

UNH Saltmarsh Planting Assessment Program
Quality Assurance Project Plan

September 1, 2005
FINAL

Prepared by:

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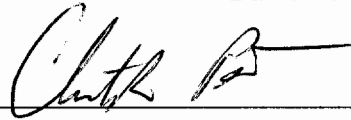
DEPARTMENT OF
ENVIRONMENTAL SERVICES

Program Manager:

 9/12/05

Signature / Date
David Burdick, Ph.D., UNH

Project QA Officer:

 9/12/05

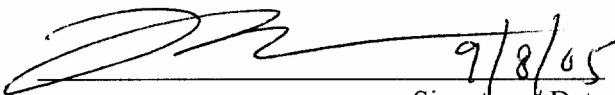
Signature / Date
Chris Peter, UNH

NHDES Quality Assurance Manager:

 9/8/05

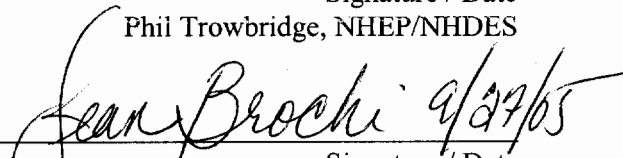
Signature / Date
Vincent Perelli, NHDES

NHEP/NHDES Project Officer:

 9/8/05

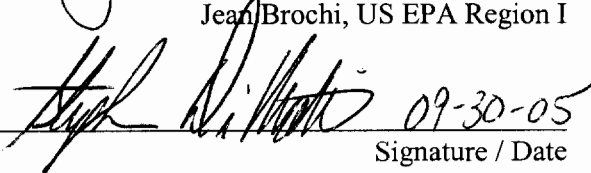
Signature / Date
Phil Trowbridge, NHEP/NHDES

USEPA Project Officer:

 9/27/05

Signature / Date
Jean Brochi, US EPA Region I

USEPA QA Manager:

 09-30-05

Signature / Date
Steve Dimattei, US EPA Region I

A2 – Table of Contents

A2 – Table of Contents 2
 List of Tables 2
 A3 – Distribution List 3
 A4 – Project/Task Organization 3
 A5 – Problem Definition/Background 4
 A6 – Project/Task Description 4
 A7 – Quality Objectives and Criteria 4
 A8 – Special Training/Certification 5
 A9 – Documents and Records 6
 B1 – Sampling Process Design 6
 B2 – Sampling Methods 6
 B3 – Sample Handling and Custody 7
 B4 – Analytical Methods 7
 B5 – Quality Control 7
 B6 – Instrument/Equipment Testing, Inspection, Maintenance 7
 B7 – Instrument/Equipment Calibration and Frequency 7
 B8 – Inspection/Acceptance Requirements for Supplies and Consumables 7
 B9 – Non-direct Measurements 7
 B10 – Data Management 7
 C1 – Assessments and Response Actions 8
 C2 – Reports to Management 8
 D1 – Data Review, Verification and Validation 8
 D2 – Verification and Validation Procedures 8
 D3 – Reconciliation with User Requirements 8
 References 9

List of Tables

Table 1. QAPP Distribution List 3
 Table 2. Project Schedule Timeline 4
 Table 3. Special Personnel Training Requirements 5

List of Appendices

Appendix A : Field Data Sheet

A3 – Distribution List

Table 1 presents a list of people who will receive the approved QAPP, the QAPP revisions, and any amendments.

Table 1. QAPP Distribution List

QAPP Recipient Name	Project Role	Organization	Telephone number and Email address
David Burdick	Program Manager	UNH Jackson Estuarine Laboratory (UNH-JEL)	603-862-5129 dburdick@cisunix.unh.edu
Chris Peter	Project QA Officer	UNH-JEL	603-862-5121
Phil Trowbridge	NHEP/NHDES Project Officer	NHDES Watershed Management Bureau	603-271-8872 ptrowbridge@des.state.nh.us
Vincent Perelli	NHDES Quality Assurance Manager	NHDES Office of the Commissioner	603-271-8989 vperelli@des.state.nh.us
Jean Brochi	USEPA Project Manager	USEPA New England	617-918-1536 brochi.jean@epa.gov
Steve Dimattei	USEPA Quality Assurance Officer	USEPA New England	617-918-8369 Dimattei.Steve@epa.gov
Jennifer Hunter	NHEP Director	NH Estuaries Project	603-862-3948 jennifer.hunter@unh.edu

Based on EPA-NE Worksheet #3

A4 – Project/Task Organization

The project will be completed by the UNH Jackson Estuarine Laboratory. David Burdick is the Program Manager for UNH and is the primary contact for UNH. He will be responsible for coordinating all program activities. This work is being done under contract for the NH Estuaries Project so the Program Manager will be accountable to the NHEP Coastal Scientist (Phil Trowbridge) and the NHEP Director (Jennifer Hunter). The U.S. Environmental Protection Agency provides funding to the NH Estuaries Project. Jean Brochi is the project manager for EPA.

Daily operations of the project will be managed by the Program Manager. The Program Manager will manage all field staff, be responsible for “stop/go” decisions in the field, and coordinate data analysis.

The Project QA Officer will be Chris Peter. The QA Officer will be responsible for a memorandum to the Program Manager summarizing any deviations from the procedures in the QA Project Plan, the results of the QA/QC tests, and whether the reported data meets the data quality objectives of the project. This memorandum should clearly state whether any data should be rejected because they did not pass QA tests.

The principal users of the data from this project will be the NH Estuaries Project staff and NHDES. The Program Manager will submit a report to the NHEP/NHDES Coastal Scientist and the NHEP Director at the end of the project with all the data and the QA Officer’s summary report.

A5 – Problem Definition/Background

The elimination of an invasive, exotic variety of *Phragmites australis* (common reed) in the southern half of Awcomin Marsh has resulted in large areas of bare sediment. In 2002, two acres were planted with *Spartina alterniflora* (smooth cordgrass) using various techniques by over 100 volunteers from the community and the region. Most of the restoration site remains unplanted. After two years, monitoring data indicate that planting bare root culms (stems) or plugs work equally well and result in greater cover by perennial plants on the marsh compared to planting seed heads or no planting. However, seed head planting did result in successful establishment of smooth cordgrass, and further monitoring is needed to see if this inexpensive method can catch up to the successful plug and culm plantings. Further, the planted perennials tend to reduce new plants entering the site naturally (this may reduce the ability of *Phragmites* to return). Continued monitoring will help answer these questions and help guide revegetation efforts in the future.

A6 – Project/Task Description

This project has three main tasks pertinent to data collection and analysis:

1. Prepare QA Project Plan

A QA Project Plan for vegetation sampling will be produced by UNH. This plan must be approved by the NHEP Coastal Scientist, DES QA Manager, and EPA Region I before data collection on this project begins.

2. Collect Assessment Data

Emergent vegetation will be assessed at the areas planted in 2002 and the new site planted this year.

3. Prepare Final Report

The final work product will be plant cover and other characteristics at the sites planted in 2002 and the 2005 site. All necessary documentation/metadata will be included in a final report describing the results and any deviations from the protocols established in the QA Project Plan.

Table 2. Project Schedule Timeline

Activity	Dates (MM/DD/YYYY)		Product	Due Date
	Anticipated Date(s) of Initiation	Anticipated Date(s) of Completion		
QAPP Preparation	6/1/05	8/31/05	QAPP Document	8/31/05
Field Assessment	9/9/05	9/30/05	Field data collection	10/15/05
Final project report preparation	11/1/05	12/31/05	Final report	12/31/05

Based on EPA-NE Worksheet #10.

A7 – Quality Objectives and Criteria

This study follows development of the emergent plant community in planted and unplanted plots within a salt marsh where dredge spoils were removed to restore the structure and function of the marsh. Each plot will be assessed for plant cover by species with informal and formal quality control checks. No laboratory or instrument measurements will be made. **All measurements will be made using a regionally accepted protocol (Neckles and Dionne 2000, available from**

<http://www.pwrc.usgs.gov/resshow/neckles/Gpac.pdf>) that we believe will provide a level of quality needed to fulfill objectives. So long as the protocols are followed, the data quality objectives will be met.

Precision: Precision is a measure of repeatability of the measure at the time and conditions of collection. Each person contributing visual estimates of plant cover will intercalibrate their estimates to reach consensus on 9 of 10 plots (informal quality control). The method for visual assessment of cover for 0.5 to 1.0 meter square areas using intercalibration is described in the regional methods for salt marsh restoration assessments (Neckles and Dionne 2000) and is based on methods in Kent and Coker (1992). Every tenth plot will be assessed individually with no intercalibration and the results not shared. These data will be analyzed and compared to intercalibrated plots to assess precision of the visual estimates.

Accuracy: Accuracy is a measure of how well the estimates represent the true cover of the plants. Cards representing 1, 2, 5 and 15 % cover will be made and set out in the sub-sample plots to help maintain accuracy.

Representativeness: Six randomly selected sub-samples will be taken for each plot. The area examined represents about 4% of each plot planted (or control).

Comparability: The method for visual assessment of plant cover for 0.5 to 1.0 meter square areas is comparable to the regional methods for plant assessments in salt marsh restorations (Neckles and Dionne, 2000; Neckles et al. 2002).

Sensitivity: Differences between control areas and planted areas are expected to be quite large (> 10% cover for dominants and planted species like *Spartina alterniflora* and *Phragmites australis*). The sample averages of six sub-samples should be sufficient to establish such differences where they exist. .

Completeness: All planted and control plots will be sampled.

A8 – Special Training/Certification

The Program Manager, David Burdick, will organize and implement a training session for QA Officer, Chris Peter. The training will be based on the QA Project Plan document. Field and laboratory staff will sign an attendance sheet for the training, which will be retained by the Program Manager and included in the final report. The training will be completed before sampling begins.

Table 3. Special Personnel Training Requirements

Project function	Description of Training	Training Provided by	Training Provided to	Location of Training Records
Assessment of Planted vegetation	Field method SOPs from Neckles and Dionne (2000), and field data sheets. This training will be conducted once at the beginning of the field season.	Program Manager	All field team staff and analysis staff.	With Program Manager and included in final report to NHEP.

Based on EPA-NE Worksheet #7.

A9 – Documents and Records

QA Project Plan

The Program Manager will be responsible for maintaining the approved QA Project Plan and for distributing the latest version to all parties on the distribution list in section A3. A copy of the approved plan will be on file with the NHEP Coastal Scientist at the DES offices, 29 Hazen Drive, Concord NH.

Field Data Sheets

Data sheets and field notes will be taken to JEL, copied and placed in a data book assigned to the project in the salt marsh laboratory under supervision of the QA Officer. Originals will be kept in a separate office at JEL by the Project Manager. Copies of the field data sheets are provided in Appendix A.

Reports to Management

The Program Manager will provide a final report to the NHEP Coastal Scientist. The final report will contain plant cover information and all necessary documentation/metadata in a final report describing the results and any deviations from the protocols established in the QA Project Plan.

Archiving

The QA Project Plan and final report will be kept on file with the NHEP Coastal Scientist at DES in Concord for a minimum of 10 years after the publication date of the final report.

B1 – Sampling Process Design

Planted areas were divided into 40 by 40 foot plots (12 by 12 meter), and six sub-samples will be collected per plot. Twenty-five plots received several treatments in 2002 including: 5 plug plots, 5 bare root plots, 5 seed-head plots, 5 control (no planting) plots, and 5 late season bare root plots. Planted areas in 2005 will produce an additional 2 planted and 2 control plots. The sub-sample locations will be randomized for each annual collection in such a way that any location within the plot has an equal chance of being sampled. In practice, three transects across the plots will be established using a random number table and then two locations along each transect will be established with the random number table using a temporary flag. Random numbers that cause any portion of the sampling area to fall outside of the planting plot, or overlap with other samples, are discarded and new numbers are selected. Approximately 30 plots will be sampled (180 sub-samples).

B2 – Sampling Methods

Each sub-sample consists of a 1.0 square meter area within a hoop that is placed around the flag at each randomly selected location. The assessment will consist of a count of the number of species at each sample, a visual estimate of percent area covered by each species, and a count of surviving and dead plantings following the SOPs for vegetation monitoring from Neckles and Dionne (2000, p.12). Finally, the presence or absence of open water within each plot will be noted if the water covers 1/3 or more of the plot (visual estimate).

B3 – Sample Handling and Custody

Data sheets and field notes will be taken to JEL, copied and placed in a data book assigned to the project in the salt marsh laboratory under supervision of the QA Officer. Originals will be kept in a separate office at JEL by the Project Manager.

B4 – Analytical Methods

The data will be analyzed using ANOVA following tests to ensure data meet the assumptions of least square analysis. Software will include Excel (Microsoft) and JMP (SAS Institute). Data transformations to ensure homogeneity of error variance and normality will likely be required for percent cover (arcsine of the square root of the percent) and species richness (square root). Statistical significance is set at an alpha of 0.05.

B5 – Quality Control

Field collections and data analysis will be subject to quality control. In the field, an informal intercalibration procedure for visual estimates of percentage cover is performed by two or more staff. Each person states their estimate of cover by species and argues their case until a compromise or consensus is reached. For this specific project, a formal quality control test will be established. Each tenth plot will be assessed separately by each staff person contributing estimate data and the results will be turned in and examined following the entire data collection (no intercalibration on these plots). In the lab, data will be input to excel files and printed. The printouts will be compared to the original data. Residuals following data analysis will be examined for possible data errors. Any errors found in each step will be corrected and the data re-analyzed.

B6 – Instrument/Equipment Testing, Inspection, Maintenance

Not applicable.

B7 – Instrument/Equipment Calibration and Frequency

Not applicable.

B8 – Inspection/Acceptance Requirements for Supplies and Consumables

Not applicable.

B9 – Non-direct Measurements

Not applicable.

B10 – Data Management

Data sheets and field notes will be taken to JEL, copied and placed in a data book assigned to the project in the salt marsh laboratory under supervision of the QA Officer. Originals will be kept in a separate office by the Project Manager. Raw data in spreadsheet files, reduced data and all analytical procedures will be kept in the project notebook in the salt marsh laboratory under supervision of the QA Officer.

C1 – Assessments and Response Actions

Review and assessment of all aspects of this project is the responsibility of the Program Manager. The Program Manager will be involved with all aspects of this project. If problems occur, appropriate adjustments will be made. All such changes will be recorded and reported to the NHEP Project Manager immediately.

C2 – Reports to Management

The Program Manager will provide the following hardcopy reports to the NHEP:

- Interim Report #1 (due 6/30/05): An update on all activities between 4/1/05 and 6/30/05.
- Interim Report #2 (due 9/30/05): A one page update on all activities between 7/1/05 and 9/30/05, including completion of a QA Project Plan.
- Final Report (due 12/31/05): The final report will contain plant cover by species of planted and control plots and all necessary documentation/metadata in a final report describing the results and any deviations from the protocols established in the QA Project Plan.

D1 – Data Review, Verification and Validation

The Project QA Officer will review the methods used to acquire, process, and interpret data on plant cover in planted and control plots to verify that the methods follow the procedures outlined in this QA Project Plan (Sections A7, B1, B2, B3, B4, and B5). The Project QA Officer will be responsible for a memorandum to the Program Manager summarizing any deviations from the procedures in the QA Project Plan, the results of the QA/QC tests.

D2 – Verification and Validation Procedures

The Program Manager reviews the memorandum from the QA Officer to see if there have been deviations from the QA Project Plan. Any decisions made regarding the usability of the data will be left to the Program Manager; however, the Program Manager may consult with project personnel, the NHEP Project Officer, or with personnel from EPA-NE, if necessary.

D3 – Reconciliation with User Requirements

The Program Manager will be responsible for reconciling the results from this study with the requirements of the study (the ultimate use of the data). Results that are qualified by the Project QA Officer may still be used if the limitations of the data are clearly reported to decision-makers. The Program Manager will:

1. Review data with respect to sampling design.
2. Review the Data Verification and Validation reports from the Project QA Officer.
3. If the project objectives from Section A7 are met, the user requirements have been met. If the project objectives have not been met, corrective action as discussed in D2 will be established by the Program Manager prior to the next monitoring event.

4. Draw conclusions from the data.

References

Kent, M., and P. Coker. 1992. *Vegetation Description and Analysis: A Practical Approach*. CRC Press, Boca Raton, FL. 363 pp.

Neckles, H.A., and M. Dionne. 2000. Regional standards to identify and evaluate tidal wetland restoration in the Gulf of Maine. Wells NERR Technical Report, Wells, ME. 21pp. Available from: <http://www.pwrc.usgs.gov/resshow/neckles/Gpac.pdf>

Neckles, H., M. Dionne, D. Burdick, R. Buschbaum, T. Diers, E. Hutchins and C. Roman. 2002. A monitoring protocol to assess tidal restoration of salt marshes on local and regional scales. *Restoration Ecology* 10: 556-563.

Appendix A: Field Data Sheet

Date: _____ Time: _____
 Samplers: _____ Weather: _____

Site: _____ Cell: _____ SET#: _____ PlantType: _____

Transect / Distance: _____
 %Cover Height #Stems Surv/Died Water Other

Transect / Distance: _____
 %Cover Height #Stems Surv/Died Water Other

Transect / Distance: _____
 %Cover Height #Stems Surv/Died Water Other

Transect / Distance: _____
 %Cover Height #Stems Surv/Died Water Other

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Transect / Distance: _____
 %Cover Height #Stems Surv/Died Water Other