

## Nova Scotia Department of Natural Resources – Habitat Conservation Fund

### Final Report Narrative

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#### I. Project Title

Cheverie Creek Salt Marsh and Tidal River Restoration Project

#### II. Proponent and Contact

Tony M. Bowron, Project Coordinator

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#### III. Reporting Period

04/01/03 - 03/31/04

#### IV. Project Partners

- Environment Canada's Science Horizons Program – internship funding
- Fisheries and Oceans' Science & Technology Youth Internship Program – internship funding, in-kind support (equipment, information/materials, consultation, project support)
- Human Resource Development Canada – funding to hire a summer student
- NS Dept. of Natural Resources' Habitat Conservation Fund – project funding
- NS. Dept. of Transportation and Public Works – in-kind project support (information/materials, on-site consultation, committed to replacing crossing)
- Atlantic Salmon Association (ASA) – in-kind support (consultation, information/materials)
- Avon Emporium – in-kind support (hosting a communication space where project materials can be posted for the community and where members of the community can post their own materials; local meeting space; accommodations)
- Bay of Fundy Ecosystem Partnership – in-kind support (expertise, equipment, information exchange, general project support)
- Community Action to Protect the Environment (CAPE) – in-kind project support (outreach/education collaboration)
- Dalhousie University – in-kind support (field equipment)
- Dr. Arthur Hines Elementary School – in-kind support (Art Smart project – students engaged in major art project focusing on the Cheverie Creek salt marsh and its restoration, educational activities, gathering of local historical information, monitoring work)
- Ducks Unlimited Canada (DUC) – in-kind support (expertise, access to property for educational activities), potential collaboration in future to develop on-site access and educational infrastructure
- Hants County Rural Development Authority – in-kind support (project promotion and support, equipment), future collaboration to develop on-site access, educational and tourism infrastructure
- Hants Shore Concerned Citizens Association (HSCCA) – in-kind project support (education, promotion, community liaison)
- NS Museum of Natural History – in-kind support (education materials, field equipment, specimen identification)
- St. Mary's University – in-kind support (GIS & GPS equipment and technical support, field equipment)

#### V. Total Value of Project (2003/2004)

Cash – \$99,645.12      In-Kind - \$33,946      Total Project Value - \$133,591.12

## **VI. Habitat Conservation Fund Contribution**

\$20,000

## **VII. Project Narrative**

The primary purpose of the Ecology Action Centre's Salt Marsh Restoration Project is to facilitate the restoration of a more natural tidal regime to a tidally restricted marsh and wetland system. Monitoring and restoration design is being conducted with the guidance of the Gulf of Maine Council and the GPAC regional protocols (Neckles et al 2000). With the loss of over 80% of salt marsh habitat in the upper Bay of Fundy, efforts to restore degraded and lost habitats are necessary as protection is no longer sufficient. This is a pilot project for Nova Scotia with the intention to not only restore tidal flow, fish passage and habitat to restricted system, but to also show that salt marsh restoration is feasible.

A key component of the restoration process has been building a coalition of awareness and support for restoration activities in the Bay of Fundy through outreach, community involvement, and partnership building with key regulatory agencies.

On a boarder scale, raise awareness about and promote the stewardship of sensitive coastal habitats, like salt marshes, both within the local community and on a provincial scale.

### **Project Objectives (and how they were met):**

- 1. Plan, implement, monitor, evaluate, and document a salt marsh restoration project (Cheverie Creek) to be replicated in the region.** Pre-restoration monitoring at Cheverie Creek began in the summer of 2002, when baseline data on the site was collected and analyzed. Restoration planning is ongoing as plans for culvert replacement in the summer of 2004 are currently being finalized. An appropriate crossing size has been selected based on analysis of hydrological data. Next steps include an engineering study, community meetings, post-restoration monitoring, and continued documentation of the process and results. These steps are described in more detail in the Results/Progress, Methodology, and Monitoring and Maintenance Sections of this report.
- 2. Galvanize the support of property owners, community and government for the restoration project at Cheverie Creek.** As described in the Community Involvement section of this report, the project has garnered the enthusiastic support of the property owners, community, and government through outreach and educational activities and creative partnership building.
- 3. Raise awareness and support about the protection and restoration of tidal rivers and wetland systems in the Bay of Fundy:** The project has been very successful at raising awareness and support about protection and restoration of tidal rivers and wetlands systems in the Bay of Fundy and beyond. This is apparent from the increase in public and media interest in coastal issues in general, and the number of community and government requests for the EAC to get involved in protecting and restoring coastal areas around the province.
- 4. Restore the tidal connection between Cheverie Creek and the Minas Basin by replacing the poorly sized and placed wooden box culvert with one designed to restore a more natural hydrologic regime to the system.** As described in the Results/Progress to date section of the report, culvert replacement is planned for summer 2004, pending the results of engineering studies by the Department of Transportation and Public Works (DOTPW). The new, larger opening will restore the tidal connection between Cheverie Creek and the Minas Basin.

5. **Restore a salt marsh ecosystem to provide habitat for anadromous fish and invertebrate species, as well as birds and terrestrial mammals.** The data collected during pre-restoration monitoring indicates that Cheverie Creek is already an important habitat for many bird species, as well as invertebrates and terrestrial mammals. Fish populations are limited in number and diversity because of the restriction caused by the culvert. Improved tidal flow to the system will dramatically improve the conditions for fish and also enhance the productivity of the habitat for birds, mammals, and marine invertebrates.
6. **Provide visitors, school children, and community members with opportunities to learn about salt marshes.** As described in the Community Involvement and Outreach Sections of this report, Cheverie Creek has become a popular site for locals and visitors alike to learn more about salt marshes. School programs and field days have provided a unique opportunity for children and teachers to get out and enjoy the marsh.
7. **Develop a handbook on salt marsh restoration in the BoF that can be used by community groups and government agencies.** The handbook is currently in its initial phases since it cannot be completed until restoration activities at Cheverie Creek have been completed and assessed. The initial draft draws heavily on formats used by other organizations in the Gulf of Maine, which have been modified to reflect the unique context of the Bay of Fundy. The handbook will be based on project experiences in site selection, community outreach, pre-restoration monitoring, implementing a restoration project, and post-restoration monitoring. It is anticipated that the handbook will be completed in Spring 2005.
8. **Conduct an audit of tidal barriers along the coast Cumberland Co. and Kings Co. in order to complete the inventory of tidal crossings for the Nova Scotia side of the Upper Bay of Fundy and identify opportunities for future salt marsh and tidal river restoration projects.** The final reports for the Cumberland Co and Kings Co audits, as well as an umbrella document presenting the results from the past three years of audit work, are currently in draft form and will be available summer 2004. The umbrella document will highlight the sites within each county that are priority sites for salt marsh and/or fish passage restoration.

Completion of the above project objectives is part of a larger effort to protect and restore coastal wetlands by building local stewardship, partnering with government agencies, and hands on restoration work. The relevance of the work at Cheverie Creek is its immense value as a demonstration restoration project in Nova Scotia that will catalyze similar restoration efforts elsewhere in the region.

Completion of restoration work at Cheverie Creek will greatly enhance the value of the system for marine fish, including commercial and sport fish species, such as the endangered Inner Bay of Fundy Atlantic Salmon. The project will ultimately improve the quantity and diversity of habitat for shellfish, waterfowl, shorebirds, and wading birds. Some of the important bird species that will benefit from this project include: Nelson's Sharp-tailed Sparrow, Willet, Great Blue Heron, Merlin, Semi-palmated Sandpiper, and Greater and Lesser Yellowlegs. The restoration of tidal flow will also increase plant diversity and reduce the area of cattails and other freshwater and upland plant species. Other important ecological functions, including the increased production and transportation of organic material, improved water quality, decreased mosquito populations, and post-restoration reduction in potential flood risk.

#### **VIII. Methodology**

Data were collected over the 2002/2003 field season according to regional protocols (Neckles *et al.* 2000) from the potential restoration site (Cheverie Creek) and a nearby unrestricted reference site (Bass Creek) to determine current wetland conditions, to aid in restoration design, and to establish a baseline against which to evaluate the benefits and success of restoration.

All attempts (given available resources, equipment, expertise, and applicability of methods) were made to apply the GPAC/GOMC regional monitoring protocols to monitor the following ecological indicators on both the restoration and reference site: vegetation, nekton, birds, soils and sediments, elevation (GPS/GIS habitat mapping), hydrology, and mosquitoes. Notable deviation from the GPAC/GOMC regional protocol occurred in the sampling of vegetation, sediment accretion, and hydrology.

### **IX. Project Results and Achievements**

Pre-restoration monitoring activities at both the restoration site and reference site were conducted during the 2003 field season according to the GPAC regional monitoring protocols. Actual restoration (culvert replacement) will be completed by September 30, 2004. Monitoring of these indicators will continue on a 1, 2, 3 and 5 year post-restoration schedule and beyond, if necessary.

The results of the pre-restoration monitoring (preliminary work conducted in 2002 and the detailed work conducted in 2003) should be available in the summer/fall of 2004. Some of the results are already available in the form of two Dalhousie University undergraduate honours thesis.

Chiasson, N. 2003. Controls On The Distribution Of Vegetation Characteristics In A Tidally Restricted Macrotidal Salt Marsh. Honours Thesis, Department of Marine Biology, Dalhousie University, Halifax, NS.

Gregory, A.M.L. 2004. Baseline Data Collection at Cogmagun Estuary, a Brackish Water Impoundment Reverting to Salt Marsh Habitat. Honours Thesis, Department of Marine Biology, Dalhousie University, Halifax, NS

The stewardship and community outreach activities have been a tremendous success – see communication and community involvement section.

The biggest achievement of this project has been the recent commitment by the Department of Transportation and Public Works to replace the Cheverie Creek crossing during the summer of 2004. The replacement work will be the result of this project, and the support of the Habitat Management Division of Fisheries and Oceans Canada.

Culvert replacement at Cheverie Creek will restore tidal flow, fish passage and habitat condition to approximately 75 hectares of tidal marsh and 9 km of river.

#### **Project's direct and/or indirect benefits to habitat**

- Improved tidal flow and fish passage to the Cheverie Creek salt marsh and tidal river system
- Increased and improved fish habitat
- Improved water quality
- Improved movement of ice and materials
- Deflection of long-shore current and diversion of materials away from the mouth of the river
- Stabilization and possible reduction in local mosquito population
- Increased awareness/stewardship of not just local community for this specific site but the awareness of the broader NS community
- Increased awareness and involvement of municipal, provincial and federal government agencies in salt marsh and tidal river protection and restoration
- Regional and international interest in and awareness of the status of salt marsh and tidal river habitats in the Bay of Fundy and the lack of provincial and federal action to protect and restore these systems
- Development of an inventory of tidal barriers on the Nova Scotia side of the upper Bay of Fundy and the identification of potential salt marsh and tidal river restoration sites

***Current and planned activities:***

*Cheverie Creek*

- Shaw Pipe has been contacted and arrangements are being made to conduct a site assessment and to begin designing a replacement crossing. DOTPW officials will be participating in this assessment. See attached letter from John Greer detailing the design and engineering activities that they will be conducting for us at the Cheverie site (May/June 2004).
- Depending on the outcomes of the Shaw Pipe's assessment and cost estimates, it may be necessary to recalibrate Dr. Konisky's hydrological model to test different sized crossings. (June)
- Continue the ecological monitoring (hydrology, soils and sediments, vegetation, birds, nekton, and mosquitoes) in accordance with the GPAC regional protocols at both the restoration and reference sites (Spring through Fall 2004).

*Based on the confirmation of a 2005 construction schedule*

- A design meeting is being scheduled for the second week of May involving the DOTPW's structural team, Shaw Pipe Engineers, and the EAC's Project Coordinator. The meeting will layout the timeline and tasks for crossing design, planning, and tendering process leading to the anticipated replacement of the crossing before December 2004.
- Conduct a community meeting to present the results of the 2003 field season and the proposed restoration scenarios to property owners and community to secure their approval of the final crossing design and timeframe. (May/June)
- In collaboration with DOTPW and Shaw Pipe to conduct the engineering studies and modeling recommended by Dr. Konisky's hydrological modeling report (July/August).
- Final crossing design, construction planning, and the securement of provincial permits are anticipated to occur the summer and fall of 2004/2005.
- Ongoing throughout this process is the development of a range of project materials, such as those outlined in our original proposals (field reports, project reports, restoration guidance documents), as well as published articles and more general educational materials, such as posters, presentations, website materials, and contributions to provincial and regional efforts to document salt marsh monitoring and restoration efforts in the Gulf of Maine and Bay of Fundy.

*Tidal Barriers & Additional Opportunities for Salt Marsh Restoration*

- Compilation of tidal barrier inventory data for the NS side of the upper Bay of Fundy and the development of comprehensive lists of tidally restricted salt marsh and tidal river systems and the identification of sites with immediate, short-term and long-term opportunities for hydrological and habitat restoration. (May/June 2004)
- Identification of all tidal crossings along the Nova Scotia side of the Bay of Fundy slated for repair or replacement work during 2004 and compare to results of tidal barrier audit results. (May 2004)
- Work with DOTPW (provincial and regional staff) to ensure that restoration goals are incorporated into proposed projects for 2004/2005. If funding can be secured, implement the GPAC regional protocols

for evaluating wetland restoration projects at each location. (Planning: May/June; Restoration, monitoring and construction: June through October)

## **X. Community Involvement**

Over the last year, the salt marsh project has been very effective at involving volunteers in all aspects of our work. This collaboration has been satisfying for volunteers and project staff alike.

Student Volunteers: A number of projects have been taken on by students at Dalhousie and St. Mary's University for course work or community service credits. Projects completed with the assistance of student volunteers include:

- handbook of birds of Nova Scotia salt marshes
- reference guide to Bay of Fundy salt marsh plants (vegetated tour of a Fundy marsh) draft
- project fact sheets
- website design and installation
- salt marsh education in local schools
- community kiosk at Avon Emporium
- newspaper articles
- posters on salt marsh habitat
- research into coastal access and coastal policy issues

Field Work: We have drawn on local and student volunteers to assist in the pre-restoration data collection at Cheverie and Bass Creek. Local residents have joined us on the marsh during salinity sampling, mosquito counts, vegetation surveys, fish surveys, and when we were measuring tidal range using the tidal gauge. Three local birders were very helpful in species identification and did bird counts on days when the project team was not able to go to the field.

Community Kiosk: The owner of the Avon Emporiums, a local café and meeting space, has donated space to the salt marsh project to set up a display on salt marshes and the work at Cheverie Creek. The school principle and teachers encourage children to display photos and information about salt marshes at the community kiosk.

Meeting Space: The local school and the Avon Emporium have been very generous in providing meeting space for community meetings and other salt marsh events.

Communications and Outreach: The project team has been able to do effective outreach because of the generosity of the Hants Shore Community Health Centre and the elementary school in letting us use their newsletters to promote community meetings and salt marsh events. The EAC is partnering with a coalition of local organizations to prepare a special coastal themed issue of the Hants Shore Community Newsletter.

## **XI. Outreach Activities**

Our outreach activities are closely linked with our efforts to involve the local community in salt marsh restoration activities.

Classroom activities: The project team designed and delivered interactive educational activities about salt marshes and coastal wetlands, tidal barriers, and restoration activities.

Presentations were made to two grade 5/6 classrooms at the Dr. Arthur Hines Elementary School in Summerville, West Hants. The presentations were done on:

- March 2003 (1/2 day)
- October 2003 (1/2 day)
- March 2004 (full day)

Teacher Training and support: The project team gave a brief seminar on salt marshes and coastal issues to Grade 5/6 and Science teachers at Dr. Arthur Hines Elementary school and helped them to prepare an Art Smart grant on the theme of salt marshes. The project team also provided teachers with teaching materials (photos, articles, websites) about salt marshes, habitat, food chains, animals and birds, and restoration.

School Curriculum: The project team developed interactive curriculum for grade 5/6 students with modules on: water and hydrology; vegetation and animal life; birds and insects; and field work and data collection.

Marsh Walks: Getting people on the marsh is the best way to bring home the message about the importance and threats facing fragile salt marsh ecosystems. The project team has hosted two marsh walks at the Cheverie site:

- June 10, 2003: Ocean Day coastal hike with 160 students, teachers, and parents from Dr. Arthur Hines Elementary school. Emphasis on learning about parts of and inhabitants of the marsh.
- October 24<sup>th</sup>, 2003: Public marsh hike. Talked with adults and children about history of Cheverie site, field work, findings, indicators of tidal restriction, restoration options and impacts.

Community Meetings: The project team is committed to involving the community in all stages of project planning, including deciding on final restoration options based on recommendations of the project team. We have held two community meetings to share information and discuss local interests and concerns about restoration activities at Cheverie Creek:

- May 2003: Information Meeting at Causeway Beach (11 community members attended)
- August 2003: Kempt Shore Community Hall (28 community members attended)

Project Updates: The project team regularly provides project updates (including photos) to local landowners at Cheverie Creek and Bass Creek, community groups, community residents, the school, local newspapers, and municipal, provincial and federal government partners. The team sent out project updates in:

- May 2003
- August 2003
- December 2003
- March 2004

Meetings with local government: The project team regularly updates the Municipal Councilors of the Municipality of West Hants via email. We have met with:

- Municipal government environmental Committee: February 2003
- Rural Development Authority representatives: March 2003
- Municipal councilors Reed Allen and Scott Allen: January 2004
- Representative of the office of Scott Brison (federal MP): April 2004

Community Kiosk: The project team maintains a community information kiosk at the Avon Emporium, a popular local café, meeting space, and corner store. The information kiosk has photos, information about field work and restoration activities at Cheverie Creek, and a display of Ecology Action Centre salt marsh publications. There is also space for community members to leave photos and to write comments about the project.

Fact Sheets: Fact sheets are a valuable tool in informing people about the project goals, objectives, and activities. The team has produced two Fact Sheets which have been distributed widely at project events, and to partner organizations, and on our website:

- Fact Sheet #1: Salt marsh restoration
- Fact Sheet #2: Highways (this fact sheet was produced as part of a training package for employees of DTPW)

Press Releases: In April 2003, the Coastal Committee prepared and disseminated a press release on Tidal Barriers and Coastal Flooding. The story was picked up by the regional radio program Maritime Noon, on which project coordinator Tony Bowron was interviewed.

Newspaper Articles: A number of articles about salt marshes, tidal barriers, and activities at Cheverie Creek appeared in local newspapers including: Hants Journal, What's Going On, and the Regional. These articles are available on the project website.

Coastlines Column: The Ecology Action Centre's Marine Issues Committee produces a monthly natural history column which appears in 12 papers around the province. Staff, students, and volunteers of the Salt Marsh team have written a number of salt marsh themed articles, all of which can be found on the project website.

Website: In March 2004, the Coastal Issues Committee launched its new website featuring information, links and photos related to salt marsh restoration and activities at Cheverie Creek. The website is still under construction.

Participation in Community Events: The project team believes in working closely with local organizations on issues of shared interest. The team has joined other local groups, such as the Hants Shore Concerned Citizens' Association and Citizen's Action to Protect the Environment, to try to stop unregulated commercial bloodworm harvesting along the Hants Shore, including on the mudflats immediately adjacent to the Cheverie site. The local group has also submitted a proposal to DFO about creating a Marine Protected Area along the Hants shore to protect the area's resources and spur local ecotourism.

The salt marsh project has also teamed with the Hants Shore Community Health Centre, Destination Hants County, Citizens' Action to Protect the Environment, and the Habitat Advocates on a proposal to provide more information about coastal issues and attractions along the Hants shore. This proposal was accepted by the Salt Water Network and includes joint activities such as preparing interpretative signage for the Cheverie Beach and salt marsh system, and two issues of a community newsletter.

## **XII. Supporting Materials**

A CD containing a copy of this report and all supporting materials has been prepared and mailed to Shelley Shaw, Secretary, NS Habitat Conservation Fund.

### XIII. Funding Information (Cash and In-kind)

Expenditure Item	2003/2004 Project Budget						All figures in Canadian Dollars		
	GOMC	Funding Received by Source				HRDC	Total Received	Total Spent	Difference/ carryover
		DNR	WHC	EC	DFO				
<b>Restoration</b>									
<b>Ecologist</b>	20000	<b>3900</b>	10000				33900	32987.7	912.3
<b>Project</b>									
<b>Coordinator</b>	6000		2500				8500	7667.76	832.24
<b>Students</b>	4800	<b>3000</b>				2520	10320	6515.53	3804.47
<b>Interns</b>		<b>6168</b>	770	10000	4860		21798	21796.06	1.94
<b>Field Research</b>									
<b>Costs</b>		<b>1000</b>					1000	745.26	254.74
<b>Project</b>									
<b>Supervision</b>							0		0
<b>Travel</b>	2000	<b>625</b>					2625	2743.24	-118.24
<b>Administration</b>	6165.12	<b>2307</b>	1730				10202.12	10202.12	0
<b>Volunteer/ In-kind</b>									
<b>Contributions*</b>							33946	33946	
<b>Permitting</b>							0		0
<b>Publications</b>	2000	<b>500</b>					2500	1483.63	1016.37
<b>Restoration Costs</b>							0		0
<b>Communications</b>	1000						1000	466.9	533.1
<b>Equipment and Supplies</b>	3300						3300	2754.7	545.3
<b>Training and workshops</b>	1000	<b>2500</b>					3500	1608.78	1891.22
<b>Contingent</b>	1000						1000	372.23	627.77
<b>Total**</b>	47265.12	<b>20000</b>	15000	10000	4860	2520	<b>133591.12</b>	<b>123289.91</b>	<b>10301.21</b>

GOMC – Gulf of Maine Council; DNR – Habitat Conservation Fund; EC – Environment Canada Science Horizons Internship Program; DFO – Fisheries and Oceans Canada Science & Technology Youth Internship Program; HRDC – Human Resource Development Canada Summer Career Placement Program

\*A detailed volunteer/In-kind Contribution Summary is provided below.

\*\*Includes all funding hold-backs (received and pending).

#### Funding Summary:

DNR	\$20,000
Matching \$ (Cash)	\$79,645.12
In-Kind Contributions	\$33,946
Total Match	\$113,591.12
Total Project Value	\$133,591.12

**Personnel:** Funding supported the project team which consisted of a Project Coordinator/Restoration Ecologist (FT, 12 + months); Project Field Coordinator (FT, 6 months); 2 project interns (FT, 5 months and 10 months); a summer field assistant (14 weeks); and a small research stipend for a Dalhousie Honours student.

**Restoration and Permitting:** Culvert replacement is scheduled to occur during the 2004/2005 fiscal year and so the project expenses and in-kind contributions relating to these activities have been rolled forward into the 2004/2005 project budget.

**Travel:** Ground travel at the charitable status rate of \$0.15/km for field work, outreach, stewardship and educational activities, and participation in meetings and workshops.

**Administration and Project Support:** Office and administrative related costs relating to telephone (phone, lines and local calling), computer access (computer, printer, software and internet), fax, photocopy machine, paper, and a contribution to Office Manager (book keeping), rent, electricity and annual audit. Amounts to 15% of project budget.

**Publications:** Production of the outreach, education, stewardship, and project update and promotional materials described in above sections.

**Communications:** Monthly long distance calling and postage.

**Equipment and Supplies:** Field work related expenses such as materials to construct salinity wells, quadrats, transect line and sampling station markers, mapping (air photos, topographical maps and GIS) and photography.

**Training and Workshops:** Supported community outreach and stewardship events (described in previous sections), as well as supported our participation in a number of regional meetings, workshops and events such as the Gulf of Maine Council Working Group meetings that took place in NS and New Hampshire during this period, and an estuarine restoration workshop hosted by the Conservation Council of New Brunswick

**Contingency:** The majority of the originally requested contingency funding (\$5,000) was absorbed by the funding deficit created a significant change in the exchange between the time the original funding contract was written up and the points at which funding payments were made.

Volunteer and In-Kind Contributions

<b>Source</b>	<b>Brief Description</b>	<b>Value</b>
St. Mary's University	Field equipment, supplies, GPS & GIS Technician and support	7000
Dalhousie University	Field Equipment	500
NS Museum of Natural History	Field Equipment, educational materials, scientific expertise	500
Dr. Arthur Hines Elementary School	Educational and promotional materials & activities, on-site activities, outreach	1250
Avon Emporium	Meeting Space, info kiosk	250
Jennifer Graham	Outreach (Community) Coordinator, fund raising	6750
DOTPW	Meetings, staff time	1000
GOMC	Working group members day on site	2100
DFO	Site work, staff time, internship supervision & support	7140
Community(office & field) volunteers	Field work; research, outreach and educational activities; participation in community events	5556
Website	Website design	500
Dr. Ray Konisky	Hydrological modeling	1400
<b>Total</b>		<b>33946</b>

References:

Neckles, H. and M. Dionne. 2000. "Regional standards to identify and evaluate tidal wetland restoration in the Gulf of Maine – A GPAC Workshop Report." <http://www/pwrc.usgs.gov//resshow/neckles/gpac.html>