

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
EPA New England
Office of Environmental Measurement & Evaluation
11 Technology Drive, North Chelmsford, MA 01863

MEMORANDUM

DATE: August 2, 2005

RFA No. 05290

SUBJ: Approval of Oyster Reef QAPP

FROM: Arthur E. Clark, Chemist, Quality Assurance Office (EQA)

TO: Jean Brochi, EPA Oceans & Coastal Protection Unit (COP)

Today I received the following quality assurance project plan:

Oyster Reef Restoration Project for the City of Dover, NH, Draft 3, by R. E. Grizzle, University of New Hampshire Jackson Estuarine Laboratory, August 1, 2005.

I have reviewed the QAPP and found that it includes the necessary elements provided in our Agency guidance document, *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5, March, 2001). I have signed a copy of the cover page and will send it to you. If you concur, please sign it and forward it to the NH DES and UNH for concurrence signatures. A photocopy of the cover page with all concurrences should be submitted to our office for our records.

This approval covers the 2005 and 2006 monitoring seasons.

- If minor changes occur, our office should be informed by email or letter, but approvals of such changes are not required. (Extension of the monitoring period is considered to be a minor change.)
- If major changes occur, a revised QAPP should be submitted for review and approval.

If you have any comments or questions, please contact me at any time. I may be reached by phone at (617)918-8374 and by fax at (617)918-8274.

cc: R. Grizzle (UNH)
M. Lataille
V. Perelli (DES)
A. Peterson
P. Trowbridge (DES)
G. Sotolongo

Oyster Reef Restoration Project for the City of Dover, NH

Quality Assurance Project Plan - DRAFT 3

August 1, 2005

Prepared by

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Jackson Estuarine Laboratory
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Durham, NH 03824

Project Manager:

Signature / Date
Dr. Raymond E. Grizzle, UNH

Project Quality Assurance Officer:

Signature / Date
Jennifer K. Greene, UNH

NHEP/NHDES Project Manager:

Signature / Date
Phil Trowbridge, NHEP

NHDES Quality Assurance Manager:

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Vince Perelli, NHEP

USEPA Project Manager:

Signature / Date
Jean Brochi

USEPA Quality Assurance Manager:

Signature / Date
Arthur Clark

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Appendix A: Field Data Sheets

A3 - Distribution List

Table 1. QAPP Distribution List

QAPP Recipient Name	Project Role	Organization	Telephone number and Email address
Ray Grizzle	Project Manager	University of New Hampshire	603-862-2175 ray.grizzle@unh.edu
Steven Bernstein	Associate Director, Office of Sponsored Research	University of New Hampshire	603-862-2420 steven.bernstein@unh.edu
Jennifer Greene	Project QA Officer	University of New Hampshire	603-862-2175 jenn.greene@unh.edu
Jennifer Hunter	NHEP Director	NH Estuaries Project	603-433-7187 jennifer.hunter@rscs.net
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	EPA Project Officer (National Estuary Prog.)	USEPA New England	617-918-1536 brochi.jean@epa.gov
Arthur Clark	EPA Quality Assurance Officer	USEPA New England	617-918-8374 Clark.Arthur@epamail.epa.gov
Bruce Smith	NHF&G Biologist	NHF&G Region 3 Durham NH	603-868-1095

Based on EPA-NE Worksheet #3

A4 - Project/Task Organization

The project manager for this study is Dr. Ray Grizzle of the University of New Hampshire. Dr. Grizzle is responsible for maintaining and distributing the approved QA Project Plan, sampling designs, fieldwork, data gathering and analysis, quality assurance, and filing interim and final reports with New Hampshire Estuaries Project (NHEP).

Dr. Grizzle is assisted with field and laboratory work by technicians employed in his laboratory as well as graduate and undergraduate students from the University of New Hampshire. Jennifer Greene will serve as the Project QA Officer and will supervise field work by technicians and students.

The principal data users will be personnel at the NHEP, the City of Dover and the New Hampshire Fish & Game Department.

The New Hampshire Estuaries Project and the City of Dover are funding the study.

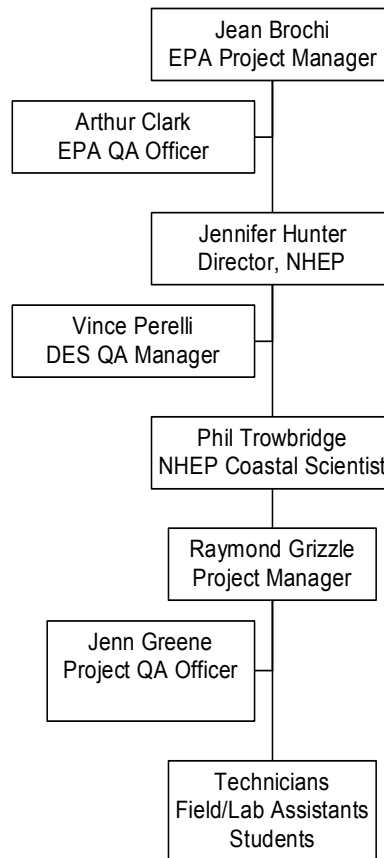


Figure 1: Organizational Summary.

A5 - Problem Definition/Background

The purpose of the NH Estuaries Project (NHEP) is to implement a Management Plan to protect, restore, and manage the state's estuarine systems. The present project is concerned with restoration of a portion of once-productive oyster reefs in the Bellamy River and in the Piscataqua River just north of Pomeroy Cove. UNH Jackson Estuarine Laboratory will conduct the project to accomplish the overall objective of enhancing oyster resources in New Hampshire.

The State recently set a goal of restoring 20 acres of oyster beds by 2010 (Trowbridge 2003). For this goal, "restoration" was defined as (Trowbridge 2003, p. 41): "...projects that actively transplant oysters to reefs will be considered restoration projects." The only method known to be effective that involves transplanting oysters (and is practical for implementation in New Hampshire) is seeding the bottom with spat from remotely set oyster larvae. Transplanting adults from one area to another is practiced in some areas, and has been tested in New Hampshire. However, it was shown in one experiment not to be effective (Grizzle et al. 2003), and it has the potential of increasing disease infestation in the transplanted area. Therefore, various techniques involving remote setting of larvae and subsequent spat seeding are currently being tested in New Hampshire. The present project was designed to contribute to meeting the state's oyster restoration goal (see above).

Figure 2 shows the general locations in the Bellamy and Piscataqua Rivers where existing (but mostly dead) oyster reefs will be restored. Both sites are in waters closed to harvesting of shellfish, but historically both were productive oyster reefs. A recent survey of the Bellamy reef involving a video

survey and sampling with tongs in about eight different areas resulted in extensive "hard bottom" covered with empty shells but only one cluster of live oysters. The Piscataqua reef has not been directly sampled, but a preliminary video survey did not show any areas with live oysters.

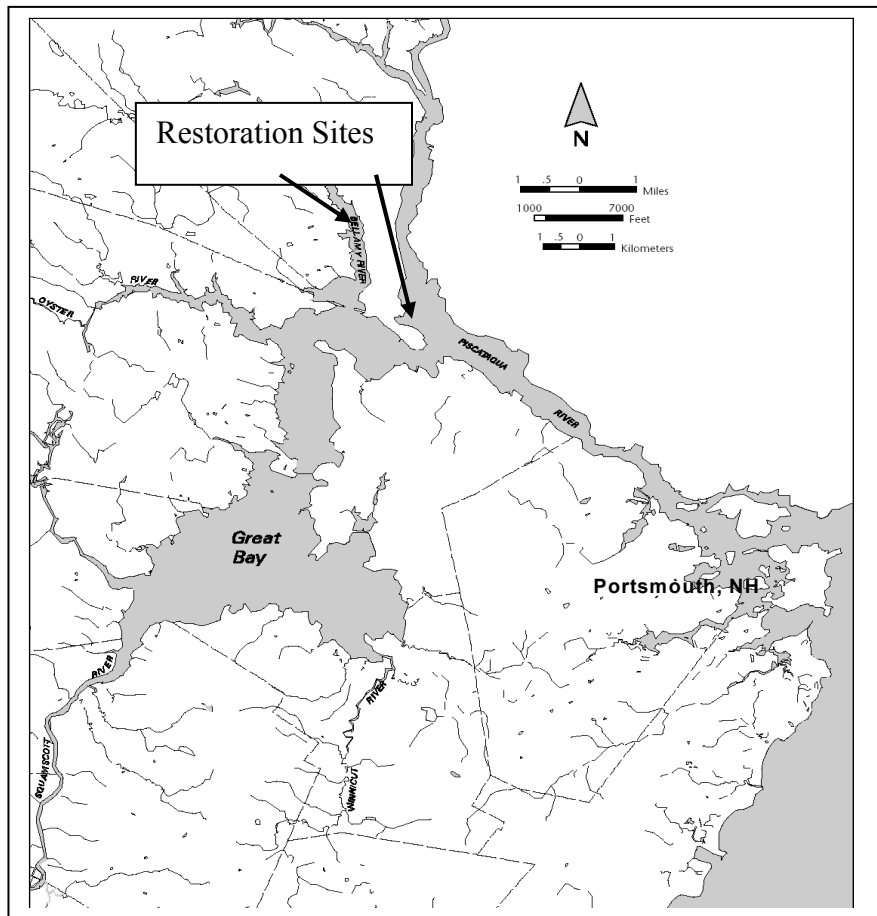


Figure 2: General locations of oyster reefs to be restored in the Bellamy and Piscataqua Rivers.

A6 - Project/Task Description

The following work tasks will be completed in order to meet the above overall objective. **This QAPP is relevant to the environmental sampling which will be completed for work task 5.**

Work Task 1: Administration. Administrative work tasks will include activities associated with managing personnel, purchases, data processing, and report writing. Permits will be obtained from appropriate local, state, and federal agencies. A Quality Assurance Project Plan will be prepared and be approved by USEPA Region 1 before field work begins.

Work Task 2: Site surveys, map production, final protocol development. Existing oyster bottom in two areas, the Bellamy River and Pomeroy Cove (Piscataqua River), will be surveyed and mapped, delineating the extent of dead shell bottom and live oysters and the general

environmental conditions in the immediate area including surrounding habitat types. Based on these surveys, a final restoration protocol will be developed for each area.

Work Task 3: Remote setting of oyster larvae. Existing setting tanks at Jackson Estuarine Laboratory will be used to remotely set hatchery-reared larvae from native New England broodstock to produce spat for reef restoration.

Work Task 4: Bottom seeding with spat. Remotely set oyster spat will be transferred to the reef site. This work task will involve carefully placing the spat onto marked areas of the bottom that delineate some portion of the outlines of the original reefs.

Work Task 5: Assessment of restoration success. Restoration success will be assessed based on a quantification of the areal extent of the restored reef bottom as well as counts and measurements of live oysters at periodic intervals using random quadrat sampling. At a minimum, the restored reef will be sampled immediately after construction (late summer or fall) and in the fall before ice cover occurs in the estuary in 2005. Subsequent sampling in 2006 will be supported by the City of Dover.

Work Task 6: Reports to the NHEP. The City of Dover shall submit interim reports and a final report to the NHEP according to the schedule below. Interim reports shall be submitted electronically using the NHEP Interim Report Form. The final report shall consist of three hard-copy reports plus one electronic version.

Major milestones for this project are summarized in the following table. **Note that this environmental monitoring described in this QAPP will occur as part of Task 5 (“Assess the success of restoration”). Therefore, this table only contains milestones relevant to this task.**

Table 2. Project Schedule Timeline.

Activity	Dates (MM/DD/YYYY)		Product	Due Date
	Anticipated Date(s) of Initiation	Anticipated Date(s) of Completion		
Prepare QA Project Plan	06/01/2005	08/15/2005	QAPP document	08/15/2005
Assess success of restoration (Task 5)	11/01/2005	11/30/2006	Report	11/30/2006
Fourth interim report	12/01/2005	12/31/2005	Interim report	12/31/2005
Submit final report	12/01/2006	12/30/2006	Final Report	12/30/2006

The preceding paragraphs describe the plan for the project. The Project Manager is responsible for adjusting this plan as needed to handle any problems that arise. The Project Manager will consult with the NHEP Coastal Scientist if any major problems are encountered such that the project design needs to be changed.

A7 - Quality Objectives and Criteria

This study is primarily a field project. The oyster reef monitoring work task consists mainly of data gathering in the field; no laboratory analyses are involved. Therefore, some of the standard data quality objectives metrics are not applicable.

Precision: Not applicable

Accuracy: Accuracy for the oyster parameters of this study will be estimated by the error terms associated with the mean abundances for spat numbers, size, and dead attached shell for each experimental reef (see Work Task 5 above). Confidence limits of +/- 25% for each abundance estimate will be considered excellent, while +/- 50% will be acceptable. Error in estimates will be calculated using the standard deviation of the mean value and the appropriate value of the t distribution.

Representativeness: Random sampling will be employed for all assessments. Therefore, the resultant data will be representative of each treatment and control or comparison area that was assessed.

Comparability: Oyster reef assessments will be conducted using conventional techniques (randomized quadrat sampling) that are compatible with previous studies.

Sensitivity: Not applicable

Completeness: The project will be considered complete if 100% of the restored reef areas and control/comparison areas are assessed three times using the sampling methods described in Sections B1 and B2.

A8 - Special Training/Certification

Field and laboratory assistants will be trained by the Project Manager prior to their conducting work on this project. The Project Manager will keep a record of the names of each person who was trained, along with the date of the training.

A9 - Documents and Records

The Project Manager will be responsible for maintaining the approved QA Project Plan and for distributing the latest version of the plan to all parties on the distribution list in section A3. A copy of the approved plan in hardcopy and electronic formats will be on file with the NHEP Coastal Scientist.

The Project Manager will be responsible for retaining the original hardcopy datasheets from this project for a period of 5 years. Electronic files of the database created for this project will be kept by the Project Manager and the NHEP Coastal Scientist for a period of 10 years.

One interim report and one final report will be produced for the NHEP. These reports will be available to the public in hardcopy from the NHEP, in electronic format on the NHEP website, and its abstract (in text form only) will be included in the NHEP tracking database. See section C2 for the reporting schedule and details.

The environmental monitoring described in this QAPP will be completed within one year so a QAPP review process is not required.

GROUP B: DATA GENERATION AND ACQUISITION

B1- Sampling Process Design

The major objective of the present project is to initiate restoration of a portion of two once-productive oyster reefs. A secondary objective is to gain new knowledge relevant to the development and implementation of larger scale oyster enhancement programs that involve: (1) design and construction of

new reefs; (2) the use of spat seeding in oyster enhancement; and (3) management of restored areas for broodstock enhancement.

B2 - Sampling Methods

All study areas will be assessed using the standard method of randomized quadrat sampling, and all measurements will be made in the field. Approximately 20 quadrats will be randomly placed on the reef area, 10 quadrats on newly constructed reef bottom and 10 on adjacent bottom. All of the oysters within each quadrat will be retrieved by divers and measured to the nearest millimeter using calipers. Live versus dead oysters will be identified. All oysters and oyster shell will be returned to the reef after enumeration. The boundaries of the living reef will be interpolated based on the live oyster density within the quadrats. Each of the reefs will be sampled three times after the restoration work is complete: immediately after restoration, late fall 2005, and 2006. The Project QA Officer will be responsible for documenting any deviations from these methods.

B3 - Sample Handling and Custody

N/A

B4 - Analytical Methods

N/A

B5 - Quality Control

Quality control assessments will be based on accuracy of the estimates of oyster parameters described in Section A7 above.

B6 - Instrument/Equipment Testing, Inspection, and Maintenance

N/A

B7 - Instrument/Equipment Calibration and Frequency

N/A

B8 - Inspection/Acceptance of Supplies and Consumables

N/A

B9 - Non-direct Measurements

N/A

B10 - Data Management

Field data will be recorded on standard field data sheets (see Appendix A) and transferred to Excel data files. Data entry will be checked using two methods. First, the entire data set will be printed and checked against the entries in each field data sheet. Second, box-plots and other graphical tools (such as residual plots) will be constructed to determine if there are outliers in the data set. All outliers will be examined further to determine whether they represent data entry or other kinds of errors. All data will be stored

electronically in spreadsheets or SYSTAT data files. Management of hardcopy data and documents is described in Section A9.

GROUP C: ASSESSMENT AND OVERSIGHT

C1 - Assessments and Response Actions

The Project Manager will participate in and evaluate the sample collection methodology as the study proceeds. 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

Reports pertaining to the environmental monitoring will be submitted to the NHEP according to the following schedule:

Interim Report on the project status plus including problems encountered, and preliminary data summaries – December 31, 2005

Final Report on the results of the assessments, any QA issues identified, and final data - December 31, 2006

The environmental monitoring described in this QAPP will be completed within one year so a mid-project QAPP review is not required.

GROUP D: DATA VALIDATION AND USABILITY

D1 - Data Review, Verification, and Validation

The Project QA Officer will review all field data sheets and final computer data files for completeness and accuracy based on the criteria described in Sections A7 and B10. The Project QA Officer will also verify that the methods used for the study followed the procedures outlined in this QA Project Plan. If questionable entries or data are encountered during the review process, the Project QA Officer will contact the appropriate personnel to determine their validity. 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 and the results of the QA/QC tests.

D2 - Verification and Validation Methods

The Project 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 Project Manager may consult with project personnel, the NHEP Project Manager, or with personnel from EPA-NE, if necessary. Final validated results will be disseminated to the data users through a final report as described in section C2.

D3 - Reconciliation with User Requirements

Any problems with the data analysis and interpretation will be reconciled by the Project Manager after consultation with New Hampshire Estuaries Program staff.

REFERENCES

- Castagna, M., M.C. Gibbons, and K. Kurkowski. 1996. Culture: application. pp. 675-690 In: Kennedy, V.S., R.I.E. Newell, and A.F. Eble (eds.) *The Eastern Oyster, Crassostrea virginica*. Maryland Sea Grant, College Park, MD.
- Grizzle, R., S. Jones, R. Mann, and M. Luckenbach. 2003. Restoring an Oyster Reef for Mitigation of Water Quality, Final Report. NOAA/UNH Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), University of New Hampshire, Durham, NH.
- Langan, R. 2000. Shellfish habitat restoration strategies for New Hampshire's estuaries. Final Report. Office of State Planning, New Hampshire Estuaries Project, USEPA. 16pp.
- Supan, J.E., C.A. Wilson and K.J. Roberts. 1999. Economics of augmentation of natural production using remote setting techniques. pp. 359-366 in: Luckenbach, M.W., R. Mann, and J. Wesson (eds.) *Oyster Reef Habitat Restoration: A Synopsis and Synthesis of Approaches*. Virginia Institute of Marine Science, Gloucester Point, VA.

Oyster Measurements (shell height, mm)

Date: _____

Personnel: _____

Notes:

Reef, Site:		Reef, Site:		Reef, Site:		Reef, Site:	
1		1		1		1	
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