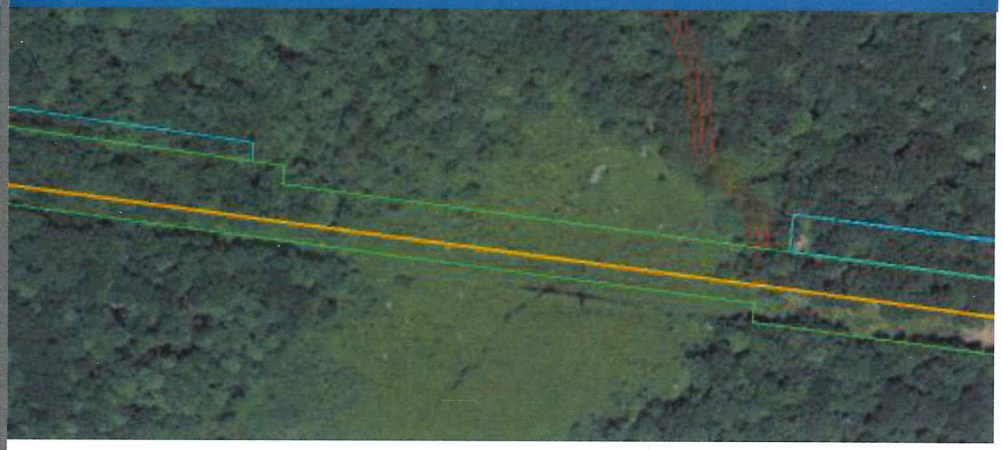
Tennessee Gas Pipeline
300 Line Project: 325 Loop
The New Jersey Highlands
Post- Construction Monitoring Report
Year 2



December 2013

Prepared For

New Jersey Highlands Council
100 North Road
Chester, NJ 07930
Ph: 908.879.6737

Submitted By

Tetra Tech, Inc.
285 Ellicott Street
Buffalo, NY 14203
Ph: 716.849.9419

TENNESSEE GAS PIPELINE COMPANY L.L.C.
300 LINE PROJECT- 325 LOOP
NEW JERSEY HIGHLANDS REGION

30-inch Loop 325, Sussex and Passaic Counties, Pennsylvania

POST-CONSTRUCTION MONITORING REPORT YEAR 2

December 2013

Prepared for:

New Jersey Highlands Council
100 North Road
Chester, NJ 07930

Prepared by:

Tetra Tech, Inc.
285 Ellicott Street
Buffalo, New York 14203

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

1.0 INTRODUCTION

As part of Tennessee Gas Pipeline Company, L.L.C's ("Tennessee") 300 Line Project ("Project"), Tennessee developed a Comprehensive Mitigation Plan ("Plan") in support of the Loop 325 segment of the Project located within New Jersey's Highlands Region in Sussex and Passaic Counties, New Jersey. Tennessee requested a determination from the New Jersey Highlands Council ("Council") and the New Jersey Department of Environmental Protection ("NJDEP") that the Loop 325 segment of the Project is exempt from the Highlands Water Protection and Planning Act, N.J.S.A. 13:20-1 et seq. ("Act"), and the Plan was developed to set forth a plan of construction and restoration by which Tennessee would avoid, minimize, and mitigate any impacts to Highlands Region resources so that there will be no net loss of such resources. The requested exemption was granted by the Council and the NJDEP.

The Project was constructed and placed in-service on November 1, 2011, following receipt of authority from the Federal Energy Regulatory Commission ("FERC").

As part of the Plan, Tennessee agreed to provide copies to the Council of the Project's periodic status reports filed with the FERC (initially filed weekly, and now filed quarterly as of August 2012), and Tennessee had provided and will continue to provide those reports to the Council. In addition, as discussed in Section 2.2.2 of the Plan, Tennessee agreed to prepare and provide to the Council an annual monitoring report, for three years following construction or until such time as wetland revegetation is successful, to document the status of the open water buffer revegetation efforts in the Highlands Region. Also, as discussed in Section 2.24.2.6 of the Plan, Tennessee agreed to prepare and provide to the Council an annual monitoring report, for three years following construction, to document restoration of the Highlands resource areas in the Highlands Region, including examining areas for invasive species.

Tennessee has contracted with Tetra Tech, Inc. ("Tetra Tech") to provide post-construction monitoring for the Loop 325 segment of the Project located in the Highlands Region. This monitoring report has been prepared to comply with the monitoring requirements from the Plan, as outlined above, for the second year of restoration activities following completion of construction and placing the Project in-service. The post-construction monitoring discussed herein involved the completion of vegetation monitoring of the entire Right-of Way ("ROW") including all disturbed wetlands, waterbodies, uplands, and open water buffer areas in the Highlands Regions, as shown in the alignment sheets (set forth in Appendix A).

This report provides results of the 2013 monitoring including purpose and objectives (Section 1.0), survey area description (Section 2.0), monitoring methods (Section 3.0), monitoring results (Section 4.0), and a brief discussion of results (Section 5.0).

1.1 Purpose and Objectives

For this Project, Tennessee developed two Project- specific Environmental Construction Plans- one for the portion of the Project located in New Jersey and one for the portion of the Project located in Pennsylvania (TGP, 2010). For ease of reference, the Project- specific Environmental Construction Plan for New Jersey will be referred to as "ECP" in this report. The ECP describes

the basic environmental construction techniques that were implemented during the construction and will be followed during restoration and maintenance. The ECP incorporated generally the provisions set forth in the FERC's "Wetland and Waterbody Construction and Mitigation Procedures" and FERC's "Upland Erosion Control, Revegetation and Maintenance Plan", with a few variations approved by the FERC, as well as the terms and conditions of the New Jersey Highlands Council Comprehensive Mitigation Plan. The ECP further incorporated guidelines and recommendations, including those set forth in permits, from the U.S. Army Corps of Engineers ("USACE"), the U.S. Department of Agriculture, and the Natural Resources Conservation Service ("NRCS").

The purpose of monitoring for the Project was to provide Year 2 post-construction inspection of vegetation restoration to document Tennessee's adherence to the New Jersey Highlands Council Comprehensive Mitigation Plan, as well as the ECP and other permits used for the Project including: FERC Certificate of Public Convenience & Necessity, US Fish and Wildlife Service Clearance Letters, Bureau of Land Management- Right of Entry, New Jersey Historic Preservation Office Clearance, New Jersey DEP Land Use Regulation Program- Highlands Applicability and Water Quality Management Plan Consistency Determination, New Jersey DEP Division of Water Supply- Temporary Dewatering Permit, New Jersey DEP Land Use Regulation Program- Freshwater Wetlands and Flood Hazard Area Permits, New Jersey DEP Bureau of Water Allocation- Short Term Water Use Permit by Rule, New Jersey Division of Fisheries and Wildlife- Water Lowering Permits, NJPDES GP – 5G3 Construction Activity Stormwater Permit (GP), and Stormwater Discharge from the Soil and Water Conservation Districts (referred to as "permits" in the remaining document).

Tasks and objectives associated with the post-construction monitoring as outlined in the CMP include:

- Monitor and record the success of revegetation in the Highlands resource areas for the first three years post-construction (November 1, 2011 to October 31, 2014), or until revegetation is successful.
- Identify the presence of non-native species and determine if there is a need for treatment or additional restoration measures.
- Prepare a report suitable for filing with the New Jersey Highlands Commission identifying the status of the revegetation efforts on a yearly basis for three years post-construction. The purpose of this report is to document areas of successful revegetation. The report will include data on percent cover achieved and problem areas (e.g., weed invasion issues and poor vegetation).

2.0 SURVEY AREA

The monitoring program included a survey of all disturbed workspaces within FERC-approved permanent rights-of-way and temporary workspaces (collectively, "ROWs") for the Loop 325 segment of the Project, including all upland areas, wetlands, waterbodies, and open water buffer areas, as delineated prior to initiation of construction. This does not include temporarily used access roads as rights of entry have expired. Appendix A to this report provides the Project alignment sheets and temporary workspaces, along with aquatic resources identified.

3.0 METHODS

The monitoring effort focused on several key criteria established in the ECP and the Comprehensive Mitigation Plan for guidance to assess and evaluate restoration success. The methods developed for this effort were designed to meet a variety of success/compliance criteria as outlined in the ECP as well as the Comprehensive Mitigation Plan.

3.1 General

During this second post-construction monitoring year (November 1, 2012 to October 31, 2013), the ROW was monitored along the entire Project, including the Loop 325 segment. Tetra Tech used a two-person team led by a qualified biologist experienced in wetland delineation and linear natural gas pipeline project restoration to walk all portions of the ROW. A technician also familiar with pipeline restoration accompanied the biologist and provided Global Positioning System (GPS) support.

Parameters evaluated included grade, hydrology, percent vegetative cover, vegetation vigor, community composition, and evidence of nuisance weed invasion. Throughout the Loop 325 segment, the community on the disturbed ROW was compared with an undisturbed portion of the same or similar community located adjacent to the disturbed area. The field team made qualitative and quantitative assessments to determine successful revegetation based on criteria outlined in the ECO and applicable permits. Additional information such as the proper installation of slope breakers, restoration of stream bed, banks, and flow, and third party impacts were also collected to further evaluate the overall restoration of each aquatic feature. Appendix B to this report provides a listing and description of the parameters collected; GPS data was collected for all uplands, open water buffer areas, wetlands, and waterbodies.

Monitoring was performed to evaluate restoration success of uplands, wetlands, waterbodies, and open water buffer areas previously mapped during preconstruction surveys. Each waterbody and wetland feature evaluation was identified with a single GPS point recorded in the approximate center of the wetland or waterbody, and an individual field form completed within the GPS data logger for each feature. Each upland and open water buffer area was identified with two GPS points, one at the start of the feature and one at the end with a single field form completed within the GPS data logger for that upland or open water buffer area. Each feature or area was identified as restored or not restored and additional data was collected to document the restoration or reasons for not meeting success criteria. Those resources not successfully restored

were assigned priority values for remedial action. Remedial action ranged from high, requiring immediate action, to low, requiring monitoring next season (i.e., area is estimated to need an additional growing season to reach restoration criteria).

Tetra Tech formulated, maintained, and updated a monitoring results Microsoft Access database to store and track monitoring data. The database contained data entry fields that matched the associated GPS data dictionary developed to facilitate the accurate collection of monitoring data. Tetra Tech used GPS units to designate each monitored resource or area and spatially link this information to the project footprint. Although a GPS data dictionary was used to collect monitoring information, field forms were developed for the project in case of GPS malfunction.

3.2 Upland and Open Water Buffer Monitoring

In accordance with the ECP, Tennessee committed to completing three years of post-construction monitoring inspections of all disturbed areas to determine the success of upland revegetation; this included delineated open water buffer areas. Tennessee agreed to submit associated results in periodic status reports filed with the FERC and provided to the Council, initially on a weekly basis and now quarterly, as of August 2012. Tennessee is conducting these inspections and preparing and filing the status reports, and has developed "punch list" items for corrective action for the Project. In addition to the quarterly reports, all uplands and open water buffer areas were examined and the following tasks were implemented during the upland and open water buffer areas:

- Compared percent cover between off-ROW and on-ROW areas;
- Photo-documented each area; and
- Noted other pertinent observations such as wildlife use, eroded or unstable areas, noxious and invasive plants, and potential third party impacts.

3.3 Wetland Monitoring

The following tasks were implemented during the wetland monitoring:

- Observed and noted hydrological conditions such as inundation and saturation;
- Compared the percent cover, percent cover of hydrophytes, and distribution of hydrophytes between off-ROW and on-ROW wetland areas;
- Visually estimated wetland shape, topography, and area reduction or increase compared to preconstruction conditions (as shown on construction alignment sheets);
- Visually inspected the restoration of all waterbody crossings located within wetlands;
- Photo-documented each restored wetland; and,
- Noted other pertinent observations such as wildlife use, eroded or unstable areas, noxious and invasive plants, and potential third party impacts.

Tetra Tech monitored all areas previously identified as wetlands during preconstruction surveys and subsequently impacted by construction (some areas were avoided). The assessment of successful revegetation of each wetland was based on criteria in FERC Procedure VI.D.4 and USACE NWP 12 requirements. Specifically, wetland revegetation shall generally be considered successful if cover of herbaceous and/or woody species is at least 80 percent similar in type, density, and distribution of vegetation in adjacent wetlands undisturbed by construction. Problems noted with any of the attributes collected for wetlands resulted in the resource being

identified as a problem area (i.e., not restored) and the appropriate priority level for remedial action assigned.

3.4 Waterbody Monitoring

The following tasks were implemented during waterbody monitoring:

- Visually estimated percent cover and success of vegetation restoration (e.g., ≥80% of the cover of the off-ROW cover);
- Visually inspected the restoration of all waterbody crossings (i.e., bed, banks, and flow);
- Photo-documented representative conditions of each restored area; and
- Noted other pertinent observations such as wildlife use, eroded or unstable areas, noxious and invasive plants, and potential third party impacts.

Tetra Tech monitored waterbodies previously identified during preconstruction surveys and subsequently impacted by construction (some areas were avoided). The assessment of successful revegetation of each waterbody was based on criteria in the FERC Procedures and USACE NWP 12 requirements. Problems noted with any of the attributes collected for waterbodies resulted in the resource being identified as a problem area (i.e., not restored) and the appropriate priority level for remedial action assigned.

4.0 RESULTS

4.1 New Jersey Highlands Analysis

In summary, 135 wetlands, waterbodies, uplands, and open water buffer areas were evaluated. These areas consisted of 43 wetlands, 33 waterbodies, 29 uplands, and 30 open water buffer areas (Table 1). Of the 135 resources, 93 were successfully restored and 42 were identified as problem areas (Table 1). Of the 42 problem areas, 39 were assigned low priority and 3 medium priority areas. No high priority areas were identified. Low priority areas were generally areas that were recently restored and an additional growing season is expected to allow the area to restore properly or documentation of invasive species spread was beginning to be documented. Restoration is expected to be successful in Year 3 and no remedial action aside from a scheduled invasive species treatment. These will be monitored during the Year 3 effort. Information on medium priority areas were conveyed to Tennessee and have been or are currently being addressed (Table 2). These medium problem areas will also be monitored during the Year 3 monitoring to ensure successful restoration. Appendix C provides the Year 2 database output summaries; Appendix D provides the Year 2 medium problem area detail report which includes a location map; Appendix E provides photographic documentation of all areas inspected; Appendix F provides detailed maps of all areas analyzed.

4.1.1 Wetland Monitoring

Of the 43 wetlands evaluated, 22 were successfully restored and 21 were identified as problem areas (Table 1). Of the 21 problem areas, 20 were low priority and targeted for Year 3 monitoring and invasive species treatment and one was a medium priority areas that has been or is currently being addressed by Tennessee (Table 2). No high priority areas were recorded. Failure was attributable to not meeting one or more of the FERC criteria (i.e., $\geq$80% vegetation cover and/or $\geq$80% cover of hydrophytes). Not meeting FERC criteria was attributable to ORV use. Table 3 provides a summary of wetland monitoring results.

4.1.2 Waterbody Monitoring

Of the 33 evaluated waterbodies, 28 were successfully restored and 5 were identified as problem areas (Table 1). Of the 5 problem areas, 4 were low priority and targeted for Year 3 monitoring. There was 1 medium priority areas that has been or is currently being addressed by Tennessee (Table 2). The primary reasons for failure of a waterbody included problems with vegetation cover and density, problems associated with erosion, and/or third-party caused problems.

4.1.3 Upland and Open Water Buffer Monitoring

Of the 29 evaluated uplands, 22 were successfully restored and 7 were identified as problem areas (Table 1). Of the 7 problem areas, all 7 were low priority and targeted for Year 3 monitoring and invasive species treatment. There were no medium or high priority areas. The primary reason for failure of the upland areas was vegetation density and presence of invasive species.

Of the 30 evaluated open water buffer ("buffer") areas, 21 were successfully restored and 9 were identified as problem areas (Table 1). Of the 9 problem areas, 8 were low priority and targeted for Year 3 monitoring. There was one medium priority area which is being addressed by

Tennessee and will be monitored next year to ensure success. The primary reason for failure of the buffer areas was presence of invasive species.

4.2 Non-Native Nuisance Species

In adherence to the Comprehensive Mitigation Plan, Tennessee will conduct inspections after the first three growing seasons following seeding to determine the success of revegetation. Revegetation will be considered successful if non-nuisance vegetation is similar in density to adjacent undisturbed lands. If vegetation cover is not successful or there is a need for noxious weed control measures, an experienced agronomist shall be used to determine the need for additional resource measures.

Throughout the New Jersey Highlands region, nuisance species were located in many areas adjacent to the ROW, primarily on the Tennessee number one line and in forest edges. These nuisance species have begun to colonize the new ROW in some areas. The most common invasive species found along the ROW edges were *Lythrum salicaria, Phragmities australis, Phalaris arundinacea, Rosa multiflora, Elaneagnus umbellate, Alliaria petiolata,* and *Berberis thunbergii.*

During the environmental monitoring, the only species that had begun to colonize the ROW were *Lythrum salicaria, Rosa multiflora, Phalaris arundinacea, and Phragmities australis.* Most areas of ROW that had invasive species present were where nuisance species previously existed adjacent to the ROW in densities similar as what was surveyed on the ROW. The invasive species have begun to migrate further into the ROW and are becoming dominant in some areas. Many areas documented in this report are still similar to off ROW conditions, but there is concern of their spread impacting survival of the plantings.

Although it is believed that much of the invasive species spread is attributable to natural seeding or vegetative reproduction and not caused by construction activities, these areas will be included in a spring invasive species treatment plan to ensure that densities remain similar or less than what was found off ROW as well as provide suitable growing conditions for the plantings. The ROW will be evaluated again in Year 3 post-construction monitoring to monitor for any new species sightings or spread.

4.3 Quantitative Sampling

In adherence to the Comprehensive Mitigation Plan, Tennessee performed quantitative sampling to determine the type and quantity of tree and shrub species naturally colonizing and re-sprouting in the construction ROW and quantitative sampling of the revegetation efforts to track survival rates and ensure supplemental plantings are completed to meet pre-determined survival thresholds.

During the spring of 2012, a large scale reforestation plan was implemented across the Loop 325. About 77,000 trees, shrubs, and herbaceous plants were planted in upland and wetland areas. The No Net Loss Reforestation Plan, the Wetland Mitigation Plan, and the Comprehensive

Mitigation Plan created a reforestation guide to replant the majority of impacted forested areas within the temporary and additional temporary workspaces. These areas must meet minimum survival percentages and care and replanting efforts must be completed to maintain goals ranging from 75 percent to 95 percent depending on size and location.

4.3.1 Volunteer and re-sprouting tree and shrub species

All plots were taken randomly within upland and buffer areas. Plot sizes were 11.8 feet or one percent of an acre. Not every area has an associated plot, primarily due to manicured lawn sites and similar vegetation types in adjacent areas. The plots completed create an accurate representation of volunteer and re-sprouting trees and shrubs throughout the New Jersey Highlands region of the Tennessee ROW.

Through the sampling it was noted that the primary colonizing tree species is *Acer rubrum*, or red maple (Table 4). The widespread distribution is likely caused by a bumper crop, which occurs every two years with red maples. The drought conditions last year likely influenced re-sprouting and colonizing of tree and shrub species. Growth of grasses, clovers, and other herbaceous ground cover has flourished in most areas, making it difficult to find colonizing tree and shrub species. Generally areas that had shorter herbaceous coverage with densities lower than 90 percent also had good re-sprouting/colonizing counts (Table 4). These areas were typically found in landscapes that were more concave, or angled away from direct sunlight during the hottest periods of the day. This likely provided shade and more moisture to withstand the dry summer. It is believed that the herbaceous cover is out-competing the tree and shrub species in many areas of the ROW.

4.3.2 Stocking Survey Data from Plantings

Post construction monitoring on the replanting areas were first conducted in August 2012 and is included in the *New Jersey Highlands Post Construction Monitoring Report-Year 1*. In addition to the location and survival information, the type of planting and number of trees per acre that were required is also included.

This stocking information, along with information collected by Williams Forestry was used to conduct a replanting effort in April and May of 2013. During that time all plants that had not survived were replanted. In total 29,754 tree and shrub species were planted along the 325 loop or about 38 percent (29754/77913) of the plantings were replanted this year. The forestry company, with approval from the State Forester, also replaced some of the species previously planted with species that will be more tolerant to stressors. In addition to replanting the dead plants, all plants were given deer repellent tablets to deter deer browsing in the upland areas. At the end of the planting there was a minimum of 100% survival (some areas had over the mandatory tree and shrubs/acre).

It is believed that the mortality experienced was largely due to drought conditions throughout the region in 2012. High temperatures mixed with low rainfall were detrimental to the plantings survival. To mitigate for drought this year, a landscape company has begun watering the

plantings and will continue to monitor and water the plantings as necessary throughout the growing season. The reforestation efforts will continue to be monitored quarterly and any additional plantings necessary to meet survival requirements will be planted.

Table 5 includes three different monitoring surveys done, one about a month after the 2013 planting was complete (June), then another one in late summer (late August), and again in the fall (November). A problem with the last two surveys is the height of the seed mix species. In some areas the grasses have reached over four feet tall, making it challenging to get accurate plot data as it is difficult to find some of the trees. In addition, the growth and dominance of the grasses may have out-competed some of the smaller tree plantings.

5.0 DISCUSSION

Across the New Jersey Highlands, 69 percent (93/135) of the wetlands, waterbodies, uplands, and buffers met the criteria for successful restoration. Although 31 percent (42) of the resources failed to pass the Year 2 inspection, 93 percent (39/42) were identified as low priority areas. It is expected that with an additional growing season and invasive species treatment these areas will meet project requirements. These areas will be monitored in Year 3, and remedial action will be determined if successful revegetation is not achieved. Of the 42 unsuccessful resources, 3 were identified as medium priority areas which require action by Tennessee personnel. Medium priority areas will also be monitored in Year 3 for successful restoration.

Approximately 51 percent (22/43) of the wetlands investigated were successfully restored with proper vegetation cover, density, and composition of hydrophytes. Of the 21 wetlands that failed to meet success criteria, 20 were recovering, and in need of another growing or invasive species treatment to allow these areas to meet project requirements. These areas will again be evaluated for successful restoration in Year 3 (2014). The remaining area was identified as requiring remedial action and is currently being addressed by Tennessee. Restricting access, regrading and seeding is expected to fix the issue.

Approximately 85 percent (28/33) of the waterbodies investigated were successfully restored with proper restoration of bed, banks, flow, and vegetation. Of the 5 waterbodies that failed to meet success criteria, 4 were recovering, and in need of another growing season to allow these areas to meet project requirements. These areas will again be evaluated for successful restoration in Year 3 (2014). The one remaining area was identified as requiring remedial action and is currently being addressed by Tennessee personnel. Restricting access along with associated stabilization is expected to result in full recovery of the area.

Approximately 76 percent (22/29) of the uplands investigated were successfully restored with proper vegetation cover and density. Of the 7 upland areas that failed to meet success criteria, all 7 were recovering, and in need of another growing season or required invasive species treatment to allow these areas to meet project requirements. These areas will be evaluated again for successful restoration in Year 3 (2014).

Approximately 70 percent (21/30) of the buffer areas investigated were successfully restored with proper vegetation cover and density. Of the 9 buffer areas that failed to meet success criteria, 8 were recovering, and in need of an additional growing season or invasive species treatment. These areas will be evaluated again for successful restoration in Year 3 (2014). The remaining area was identified as requiring remedial action and is currently being addressed by Tennessee personnel. Having the runoff from the road properly dealt with should address issues with this area. This area will also be evaluated for successful restoration in Year 3 (2014).

In summary, we believe the Year 2 monitoring purpose and objectives were met. Notable outcomes from the monitoring include:

1) A complete walkover and inspection of project including wetland and waterbodies to assess successful restoration was performed during the 2012 growing season.

2) A large number of parameters were collected for each evaluation to allow determination of successful restoration based on the Project ECP for New Jersey and USACE NWP 12 criteria.

3) Priority-level assignments to problem areas were used to facilitate remedial action response by TGP.

The results presented herein, on-going remedial actions, and continued monitoring will provide a sound foundation for coordinating and planning the Year 3 effort.

6.0 REFERENCES

Federal Energy Regulatory Commission (FERC). 2003a. Upland Erosion Control, Revegetation, and Maintenance Plan (Plan)

Federal Energy Regulatory Commission (FERC). 2003b. Wetland and Waterbody Construction and Mitigation Procedures (Procedures)

Tennessee Gas Pipeline Company (TGP). September, 2009. Comprehensive Mitigation Plan: Highlands Region.

Table 1. Post-construction monitoring Year 2 results by resource type.

	Waterbodies	Wetlands	Uplands	Buffers	Total
Evaluated	33	43	29	30	135
Restored	28	22	22	21	93
Problem Areas	5	21	7	9	42

Table 2. Post-construction monitoring Year 2 problem area summary.

Priority	Waterbodies	Wetlands	Uplands	Buffers	Total
Low-Monitor Next Season	4	20	7	8	39
Medium-Action Required	1	1	0	1	3

Table 3. Post-construction monitoring Year 2 wetland restoration summary.

Description	#
Wetlands monitored	43
Wetlands restored	22
Wetlands failed	21
Impacted by invasive species spread	17
Wetlands with < 80% cover – hydrophytes[1]	4
Wetlands impacted by third party	1

[1] Wetland failed to meet FERC requirement if the type (i.e., hydrophytes) was less than 80 percent of the adjacent wetland.

Table 4. Year 2 Post-construction quantitative re-sprouting/colonizing tree/shrub species

Sample Plot	Re-sprouting/Colonizing Trees and Shrubs in 11.8ft radius (total count)	Cover Type
B001- Sample	No shrub or tree species found	Primarily clover
U001- Sample	No shrub or tree species found	Primarily grasses and weedy species
B002- Sample	1 *Rubus*, 1 *Quercus*, 1 *Acer rubrum*	Primarily *Solidago*
U002- Sample	No shrub or tree species found	Primarily clover and wildflowers
B003- Sample	No shrub or tree species found	Grasses
U004-Sample	1 *Acer rubrum*, 5 *acer saccharum*, 1 *Carya*	Primarily grasses and *Chamaecrista fasciculata* Partridge pea
B005-Sample	5 *Rubus*	Primarily grasses and lawn
B006-Sample	No shrub or tree species	Primarily grasses and *Chamaecrista fasciculata*
B008-Sample	No shrub or tree species	100% *Chamaecrista fasciculata*
B009-Sample	60 *Populus*, 5 *Acer saccharum*, 3 *Acer rubrum*,	Primarily lawn
U009- Sample	5 *Rhus*, 20 *Populus*, 10 *Acer saccharum*, 3 *Acer rubrum*	Primarily grasses
B011- Sample	5 *Acer saccharum*, 1 *Rhus*, 2 *Fraxinus pennsylvanica*	Primarily clover, grasses, and other weedy species
U011-Sample	1 *Populus*, 1 *Betula*, 3 *Acer Rubrum*, 2 *Platanus occidentalis*, 1 *Rubus*, 7 *Fagus grandifolia*	Primarily grasses and clover
B012-Sample	5 *Rubus*, 7 *Fraxinus pennsylvanica*, 3 *Acer rubrum*	Primarily grasses and clover
U012-Sample	1 *Rubus*	Dominated by very high grasses and clover
B013-Sample	No tree or shrub species found	Dominated by grasses
U013- Sample	2 *Populus*	Primarily clover and grasses
B014- Sample	3 *Rubus*, 2 *Acer rubrum*	Primarily clover and other seed mix species
B015- Sample	No shrub or tree species found	Primarily clover
U015- Sample	No shrub or tree species found	Mostly grasses
B016- Sample	No shrub or tree species found	Very dense clover
U016- Sample	15 *Tamarak*	Primarily grasses
B017- Sample	6 *Cornus*	Primarily *clover,* grasses, and *Juncus*
U017- Sample	No shrub or tree species found	Primarily clover and *Comptonia peregrina*
B018- Sample	No tree or shrub species found	Very dense *clover, Carex,* and *Juncus*
U019- Sample	4 *Fagus grandifolia*, 10 *Rubus*, 2 *Rhus*	Primarily grasses, rocky
U020-Sample	100+ *Acer rubrum*	Primarily grasses and clover
B022- Sample	No tree or shrub species found	Very tall vegetation *Solidago, Aster*, and grasses
B023- Plot	No tree or shrub species found	Very dense seed mix species, *Carex, and Juncus*
U023- Sample	No tree or shrub species found	Primarily grasses and clover
B025- Sample	2 *Rhus*, 10 *Fagus grandifolia*	Primarily grasses
B026-Sample	No tree or shrub species found	Primarily trefoil
U026- Sample	No tree or shrub species found	Primarily trefoil

B027- Sample	9 *Rubus*, 5 A*cer rubrum*	Grasses dominate, but hill is rocky
B028- Sample	No tree or shrub species found	Primarily grasses where it isn't developed land
U028- Sample	1 *Populus*	Primarily clover and trefoil
B029- Sample	No tree or shrub species found	Primarily clover
U029-Sample	No tree or shrub species found	Primarily clover and trefoil
W003- Sample	20 *Rubus*, 4 *Multiflora*	Primarily *Phragmities, Solidago, Impatiens capensis*
W014-Sample	1 *Fraxinus pennsylvanica*	Primarily hydric vegetation such as *Carex, Juncus, Scirpus,* and *Typha*
W016-Sample	3 *Acer rubrum*, 1 *Salix*	Primarily purple loosestrife and tall grasses
W018- Sample	2 *Salix*	Primarily *Carex* and *Typha*
W019-Sample	1 *Acer rubrum*	Very dense *Carex* and *Typha*
W021- Sample	No tree or shrub species found	Primarily *Solidago, Typha, Phragmities*
W022- Sample	10 *Liriodendron tulipifera*, 3 *Acer saccharum*, 5 *Rubus*	Primarily *Typha, Juncus,* and *Carex*
W027- Sample	10 rubus	Primarily *Scirpus, Juncus*
W028- Sample	100+ *Acer rubrum*	Primarily *Scirpus, Carex*
W032- Sample	1 *Acer rubrum*, 5 *Rubus*	Very dense *Carex, Juncus, Scirpus*
W035- Sample	1 *Populus*, 5 *Acer rubrum*	Primarily Carex, Juncus, Scirpus
W038- Sample	7 *Fraxinus pennsylvanica*, 2 *Acer rubrum*	Primarily *Typha* and *Solidago*
W039- Sample	No tree or shrub species found	Very dense *Carex* and *Juncus*
W040A- Sample	No tree or shrub species found	Primarily clover
W041- Sample	No tree or shrub species found	Very dense *Carex* and *Juncus*
W042- Sample	2 *Populus*, 4 *Acer rubrum*, 5 *Liriodendron tulipidera, Fagus grandifolia*	Primarily *Juncus, Carex,* and *Scirpus*
W047- Sample	3 *Rubus*, 2 *Salix*, 1 *Betula*, 1 *Populus*, 1 *Acer rubrum*	Primarily *Carex, Juncus, Scirpus,* and *Solidago*
W047B- Sample	1 *Cornus*, 8 *Acer rubrum*	Primarily *Carex* and *Juncus*
W048- Sample	10+ *Vaccinium corymbosum*	Dense *Vaccinium corymbosum*
W049- Sample	30+ *Acer rubrum*, 1 *Salix*	Primarily *Carex*
W052- Sample	1 acre rubrum	Primarily *Carex, Juncus* and *Phragmities*
W054- Sample	No tree or shrub species found	Very dense *Carex* and *Juncus*
W072- Sample	No tree or shrub species found	Primarily *Typha, Carex, Juncus*
W121- Sample	2 *Rhus*, 15 *Rubus*	Primarily *Rubus, Carex*

Table 5. Year 2 Post-construction quantitative sampling of reforestation efforts

Mile Post		Plan	Planted Type	Planted Density (trees and shrubs per acre)	Monitoring Results June 2013				Survival Percent
Begin	End				Date	Plots	Tally	Total (per acre)	
1.49	1.70	CMP	Whip	600	6/4/2013	8	45	563	94%
2.04	2.16	CMP	Whip	900	6/10/2013	7	39	557	62%
2.86	3.08	CMP	Whip	600	6/10/2013	16	73	456	76%
4.28	4.30	CMP	Whip	600	6/10/2013	2	26	650	108%
4.63	4.78	CMP	Seedling	900	6/15/2013	5	76	690	77%
5.26	5.38	NNL	Seedling	1210	6/5/2013	3	28	933	77%
5.38	5.41	NNL	Whip	900	6/5/2013	7	54	771	86%
6.50	8.41	CMP	Whip	600	6/5/2013	28	217	775	129%
8.41	8.45	CMP	Seedling	900	6/5/2013	10	74	740	82%
8.45	8.84	CMP	Whip	600	6/5/2013	7	49	700	117%
8.84	9.25	CMP	Seedling	900	6/5/2013	14	90	643	71%
9.25	9.59	NNL	Seedling	1210	6/6/2013	20	199	995	82%
9.59	9.72	NNL	Whip	900	6/6/2013	6	67	1117	124%
9.94	11.22	NNL	Seedling	1210	6/6/2013	31	340	1097	91%
11.40	12.79	NNL	Seedling	1210	6/6/2013	98	1016	1037	86%
12.79	13.00	CMP	Whip	600	6/7/2013	14	90	643	107%
13.00	13.20	CMP	Whip	900	6/7/2013	12	94	783	87%
13.36	14.11	CMP	Whip	600	6/7/2013	5	30	600	100%
14.81	15.49	NNL	Seedling	1210	6/4/2013	13	134	1031	85%
1.00	15.47	WMP	Container	600	6/4/2013-6/10/2013	100	524	524	87%
								Overall Survival Percentage	**91%**

Mile Post		Plan	Planted Type	Planted Density (trees and shrubs per acre)	Monitoring Results August 2013				Survival Percent
Begin	End				Date	Plots	Tally	Total (per acre)	
1.49	1.70	CMP	Whip	600	8/28/2013	7	35	504	84%
2.04	2.16	CMP	Whip	900	8/28/2013	2	14	700	78%
2.86	3.08	CMP	Whip	600	8/28/2013	7	20	285	48%
4.28	4.30	CMP	Whip	600	8/28/2013	2	8	400	67%
4.63	4.78	CMP	Seedling	900	8/23/2013	5	9	180	20%
5.26	5.38	NNL	Seedling	1210	8/23/2013	9	48	533	44%
5.38	5.41	NNL	Whip	900	8/23/2013	5	19	380	42%
6.50	8.41	CMP	Whip	600	8/23/2013 & 8/26/2013	47	197	421	70%
8.41	8.45	CMP	Seedling	900	8/26/2013	2	16	800	89%
8.45	8.84	CMP	Whip	600	8/26/2013	8	44	550	92%
8.84	9.25	CMP	Seedling	900	8/26/2013	13	72	554	62%
9.25	9.59	NNL	Seedling	1210	8/26/2013	2	24	1200	99%
9.59	9.72	NNL	Whip	900	8/26/2013	8	75	938	104%
9.94	11.22	NNL	Seedling	1210	8/27/2013	16	125	719	59%
11.40	12.79	NNL	Seedling	1210	8/27/2013	43	322	751	62%
12.79	13.00	CMP	Whip	600	8/27/2013	17	65	500	83%
13.00	13.20	CMP	Whip	900	8/27/2013	4	18	450	50%
13.36	14.11	CMP	Whip	600	8/22/2013	15	45	300	50%
14.81	15.49	NNL	Seedling	1210	8/21/2013	22	133	605	50%
1.00	15.47	WMP	Container	600	8/21/2013-8/28/2013	73	424	581	97%
								Overall Survival Percentage	**67%**

Mile Post		Plan	Planted Type	Planted Density (trees and shrubs per acre)	Monitoring Results November 2013				Survival Percent
Begin	End				Date	Plots	Tally	Total (per acre)	
1.49	1.70	CMP	Whip	600	11/24/2013	7	30	429	72%
2.04	2.16	CMP	Whip	900	11/24/2013	3	6	200	22%
2.86	3.08	CMP	Whip	600	11/25/2013	10	20	200	33%
4.28	4.30	CMP	Whip	600	11/21/2013	4	14	350	58%
4.63	4.78	CMP	Seedling	900	11/21/2013	13	34	263	29%
5.26	5.38	NNL	Seedling	1210	11/21/2013	9	42	467	39%
5.38	5.41	NNL	Whip	900	11/21/2013	14	58	414	46%
6.50	8.41	CMP	Whip	600	11/22/2013/ 11/23/2013	94	403	429	72%
8.41	8.45	CMP	Seedling	900	11/23/2013	3	16	533	59%
8.45	8.84	CMP	Whip	600	11/23/2013	8	44	550	92%
8.84	9.25	CMP	Seedling	900	11/23/2013	16	78	488	54%
9.25	9.59	NNL	Seedling	1210	11/23/2013	4	24	600	50%
9.59	9.72	NNL	Whip	900	11/23/2013	6	32	533	59%
9.94	11.22	NNL	Seedling	1210	11/23/2013	48	245	510	42%
11.40	12.79	NNL	Seedling	1210	11/22/2013	61	385	331	27%
12.79	13.00	CMP	Whip	600	11/22/2013	8	32	400	67%
13.00	13.20	CMP	Whip	900	11/22/2013	2	7	350	39%
13.36	14.11	CMP	Whip	600	11/21/2013	13	26	200	33%
14.81	15.49	NNL	Seedling	1210	11/21/2013	35	162	463	38%
1.00	15.47	WMP	Container	600	11/21/2013-11/25/2013	137	432	315	53%
								Overall Survival Percentage	**49%**