VIRGINIA RECREATIONAL FISHING DEVELOPMENT FUND PROJECT APPLICATION

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NAME AND ADDRESS OF APPLICANT Virginia Institute of Marine Science P.O. Box 1346 Gloucester Point, VA 23062-1346	**PRINCIPAL INVESTIGATORS** Robert J. Orth
PRIORITY AREA ADDRESSED HABITAT RESTORATION AND EDUCATION	**PROJECT LOCATION** VIMS

DESCRIPTIVE TITLE OF PROJECT

Restoration of Submerged Aquatic Vegetation (SAV) Habitat in Chesapeake Bay and the Virginia Coastal Bays

PROJECT SUMMARY

Seagrasses, one of the most valuable habitats in the world, remain absent or sparse in many areas of the Chesapeake Bay and its tributaries and the Virginia Coastal Bays. The goal of the seagrass restoration program is to establish seagrass in areas that formerly supported this habitat and especially in areas that are important for recreational fishing. The objectives of our 2011/12 work are to build on previous years successes by completing the following: 1. Continue seagrass restoration in areas that are suitable for large scale plantings using seeds, targeting areas in the James River and the seaside coastal lagoons, 2. Monitor success of previously planted areas; and 3. work collaboratively with Chesapeake Bay conservancy (e.g. TNC) and state management groups (e.g.,VMRC) to assist in baywide SAV restoration efforts.

EXPECTED BENEFITS

Restoration of seagrass habitat to areas that once supported these productive communities will provide additional foraging areas for several species of recreationally important finfish species (e.g. speckled trout, striped bass, red drum), and their preferred food items, especially species such as juvenile blue crabs.

COSTS

May, 1, 2011, through April 30, 2012
VMRC Funding: $ 107,551
VIMS Funding: $ 18,638
Total Cost: $ 126,189

detailed budget included with proposal

Title: SAV restoration

A.	**Personnel**	**Time**	**Monthly**	**Agency VIM**	**S**	**Total**
	S. Marion, Marine Scientist	7.00	$4,459	$31,213	$0	$31,213
	C. Holbert, Tech. Support	12.00	$2,199	$26,388	$0	$26,388
	Personnel, salaried			$57,601	$0	$57,601
	Personnel, hourly			$0	$0	$0
	Fringe, 40% salaries;			$23,040	$0	$23,040
	7.65% hourly			$0	$0	$0
	Total Personnel			$80,641	$0	$80,641
B.	**Communications/Printing**			$0	$0	$0
C.	**Supplies**			$600	$0	$600
D.	**Travel**			$2,400	$0	$2,400
E.	**Contractual Services**			$0	$0	$0
				$0	$0	$0
				$0	$0	$0
F.	**Tuition**			$0	$0	$0
G.	**Vessels**			$2,400	$0	$2,400
H.	**Publication Center**			$0	$0	$0
I.	**Nutrient Analysis**			$0	$0	$0
J.	**Equipment**			$0	$0	$0
	SUBTOTAL: Direct Costs			$86,041	$0	$86,041
K.	**Facilities & Administrative Costs**	**25%**		$21,510	$18,638	$40,148
	TOTAL $			**107,551**	**$18,638**	**$126,189**

Notes on Budget Items

A. Fringes are based on average costs: **40%**

E. Only take IDC on first $25,000 of each contract.

J. Equipment -- items more than $2,000, no IDC

K. F&A calculated on MTDC (modified total direct cost): personnel, supplies, travel, and first $25,000 of each subcontract, etc.; excludes service centers, tuition and equipment.
The current federally negotiated F&A rate is **48%**

Proposal Submission to

The Virginia Marine Resources Commission
Virginia Recreational Fishing Development Fund

By

The Virginia Institute of Marine Science
College of William and Mary

Restoration of Submerged Aquatic Vegetation (SAV) Habitat In Chesapeake Bay and the Virginia Coastal Bays

BUDGET PERIOD: May 1, 2011 to April 30, 2012

Robert J Orth

Dr. Robert J. Orth
Principal Investigator

Kenneth A Moore

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Roger Mann

Dr. Roger Mann
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Jane A Lopez /for

Jane A. Lopez
Director, Sponsored Programs

INTRODUCTION

The value of seagrass beds as nursery areas and as feeding grounds for several species of commercially and recreationally important fish is well established (Peterson, 1918; Thayer, et al., 1984; Orth, et al., 1984; Orth and van Montfrans, 1987; Orth and van Montfrans, 1990). The 1997 blue crab management plan established seagrass beds as one of the most important nursery habitats (Chesapeake Executive Council, 1997). The importance of established seagrass beds in the lower Chesapeake Bay are often cited in newspaper accounts as prime fishing locations for recreationally important species such as speckled trout.

The dramatic decline of submerged aquatic vegetation (SAV) in Chesapeake Bay in the early 1970s resulted in many shallow water areas becoming devoid of any vegetation (Orth and Moore, 1983). A quarter century later, many of these same areas remain either unvegetated or very sparsely vegetated (Orth et al., 2007). A major focus of SAV research in Chesapeake Bay was initially on water quality effects limiting regrowth of SAV (Dennison et al., 1993). However, recent observations in areas experiencing natural revegetation and experiments on the seed dispersal ecology of eelgrass (Orth et al., 1994; 2003) suggests that transplanting efforts may be an important component to restore or enhance seagrass habitat to historic levels.

Our research program in seagrass habitat restoration, currently partially funded by the Virginia Saltwater Recreational License Fund, couples basic factors limiting seagrass recruitment, growth and survival, with the applied aspects of seagrass restoration and the relevance for important recreational species. We are exploring these relationships by using transplanted beds of eelgrass, the dominant species of SAV in the lower Chesapeake Bay, in areas that were historically vegetated prior to 1972, and are presently unvegetated, or very sparsely vegetated, as well as in the seaside coastal lagoons which once supported abundant grassbeds up until 1933. A major goal is to understand factors that limit the re-growth of eelgrass and how restored areas function to support recreational fisheries. In those areas where habitat restoration is successful, we are examining the dynamics of plant colonization, either from vegetative growth or from seeds. Our restoration program has relevance in the overall context of Chesapeake Bay's Executive Council's Directive to restore seagrass beds to their historical distributions (Chesapeake Executive Council, 1989, 1990). Our past proposals have received the endorsement of several bay groups such as the EPA's Chesapeake Bay Program and the Chesapeake Bay Commission.

The overall goal of this long-term project is aimed at addressing several of the priority concerns of the Recreational Fishing Development Fund. Besides improving and enhancing habitat through transplanting adult plants and seeds, we conduct research and gather data to improve the techniques to restore grasses and better understand the roles these beds play for recreational fisheries. This project also supports educational opportunities, primarily with non-profit Chesapeake Bay conservation groups. Many of these groups have learned from our experiences with this project and incorporated such information to their own seagrass restoration efforts to improve their own success rates (e.g. Chesapeake Bay Foundation, Alliance for the Chesapeake Bay, The Nature Conservancy).

IMPORTANT FINDINGS TO DATE

PROJECT GOALS

Two of our major goals had been:

Restore seagrass beds in lower Chesapeake Bay and the Coastal Bays.

Large scale seagrass plantings have occurred each year from 1996 through 2009 in either the James, York, Rappahannock or Piankatank rivers, or the seaside coastal bays. Some of these sites continue to grow and spread into surrounding areas, in particular the seaside coastal bays. Our greatest success continue to be along the seaside bays of the VA coastal bays where we have broadcast over 32 million seeds into 262 acres which have now spread to over 3200 acres of bottom (Figs. 1 and 2).

We have also been successful in seagrass restoration in the Hampton Roads area as well as York River in projects that were initiated in 1996.

Partner with various educational and conservancy groups that are working toward successful SAV restoration.

VIMS staff have worked successfully in the past with a number of volunteer groups. Many of these groups have initiated SAV restoration programs themselves to varying degrees. We believe a synergistic relationship between VIMS and these other programs will more quickly enhance SAV habitat and increase awareness and education of the importance of grasses. For example, we have worked collaboratively with VMRC staff and volunteers from the Nature Conservancy in a seagrass restoration project along the seaside of the Delmarva Peninsula (South Bay). In 2001, we advised the Alliance for the Chesapeake Bay with transplant methodology and with establishing grow-out areas from which to collect plants for transplantation. From 2000 through 2004 VIMS staff has worked with CBF and Alliance for Chesapeake Bay staff by providing advice to grow eelgrass and wild celery in public middle and high school classrooms. This program has previously been successful growing the freshwater species wild celery (*Vallisneria americana*) in classrooms and planting these into the James River.

PROPOSED 2011-2012 WORK: GOALS

1. Collect and disperse seeds in large areas while conducting additional restoration experiments that optimize growth and spread of seagrass in Virginia waters and monitor the success of previously planted areas.

2. Continue to work collaboratively with Bay conservancy groups, such as the Chesapeake Bay Foundation (CBFand Nature Conservancy (NC), as well as other bay state management groups (MD Dept. of Natural Resources) to assist and enhance baywide SAV restoration efforts.

GOAL 1 Large scale restoration efforts and additional experiments.

* Collect and disperse seeds in large areas while conducting additional restoration experiments that optimize growth and spread of seagrass in Virginia waters and monitor the success of previously planted areas.

In 2011, we will continue to emphasize the use of seeds in large-scale restoration efforts with eelgrass. During this year, we will concentrate our efforts in several locations where we have had recent successes. First and foremost we will continue our efforts in the seaside coastal bays where we have been having unparalleled success to date in re-establishing seagrass to areas formally supporting eelgrass in the early 1900s. Second, we will build on our recent work in the James and York rivers, and depending on the success of seedlings on the Poquoson Flats, enhance that area with additional plots in 2011.

Our previous work with harvesting seeds has shown that there is generally a 3-4 week window to harvest mature reproductive shoots with ripe seeds, usually from the first week of May to the first of June. Our collection period in the coastal bays in 2007-2009 indicated that seeds were available for harvest through mid-June, although the initial collection date was late May. As our observations have indicated that floating seeds are available for a much briefer period (perhaps a week at most), our major efforts will be to continue our previous protocols of hand harvesting reproductive shoots with mature seeds when they become available until the time when our observations indicate that most seeds have been released by the plants. Our past efforts have usually been completed by June 10. In 2005, we developed a portable mechanical harvester with funds provided by the Army Corps of Engineers which allowed us to harvest plants with fewer people and reduced costs. These methods will be used again in 2011 where feasible. Harvested reproductive shoots are returned to the VIMS laboratory and placed in large seawater holding tanks at the SAV greenhouse. These are monitored for seed release and when completed, seed are separated from all detritus and plant material and held until the period when seeds are broadcast. The maximum yield from our hand harvest and mechanical collections has been 12 million seeds. However, as flowering shoot densities vary each year, we have generally averaged between 3 and 4 million seeds. Our goal for seed collection efforts in 2011 will be 15 million seeds.

GOAL 2 Partnerships with conservancy and bay state management groups.

* Work collaboratively with Bay conservancy groups such as the Chesapeake Bay Foundation (CBF) and The Nature Conservancy (TNC) among others, to assist and enhance baywide SAV restoration efforts.

Many conservancy groups are conducting restoration projects on their own, utilizing lessons learned via our work with this project. The future of SAV restoration baywide will require both the ability to grow SAV in an aquaculture setting, so that wild beds remain undisturbed, but also to utilize existing beds as a seed source as we are currently doing for eelgrass seeds.

We will also continue to assist conservancy groups with their restoration efforts by providing technical advice and training sessions as requested and by inviting these groups to help us in our projects, including seed collections in the late spring. Our objective is to develop unique partnerships between scientists, educators, and the general public to restore bay grasses where possible.

PRODUCTS

Quarterly reports will be submitted to VMRC outlining progress and results to date for that quarter as well as planned activities for the next quarter. Reports will be due as required by VMRC. In lieu of a final report, we will continue to analyze data and write papers in a publishable format and submit these to peer review journals. We will also make presentations at scientific meetings as well as general public meetings as requested.

TIMELINE

TASK	2011 J	J	A	S	O	N	D	2012 J	F	M	A	M
Collect and Maintain Seeds	X	X	X	X								X
Disperse Seeds				X	X	X						
Monitor Transplants	X	X			X	X					X	X
Data Analysis			X				X	X	X	X		
Quarterly Reports				X				X			X	

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Figure 1. Restoration trajectories from the Virginia Coastal Bays measured by three metrics: (1) Cumulative area seeded with eelgrass between 1998 and 2009; (2) Area mapped by an annual seagrass monitoring program each year through 2007, incorporating the entire polygon area surrounding restored plots; (3) Area of bottom cover through 2009, the estimated area of eelgrass canopy cover calculated from the weighted sum of areas in four cover classes assigned during mapping.

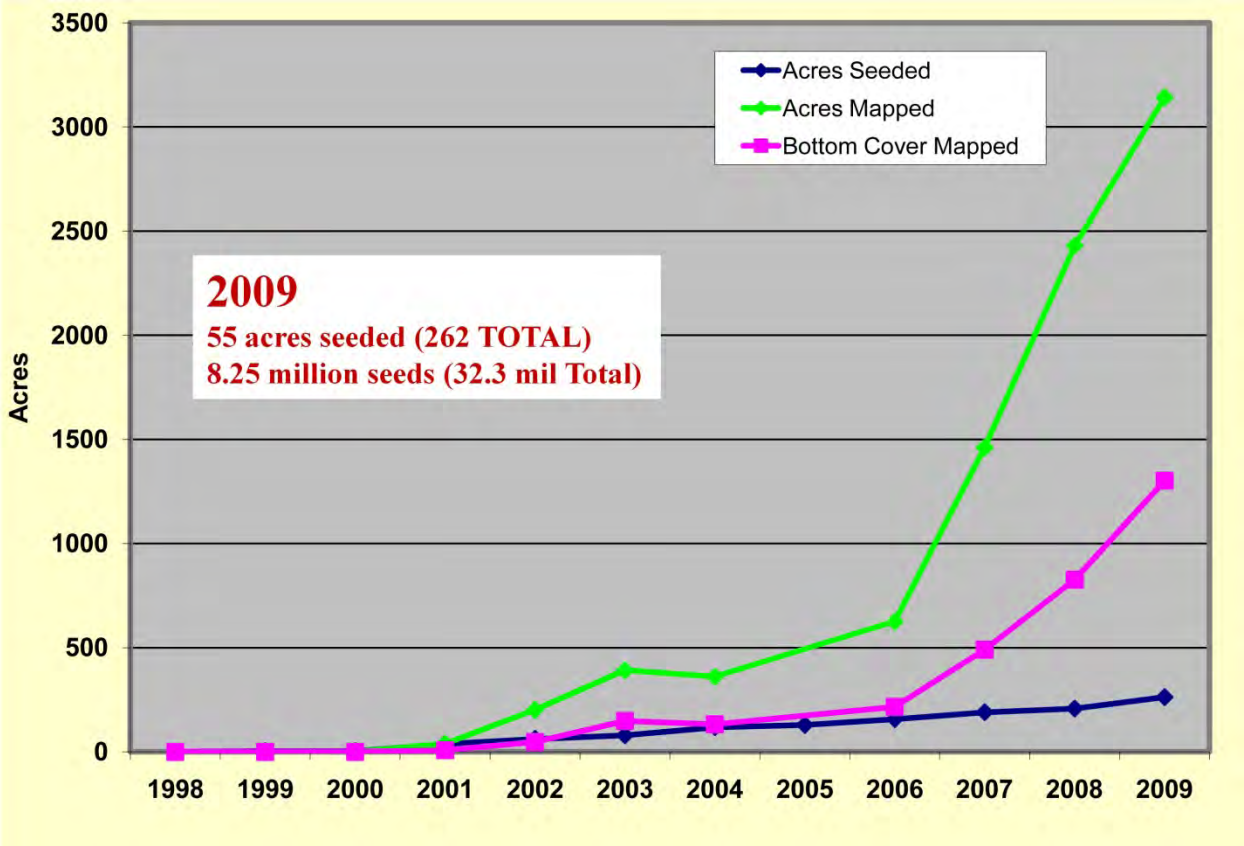

Fig 2. . Sequence of aerial photographs of the South Bay restoration site for 2002-2008. One-acre plots distributed in 2001 are faintly visible as dark squares by 2002. Consolidation of plots is visible as a dark region along the east side of the bay in 2006. By 2008, the entire area between plots had consolidated into a largely continuous-cover meadow of over 750 acres.