SEC
APPROVED
BY VMF
DATE 8/12/95

UNITED STATES
DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
State, Federal & Constituent Programs Division

COMPLETION REPORT

Grantee: VIRGINIA MARINE RESOURCES COMMISSION

Project No: N/A

Grant No: NA46FU0180

Project Title: CREATION OF OYSTER REEF SANCTUARIES IN THE JAMES RIVER, CHESAPEAKE BAY

Period Covered: MAY 1, 1994 - APRIL 30, 1995

Prepared by: DR. JAMES A. WESSON

Approved by: _____

Date: _____

Statutory Funding Authority:
_____ Anadromous Fish Conservation Act (P.L. 89-304)
__X__ Chesapeake Bay Studies
_____ Endangered Species Act
_____ Interjurisdictional Fisheries Act (Title III of P.L. 99-659)
_____ Magnuson Act
_____ Oyster Disease Research
_____ Saltonstall-Kennedy
_____ Unallied Industry Projects
_____ Unallied Science Projects

FINAL REPORT

FOR THE PERIOD MAY 1, 1994 - APRIL 30, 1995

SUBMITTED TO:

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

ATTENTION: MS. VIRGINIA M. FAY
U. S. Dept. of Commerce, NOAA, NMFS
One Blackburn Drive
GLOUCESTER, MASS 01930

SUBMITTED BY:
JAMES A. WESSON
CONSERVATION AND REPLENISHMENT DIVISION
VIRGINIA MARINE RESOURCES COMMISSION
P. O. BOX 756
NEWPORT NEWS, VIRGINIA 23607

FOR THE PROJECT ENTITLED:

CREATION OF OYSTER REEF SANCTUARIES
IN THE JAMES RIVER, CHESAPEAKE BAY

GRANT AWARD NO. NA46FUO180

DATE REPORT SUBMITTED: June 15, 1995

ABSTRACT

Oysters evolved in three-dimensional reef structures in the Chesapeake Bay, and these structures are very likely important to the oyster's ability to survive. Three-dimensional oyster reefs have been mostly removed by harvesting activity. This project has continued efforts in Virginia to rebuild oyster reefs in structures similar to their undisturbed (by man) form, with the hypothesis, that, an optimal physical environment for the oyster will improve its survival. A 3,040 linear foot oyster reef in a configuration with two reef lines parallel and two lines perpendicular to the tidal current was constructed using shucked oyster shells for the reef material. Siting controversies resulted in a less than optimal location for this reef; however, information will be provided on settlement and growth of oysters in relation to tidal flow.

ACKNOWLEDGEMENTS

We thank John Register and Calvin Wilson for boat operation and project supervision; Gerry Showalter and Benny Stagg for site surveying and map preparation; and Kathy Leonard for report preparation, all from the Virginia Marine Resources Commission.

We also thank Bill MaGann and W. F. MaGann Corporation, Norfolk, Virginia for their patience during project delays and for their proficiency and innovation in construction methodology. Shells were provided by Bevans Oyster Company, Kinsale, Virginia and Cowart Seafood, Lottsburg, Virginia and we thank them for their efforts.

INTRODUCTION

The oyster resource in Virginia's portion of the Chesapeake Bay is at a critically low level. The oyster is a pivotal organism in the ecology of the Chesapeake Bay and it's numbers have supported a very substantial commercial fishery. Years of harvesting, habitat destruction, pollution, and severe disease-induced mortalities have reduced oyster populations, and Virginia's annual oyster harvest from 10-15 million bushels in the 1800's to less than 40,000 bushels in 1994. Oysters evolved in three dimensional reef structures, and there is reason to suspect that since oysters evolved in reef structures, that the reef structure was important to the oyster's ability to survive. Historical accounts indicate that during colonial times many oyster rocks in Virginia were exposed at low tide. After years of harvesting most reefs are just "footprints" of former elevations at a minimum several feet below mean low water (MLW). At the same time that the reefs were being removed by harvesting, there have been major changes in water quality of the Bay and for the last three decades there has been the devastating effects of the two protistan parasites, Perkinsus marinus ("Dermo") and Haplosporidium nelsoni ("MSX"). The reproductive potential of the oyster has been severely compromised by the low population levels and the shrinkage of optimal reef habitat.

Reef restoration was a major recommendation of Virginia's 1992 Blue Ribbon Oyster Panel. Additionally, the Governor of Virginia in 1994 signed the Chesapeake Bay Aquatic Reef Plan and Oyster Fishery Management Plan, both of which called for the creation of 5,000 acres of oyster reef habitat during the next five years. In 1993, the VMRC Oyster Replenishment Program began two projects to investigate both the value of reef structures for the survival of the oyster as

well as methods by which reefs could be constructed. We have attempted to build oyster reefs similar to those present in the oyster community in its undisturbed (by man) form, with the hypothesis that an optimal physical environment for the oyster will be created and that the oyster will strike and grow in an improved manner compared to that observed on the bottom. The first project was in the Piankatank River (Figure 1) and involved the construction of an intertidal oyster reef made entirely from shucked oyster shells. Shells were loaded on barges at shucking houses, moved by tugboat to the Piankatank River and offloaded by water cannon. The reef was constructed parallel with the direction of tidal movement on the footprint of an old oyster reef. Water depths were approximately seven feet at high tide and oysters were deployed in a 1000 foot long by 100 foot wide, 5 to 7 foot high reef structure that consisted initially of 22 individual intertidal mounds. The Piankatank normally has an 18 inch tidal range and all 22 mounds were covered at high tide and exposed to some degree at low tide. This reef project had a total cost of $137,908 or $137.91 per linear foot. Building reefs with shucked shells which are transported from land appears very expensive for significant restoration efforts.

A second construction technique was tested at Wreck Shoals in the James River. At Wreck Shoals, historic bathymetric and oyster survey information was examined to select an area that would have firm bottom and high buried shell content. Marine construction proposals were then solicited to build, using the bottom substrate, 25,000 linear feet of 5 to 6 foot tall reef structures in water depths of 12 feet. Specifications limited the depth that contractors could dig when building the reef structures. Several methods were proposed, and the construction method chosen used a clam shell dredge on a barge. Thirteen parallel berms were constructed using the clam shell dredge to mound bottom substrate in a pattern similar to field furrows (Figure 2). The

cost of this project was $251,887 or approximately $10.08 per linear foot. After construction, 80,000 bushels of clam shell cultch were spread on the reef area, which covered a total of approximately 50 acres. This increased the final cost to approximately $12 per linear foot of reef. This method appears to be the most cost-efficient method of constructing significant amounts of reef structures.

Both of the 1993 reef projects were in historic oyster habitat with moderate salinity (15-20ppt), where modest setting potential still exists, and both oyster diseases (MSX and Dermo) are present which should give long term information on disease mortality. Spat sets were light in both areas in the summer of 1993 and 1994; however, oysters are now apparent on both sites. Results are preliminary, but in the fall of 1994, there were more oysters per meter on the Piankatank River Reef than on the Wreck Shoals Reef (5 or 10 to 1). The larger population of oysters on the Piankatank River Reef may have resulted from the thickness of oyster cultch which may have increased the survival of the young oysters. However, many differences in the reef sites may have brought about these differences, including reef configuration, substrate material, geographic location, broodstock levels and water depths, and all of these factors continue to be monitored.

The current reef project continues the investigation of the creation of oyster reef habitat and will evaluate development of the oyster reef in relation to its orientation with current flow direction.

METHODS

This reef project location was proposed for approximately one and a half miles west of the

Wreck Shoals Reef in an area of historically productive though currently unproductive public oyster bottom. Additionally, the proposed reef would have been constructed with marine construction equipment using bottom substrate to construct a reef in a pattern similar to the "spokes of a wheel" radiating out from a center hub. Pairs of 800 foot long reefs would radiate from the center in at least eight directions from the center hub. Individual reef structures in each pair were prepared to be approximately 5 feet high and 16-20 feet wide and would have been spaced approximately 40 feet apart. This construction technique was the most cost-effective in our previous studies, and this pairing allowed a further construction cost savings in that they could build the structures on both sides of a barge simultaneously and only one reference siting point would have to be moved for each pair of lines, as the center "hub" reference site remained constant. The project had been through scientific peer review and a successful construction bidding process; however, in May, approved site and methodology were challenged by local watermen (Attachment 1). As a consequence of this challenge, the project was delayed and a committee of watermen and fisheries managers was appointed to choose a new site and review the proposed methodology. After examining several sites in the James River, the committee chose a site on barren, shifting, sandy bottom, on the public (Baylor) oyster grounds inshore of Rocklanding Channel near Mulberry Point (Figures 2 and 3). In many ways, the committee decision stood in opposition to the principles of the funded project. There were no living oysters on the construction site; however, oyster beds were upriver and downriver of the site. The annual records for salinity on the site varied from a minimum of 0 ppt to a maximum of around 12 ppt, but averaged 5 to 10 ppt. Neither Dermo no MSX were suspected to cause mortality in this area; but, oysters were subject to freshets. Tidal currents in the area were extremely rapid, both ebb and flow. It is not known why the oysters did not exist on this site; nevertheless, a majority

of the committee believed that if substrate was placed at this site in a reef structure, oysters would colonize the reef.

The committee also decided to change the construction method. As originally proposed, marine construction equipment would mound bottom materials on site to create the reefs and then cap the structure with shell veneer. The committee recommended the construction of the reef from deployed shell material. Shells would be purchased from oyster and clam houses and came by barge to the site. Since the cost of the shell method was much more than the bottom construction method that was originally proposed, the design of the reef had to be simplified. Only four lines of reef structure were surveyed and marked for deployment in an orientation where two lines were approximately parallel with the tidal flow and two lines were approximately perpendicular to the tidal flow (Figure 4). Water depths at the site varied from 5 to 12 feet MLW. Construction began on August 17 and was competed on September 23, 1994. During each deployment of shells, a barge was placed in a parallel position adjacent to one at the lines which had been marked by flags. A spud barge with a crane held the shell barge in place. A water cannon on the shell barge was maneuvered with a "bobcat" loader and shells were washed off one side for the entire 150 length. Each bargeload completed 150 to 200 feet of mound approximately 6 feet tall and 15 to 20 feet wide. A total of 3,040 linear feet of structure was completed with lines 1 (841 ft) and 4 (840 ft) being partially intertidal and line 2 (794 ft) and 3 (564 ft) being entirely subtidal. A total of 302,390 bushels of shells was placed in reef structures at an average cost of $0.95 per bushel or $94.75 per linear foot of reef (Table 1).

RESULTS AND DISCUSSION

A reef structure which may provide information on the survival and growth of oysters in

relation to tidal flow was constructed. In recent years, spatfall has occurred in the James River between late July and mid-September. Due to the delay in the siting process of the second reef site, the construction occurred late in the oyster setting season and we observed no spat set during 1994. In April 1995, several areas in the reef were examined by SCUBA, and again no spat were apparent. The shells appear clean and should be available for larval attachment in 1995. The rapid movement of the tidal flow in the area has resulted in extremely difficult sampling conditions for an accurate assessment of settlement; however, efforts will be continued in the fall of 1995.

Intertidal areas on two lines of the reef were apparent at the completion of construction. Both of these lines now appear subtidal as the height of the reef appears to have been lowered by rapid tidal movement. This was a major concern with the location of the reef on this site and indeed the height of the reef may continue to be lowered through time. Additionally, bathymetric tracing of the bottom next to the reef shows large sand ridges that indicate large amounts of sand transport at this site and we continue to have concerns for the long term stability of the reef. Our program will continue to monitor the colonization of this reef for the next several years.

In conclusion, Virginia's oyster reef program did not create the most optimum nor cost effective oyster reef structure in the current project. Nevertheless, we gained further insight on the potential difficulties in reef siting in areas that are still actively harvested. From these lessons, we have sited the 1995 reef projects in areas that are less controversial (Figure 1). As these reef projects are proven valuable for oyster restoration, we will again make proposals to rebuild reef habitat in this very important area of Virginia's last commercial oyster fishery in the James River.

TABLE 1.
MULBERRY POINT OYSTER REEF
EXPENSE REPORT

OYSTER BUYER	SHELLS (BU)	COST/BU	COST
OYSTER SHELLS			
Bevans Oyster Co.	74,740	1.20	$89,688.00
	19,280	1.20	23,136.00
W. Ellery Kellam	29,250	1.20	35,100.00
Abbott Bros.	18,265	1.20	21,918.00
Barrack & Reynolds	17,080	1.20	20,496.00
Stingray Pt.	28,665	1.20	34,398.00
CLAM SHELLS			
J. H. Miles	85,050	0.55	46,777.50
	30,060	0.55	16,533.00
DEQ Permit Waiver			300.00
Marking Buoys (10)			649.00
Marking Pilings (2)			624.50
1995 Reef Symposium contribution			2,792.00
TOTALS	302,390		$289,620.00
INDIRECT COSTS			$28,568.00
GRAND TOTAL			$318,188.00

REV 6/14/95

FIGURE 1

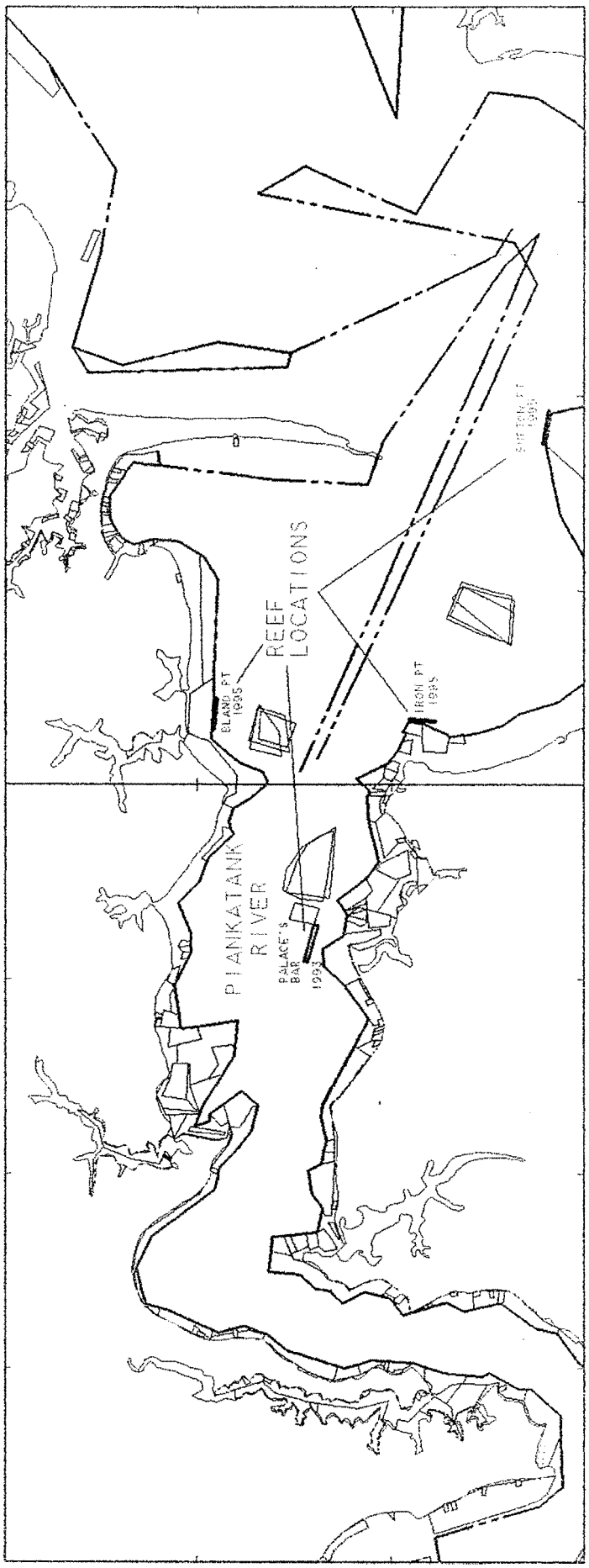
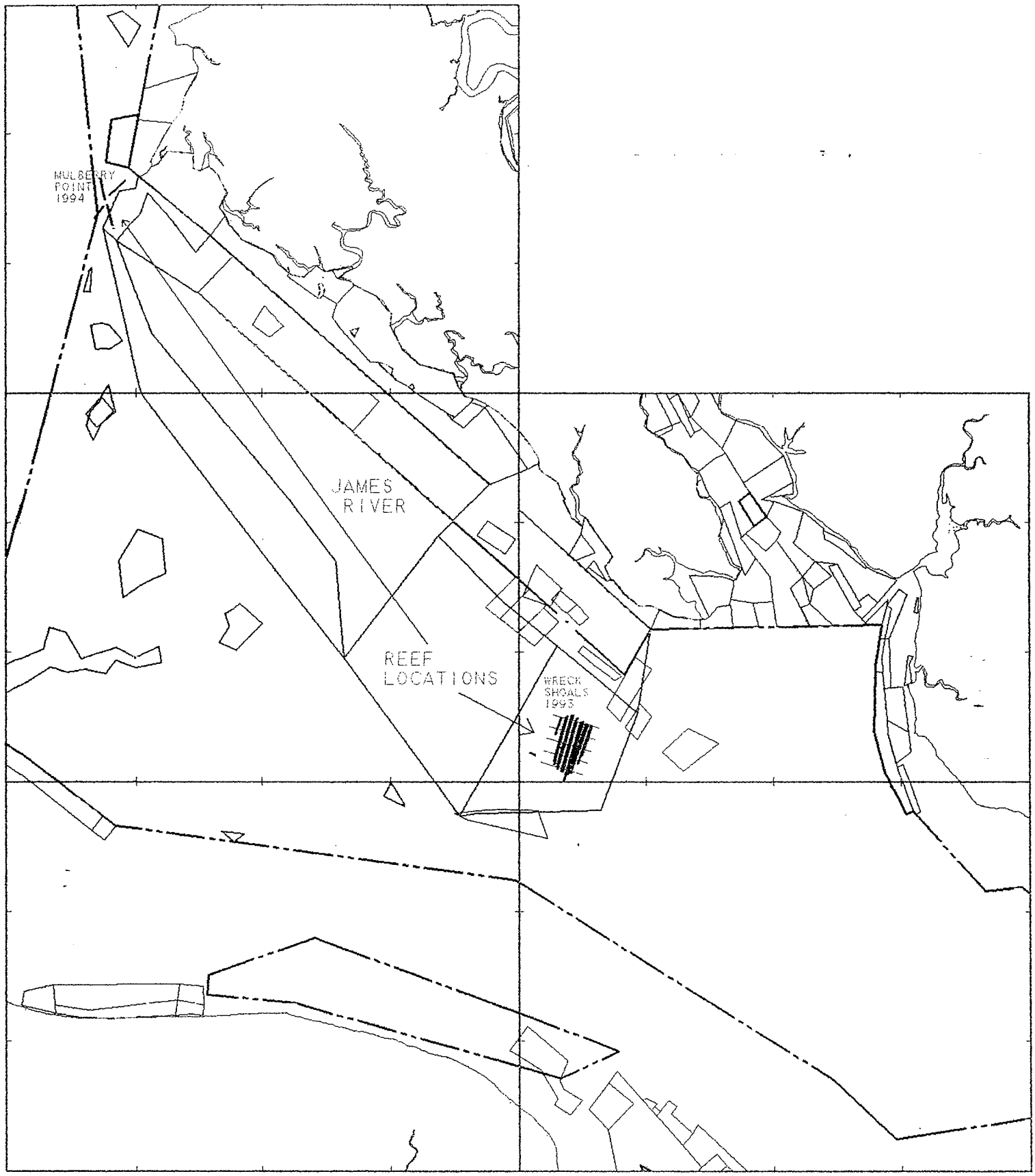
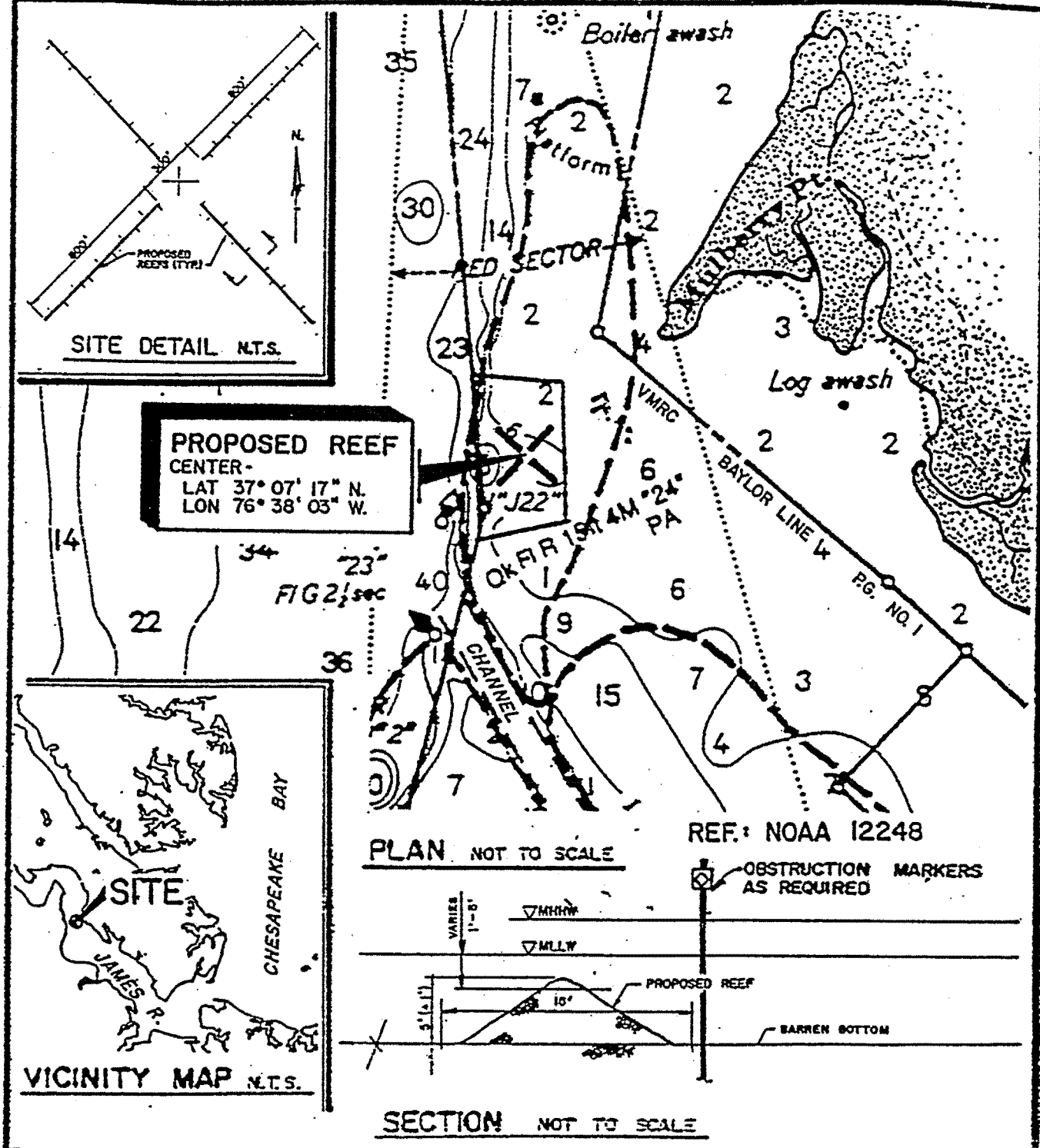

REEF
LOCATIONS
BLAND PT
1995
IRON PT
1995
PIANKATANK
RIVER
PALACE'S
BAR
1995

FIGURE 2



REEF LOCATIONS JAMES RIVER

FIGURE 3



PURPOSE: OYSTER BROOD STOCK

DATUM NAD 27, MLW

ADJACENT PROPERTY OWNERS: N/A

1

2

3

MULBERRY PT. REEF

AT JAMES RIVER

COUNTY OF CITY OF N.N. STATE VA.

APPLICATION BY V.M.R.C.

FISHERIES MGT. - REPLETION

SHEET 1 OF 1 DATE JULY 94

FIGURE 4

FIELD BOOK	PAGE
276	42

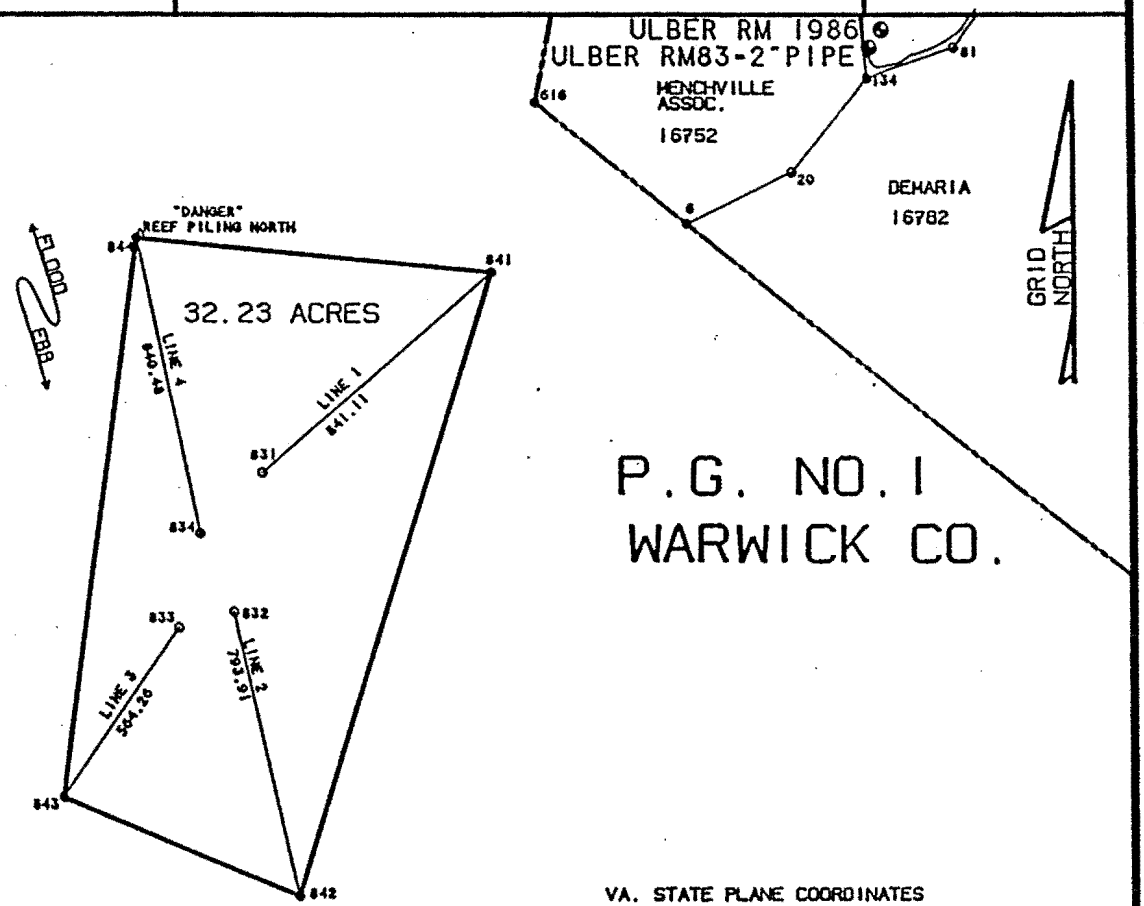
MULBREEF.GCD
2852540F.GCD
LEASE - NUMBER

COMMONWEALTH
OF
VIRGINIA
MARINE RESOURCES COMMISSION

APP. NO. MULBERRY REEF

MAP NO. 285-2540

FILE NO.



"DANGER" REEF PILING SOUTH △

2" PIPE ULBER RM 86		HAR 2	DISTANCE FROM ULBER RM 86
0-00-00	GRID NORTH	0-00-00	
AT	ULBER RM 86	195-00-03	
15-00-03	HAR 2	AT	
341-48-56	DWSL E. POLE	313-03-07	
7-42-34	BASF TANK	5-51-40	
234-37-00	831	206-51-45	2108.00
228-10-10	832	205-59-41	2413.00
229-45-10	833	206-58-16	2558.00
233-42-40	834	207-31-46	2348.00
238-41-20	841	203-47-15	1275.00
214-10-50	842	202-11-42	2880.00
227-06-12	843	207-34-00	3107.00
254-39-00	844	212-31-55	2145.00
254-50-00	REEF PILE N	212-30-00	2132.37
211-32-26	REEF PILE S	201-19-00	2959.95

HAR 2-USE DISC IN CONCRETE

VA. STATE PLANE COORDINATES
NAD 27 SOUTH ZONE (FEET)

NORTH	EAST
293866.53	2545686.11
298479.53	2546922.23
302216.96	2542921.61
317174.33	2546841.31
292645.91	2543967.47
292257.23	2543888.13
292213.84	2543733.68
292476.85	2543793.52
293203.93	2544596.80
291483.99	2544068.12
291751.66	2543409.98
293298.72	2543617.63
293308.64	2543628.01
291343.85	2544137.75

32.23 ACRES
(3040 LINEAR FEET)

OYSTER PLANTING GROUND
OF
MULBERRY POINT REEF SITE
IN
JAMES RIVER 07-00-00

DISTRICT NO. 18 CITY OF NEWPORT NEWS

SCALE 1/5000 OCTOBER 5 19 94

V.M.R.C. APPROVED/RECORDED

CERTIFIED SURVEYOR

PLAT BY RBS

Daily Press

Sunday, Aug. 7, 1994

Oyster reef has backers, critics, too

By Mark Di Vincenzo
Daily Press

Build it, and they will come. Or will they?

There is much disagreement over a decision to build an oyster reef just off Fort Eustis on 30 acres of James River bottom.

On one side are the state's top oyster official and at least two oyster scientists, who say the site traditionally does not attract oyster larvae, and there's no reason to believe it will now.

"There is no evidence — none —to support putting a reef in that place," said William J. Hargis Jr., an oyster scientist at the Virginia Institute of Marine Science.

On the other side are the state's watermen and several Virginia Marine Resources Commission fisheries managers, who say a reef at that site will benefit from nearby existing reefs and will attract larvae spawned at those reefs.

"I think it's the best place for a reef," said longtime Gloucester County waterman Charles Rowe.

Please see Reef/C2

Reef

Continued from C1

The site, just below an oyster bed watermen call Mulberry Point Rock, was picked by a committee made up of Rowe; two other watermen; five Marine Resources Commission staffers; Hargis and Jim Wesson, the state's oyster repletion manager. It didn't matter that Hargis missed the meeting in which the committee voted.

The vote was 8 to 1 in favor of the site. Wesson, who won a $320,980 federal grant to build the reef, was the only one who voted against building it near Mulberry Point. He has declined to talk about the reef.

Most scientists, Wesson and Hargis included, believe oysters in reefs have a better chance of fighting off disease-causing parasites, which are killing most oysters in the Chesapeake Bay before they are large enough to be harvested. So Virginia and Maryland are building reefs to try to help their ailing oyster stocks.

The reef scheduled to be built off the Army post will be the second man-made reef in the James and third in the lower bay, including one in the Plankatank River.

Those who oppose the site say for whatever reason James River oyster larvae, which seek out hard surfaces on which to attach themselves and grow, don't swim to that site.

First, the flow of water in that part of the James doesn't tend to move oyster larvae to that area. But, larvae that end up there have nothing on which to attach themselves. Surveys of oyster reefs in 1910 and 1980 show no reefs at the site where the debated one is to be built.

"Putting the reef up off Mulberry Point isn't a particularly good place," said Roger Mann, another marine science institute oyster scientist.

"I don't think we're going to get anywhere near as much information from this reef as we will from the Plankatank reef. Given the fact that a lot of money will be spent here, that's really a shame."

Hargis said the site has other problems. The bottom, where oyster and clam shells will be placed to form the reef, is hard and sandy with ridges, which, he said, indicates sand will smother the shells.

What's more, the scientists note the reef will be in a part of the James where the disease-carrying parasites sometimes infect oysters, but don't kill them.

So it will be difficult to gauge how well oysters in that reef battle the parasites.

This reef is not intended to see how well oysters on it fight the parasites, said Jack G. Travelstead, a member of the reef site selection committee and chief of VMRC's Fisheries Management Division.

Besides trying to build a reef that is attractive to oysters, Travelstead said, the reef should provide valuable information about the effects of river currents on a reef.

As for the possibility that the reef will be overrun by sand, Rowe said he has been tonging for oysters in the James for 43 years, and the bottom there does not shift.

Rowe, who has been critical of the reef in the Plankatank, said, "We don't want this reef to fail. We want it to succeed."

Meanwhile, Wesson has applied for another grant to build another oyster reef next year.

VMRC turns down reef grant

Panel says project endangers oysters

By Mark Di Vincenzo
Daily Press

NEWPORT NEWS — Virginia Marine Resources Commission head William A. Pruitt has told the U.S. Environmental Protection Agency to keep a $320,980 grant that was to be used to build an experimental oyster reef in the James River.

Work on the 15-acre reef was to begin Monday. But Pruitt said the site proposed for the reef contained many healthy oysters that would have been buried during the construction of the reef. And he worried, he said Monday, that if the state received the EPA money, it would be obligated to pay the contractor hired to do the work.

"One way not to proceed with the project was to keep the federal money from being delivered to us," said Rob O'Reilly, deputy chief for the commission's Fisheries Division.

The terms of the contract, however, do not obligate the state to pay the contractor if it receives the grant money. It's unclear whether the commission, the Newport News-based state agency that makes decisions affecting the tidal waters of Virginia, can get the money back.

■ The commission declines to limit the number of blue crabs a waterman may catch. C5

"We may have burned some bridges with EPA," said Jim Wesson, the commission's oyster repletion manager, who worked for eight months to get the grant. Wesson learned of Pruitt's decision last week, after he returned from a weeklong vacation in Mexico.

On Monday, Pruitt said, "You can't run an agency with people on vacation." But he praised Wesson, whose idea it was to build the reef.

Pruitt's decision became public Monday, during a meeting which initially was to include only him, state Del. Harvey B. Morgan, R-Gloucester, and a couple of oyster scientists from the Virginia Institute of Marine Science. But the meeting, which Morgan requested, was held right after a specially called commission board meeting Monday afternoon. And when a majority of the commission's board members

Please see Oysters/C2

■ Oysters

Continued from C1

attended, the meeting had to be open to the public.

"I'm very concerned that we sent the money back when we knew we had it coming to us and were prepared to go forward," Morgan said.

Pruitt said Bill Matuszeski, director of EPA's Chesapeake Bay Program office, has been asked to hold the money. VMRC staffers decided during the meeting to ask the EPA for a six-month "no-cost extention," which allows the EPA to officially hold the money for the commission. Pruitt said Matuszeski is enthusiastic about the reef building project, and he hopes Matuszeski will grant the extention. Matuszeski could not be reached for comment Monday.

Some, including Wesson, believe oysters in reefs have a better chance of fighting off disease-causing parasites, which kill most oysters before they are large enough to be harvested. And in recent years, the commission — with Pruitt's support — has had reefs built in the James and Piankatank rivers.

The $320,980 reef, which was to be south of the James River Reserve Fleet, was to be made up of oysters dug out of the river bottom by a huge crane.

But watermen who harvest oysters from the James, some of whom don't like Wesson, told Pruitt they are concerned that too many healthy oysters would be buried in the reef.

"They would have destroyed the oysters," said Gloucester waterman Oscar Setterholm, who is president of the western branch of the Working Watermen's Association of Virginia, a post Wesson once held. "Jim Wesson wouldn't let us catch the oysters."

Pruitt sided with the watermen. "The watermen were going to crucify me," he said Monday during an interview after the meeting.

So during the third week of April, with Wesson vacationing in Mexico, Pruitt told the EPA to keep the money.

Roger Mann, an oyster scientist who attended Monday's meeting, questioned why Pruitt didn't take the money, saying, "I tend to live on grant money, and I hate to see it go back."

"That's taxpayers' money," Pruitt responded.

He said he is optimistic that the EPA will give it back after watermen help Wesson find another site to build the oyster reef.

"This has been an agonizing decision for me," Pruitt said.