Subtotal (A): 4

Non-hydrophytes Subtotal (B): 0

PERCENT HYDROPHYTES (100A/A+B): 100

## HYDROLOGY

### ☐ RECORDED DATA

Stream, lake, or tidal gage

Identification: \_\_\_\_\_

Aerial photography

Identification: \_\_\_\_\_

Other

Identification: \_\_\_\_\_

### ☐ NO RECORDED DATA

### ☒ OBSERVATIONS:

Depth to Free Water: \_\_\_\_\_

Depth to Saturation (including capillary fringe): Saturation to surface

Altered Hydrology (explain): \_\_\_\_\_

☐ Inundated

☒ Saturated in  
upper 12"

☐ Water Marks

☐ Drift Lines

☐ Sediment  
Deposits

☐ Drainage  
Patterns

☐ OTHER (explain): \_\_\_\_\_

within Wetland

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.



Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-14+		7.5YR 3/3		

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO
Hydrophytic vegetation criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hydric soils criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wetland hydrology criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
IS THIS DATAPOINT IN A WETLAND?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

REMARKS: This site meets all criteria with the exception of the hydric soil parameter. Given the composition of the plant community and the low depth to groundwater encountered during several years of dry-season soil test pit sampling, it seems clear that the water table is high enough in this plot for soils to become hydric over time.

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Res. North

PLOT: TP-WET

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Res. North

PLOT: TP-UP

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

Dominance  
RatioPercent  
DominanceD  
O  
M

NWI Status

TREE	black birch	<i>Betula lenta</i>	55/110	50	Y	FACU
	red maple	<i>Acer rubrum</i>	40/110	36	Y	FAC*
	Eastern hemlock	<i>Tsuga canadensis</i>	15/110	14	N	FACU
SAPLING	red maple	<i>Acer rubrum</i>	30/55	55	Y	FAC*
	white pine	<i>Pinus strobus</i>	10/55	18	N	FACU
	sugar maple	<i>Acer saccharum</i>	15/55	27	Y	FACU-
SHRUB	N.A.					
HERBACEOUS	cinnamon fern	<i>Osmunda cinnamomea</i>	15/30	50	Y	FACW*
	Canada mayflower	<i>Maianthemum canadense</i>	10/30	33	Y	FAC-
	white pine	<i>Pinus strobus</i>	5/30	17	N	FACU
	common periwinkle	<i>Vinca minor</i>	3	-	N	NL
	red maple	<i>Acer rubrum</i>	3	-	N	FAC*
Vine	N.A.					

## HYDROPHYTES

## NON-HYDROPHYTES

0    1    2    0  
 OBL    FACW    FAC    \*OTHER

1    2    0  
 FAC-    FACU    UPL

Hydrophytes Subtotal (A): 3Non-hydrophytes Subtotal (B): 3PERCENT HYDROPHYTES (100A/A+B): 50

## HYDROLOGY

☐

## RECORDED DATA

Stream, lake, or tidal gage

Identification: \_\_\_\_\_

Aerial photography

Identification: \_\_\_\_\_

Other

Identification: \_\_\_\_\_

☐

## NO RECORDED DATA

☐

## OBSERVATIONS:

Depth to Free Water: \_\_\_\_\_

Depth to Saturation (including capillary fringe): \_\_\_\_\_

Altered Hydrology (explain): \_\_\_\_\_

☐

Inundated

☐Saturated in  
upper 12"☐

Water Marks

☐

Drift Lines

☐Sediment  
Deposits☐Drainage  
Patterns  
within Wetland☐

OTHER (explain): \_\_\_\_\_

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.



DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
1"	litter			
0-3	A	10YR 3/2		
3-12+	B	7.5YR 4/6		

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric soils criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland hydrology criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
IS THIS DATAPOINT IN A WETLAND?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Res. South

PLOT: TP-WET

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

Dominance  
RatioPercent  
DominanceD  
O  
M

NWI Status

TREE N.A.

SAPLING N.A.

SHRUB N.A.

HERBACEOUS	soft rush	<i>Juncus effusus</i>	25/80	31	Y	FACW++
	soft-stem bulrush	<i>Scirpus validus</i>	20/80	25	Y	OBL*
	purple loosestrife	<i>Lythrum salicaria</i>	15/80	19	N	FACW++
	common boneset	<i>Eupatorium perfoliatum</i>	10/80	13	N	FACW++
	dwarf umbrella sedge	<i>Fuirena pumila</i>	5/80	6	N	OBL*
	arrow arum	<i>Peltandra virginica</i>	5/80	6	N	OBL*

VINE N.A.

## HYDROPHYTES

## NON-HYDROPHYTES

<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>
OBL	FACW	FAC	*OTHER

<u>0</u>	<u>0</u>	<u>0</u>
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 2Non-hydrophytes Subtotal (B): 0PERCENT HYDROPHYTES (100A/A+B): 100

## HYDROLOGY



## RECORDED DATA

Stream, lake, or tidal gage

Identification: \_\_\_\_\_

Aerial photography

Identification: \_\_\_\_\_

Other

Identification: \_\_\_\_\_



## NO RECORDED DATA



## OBSERVATIONS:

Depth to Free Water: \_\_\_\_\_

Depth to Saturation (including capillary fringe): Saturation to surface

Altered Hydrology (explain): \_\_\_\_\_



Inundated

Saturated in  
upper 12"

Water Marks

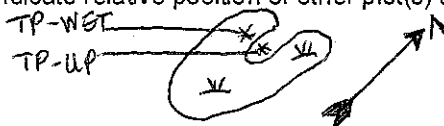


Drift Lines

Sediment  
DepositsDrainage  
Patterns  
within Wetland

OTHER (explain): \_\_\_\_\_

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.



Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-9	A	7.5YR 2.5/2		
9-11	B	7.5YR 4/1	20% 7.5 YR 2.5/2	
11+	Refusal (Rock)			

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Hydric soils criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Wetland hydrology criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
IS THIS DATAPOINT IN A WETLAND?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Res. South

PLOT: TP-UP

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

Dominance  
RatioPercent  
DominanceD  
O  
M

NWI Status

TREE N.A.

SAPLING N.A.

SHRUB N.A.

HERBACEOUS grass, sp. unknown  
Queen Anne's lace  
common burdock  
purple loosestrife

*Gramineae sp.*  
*Daucus carota*  
*Arctium minus*  
*Lythrum salicaria*

70/100  
15/100  
10/100  
5/100

70  
15  
10  
5

Y  
N  
N  
N

NL  
NL  
NL  
FACW+\*

VINE N.A.

## HYDROPHYTES

## NON-HYDROPHYTES

0 0 0 0  
OBL FACW FAC \*OTHER

0 0 1  
FAC- FACU UPL

Hydrophytes Subtotal (A): 0Non-hydrophytes Subtotal (B): 1PERCENT HYDROPHYTES (100A/A+B): 0

## HYDROLOGY

☐ RECORDED DATA

Stream, lake, or tidal gage  
Aerial photography  
Other

Identification: \_\_\_\_\_  
Identification: \_\_\_\_\_  
Identification: \_\_\_\_\_

☐ NO RECORDED DATA☐ OBSERVATIONS:

Depth to Free Water: \_\_\_\_\_  
Depth to Saturation (including capillary fringe): \_\_\_\_\_  
Altered Hydrology (explain): \_\_\_\_\_

☐ Inundated☐ Saturated in  
upper 12"☐ Water Marks☐ Drift Lines☐ Sediment  
Deposits
☐ Drainage  
Patterns  
within Wetland
☐ OTHER (explain):

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.



Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-8	A	7.5YR 3/2		
8-12+	B	7.5YR 3/4		
12+	Refusal (Rock)			

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric soils criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland hydrology criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
IS THIS DATAPOINT IN A WETLAND?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Res. South

PLOT: TP-UP



PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: White Oak

PLOT: TP-WET

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

Dominance  
RatioPercent  
DominanceD  
O  
M

NWI Status

TREE N.A.

SAPLING N.A.

SHRUB N.A.

## HERBACEOUS

wool grass

*Scirpus cyperinus*

40/80

50

Y

FACW+\*

dwarf umbrella-sedge

*Fuirena pumila*

10/80

13

N

OBL\*

giant burreed

*Sparganium eurycarpum*

15/80

19

N

OBL\*

common boneset

*Eupatorium perfoliatum*

10/80

13

N

FACW+\*

Joe-pye weed

*Eupatoriadelphus maculatus*

5/80

6

N

FACW\*

VINE N.A.

## HYDROPHYTES

## NON-HYDROPHYTES

0

1

0

0

OBL

FACW

FAC

\*OTHER

0

0

0

FAC-

FACU

UPL

Hydrophytes Subtotal (A): 1

Non-hydrophytes Subtotal (B): 0

PERCENT HYDROPHYTES (100A/A+B): 100

## HYDROLOGY

☐ RECORDED DATA

Stream, lake, or tidal gage

Identification: \_\_\_\_\_

Aerial photography

Identification: \_\_\_\_\_

Other

Identification: \_\_\_\_\_

☐ NO RECORDED DATA☒ OBSERVATIONS:

Depth to Free Water: Plot inundated (approx. 1 1/2" deep)

Depth to Saturation (including capillary fringe): saturation to surface

Altered Hydrology (explain): \_\_\_\_\_

☒ Inundated☒ Saturated in  
upper 12"☐ Water Marks☐ Drift Lines☐ Sediment  
Deposits☐ Drainage  
Patterns

within Wetland

☐ OTHER (explain): \_\_\_\_\_

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.



Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-6	A	5YR 3/2	10% 5YR 2.5/2, 20% 10YR 5/1	
6-11	A2	5YR 3/2		
11-16+	B	5YR 3/3		

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO
Hydrophytic vegetation criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hydric soils criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wetland hydrology criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
IS THIS DATAPOINT IN A WETLAND?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

REMARKS: This site meets all criteria other than the hydric soils parameter. It appears from the consistent evidence of a high water table throughout the growing season that the soils on the site will eventually become hydric.

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: White Oak

PLOT: TP-WET

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: White Oak

PLOT: TP-UP

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

			Dominance Ratio	Percent Dominance	D O M	NWI Status
TREE	sugar maple	<i>Acer saccharum</i>	70/105	67	Y	FACU-
	white oak	<i>Quercus alba</i>	30/105	29	Y	FACU-
	shag-bark hickory	<i>Carya ovata</i>	5/105	5	N	FACU-
SAPLING	sugar maple	<i>Acer saccharum</i>	10/20	50	Y	FACU-
	witch-hazel	<i>Hamamelis virginiana</i>	5/20	25	Y	FAC-
	white oak	<i>Quercus alba</i>	5/20	25	Y	FACU-
SHRUB	N.A.					
HERBACEOUS	white oak	<i>Quercus alba</i>	10	67	Y	FACU-
	sugar maple	<i>Acer saccharum</i>	5	33	Y	FACU-
	witch-hazel	<i>Hamamelis virginiana</i>	<3	-	N	FAC-
VINE	N.A.					

## HYDROPHYTES

0    0    0    0  
 OBL    FACW    FAC    \*OTHER

Hydrophytes Subtotal (A): 0

## NON-HYDROPHYTES

1    6    0  
 FAC-    FACU    UPL

Non-hydrophytes Subtotal (B): 7PERCENT HYDROPHYTES (100A/A+B): 0

## HYDROLOGY



## RECORDED DATA

Stream, lake, or tidal gage

Identification: \_\_\_\_\_

Aerial photography

Identification: \_\_\_\_\_

Other

Identification: \_\_\_\_\_



## NO RECORDED DATA



## OBSERVATIONS:

Depth to Free Water: \_\_\_\_\_

Depth to Saturation (including capillary fringe): \_\_\_\_\_

Altered Hydrology (explain): \_\_\_\_\_



Inundated

Saturated in  
upper 12"

Water Marks

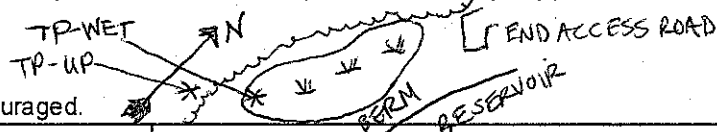


Drift Lines

Sediment  
DepositsDrainage  
Patterns  
within Wetland

OTHER (explain): \_\_\_\_\_

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.



Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
2"	litter			
1-0	O			
0-6	A	7.5YR 3/1		
6-14+	B	5YR 3/3		

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric soils criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland hydrology criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
IS THIS DATAPOINT IN A WETLAND?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Central

PLOT: TP-WET

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

Dominance  
RatioPercent  
DominanceD  
O  
M

NWI Status

TREE N.A.

SAPLING N.A.

SHRUB N.A.

HERBACEOUS giant burreed *Sparganium eurycarpum* 40/100 40 Y OBL\*

wool grass *Scirpus cyperinus* 30/100 30 Y FACW+\*

rush, unknown sp.\*\* *Juncus sp.* 20/100 20 Y -

grass, unknown sp. 5/100 5 N

common boneset *Eupatorium perfoliatum* 5/100 5 N FACW+\*

VINE

## HYDROPHYTES

## NON-HYDROPHYTES

1 1 0 1\*\*

OBL FACW FAC \*OTHER

0 0 0

FAC- FACU UPL

Hydrophytes Subtotal (A): 3Non-hydrophytes Subtotal (B): 0PERCENT HYDROPHYTES (100A/A+B): 100\*\*

## HYDROLOGY

☐ RECORDED DATA

Stream, lake, or tidal gage

Identification: \_\_\_\_\_

Aerial photography

Identification: \_\_\_\_\_

Other

Identification: \_\_\_\_\_

☐ NO RECORDED DATA☒ OBSERVATIONS:Depth to Free Water: approximately 30% of plot inundatedDepth to Saturation (including capillary fringe): saturation to surface

Altered Hydrology (explain): \_\_\_\_\_

☒ Inundated☒ Saturated in  
upper 12"☐ Water Marks☐ Drift Lines☐ Sediment  
Deposits☐ Drainage  
Patterns

within Wetland

☐ OTHER (explain): \_\_\_\_\_

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

TPW  
TPU  
PT 012  
BASIN  
\* \* \*



Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-8 8-16+	A B	2.5Y 3/2 7.5YR 3/3		

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO
Hydrophytic vegetation criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hydric soils criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wetland hydrology criterion met?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
IS THIS DATAPOINT IN A WETLAND?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

REMARKS: \*\*The unknown rush species was assumed to be hydrophytic since most rushes are wetland plants. It should be noted, however, that the indicator status of this species is inconsequential to the hydrophytic vegetation criteria being met.

The site meets all but the hydric soils criteria. Multiple field observations each year of monitoring indicate that these soils are typically either inundated or saturated to within  $\leq 12$ " of the soil surface during the growing season and even in the drier months. Along with a strongly hydrophytic plant community, such evidence of a high water table suggests that hydric soils will eventually form.

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Central

PLOT: TP-WET

PROJECT TITLE: 81-82 Reconstruction of Route 66, Middlefield

TRANSECT: Central

PLOT: TP-UP

DELINEATOR(S): A. Freitas

DATE: July 15, 2009

## VEGETATION

Stratum and Species

Dominance  
RatioPercent  
DominanceD  
O  
M

NWI Status

TREE	sugar maple	<i>Acer saccharum</i>	40/100	40	Y	FACU-
	red oak	<i>Quercus rubra</i>	40/100	40	Y	FACU-
	Norway maple	<i>Acer platanoides</i>	20/100	20/100	Y	NL
SAPLING	N.A.					
SHRUB	red oak	<i>Quercus rubra</i>	5/100	100	Y	FACU-
HERBACEOUS	grass, sp. unknown**		60/100	100	Y	-
VINE						

## HYDROPHYTES

## NON-HYDROPHYTES

<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
OBL	FACW	FAC	*OTHER

<u>0</u>	<u>3</u>	<u>1</u>
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 0Non-hydrophytes Subtotal (B): 4PERCENT HYDROPHYTES (100A/A+B): 0 \*\*

## HYDROLOGY



RECORDED DATA

Stream, lake, or tidal gage

Identification: \_\_\_\_\_

Aerial photography

Identification: \_\_\_\_\_

Other

Identification: \_\_\_\_\_



NO RECORDED DATA



OBSERVATIONS:

Depth to Free Water: \_\_\_\_\_

Depth to Saturation (including capillary fringe): \_\_\_\_\_

Altered Hydrology (explain): \_\_\_\_\_



Inundated

Saturated in  
upper 12"

Water Marks

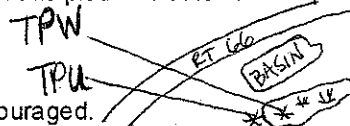


Drift Lines

Sediment  
DepositsDrainage  
Patterns  
within Wetland

OTHER (explain): \_\_\_\_\_

**SOIL** Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.



Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-2	A	7.5YR 2.5/1		
2-12	B	7.5YR 3/4		
12+	Refusal (Rock)			

HYDRIC SOIL INDICATOR(S):

REFERENCE(S): Field Indicators for Identifying Hydric Soils in New England

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:  
Soil drainage class:  
Depth to active water table:  
NTCHS hydric soil criterion:

## CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	**Since its indicator status is both unknown and inconsequential to whether the hydrophytic vegetation criteria is met, the unknown species of grass was not accounted for in the calculation of percent hydrophytes. In other words, the grass is likely not a hydrophyte, but even if it were the percent hydrophytes would only increase to 20% and would still not meet the criterion.
Hydric soils criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland hydrology criterion met?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
IS THIS DATAPOINT IN A WETLAND?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	