

FINAL REPORT

**SHP - AN EVALUATION AND COMPARISON OF DREDGE FISHING ACTIVITY ON
THE SEASIDE OF VIRGINIA'S EASTERN
SHORE BETWEEN 1994 - 1995 AND 2005 - 2006**

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Virginia Coastal Zone
MANAGEMENT PROGRAM



This project was funded in part by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA05NOS4191180, Task 9.07 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended.

Clam dredging and crab dredging are allowed in the shallow bays, coastal lagoons, and guts of the Seaside of the Eastern Shore on unassigned grounds, in waters which are deeper than 4 feet at mean low water (MLW). The public season for this activity is from December 1 through March 31. Clam dredging is not allowed on unassigned grounds in the Chesapeake Bay and crab dredging is restricted to the deeper waters of the Bay's main stem. Clam dredges on Seaside have not been described in regulation, and many of them have been adapted for the Seaside into a apparatus with very long teeth and a metal, heavy, barred box that functions more as a digging device that holds the boat and allows the boat propeller to fluidize the bottom as the dredge is towed forward. In this way, the clams are actually "kicked" out of the bottom. This type of clam dredge is also used on Seaside for the harvest of clams on private shellfish grounds. More conventional, bagged dredges are used for harvesting crabs on Seaside and in some softer bottom areas more conventional dredges are used for clam harvest. Both clam and crab dredging, especially with the very heavy, metal dredges, has been controversial on Seaside for many years. Many local watermen have said for years that the extreme drop in clam densities on Seaside has been the result of unregulated clams dredging, and there has been an overall concern that this type of harvesting is inappropriate for the shallow, nursery type habitat that is so important to many other commercial and recreational species in the area.

In the early 1990's, harvesters on Seaside would hold both a crab and clam dredge license, and could harvest unlimited quantities of both species. This allowed the harvest of either species to continue in areas where the numbers of one or both had dropped to extremely low densities, so there was no economic "cut off point for the less dense species, if there were sufficient quantities of the other. This factor, along with the concern of many watermen, scientists, and managers on Seaside, instigated a study funded by the Virginia Coastal Zone Management Program in 1994-95. Staff from the Virginia Institute of Marine Science, Wachapreague Laboratory and Virginia Marine Resources Commission completed a study and produced a report entitled, "Evaluation of Dredge Fishing Activity on the Seaside of Virginia's Eastern Shore, December 1994-November 1995. This study documented that the dredge fishery was a diverse fishery that targeted blue crabs, hard clams, and blood clams depending on availability and tides. During the public fishery time period, based on aerial surveys, the participation was never very large—averaging between 2 and 8 dredge boats per day on all of Seaside. This study did an initial examination of the short-term impacts of both a more conventional bag dredge and the metal cage dredge on clams stocks. There appeared to be an interaction between the dredge type and sediment type, which affected the extent of damage to clams. Metal cages on firmer bottom increased harvest efficiency, but caused significant damage to both the harvested clams and to clams left on the bottom. In many cases shelf life for clams harvested by dredge was less than for clams caught with other methods. There were also indications that there was potential damage the local clam stocks and to many aquaculture operations from the turbidity and sediment movement caused by the dredging operation. The study in 1994-95 had several recommendations:

- 1) That the unlimited bycatch allowable under the crab dredge fishery and clam dredge fishery regulations should not be allowed, as it allowed each fishery to continue beyond the time it would ordinarily cease for economic reasons. (This change was made in 1995, and from 1996 through the 2005-2006 season, a harvester had to be either a crab dredger or a clam dredger on any one day, with bycatch of the other species not allowed).

2) The study also recommended that the modification of the clam dredge with longer teeth and metal cages, which has increased its effectiveness by effectively allowing the "kicking" of clams, that is, using the propeller to work clams out of the bottom, should be addressed by the Virginia Marine Resources Commission. (This has not been done to date.)

3) That the practice of acquiring or using leased bottom primarily for the purpose of dredging hard clams is inconsistent with §28.2-603 of the Code of Virginia, which authorizes leasing of state-owned bottom for the "purpose of planting and propagating shellfish." The Engineering and Surveying Department of VMRC has been much more vigilant in not allowing new leases for this practice since this report; however, a small number of dredge permits are still given for leases that are already in place.

Since there had been a decline in the number of clam dredge licenses from 1995 (Figure 1) and there appeared to be less clam dredging activity on private grounds, VMRC requested funds from the Virginia Coastal Zone Management Program in 2005 to repeat an aerial survey of dredge activity on Seaside for comparison to activity in 1994-95. VMRC staff worked with the VIMS Wachapreague staff again on this project with the VMRC plane. VMRC Staff flew over all of Seaside and recorded all dredge activity four times per month during the public crab and clam dredging seasons (December - March) and two times per month for the remainder of the year. Staff at VIMS Wachapreague entered the data in a GIS system and prepared maps of the sightings.

The number of clam dredge licenses has declined significantly since 1995 (Figure 1). This was also obvious in the aerial flight observations (Tables 1 & 2). Clam dredging was only observed during the December - March public season, with an average of 2.9 clam dredge boats per day (Tables 4 & 5). In the 1994-95 survey, the average was 5.3 boats per day. There was also a large decline in the number of crab dredgers with an average of 6.4/day in 1994-95 and only 0.4/day in 2005-06. The reported harvest (Figure 1) does not give as clear a picture, as the number of reported clams harvested is certainly low in relation to historic amounts, but does not appear to have changed a great deal during the past 10 years. Most notably, there was no observed clam dredging activity on private grounds on any of the 32 flights in 2005-06.

Based on conversations with local Seaside watermen, there has been a major decline in the wild clam populations, which has resulted in very few opportunities for harvesting wild clams by hand, or any other less efficient gear than the clam dredge. This has occurred at the same time that Virginia's aquaculture clam harvest has risen to an estimated harvest of over 100 million clams and now leads the nation in aquaculture clam production. The reason for the reported sharp decline in clam populations was unclear, but is cause for concern.

During the aerial flights, the position of all dredge boats was marked by GPS. An example is shown in Figure 8. The small dot in the circle is the position, and the wider circle is the maximum error of the GPS instrument and operator. As mentioned earlier, clam dredging is only allowed on unassigned ground with water depths that are greater than 4 feet at MLW. In this figure, it is apparent that there are several violations occurring within these observation points. The number in the center of the circle corresponds to 6 sites that the depths were measured. All of the observations were in water less than 4 feet MLW (Table 3). Additionally, with the complicated juxtaposition of leased ground, public ground, and unassigned ground that occurs on

Seaside, at least 4 of those points were on public grounds. Whether or not it is intentional, the general pattern observed was that much of the harvesting activity was in shallow areas or on public grounds both of which are illegal activities. Possibly these are the only areas that now still have any significant populations of clams, since they were dredged less in the past.

The final deliverable for this grant was a presentation of findings to the VMRC Commission meeting in January, 2007. Prior to scheduling this meeting, one of the Commissioner's from Seaside requested a public hearing for January 2007, to allow clams to be kept on crab dredging boats as was the practice before the 1995 VCZMP Dredge Survey Report.

Based on the observations and recommendations in the 1994-95 survey and report, and the observation in the aerial surveys in 2005-06, VMRC staff did not recommend any changes in the clam dredge Regulation 4VAC 20-71-10 that would allow any additional clam dredging. Allowing the return of a bycatch provision for clams on crab dredge boats would return the regulation to the same situation that was in place before 1995. Based on the 2005-2006 survey, the VMRC staff was of the opinion that it would be more prudent to consider ceasing clam dredging and crab dredging on Seaside. Based on the aerial surveys, this activity has almost disappeared on its own. It appeared to be an ideal time to also stop clam dredging on private grounds. This activity remains inconsistent with the intent of shellfish leases that are for the "purpose of planting and propagating shellfish." Staff suggested to the Commission that it might be the time to consider banning clam dredging, or at least having it sunset as a practice at the end of this year's season on March 31st. It may take many years for the wild clam populations on Seaside to recover, but it is quite obvious that this is too efficient of a gear type for the clam population in its current condition. Crab dredging on Seaside was another issue, for another public hearing, and staff recommended that it might be the time to consider stopping this activity, also based on the very small number of participants at this time, and the damage caused by this gear type on the more fragile ecosystem of the Coastal Bays.

After taking public comments, the Commission closed the public hearing and voted 8 to 0 to allow the bycatch of clams on a crab dredge boat, if the boat held both licenses. This is a significant setback in the clam management of Seaside. The Commission did vote to form a committee to evaluate the size and weight of the metal clam dredges on Seaside. This had been the second recommendation of the first VCZMP clam dredge survey report. Both VMRC and VIMS staff will be invited to serve on this committee.

Both VIMS and VMRC staff were disappointed by this decision, but will continue to observe the clam and crab dredging activity on Seaside. If there is another opportunity to present these results, they will be represented, especially if there is a change in the Commission's makeup with gubernatorial appointments.

All of the maps, tables and figures are included in 3 attached compact discs. Additionally, the presentation photographs of clam dredging that was shown to the VMRC Commission are included on a compact disc.

Clam Dredge Licenses and Harvest for Public Ground 1987 - 2005

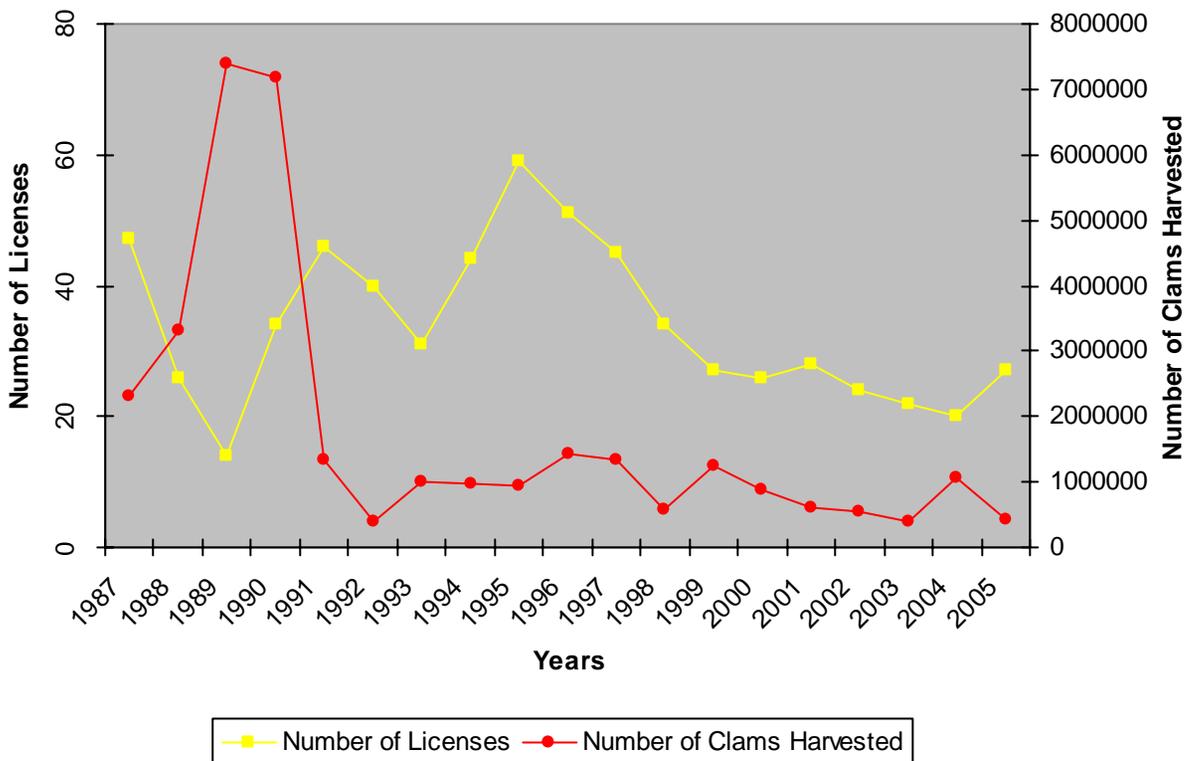


Figure 2a. Dredge & patent tong activity observed during Oct. 2005-Sept. 2006 on the seaside of Virginia's Eastern Shore (each point represents one boat).



Figure 2b. Dredge & patent tong activity observed during Oct. 2005-Sept. 2006 on the seaside of Virginia's Eastern Shore (each point represents one boat). Refer to regions labeled by figure number for more detailed maps.

Fishing Activity

- Clam Dredging
- Crab Dredging
- Patent TONGING

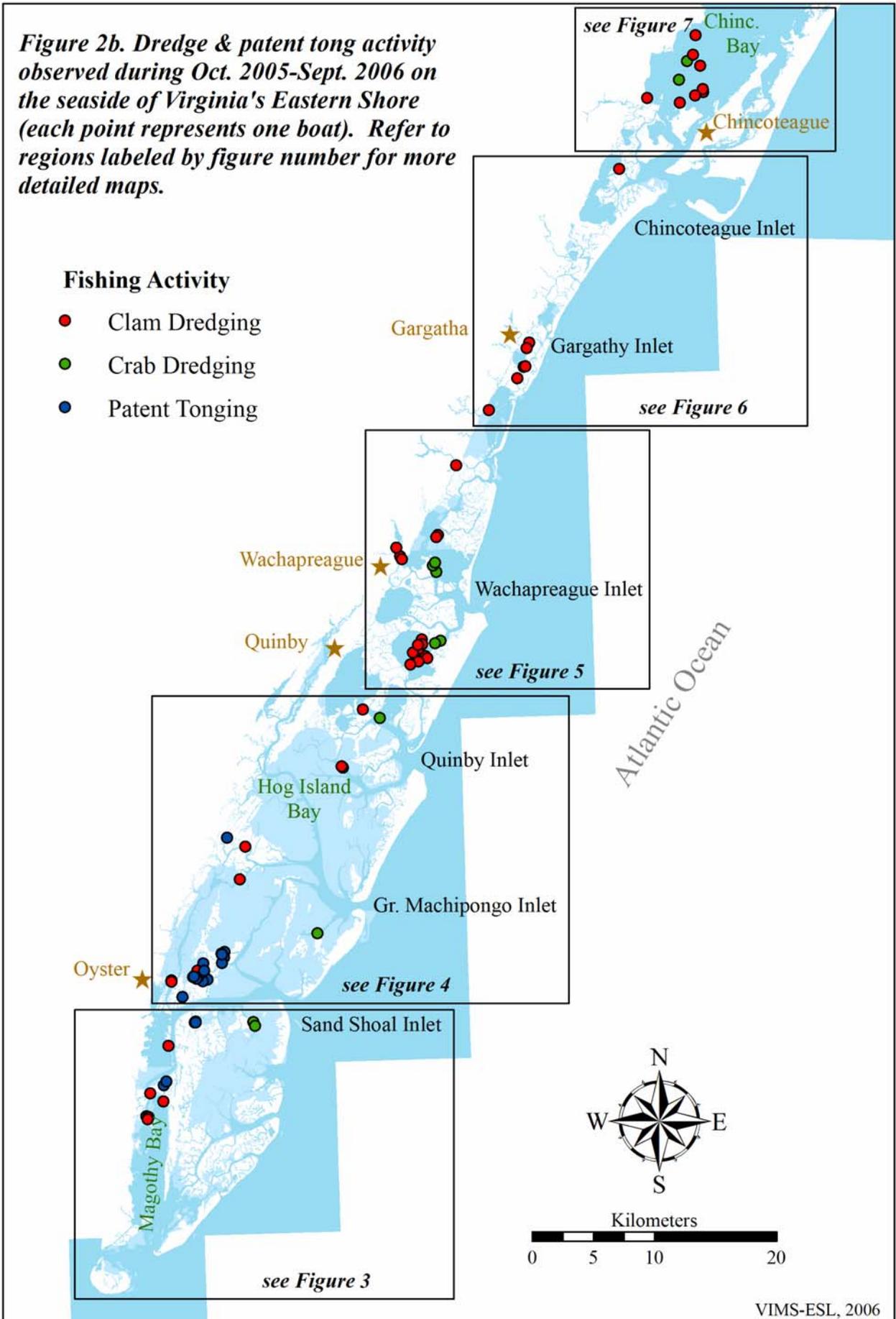


Figure 3. Activity from Fisherman's Island to Sand Shoal Inlet, Oct. 2005-Sept. 2006 (each point represents one boat).

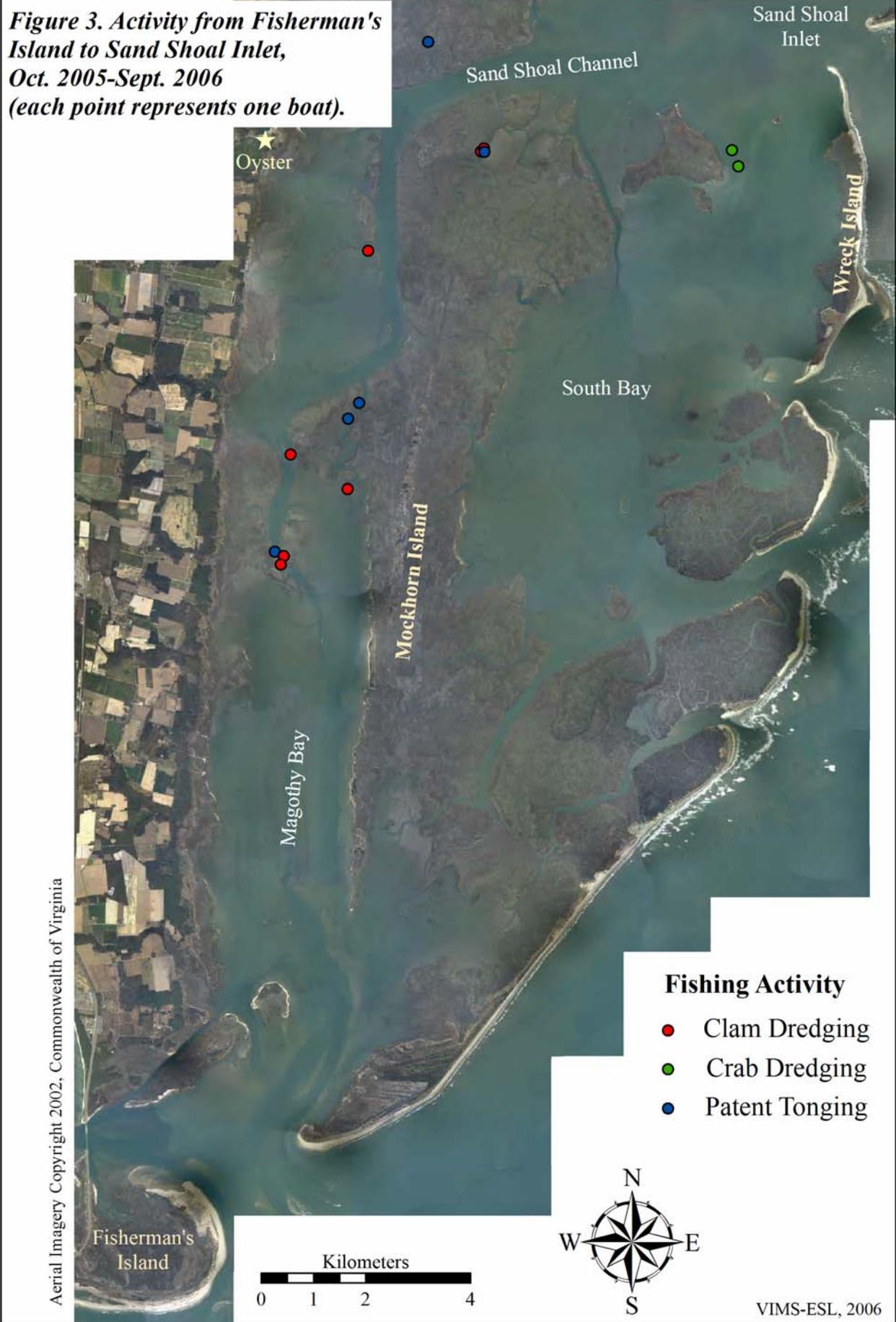


Figure 4. Activity from Sand Shoal Inlet to Quinby Inlet, Oct. 2005-Sept. 2006 (each point represents one boat).

Fishing Activity

- Clam Dredging
- Crab Dredging
- Patent Tonging



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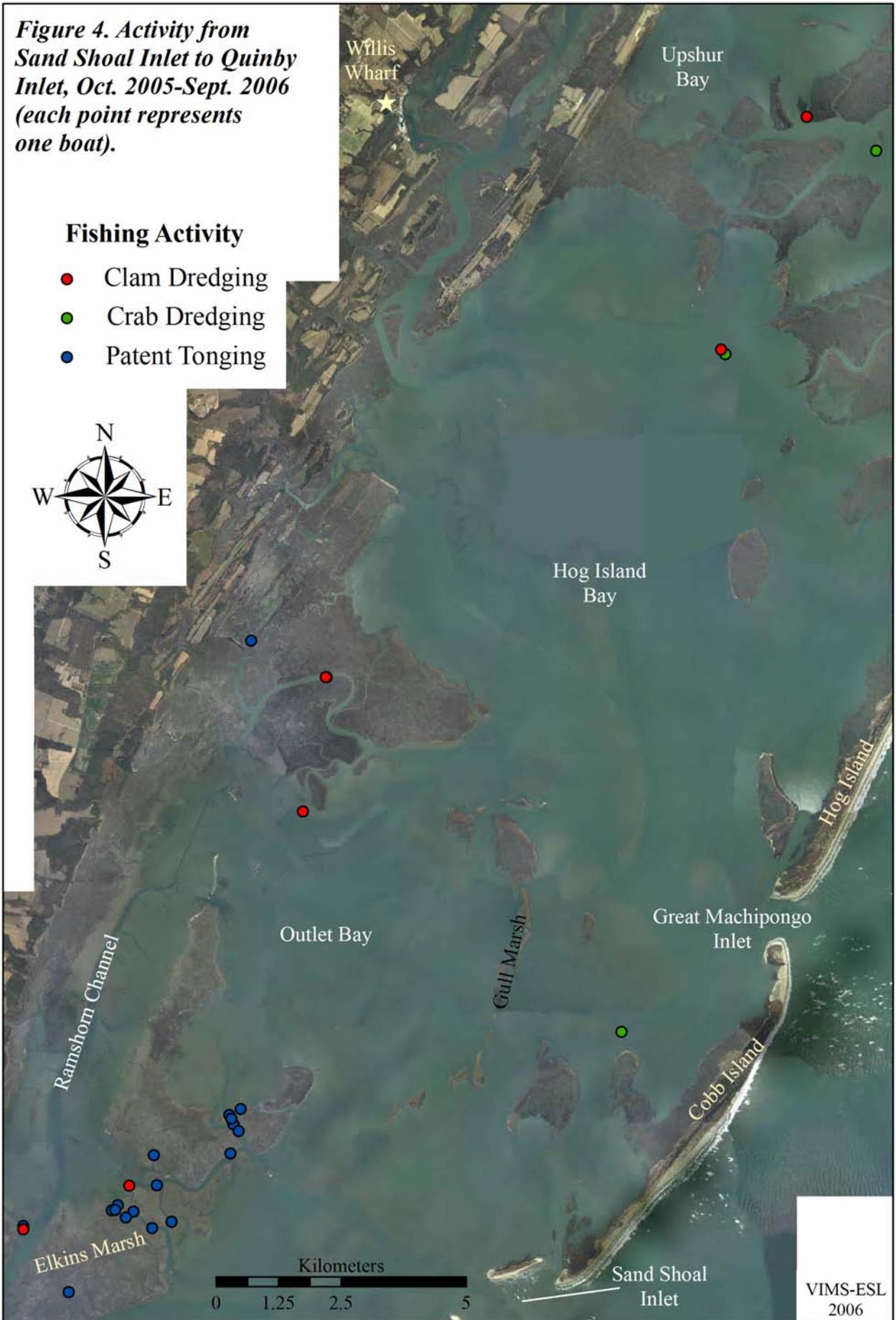


Figure 5. Activity from Quinby Inlet to Metompkin Inlet, Oct. 2005-Sept. 2006 (each point represents one boat).

Fishing Activity

- Clam Dredging
- Crab Dredging
- Patent TONGING

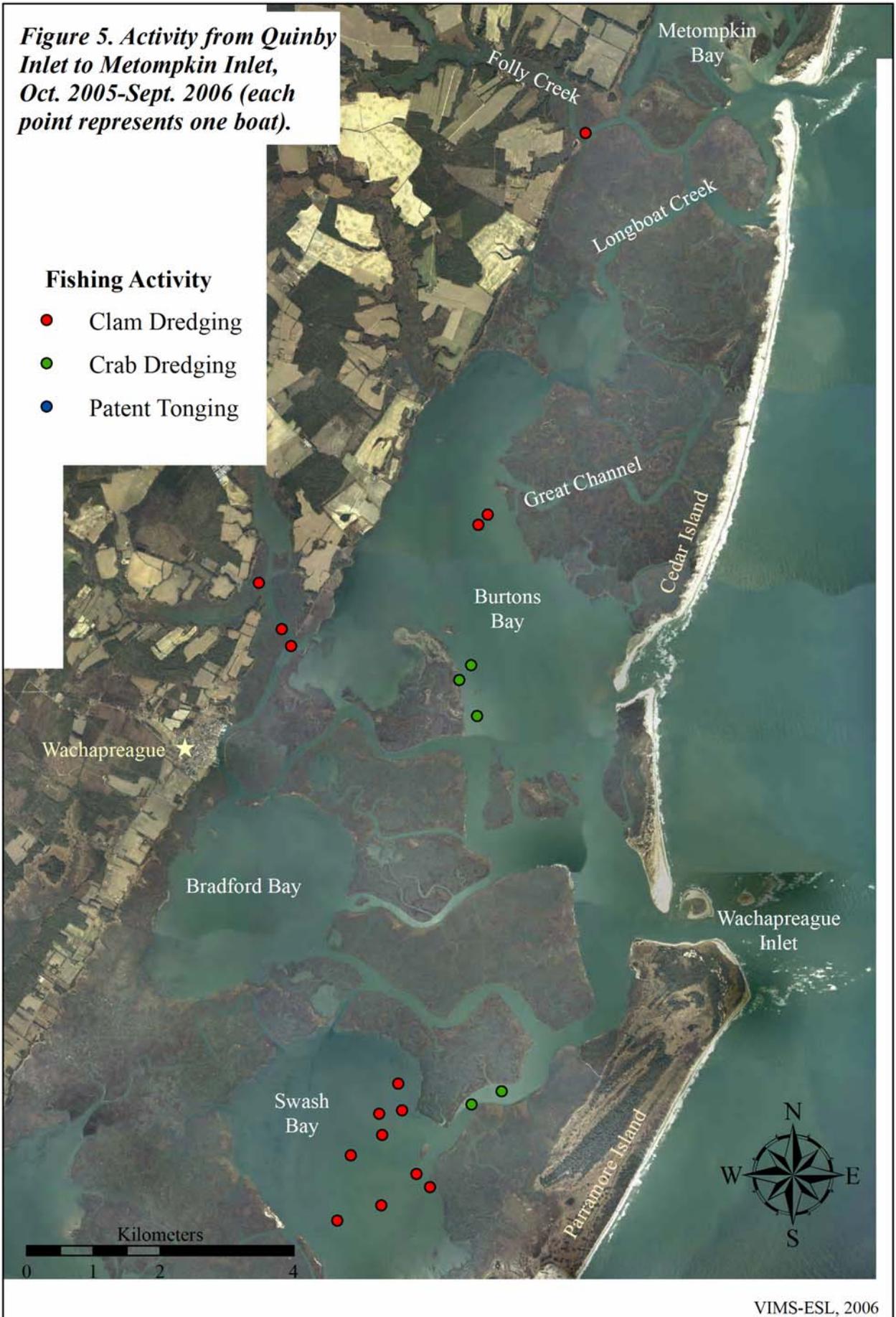


Figure 6. Activity from Metompkin Inlet to Chincoteague Inlet, Oct. 2005-Sept. 2006 (each point represents one boat).

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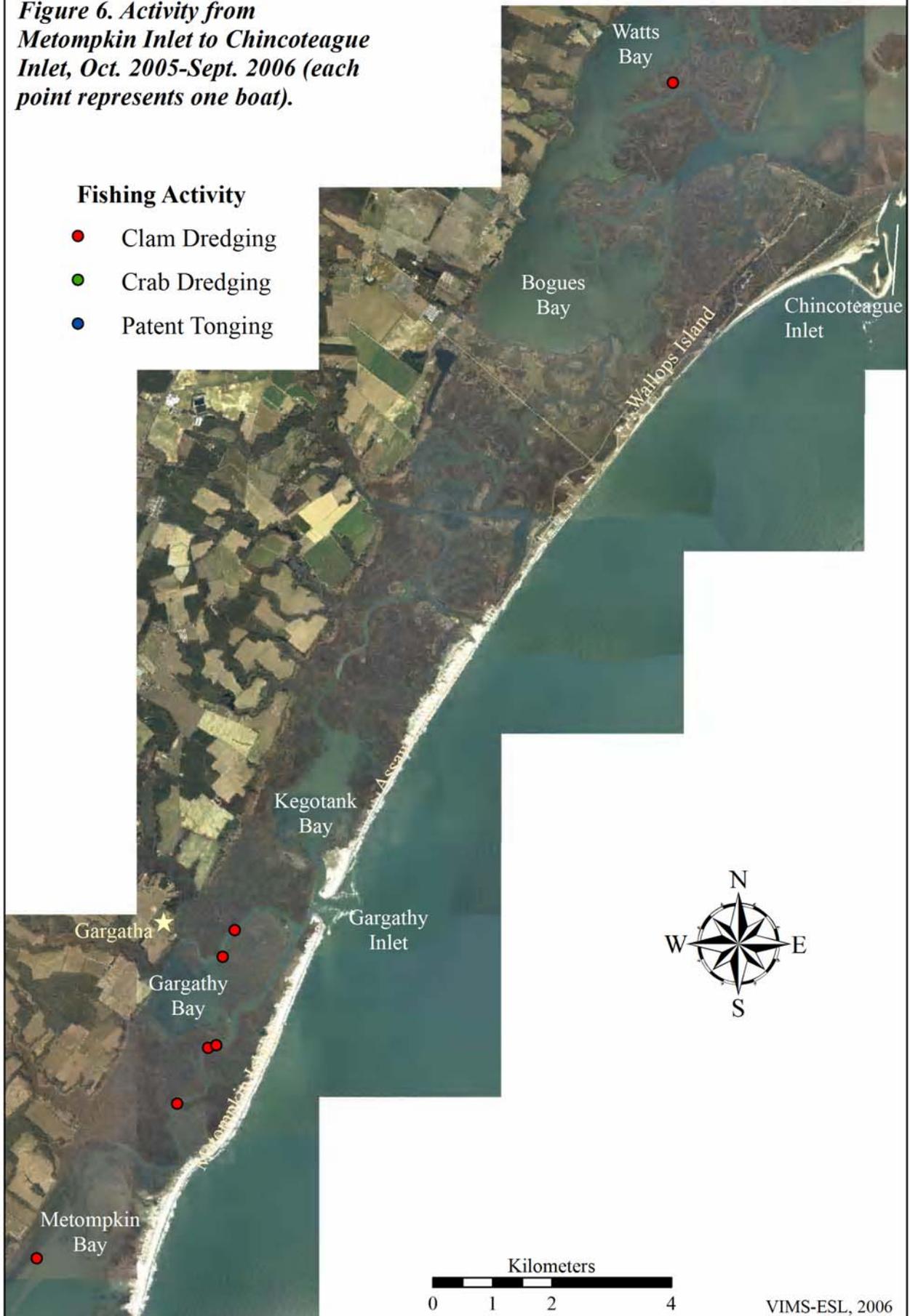
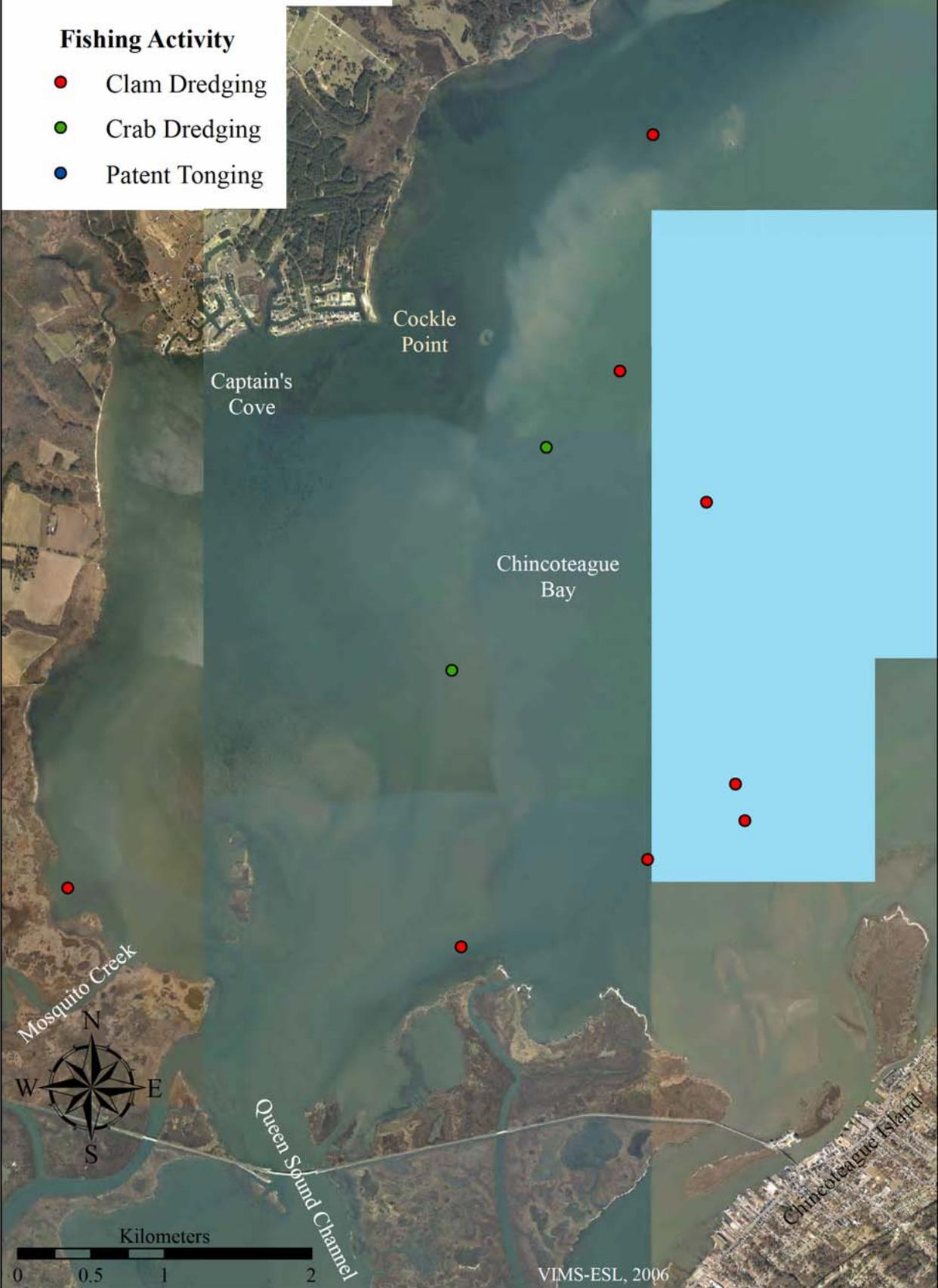


Figure 7. Activity in Chincoteague Bay, Oct. 2005-Sept. 2006 (each point represents one boat).



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Figure 8. Water depth sample points (which include the red boat locations within the six buffers where depth was quantified). A total of 24 points were sampled on an average low tide.

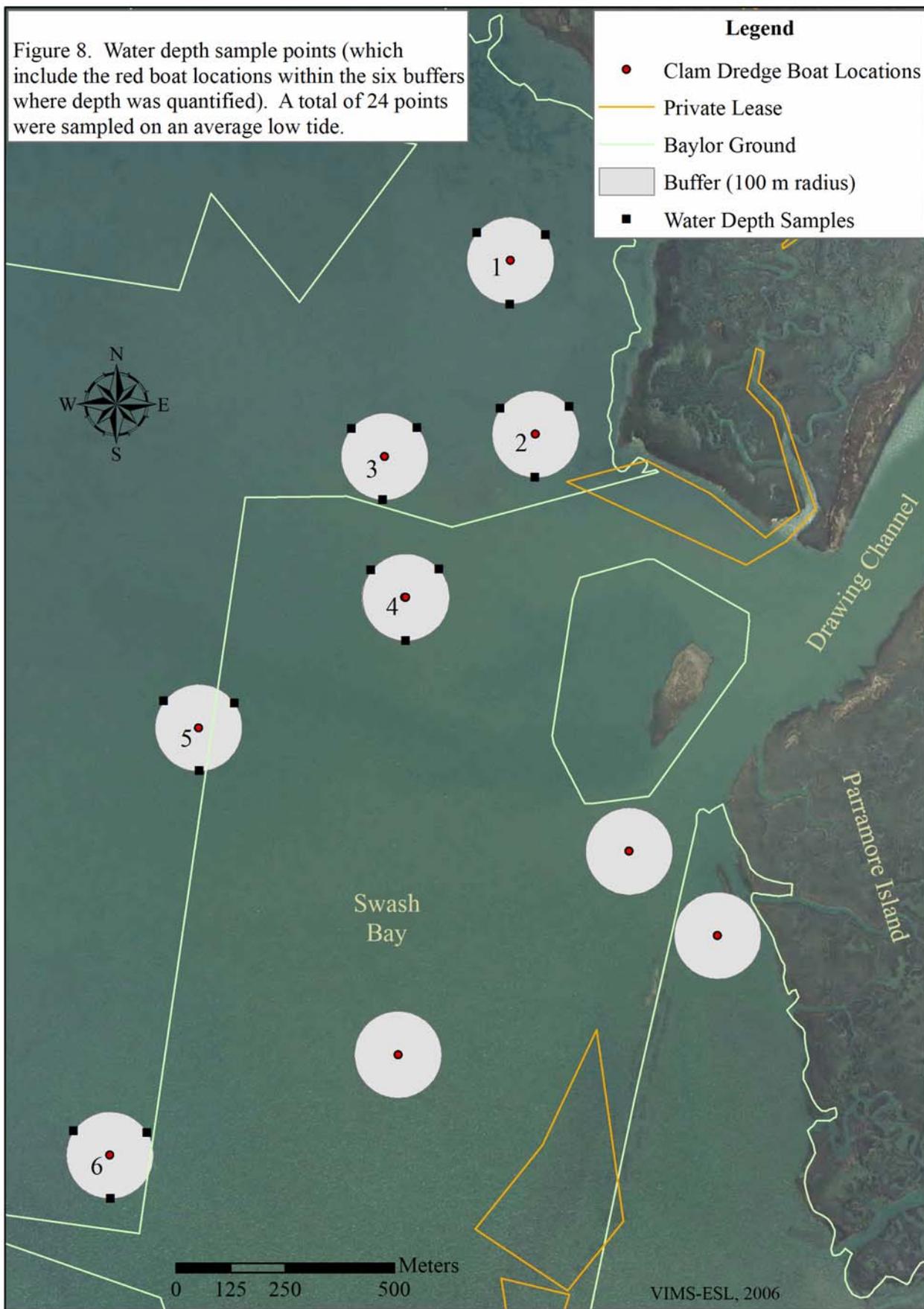


Table 1. Observations of fishing activity from overflights of the seaside, Oct. 2005-Sept. 2006. Numbers of boats observed clam dredging, crab dredging and patent tonging are indicated.

Date	Month	Sample ID	# clam dredge	# crab dredge	# patent tong
10/20/05	Oct	1*	0	0	0
10/31/05	Oct	2	0	0	0
11/17/05	Nov	1	0	0	0
11/18/05	Nov	2	0	0	0
12/1/05	Dec	1	1	0	0
12/8/05	Dec	2	1	1	1
12/16/05	Dec	3	2	1	2
12/22/05	Dec	4	0	0	0
1/10/06	Jan	1	6	2	2
1/17/06	Jan	2**	5	0	1
1/19/06	Jan	3	6	1	2
1/25/06	Jan	4***	1	0	0
2/2/06	Feb	1	6	3	2
2/8/06	Feb	2	4	1	2
2/16/06	Feb	3	3	1	2
2/28/06	Feb	4	0	0	2
3/8/06	Mar	1	6	3	1
3/17/06	Mar	2	4	0	2
3/23/06	Mar	3	0	0	2
3/27/06	Mar	4****	2	0	2
4/10/06	April	1	0	0	0
4/20/06	April	2	0	0	0
5/17/06	May	1	0	0	0
5/30/06	May	2	0	0	0
6/13/06	June	1****	0	0	0
6/22/06	June	2	0	0	0
7/11/06	July	1****	0	0	0
7/24/06	July	2	0	0	0
8/4/06	Aug	1	0	0	0
8/9/06	Aug	2	0	0	0
9/18/06	Sept	1	0	0	0
9/27/06	Sept	2	0	0	0

* Accomack County only due to fog

** All except Gargatha due to "no-fly zone" for Wallops Island

*** Chincoteague Bay to Wachapreague area only due to wind

**** All except Chincoteague due to "no-fly zone" for Wallops Island

Table 2. Observations of fishing activity by month from overflights of the seaside, Oct. 2005-Sept. 2006. Mean number of vessels observed per overflight are reported.

Year	Month	# Surveys	Mean # clam dredge	Mean # crab dredge	Mean # patent tong
2005	Oct	2	0	0	0
2005	Nov	2	0	0	0
2005	Dec	4	1	0.5	0.75
2006	Jan	4	4.5	0.75	1.25
2006	Feb	4	3.25	1.25	2
2006	Mar	4	3	0.75	1.75
2006	April	2	0	0	0
2006	May	2	0	0	0
2006	June	2	0	0	0
2006	July	2	0	0	0
2006	Aug	2	0	0	0
2006	Sept	2	0	0	0
TOTAL		32	1.47	0.41	0.72

Table 3. Water depth data for six clam dredge locations in Swash Bay near Wachapreague, VA measured during an average low tide between 1145-1258 hrs on 10/4/06 (see Figure 8 for a map of sample points).

Location	Mean Water Depth (ft)	Sub-sample	Tide	Water Depth (ft)
1	2.5	A	Low	2.4
		B	Low	2.5
		C	Low	2.4
		D	Low	2.6
2	2.4	A	Low	1.8
		B	Low	1.7
		C	Low	3.7
		D	Low	2.6
3	1.8	A	Low	1.4
		B	Low	1.6
		C	Low	2.0
		D	Low	2.1
4	2.9	A	Low	2.3
		B	Low	2.2
		C	Low	2.7
		D	Low	4.3
5	2.9	A	Low	2.8
		B	Low	3.1
		C	Low	3.3
		D	Low	2.5
6	2.0	A	Low	1.9
		B	Low	1.7
		C	Low	1.9
		D	Low	2.4

Table 4. Comparison of yearly fishing activity between the 1994/1995 study and this study (mean # vessel days per survey flight).

Survey	# Surveys	Mean # clam dredge	Mean # crab dredge	Mean # patent tong
1994/1995	39	3.6	2.5	2.2
2005/2006	32	1.5	0.4	0.7
% Change		-58%	-84%	-68%

Table 5. Comparison of fishing activity during the Dec.-March public season between the 1994/1995 study and this study (mean per survey flight)

Survey	# Surveys	Mean # clam dredge	Mean # crab dredge	Mean # patent tong
Dec. 1994-March 1995	15	5.3	6.4	3.5
Dec. 2005-March 2006	16	2.9	0.8	1.4
% Change		-45%	-88%	-60%

Table 6. Estimation of position marking error^a from aerial overflights via marking the position of four groundtruthed objects. Three replicate passes were made for each object.

Object	Pass #	Ground Speed (knots)	Distance from Known Position (m)	Distance from Known Position (ft)
A	1	121	34	112
	2	100	42	138
	3	124	160	525
B	1	114	66	216
	2	90	49	161
	3	93	29	95
C	1	120	55	180
	2	96	70	230
	3	96	11	36
D	1	115	15	49
	2	91	20	66
	3	93	32	105
Mean Distance Error (ft)			48.6	159.4

^a This error results from the following components: ground speed/GPS updating relationship; inherent GPS position error; and observer error (all of which can only be reduced, but not eliminated with the technology used for this study).

Table 7. Dredging and patent tong activity by lease status, Oct. 2005-Sept. 2006. Total # vessel days are reported for each category.

Activity	Unassigned Ground	Baylor Ground	Private/Leased Ground	Public Clam Ground
Clam Dredging	33	12	2	
Crab Dredging	9	1	3	
Patent Tonging	21	0	2	
Total	63	13	7	

Table 8. Dredging and patent tong activity by lease status, Oct. 2005-Sept. 2006. Mean # vessel days per survey overflight are reported for each category .

Activity	Unassigned Ground	Baylor Ground	Private/Leased Ground	Public Clam Ground
Clam Dredging	1.03	0.38	0.06	
Crab Dredging	0.28	0.03	0.09	
Patent Tonging	0.66	0.00	0.06	
Total	1.97	0.41	0.22	

Figure __. Dredging and patent tonging activity for 2005-2006 overflights (% of total observed activity).

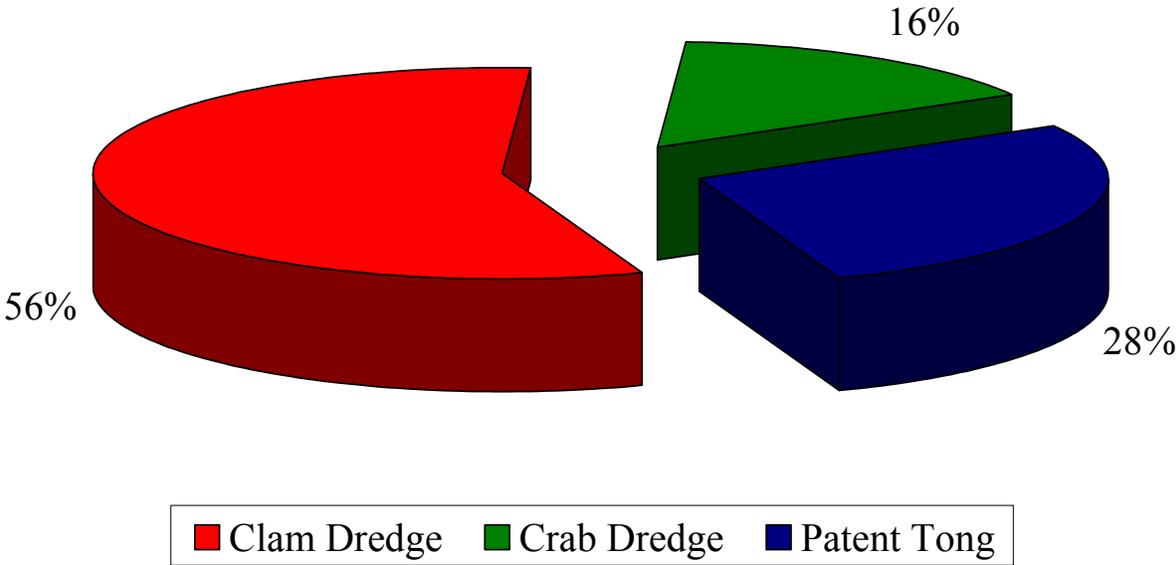


Figure __. Dredging and patent tonging activity for 2005-2006 overflights (monthly average number of boats per survey).

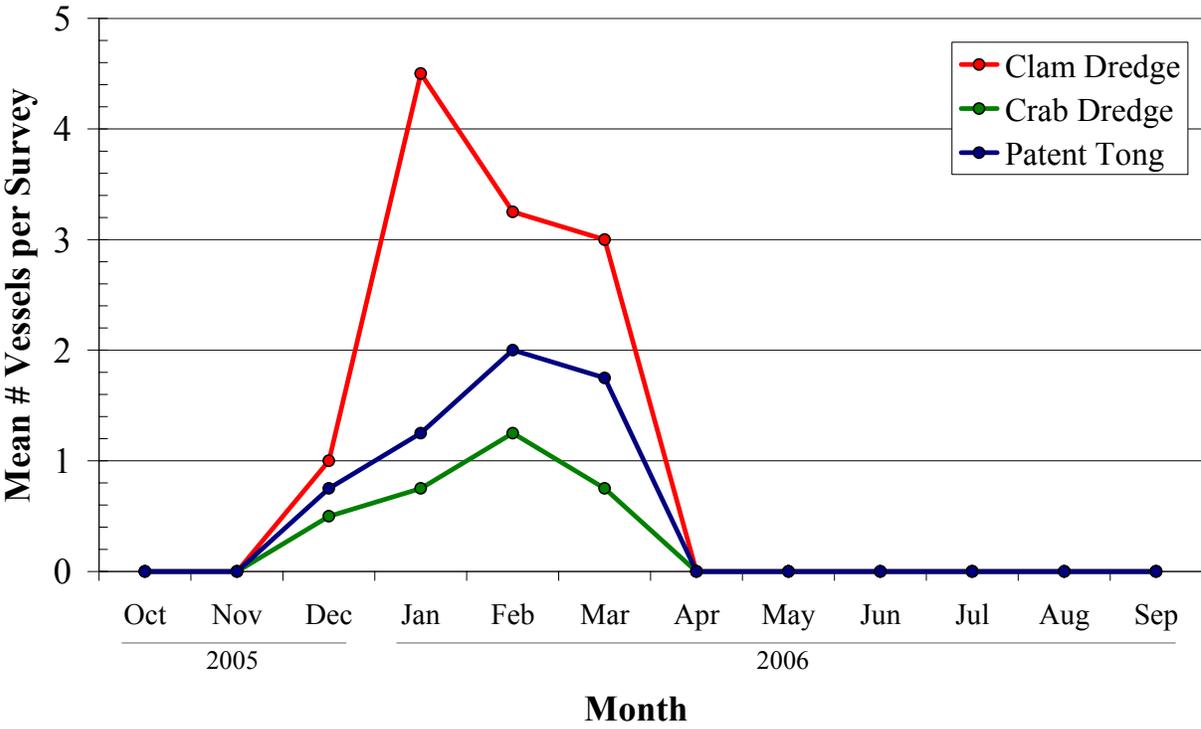
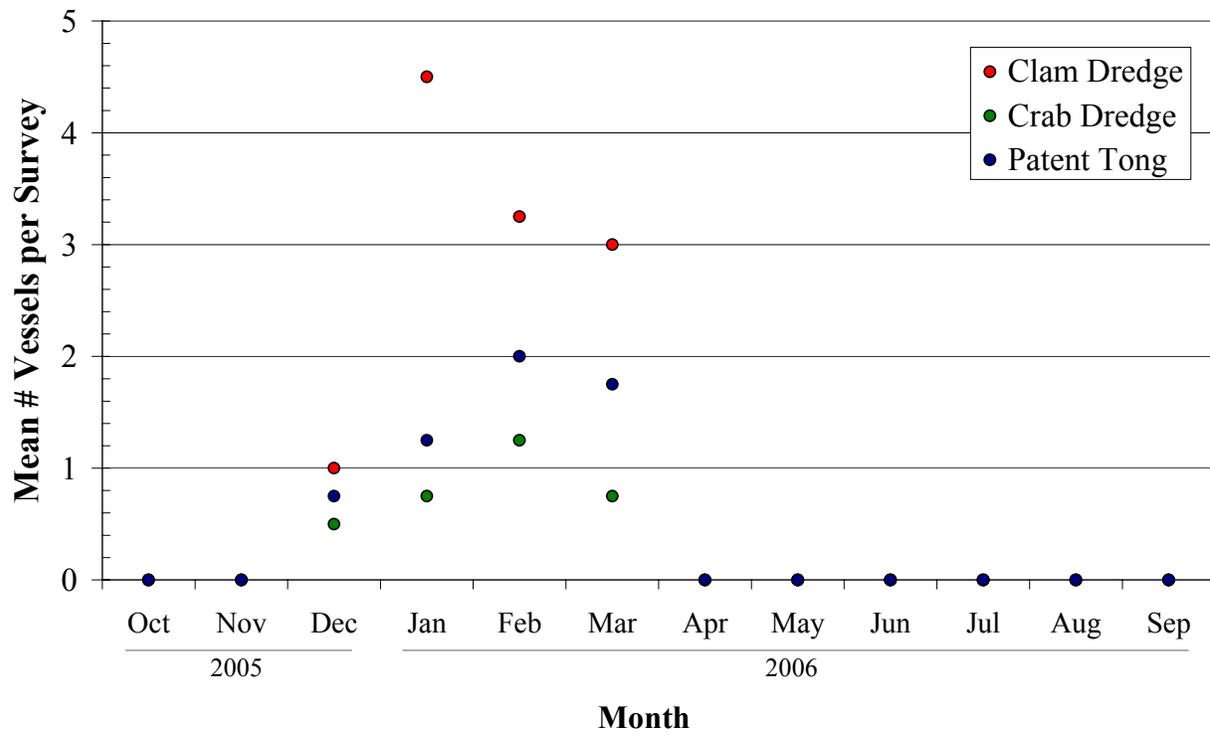


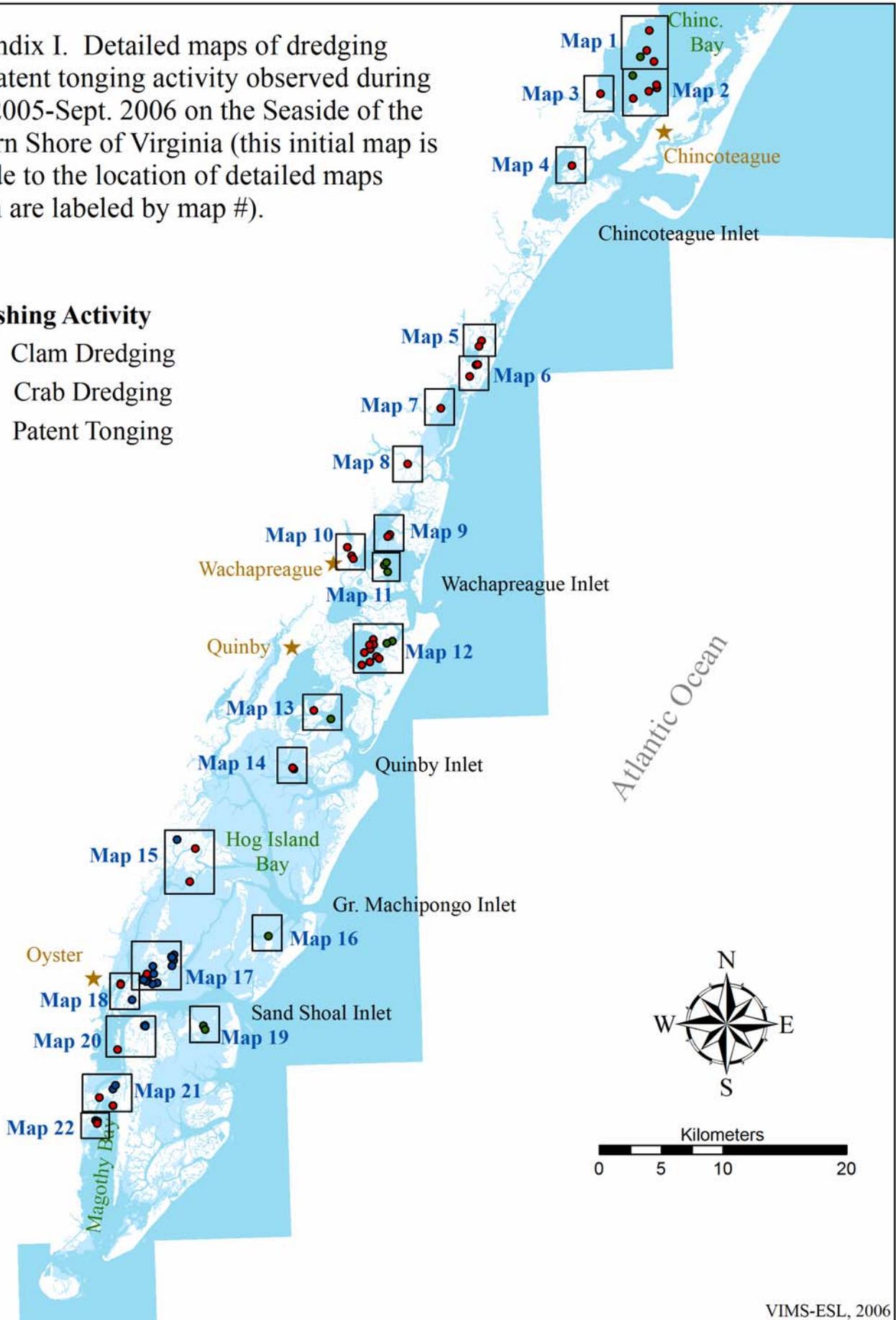
Figure __. Dredging and patent tonging activity for 2005-2006 overflights (monthly average number of boats per survey).



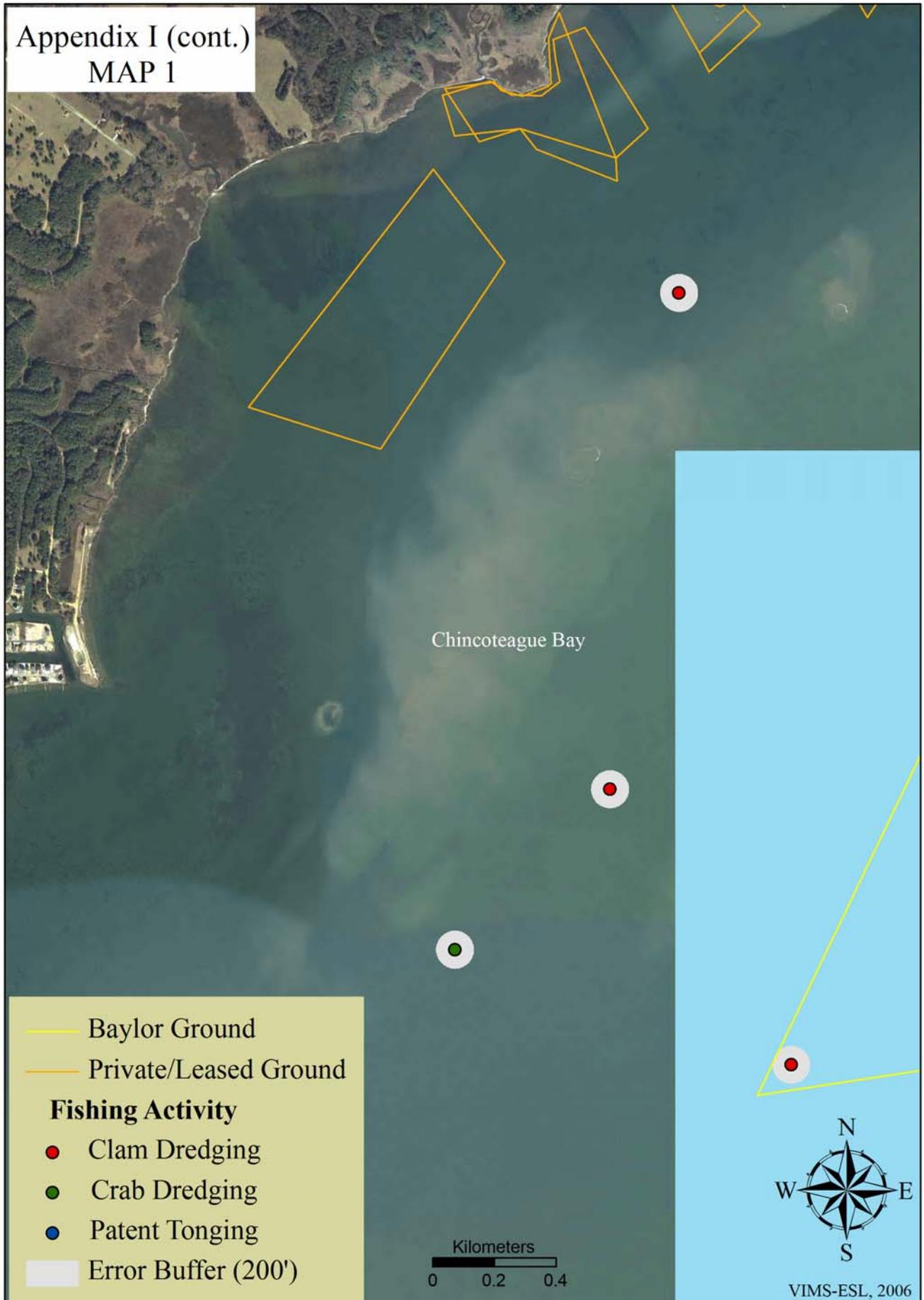
Appendix I. Detailed maps of dredging and patent tonging activity observed during Oct. 2005-Sept. 2006 on the Seaside of the Eastern Shore of Virginia (this initial map is a guide to the location of detailed maps which are labeled by map #).

Fishing Activity

- Clam Dredging
- Crab Dredging
- Patent Tonging



Appendix I (cont.)
MAP 1



Appendix I (cont.)
MAP 2



Chincoteague Bay

Aerial Imagery Copyright 2002, Commonwealth of Virginia

-  Baylor Ground
-  Private/Leased Ground
- Fishing Activity
 -  Clam Dredging
 -  Crab Dredging
 -  Patent TONGING
-  Error Buffer (200')

Kilometers
0 0.2 0.4

VIMS-ESL, 2006



Appendix I (cont.)
MAP 3



Chincoteague Bay



Aerial Imagery Copyright 2002, Commonwealth of Virginia

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent TONGING
- Error Buffer (200')

Appendix I (cont.)
MAP 4



Aerial Imagery Copyright 2002, Commonwealth of Virginia

VIMS-ESL, 2006

Appendix I (cont.)
MAP 5



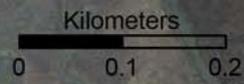
Appendix I (cont.)
MAP 6

Gargathy Bay

Wire Passage

Metompkin Island

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent TONGING
- Error Buffer (200')



VIMS-ESL, 2006

Appendix I (cont.)
MAP 7

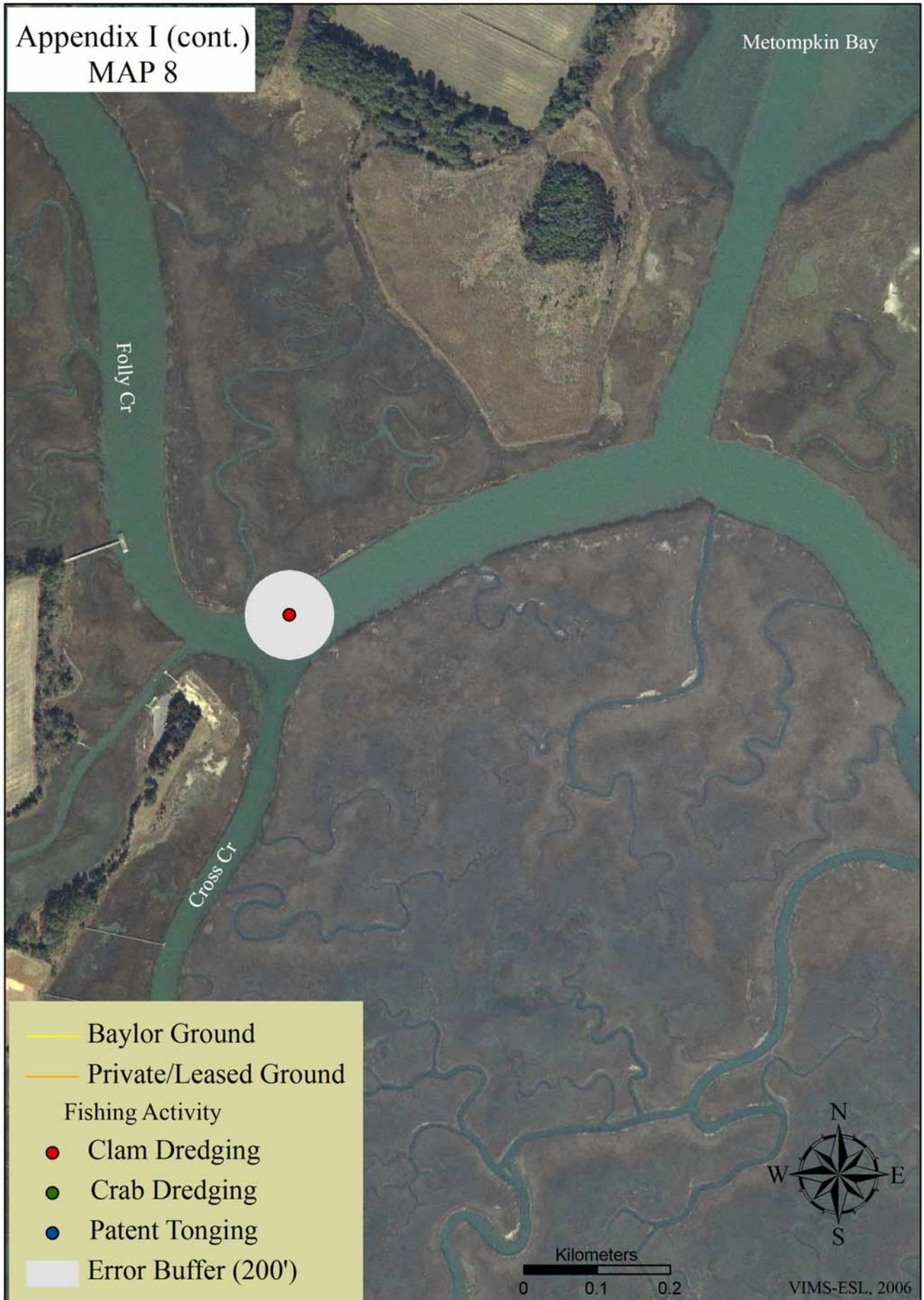


Aerial Imagery Copyright 2002, Commonwealth of Virginia

VIMS-ESL, 2006

Appendix I (cont.)
MAP 8

Metompkin Bay



Appendix I (cont.)
MAP 9

Burton's Bay

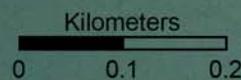
Great Channel

— Baylor Ground
— Private/Leased Ground

Fishing Activity

- Clam Dredging
- Crab Dredging
- Patent TONGING

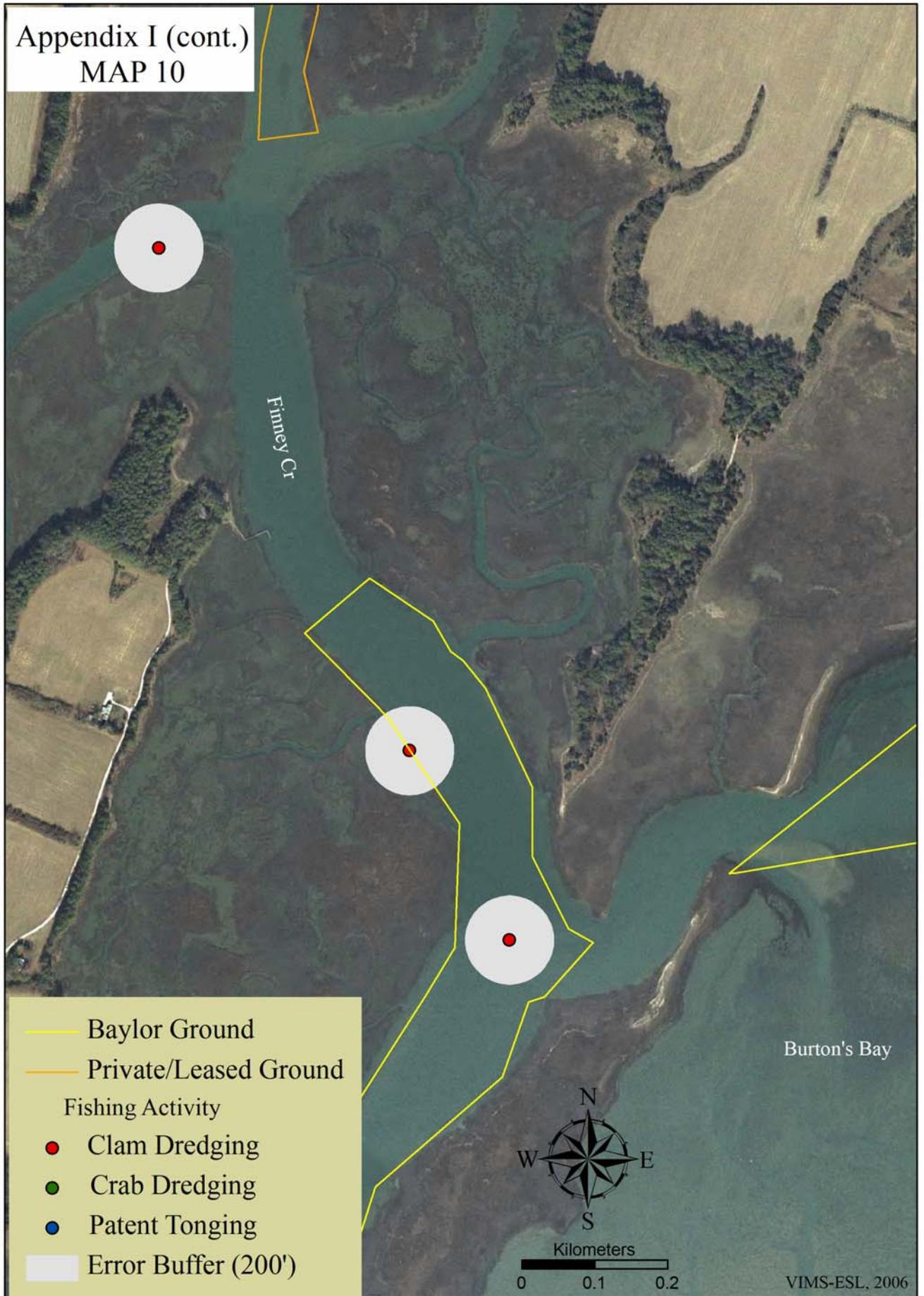
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VIMS-ESL, 2006

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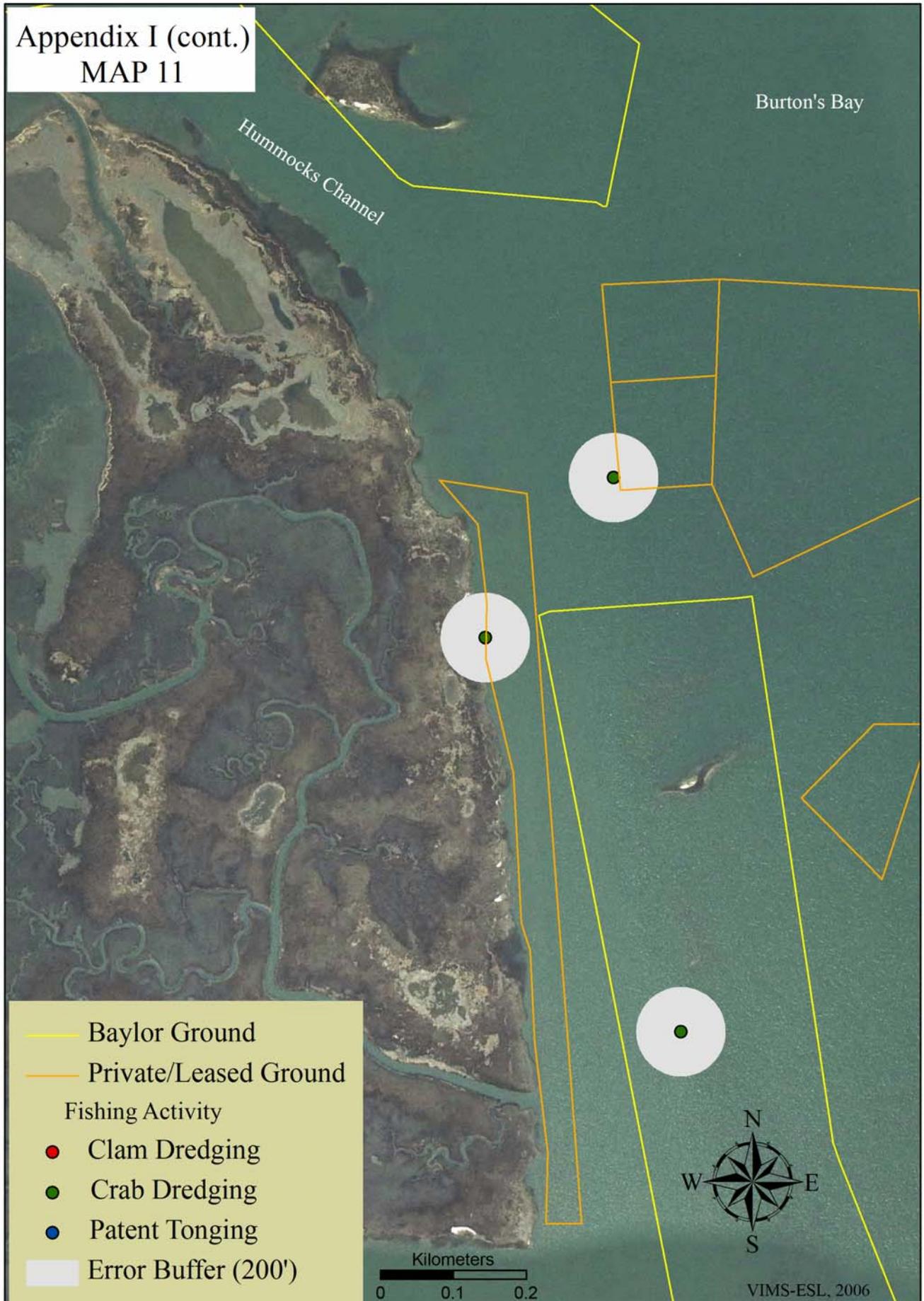
Appendix I (cont.)
MAP 10



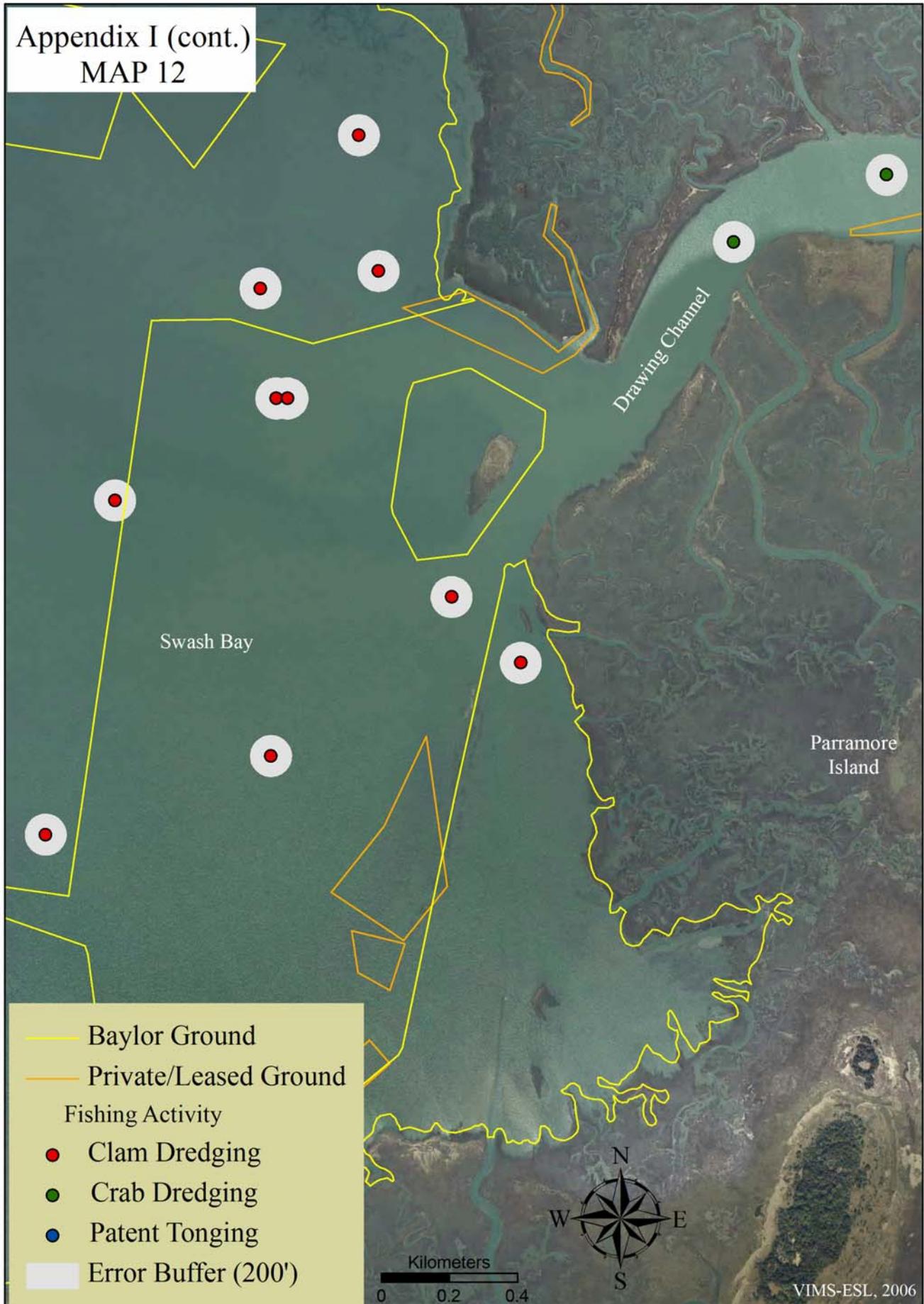
Aerial Imagery Copyright 2002, Commonwealth of Virginia

VIMS-ESL, 2006

Appendix I (cont.)
MAP 11



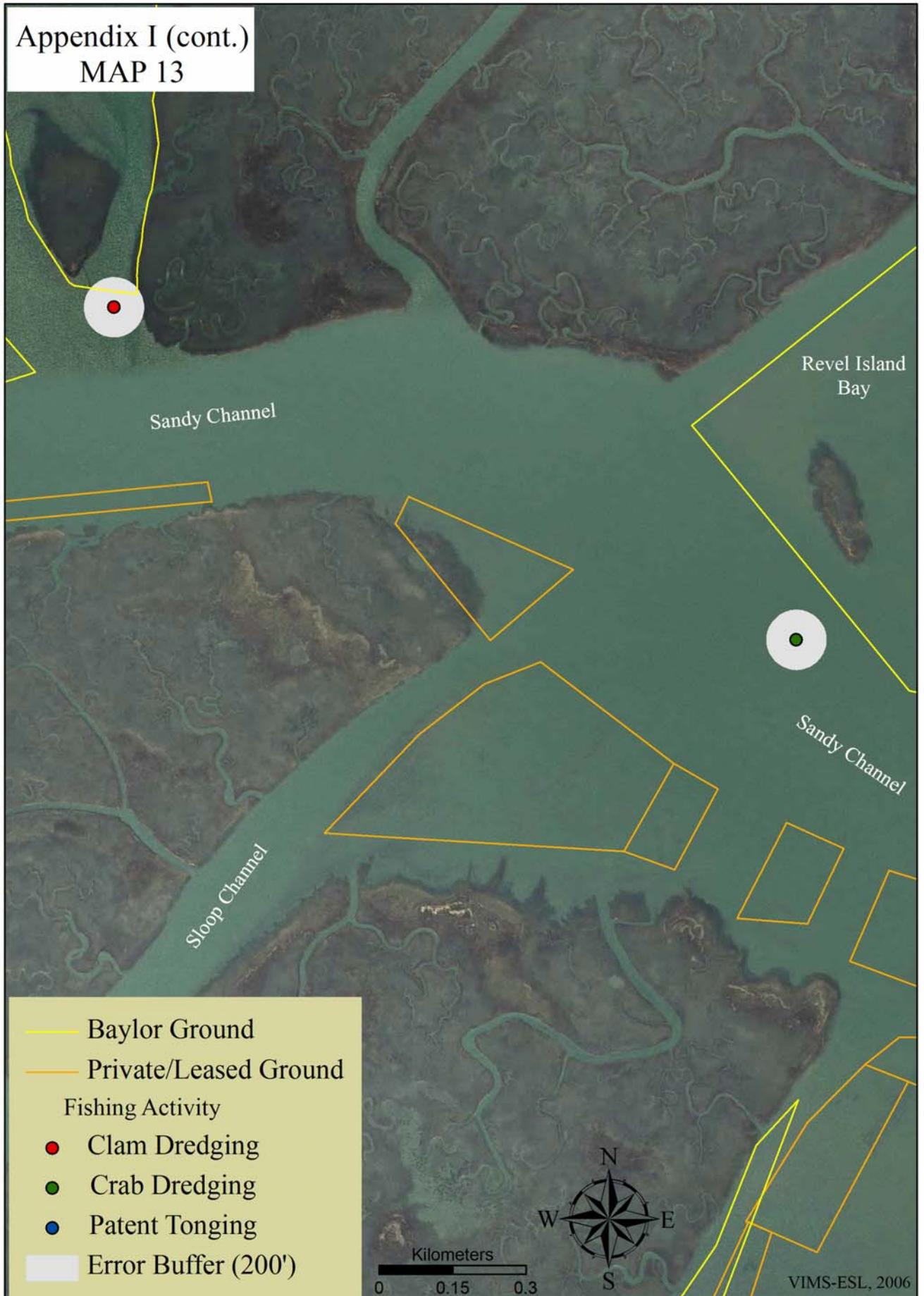
Appendix I (cont.)
MAP 12



Aerial Imagery Copyright 2002, Commonwealth of Virginia

VIMS-ESL, 2006

Appendix I (cont.)
MAP 13



Aerial Imagery Copyright 2002, Commonwealth of Virginia

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent TONGING
- Error Buffer (200')

Kilometers
0 0.15 0.3



VIMS-ESL, 2006

Appendix I (cont.)
MAP 14



Appendix I (cont.)
MAP 15



Aerial Imagery Copyright 2002, Commonwealth of Virginia

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent TONGING
- Error Buffer (200')

Kilometers
0 0.2 0.4

VIMS-ESL, 2006

Appendix I (cont.)
MAP 16



Rowes Hole Channel

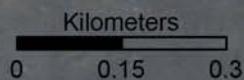


Little Easter Marsh

Cobb Island

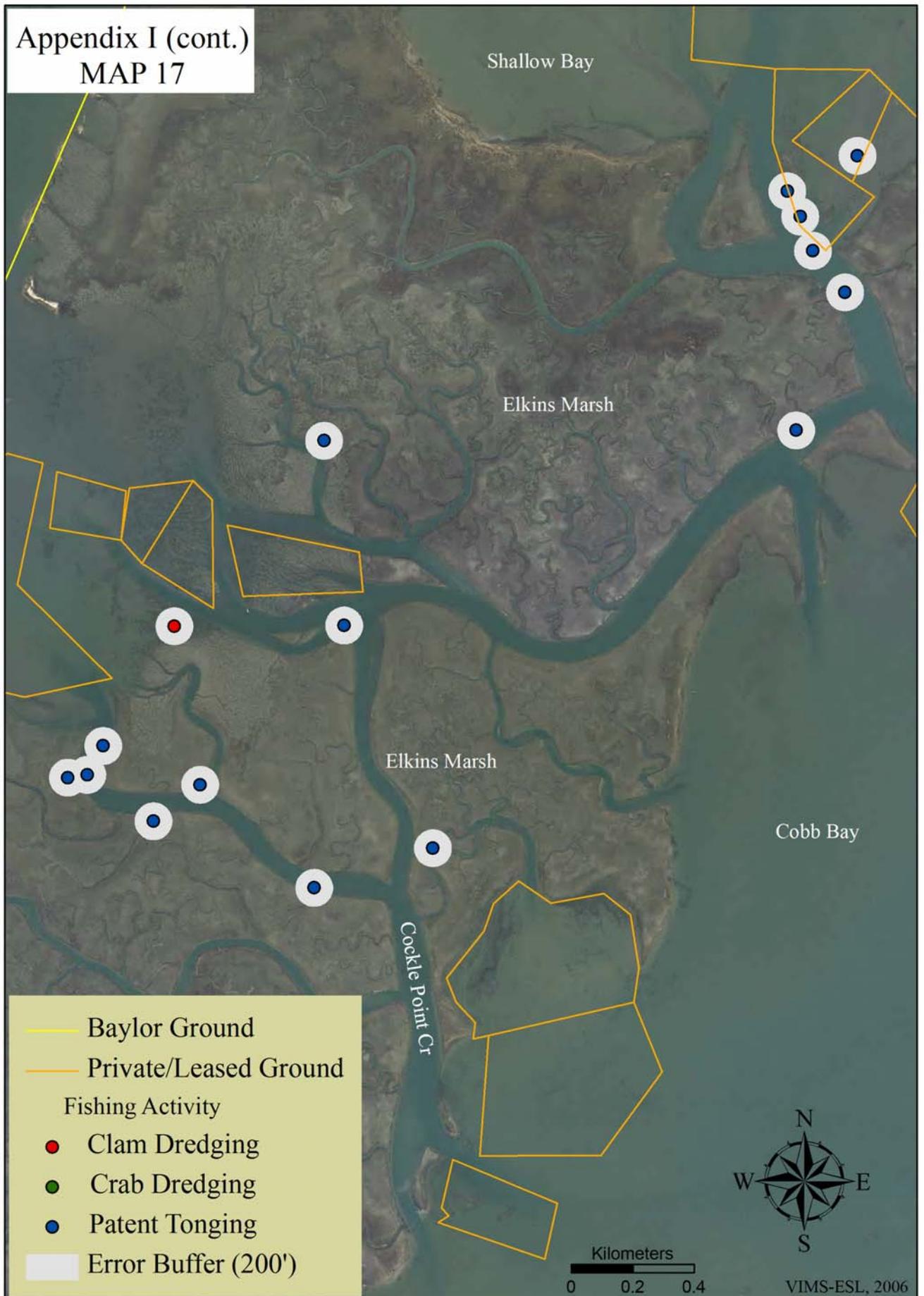
-  Baylor Ground
-  Private/Leased Ground
- Fishing Activity
 -  Clam Dredging
 -  Crab Dredging
 -  Patent TONGING
-  Error Buffer (200')

Aerial Imagery Copyright 2002, Commonwealth of Virginia



VIMS-ESL, 2006

Appendix I (cont.)
MAP 17



Appendix I (cont.)
MAP 18

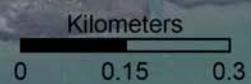


Ramshorn Channel

Elkins Marsh

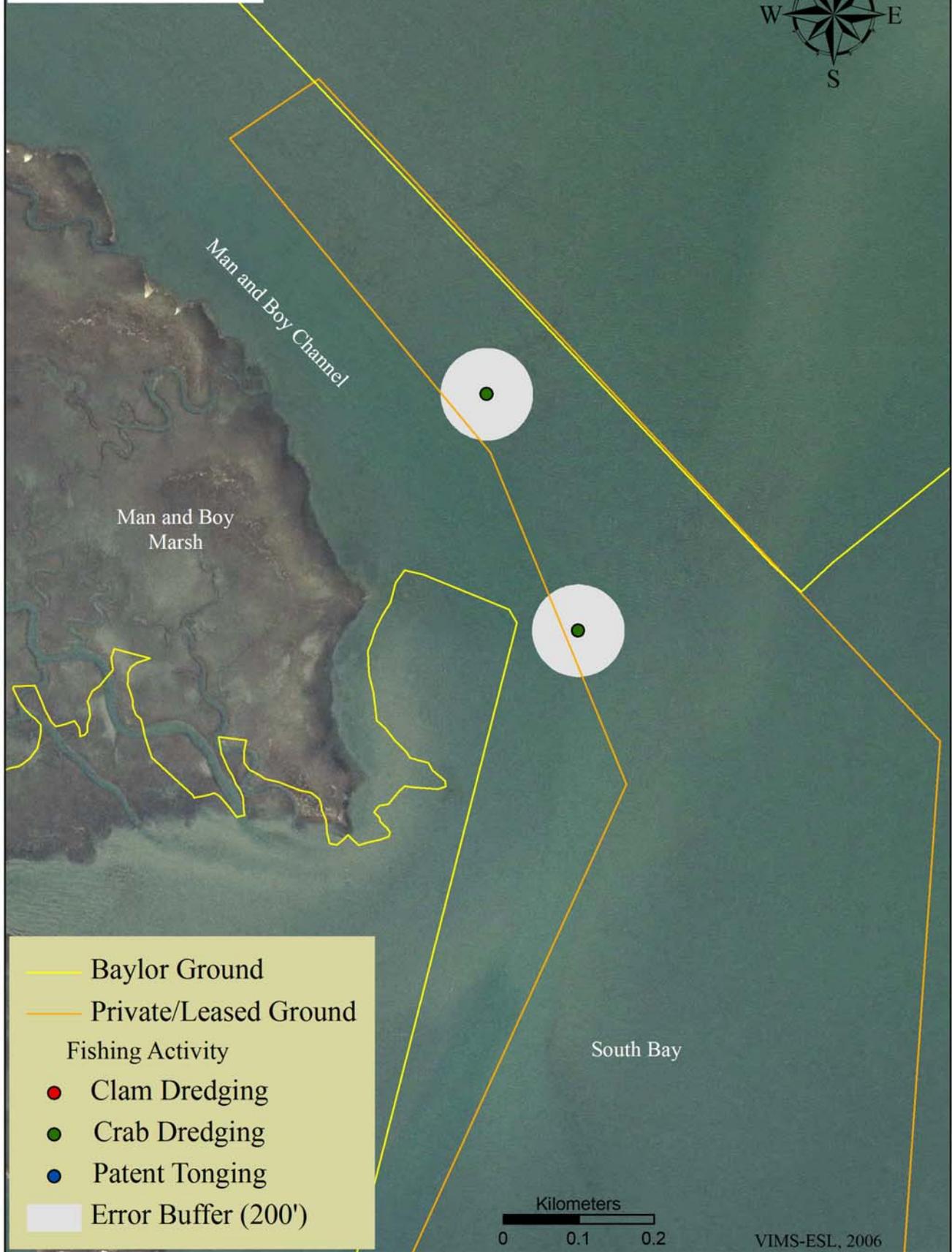
Sand Shoal Channel

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent Tonging
- Error Buffer (200')



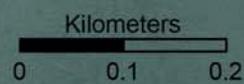
Aerial Imagery Copyright 2002, Commonwealth of Virginia

Appendix I (cont.)
MAP 19



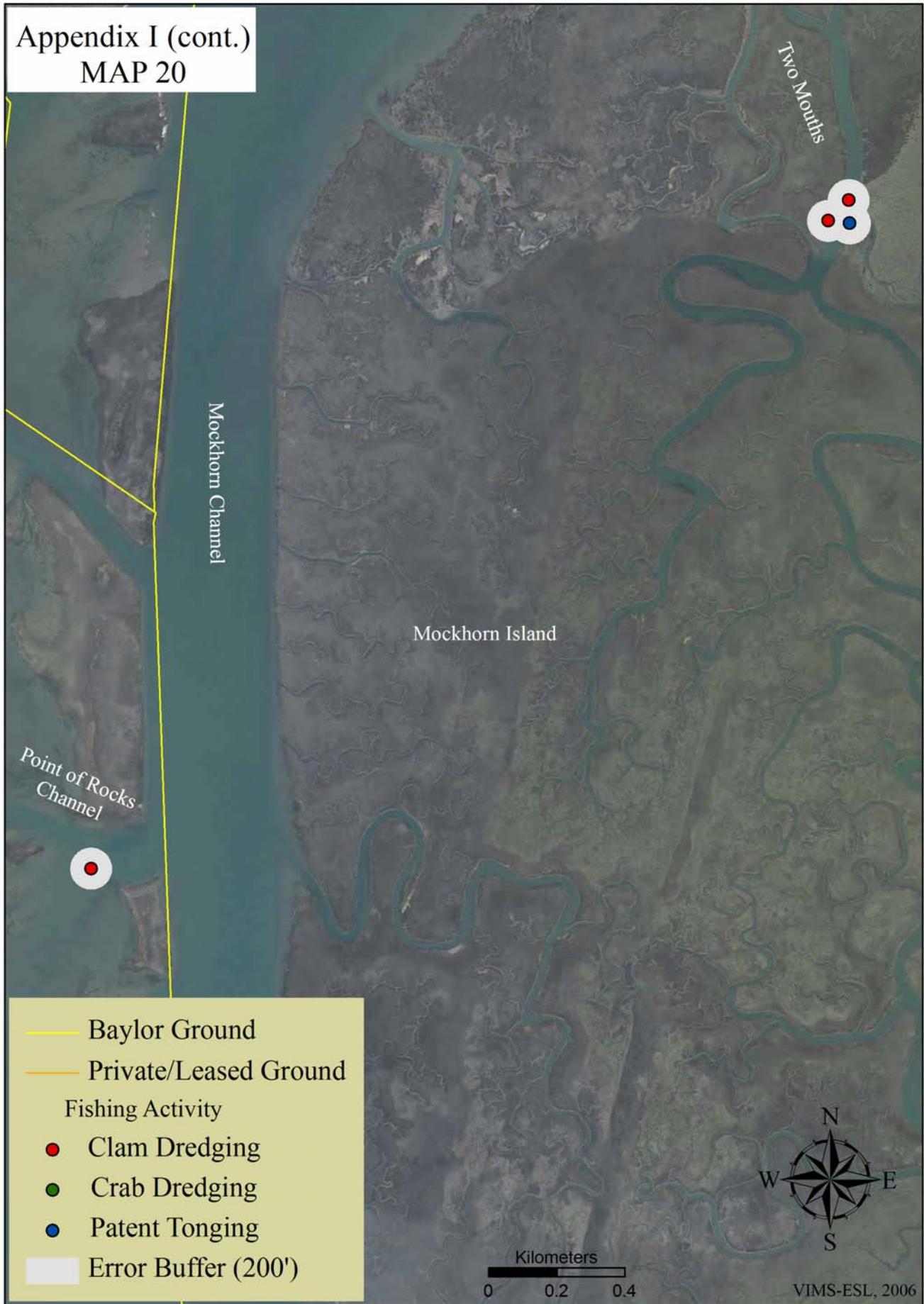
Aerial Imagery Copyright 2002, Commonwealth of Virginia

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent TONGING
- Error Buffer (200')



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Appendix I (cont.)
MAP 20



Aerial Imagery Copyright 2002, Commonwealth of Virginia

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent Tonging
- Error Buffer (200')

Kilometers
0 0.2 0.4



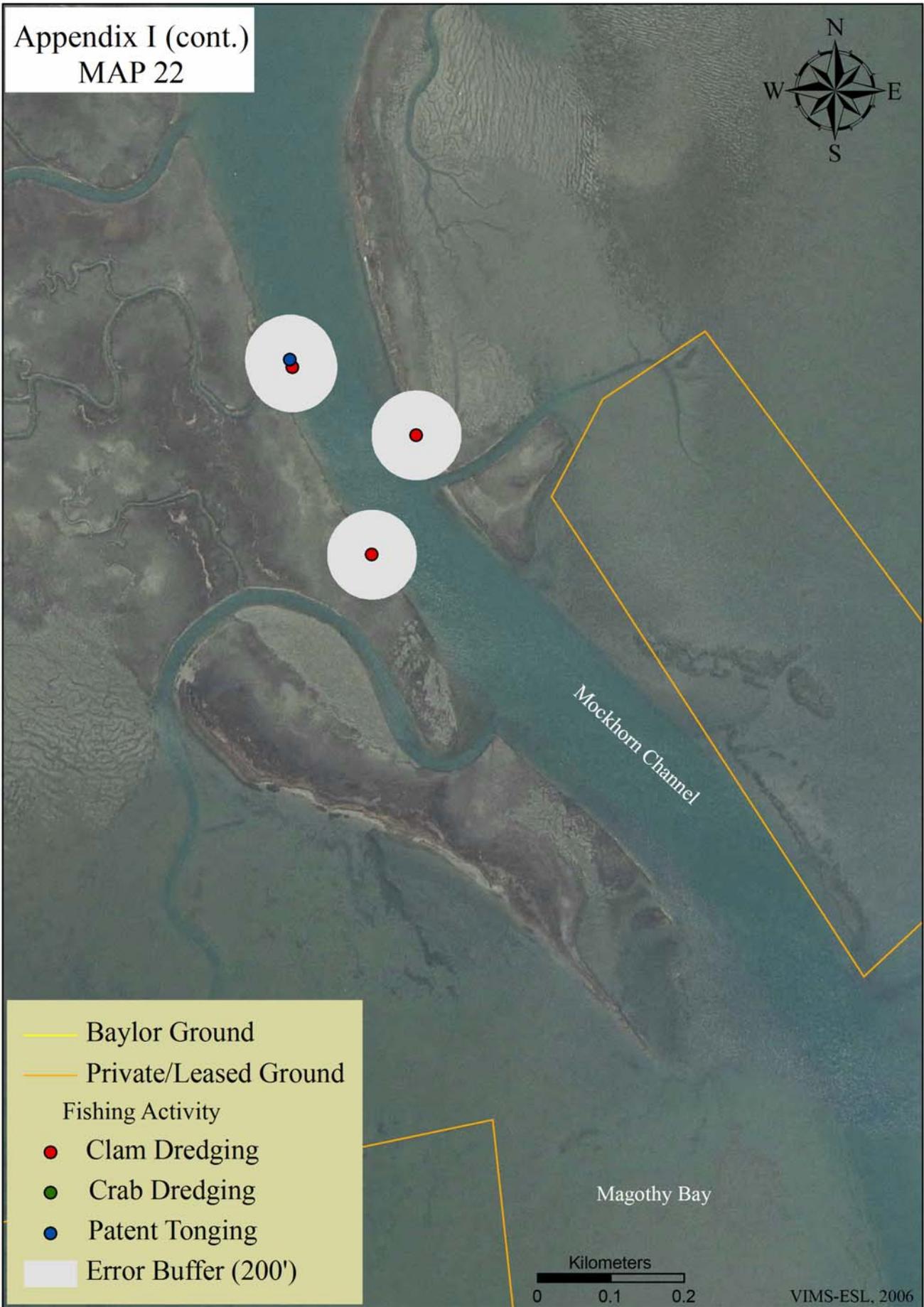
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Appendix I (cont.)
MAP 21



Aerial Imagery Copyright 2002, Commonwealth of Virginia

Appendix I (cont.)
MAP 22



Aerial Imagery Copyright 2002, Commonwealth of Virginia

- Baylor Ground
- Private/Leased Ground
- Fishing Activity
 - Clam Dredging
 - Crab Dredging
 - Patent Tonging
- Error Buffer (200')

Kilometers
0 0.1 0.2

VIMS-ESL, 2006

