10-18-2006

NOAA Restoration Center Community-based Restoration Program (CRP) : Progress Report Narrative Format, October 18, 2006

Maine Department of Transportation

I. Project Title: Sherman Marsh Restoration and Monitoring: a Serendipitous Opportunity

II. Reporting Period **6 July 2006 - 16 October 2006**

Semi-annual performance reports are required no later than 30 days following each 6-month period from the start date of the award; comprehensive final reports are due 90 days after the expiration of the award. Reporting periods start on the first day of a given month, and end on the last day of a given month.

III. Project Narrative (this section is required for the final comprehensive report only):

The project narrative should identify the problems that the project has addressed, describe short- and long-term objectives and goals and how they were met, and explain the relevance of the project to enhancing habitat and/or to benefiting living marine resources, including a description of any threatened or endangered species the project will benefit.

IV. Methodology

Describe the methodology used to undertake on-the-ground activities during this reporting period to achieve the project goals and objectives, including the restoration techniques and materials used.

- Vegetation surveys: Permanent vegetation transects running perpendicular to the tidal creek were set up at random positions within every 500 m stretch of the main tidal creek. Transects began at the low water mark and ran to the uplands. Permanent vegetation plots were situated at 1, 3, and 15 meters, and every 15 m thereafter. Vegetation plots were marked with PVC pipe poles. Vegetation was surveyed using the point plot method, which measures plant presence at 50 grid points within a 1 m^2 plot. Species percent cover is calculated as number of points that species was present times 2%. Total percent cover can be greater than 100% for a given plot because more than one plant species can be touching each point. As of fall 2007, we have established 8 permanent transects within Sherman Marsh, and 2 transects in the reference marsh. Transect lengths ranged from 30 to 190 m with an average of 8.5 plots, for a total of 85 plots.

- Soil characteristics: Pore water salinity wells were installed along the vegetation transects in the 'high marsh', usually 2 – 3 per transect. Salinity well were constructed of a 35 cm length of 1.9 cm dia (3/4 inch) CPVC pipe, with holes located from 5 to 25 cm below the surface. The bottom of the well was taped with duct tape, and the top capped with two 90°CPVC elbows to prevent rainwater intrusion but allow pressure equalization. Salinity was measured using a temperature corrected refractometer during August and September.
  Soil cores were taken for soil organic content throughout the marshes.

- Water quality: Water quality measurements (temperature, salinity, dissolved oxygen) were made on both the incoming and outgoing tides at 8 stations in Sherman Marsh, and two stations in the reference marsh (the Marsh River). Water quality stations were located using a handheld GPS unit (Garmin etrex Legend) with 5 to 7m accuracy. Water quality measurements were made using a YSI 85.

- Fish community assessment: Lift nets (1m x 1.5 m) were constructed and tested in preparation for the 2007 sampling season. Notes on fish activity were made throughout the summer.

- Marsh surface elevations: In collaboration with the Maine Department of Transportation and Wells National Estuarine Reserve, we use a Total Station surveying system to survey marsh surface elevations at locations within sight of the tidal constriction (Route 1).

- The role of wrack in recolonization of Sherman Marsh: In this project, Laura Jones, a graduate student in Biology at the University of Southern Maine, set up 45 plots to examine the role of wrack as a source of propagules and/or cover for colonizing species in the high marsh. Treatments included bare ground, salt marsh wrack collected from the reference marsh, and autoclaved straw representing cover but not a source of propagules. All plots were covered with wide-mesh landscaper's burlap, and a surface salinity well (with holes at 2 cm depth) was placed in each plot. Plots were examined every three weeks from June to September for plant percent cover and surface soil salinity. Available nitrogen was measured over the growing season with resin bags.

V. Results/Progress to Date

Describe in sufficient detail the status of the project (planning/design, implementation, monitoring, complete) in terms of progress and results achieved during the reporting period. This should include information such as the actual acreage that were restored/enhanced/protected or created to date (cumulative), and how this measurement was determined; projected acreage yet to be restored with CRP funds; miles of stream that were opened or will be opened for fish passage; lessons learned during this reporting period; challenges or potential roadblocks to future progress; and an updated timeline of remaining tasks needed to complete project.

Preliminary results and observations to date:

Hydroperiod (Flooding Regime)

Flooding and salinity regime drives plant community formation. The tidal range behind the Route 1 constriction is severely dampened: water height fluctuates from 0.3 to 1 m. In contrast, the Marsh River below the tidal constriction at Route 1 fluctuates from 2.1 to 3.7 m. During the tidal cycle, much of the creek water is retained within Sherman Marsh which prohibits the return of intertidal low marsh or mudflat habitat historically present. Another consequence of the restriction is that the creek does not reach full high tide levels.

Consequently, high marsh habitat floods less frequently than historically. We are continuing to work with the Maine Department of Transportation to survey creek waters.

Salinity

Surface water salinity has increased over the growing season. June 19th we saw a range of 2.2 ppt at the inward reaches of Sherman Marsh to 11.4 ppt near the constriction. Ranges found on August 11th were 12.1 to 19.1 ppt. On September 22nd, soil salinities reached an all-time high of 22.7 ppt at the far reaches of the creek.

Pore water salinities vary greatly throughout the marsh and depend upon elevation, distance from the creek and distance from the constriction. Water samples from most salinity wells were fresh to brackish. For example, pore water from an area that had been predicted to become salt marsh had salinities of 0 ppt and 4 ppt in August and September, respectively. The highest salinities in Sherman Marsh in August were 20 ppt compared with 25 ppt in the reference marsh. Considerable rain throughout the summer may have maintained fresh conditions on the extensive high marsh surface.

Sediments

Of note, much of the marsh sediments consisted of dense peat, presumably originating from the salt marsh originally flooded 71 years ago. Creek banks showed evidence of filling in, with shallow sloping sides and often very soft sediments.

Vegetation

The reference marsh exhibited a classic set of salt marsh plant species dominated by perennial grasses. *Spartina alterniflora* dominated the low marsh. *Spartina patens* and *Juncus gerardii* dominated the high marsh, with *Triglochin maritima, Plantago maritima, Salicornia europeae,* and *Distichlis spicata* occurring regularly. In addition to salt marsh plants, areas of the marsh toward the upland supported *Cyperus* and *Scirpus* species indicative of a less saline, brackish marsh.

In mid-April, the surface of Sherman Marsh consisted of dead freshwater plant material (decomposed rhizomes and stems of *Nymphea* sp., *Pontederia cordata*, and *Scirpus* sp.) remaining from the dewatering event in October 2006, and expanses of bare mud. Heavy and frequent spring rains aided the re-establishment of freshwater species previously growing in Sherman Lake. Our surveys found high occurrence of these plants, including *Pontederia cordata, Eleocharis acicularis, Eriocaulon aquaticum, Zizania* sp., *Sagittaria* spp.,and *Nymphea* sp. These species were especially numerous farther into the marsh. We found that vegetation colonizing areas near the constriction (receiving greatest salt water flushing) reflect its higher salinity regime. *Atriplex patula* plays a large role in colonizing these areas as does *Salicornia* and *Scirpus maritimus*. Low marsh habitat in these salty waters excludes all plants but *S. alterniflora*, as seen near the constriction. Many areas that we know to be brackish support *Scirpus maritimus* in abundance in both the low and high marsh. Only one plant species was distributed throughout the marsh, across all salinity regimes. Based on vegetative characteristics and habit this species is likely to be *Juncus gerardii*. In both fresh and brackish high marsh areas *Typha* is becoming well established as is the invasive *Lythrum salicaria*. The presence of fresh, brackish and salty

habitats on the marsh resulted in an eventual high species richness and evenness. The marsh surface was well vegetated by mid-summer.

We have observed many changes in the vegetation over just one growing season and therefore have some predictions for next year. Freshwater species likely prospered early in the season as a result of freshwater flooding from heavy rains. However, we observed that some of these, such as *Zizania, Nymphea, Sagittaria,* and *Pontederia,* died off as the marsh surface dried or become more saline with drier weather, suggesting that these species will be much less abundant in 2007. We have observed cattails' continued growth during the season, whose canopy shades shorter vegetation, reducing diversity. Purple loosestrife is also a strong competitor; progeny of individual plants found in the survey are likely to occupy more space next year.

Animals

Forage fish have been observed throughout the creek system, including in the upper reaches, side creeks and some pools. Using lift nets to sample nekton from a pool and creek edge, three attempts yielded at total of 500 fish. We caught a few sticklebacks but the vast majority were mummichogs. Recreational fishermen have reported catching stripped bass and white perch, and eel were seen at the mouth of a freshwater inlet to the marsh. Cormorants were actively feeding in the marsh throughout the summer; osprey were active in early to mid-summer. Shorebirds were abundant in August. Grazing from a breeding flock of approximately 20 Canada Geese was evident much of the summer. Several (freshwater) turtles were observed in the upper reaches of the marsh, and evidence of nesting by snapping turtles was noted in sandy roadsides located in the lower reaches of the marsh.

Remaining tasks to complete the project:

- Data analysis, especially of the vegetation data and experimental work
- Additional soil cores
- Soil sulfide content: if conducted once a year, needs to be conducted in August.
- Additional pore water salinity measurements
- Fish
- Additional marsh surface elevations: collaborate with the Wells Estuarine Reserve to survey all vegetation transects for marsh elevation.
- Additional tidal stage information: Purchase pressure transducers and deploy in the upper reaches in conjunction with the Maine DOT's transducers above and below the tidal constriction.

VI. Monitoring and Maintenance Activities

Describe any monitoring and maintenance that has taken place during the reporting period and/or procedures that are being used to evaluate the relative success of the project in achieving its goals and objectives. When will monitoring results become available?

- Please see section V. Currently most work on the marsh is monitoring, in preparation for further hydrologic modifications (i.e., widening and deepening) of the tidal constriction located at the Route 1 breach.

VII. Community Involvement

Describe community support and any public involvement in the project that has occurred during the reporting period, including the specific roles of volunteers in project activities.

- The Damariscotta River Association provided access to a canoe & equipment, a YSI 85 temp/d.o./salinity meter and access to their facilities. In particular, Mark DesMeules, Executive Director, helped with logistics and provided background information on the project.
- Dr. Terry Theodose, University of Southern Maine (USM), volunteered several days of her time in the field and in the lab assisting with plant identification and training.
- Ten students from USM's wetland ecology class helped set fyke nets in Sherman Marsh in April 2006. Seven students from USM's Field Methods Course collected additional vegetation data near the inlet of Sherman Marsh and in the reference marsh in September 2006. Most students at USM live and work in the region.
- Volunteers assisting Laura Jones in the field over the course of the summer included six USM graduate and undergraduate students, two community members and a Bowdoin College instructor.
- Justin Schlawin, a botanist with the TNC, assisted with vegetation surveys.
- The Wells National Estuarine Reserve contributed fish nets and access to their Total Station surveying equipment as well as technical support.

VIII. Outreach Activities

Describe any outreach or educational activities (e.g. training, brochures, videos, press releases or public events) related to the project that have occurred during the reporting period.

- A general press release is scheduled for release by November 15th. Most vegetation data is still being analyzed.

IX. Supporting Materials

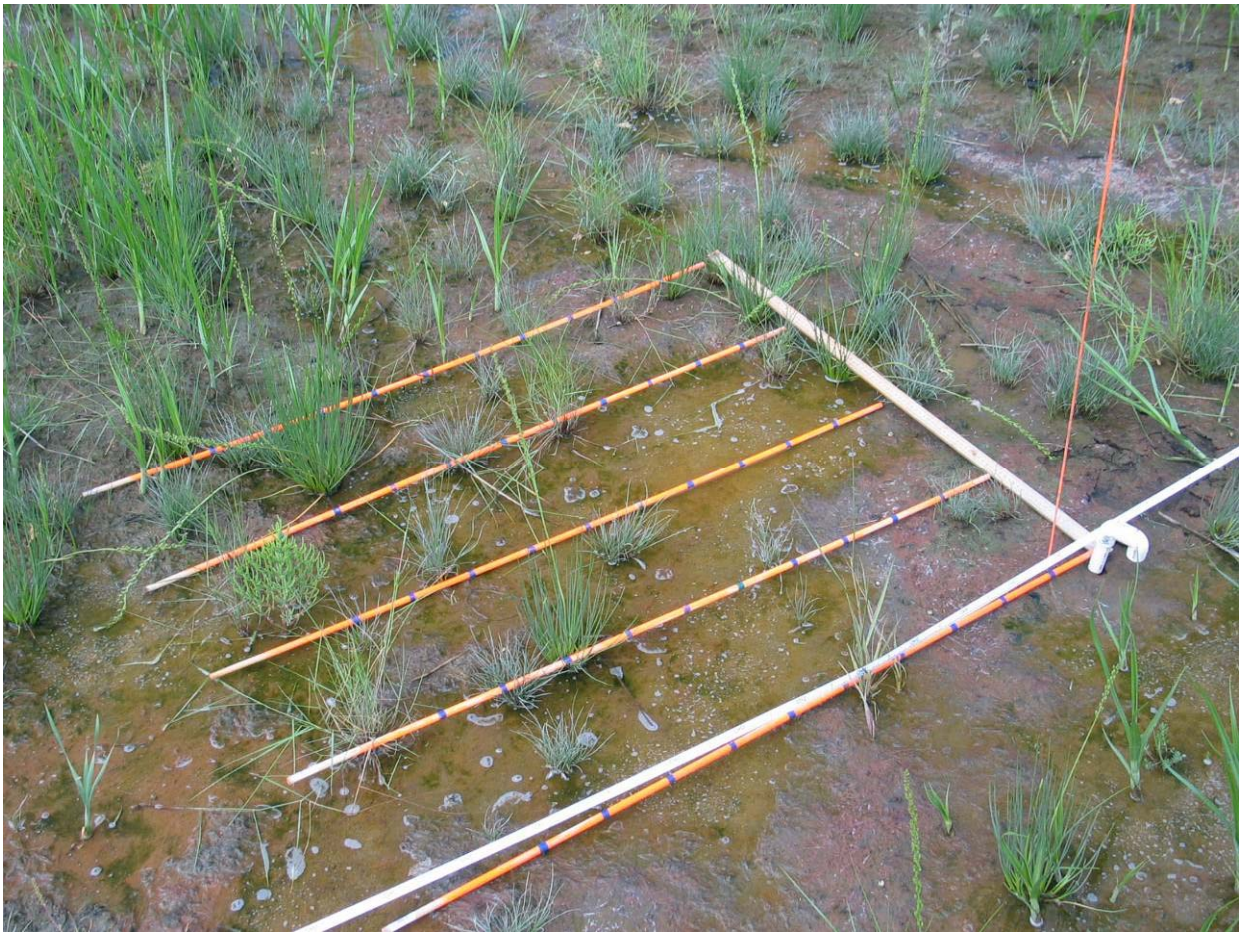
Please include any supporting materials relating to the project, such as articles/news clippings, project photographs (before, during, and after--high resolution images on CD ROM are appreciated), project maps, related web sites, and proof of NOAA Community-based Restoration Program support (e.g. photographs of signs at project sites, funding credit on outreach materials, press releases with complete program name, etc.)

- The Gulf of Maine Council maintains a website on Sherman Marsh:
  http://restoration.gulfofmaine.org/shermanlake/
  and has published articles on the site leading up to this summer's work:
  http://www.gulfofmaine.org/times/summer2006/plans.html
  http://www.gulfofmaine.org/times/spring2006/scienceinsights.html

Photo 1: University of Southern Maine students returning from collecting soil salinities in Sherman Marsh near the tidal constriction. In the foreground is newly established *Spartina alterniflora* and algae-covered flats. (Photographer: Karen Wilson, Sept 2006)

Photo 2: A shallow freshwater pool in the interior of the marsh dominated by a dense mat of *Eleocharis acicularis* (dwarf spike rush). The vegetation transect meter tape is in the background. With increased tidal flooding, it is likely that this area of the marsh will become more brackish. (Photographer: Karen Wilson, August 2006)

Photo 3: Vegetation survey method showing 1 m^2 quadrat with 50 point grid. A salinity well marks the lower left corner of the permanent plot. Located near the tidal constriction, this area was dominated by salt-tolerant species including *Triglochin maritima, Salicornia europeae* and *Scirpus maritimus.* (Photographer: Karen Wilson, August 2006)



X. Funding Information (Cash and In-kind)

1. *Itemized Budget table (similar to example below) showing expenses incurred during the reporting period, for both NOAA funds and matching contributions, as follows. Budget categories should correspond to those described in the approved proposal.*

Budget Category (e.g. personnel, supplies, contractual, etc.)	NOAA Funds	Matching Contributions	Total Expense	Nature (cash or in-kind) and Source of Match
Supplies (salinity wells, fish nets, vegetation quadrats, etc)	$595.14	$1000.00	$1595.14	Cash awarded to Laura Jones by USM for graduate research supplies
Contractor (summer salaries for L. Jones through USM)	$4000.00	$1727.81	$5727.81	In-kind indirect funds waived by USM
Volunteers		$2088.00	$2088.00	Assuming 116 hours at a rate of $18/hr. In fact volunteer hours are at 157 hours to date.
		$851.00	$851.00	In-kind time from Dr. Terry Theodose

2. *Budget Narrative: Describe expenditures by category and explain any differences between actual and scheduled expenditures. Include documentation of volunteer hours and in-kind donations.*

Supplies
Supplies purchases have included materials to construct fish nets, salinity wells and vegetation quadrats.
Money spent by Laura Jones (match) on her graduate research included the purchase of a refractometer and materials for setting up her experimental plots in the field.

Contractor (salaries)
Laura Jones was paid $4000 for her work this summer.

Volunteers
We are in the process of compiling documentation of volunteer hours.

CONTACT INFORMATION

Contact Name: **Nancy Sferra**
Contact Title: **Director of Science and Stewardship**
Organization (Grantee): **The Nature Conservancy**
Street Address: **14 Maine Street, Suite 401**
City: **Brunswick** State: **Maine** Zip: **04011**
Phone: **207-729-5182** Fax: **207-729-4118**
E-mail: **nsferra@tnc.org**
Organization website (if applicable)**:**

Contact Name: **Dr. Karen Wilson**
Contact Title: **Assistant Research Faculty**
Organization (Grantee): **University of Southern Maine**
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Organization website (if applicable)**:**

PROJECT INFORMATION

Project Title: Sherman Marsh Restoration and Monitoring: a Serendipitous Opportunity

Project Award Number: Project Reporting Period: 6 July 2006 - 16 October 2006

Project Location

City: **Newcastle**
County: **Lincoln** State: **Maine** Zip Code: **04553**
Congressional District(s): **Maine 01**
Landmark (e.g. road intersection, beach): **Intersection of Route 1 and south branch of the Marsh River; adjacent to rest area.**
Land Ownership (check one): Public: Private: Both: **X**
Geographic Coordinates (in decimal degrees)

Longitude (X-coord): **69°35.627′**

Latitude (Y-coord): **44°00.534′**

Are there multiple project sites for this award?* Yes No **X**

River Basin: **Marsh River, a tributary to the Sheepscot River**

Geographic Identifier (e.g. Chesapeake Bay): **Marsh River, Sheepscot River**

Project Start Date: **6 July 2006** Project End Date: **30 June 2007**

Project Volunteers

Number of Volunteers: **27** Volunteer Hours: **154 hours to date**

* If multiple project sites are part of the same award, please duplicate this form and submit required information for each site

Brief Project Description (1-2 sentences) describing project and what it hopes to accomplish:

Sherman Marsh (Lake), Newcastle/Edgecomb, Maine was impounded by an earthenwork roadbed constructed over 70 years ago beneath U.S. Route 1, resulting in the conversion of a tidal saltmarsh to a shallow freshwater lake. On October 9th, 2005, a 200-year storm event caused flood waters to breach the dam and return the lake to a tidal system. Before draining, Sherman Lake covered between 87 to 96 hectares, making it the largest salt marsh restoration site in Maine (M. Dionne, pers. comm.). This is a serendipitous opportunity to learn from the recovery of a unique system through the documentation of wetland changes caused by the breach and the establishment of baseline condition for restoring the remaining tidal constriction.

List of Project Partners and their contributions (e.g. cash, in-kind, goods and services, etc.)

University of Southern Maine: waived indirect costs, equipment, volunteer time from, students and faculty
Damariscotta River Association: use of a canoe & paddles, logistical support

If permits are required, please list the permits pending and those acquired to date:

Preliminary fish sampling was conducted under state Department of Marine Resources permit awarded to Dr. Michele Dionne, Wells National Estuarine Reserve. Permits for 2007 will be applied for by Dr. Karen A. Wilson.

RESTORATION INFORMATION- Please complete this section to the best of your ability. Information below will be confirmed via site visit or phone call by NOAA staff before the close-out of an award.

List the habitat type(s) and acres restored/enhanced/protected or created to date (cumulative) and remainder to be restored/enhanced/protected or created (projected) with CRP funds by the end date of the award. If the project restores fish passage, list the stream miles opened upstream and downstream for fish access. Actual and Projected columns should add up to the total(s) for acreage to be restored with CRP funds indicated in the approved proposal.

Habitat Type *(e.g. tidal wetland, oyster reef, mangrove)*	**Actual Acres Restored** *(To date-cumulative)*	**Projected Acres** *(i.e. Remainder to be restored with CRP funds by award end date)*	**Actual Stream Miles Opened for Fish Access**	**Projected Stream Miles Opened for Fish Access** *(i.e. Remainder to be restored with CRP funds by award end date)*
Tidal wetland (salt marsh)	**~200 acres partial restoration of tidal flow**		**2.2 miles (roughly)**	

What indirect benefits resulted from this project? (e.g. improved water quality, increased awareness/stewardship):
One example is the reversing rips created by the (incomplete) breach of the old dam have attracted striped bass and striped bass fishermen. The fishermen have expressed great interest in the marsh, dam removal and use of the marsh by striped bass.

List of species (fish, shellfish, invertebrates) benefiting from project (common name and/or genus and species):

1. **Marsh mummichog**
2. **Striped bass**
3. **American eel**
4. **Silversides**
5. **Horseshoe crabs (based on presence of exoskeletons)**
6.
7.
8.
9.
10.

MONITORING ACTIVITIES

List of monitoring techniques used (e.g. salinity, fish counts, vegetation presence/absence):

1. **Soil salinities**
2. **Vegetation species cover**
3. **Water temperature, salinity, dissolved oxygen**
4. **Preliminary fish surveys**
5.
6.
7.
8.
9.
10.

Report Prepared By: **Dr. Karen A. Wilson** (Signature) **16 October 2006** (Date)

Please send semi-annual and final progress reports and supporting materials to:

NOAA Restoration Center F/HC3
1315 East-West Highway
Silver Spring, MD 20910
ATTN: NOAA Community-based Restoration Program Progress Reports

The Progress Report Narrative Format and Project Data Form are available on the NOAA Restoration Center website at: http://www.nmfs.noaa.gov/habitat/restoration/community. Electronic submissions are encouraged. Please submit electronic progress reports on PC compatible floppy disk or CD ROM in Microsoft Word, WordPerfect or PDF formats.

Be sure to save a copy of each report for your records; subsequent submissions of the Project Data Form need only add outstanding information, so that the form is completed in its entirety as part of the final comprehensive progress report.

Questions? Please call 301-713-0174 and ask to speak with NOAA Community-based Restoration Program staff

NOTICE

Responses to this collection are required of grant recipients to support the NOAA Community-based Restoration Program. The information provided will be used to evaluate the progress of the work proposed under the grant/cooperative agreement and determine whether the project conducted under the grant/cooperative agreement was successfully completed. Public reporting burden for completing the progress report narrative and project data form is estimated to average fifteen hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the information needed and completing and reviewing the collection of information. Responses to this information collection are required to retain funding provided by the NOAA Community-based Restoration Program. Confidentiality will not be maintained – the information will be available to the public. Send comments regarding this burden estimate or any other aspects of this collection of information, including suggestions for reducing this burden, to the NOAA Fisheries Office of Habitat Conservation, Restoration Division, F/HC3, 1315 East West Highway, Silver Spring, MD 20910.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.

The information collected will be reviewed for compliance with the NOAA Section 515 Guidelines established in response to the Treasury and General Government Appropriations Act, and certified before dissemination.