Draft Environmental Assessment
and
Regulatory Impact Review
Regulatory Flexibility Act Analysis
of
Sea Turtle Conservation Measures
for the Pound Net Fishery
in Virginia Waters of the Chesapeake Bay

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National Marine Fisheries Service
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Table of Contents

1.0 INTRODUCTION 8
2.0 PURPOSE AND NEED FOR ACTION 8
2.1 Background 9
2.1.1 Sea Turtle Strandings in Virginia Waters 9
2.1.2 Monitoring and Regulatory Action in Response to Sea Turtle Strandings 10
2.1.3 New Information - Modified Pound Net Gear Experiment 13
3.0 ALTERNATIVES 16
3.1 Preferred Alternative (PA) 17
3.2 Non-preferred Alternative 1 (NPA 1): No Action/Status Quo Alternative 18
3.3 Non-preferred Alternative 2 (NPA 2) - Expanded Geographic Area of Pound Net Gear Restrictions 18
3.4 Non-Preferred Alternative 3 (NPA 3) – Gear Modification for Offshore Nets 18
3.5 Alternatives Considered but Rejected from Further Analysis 19
3.5.1 Pound Net Gear Restrictions from May 6 through November 30 each year 19
3.5.2 No Federal Regulations in the Pound Net Fishery 20
4.0 AFFECTED ENVIRONMENT 21
4.1 Fishery Resources 22
4.2 Threatened, Endangered and Protected Species 23
4.2.1 Protected Species Not Likely Affected 24
4.2.2 Threatened and Endangered Species Likely to be Affected 24
4.2.2.1 Loggerhead sea turtle 25
4.2.2.2 Kemp's ridley sea turtle 27
4.2.2.3 Green sea turtle 28
4.2.2.4 Leatherback sea turtle 30
4.2.2.5 Hawksbill sea turtle 31
4.2.2.6 Shortnose sturgeon 31
4.2.3 Marine Mammals 33
4.3 Birds 34
4.4 Habitat 35
4.5 Economic and Social Environment (including description of the fishery) 36
5.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES 39
5.1 Environmental Consequences of the Preferred Alternative 39
5.1.1 Impacts on Fishery Resources of the Preferred Alternative 39
5.1.2 Impacts on Endangered and Threatened Species of the Preferred Alternative 41
5.1.2.1 Historical Sea Turtle/Pound Net Interactions 42
5.1.2.2 Recent Sea Turtle/Pound Net Interactions (2001-2003) 42
5.1.2.3 Monitoring in 2004 45
5.1.2.4 2004 Modified Leader Experiment Results and Analysis of Modified Leader Components 45
5.1.2.5 Geographic Area and Environmental Conditions 51
5.1.2.6 Time Frame of the PA 51
5.1.2.7 Benefits to Sea Turtles 52
5.1.2.8 Other Endangered and Threatened Species 53
5.1.3 Impacts of the Preferred Alternative on Marine Mammals 54
5.1.4 Impacts on Birds of the Preferred Alternative 56
5.1.5 Impacts on Habitat of the Preferred Alternative 57
5.1.6 Economic Impacts of the Preferred Alternative 58
5.1.6.1 Comparison of All Management Alternatives 58
5.1.6.1.1 Benefits 59
5.1.6.1.2 Costs 60

5.1.6.2 Data and Methods Used in Economic Analysis of All Alternatives 60
5.1.6.2.1 Data 61
5.1.6.2.1.1 VRMC Landings Data 61
5.1.6.2.1.2 NEFSC Gear Survey 61
5.1.6.2.1.3 Leader Cost Data 64
5.1.6.2.2 Pound Net Fishery 66
5.1.6.2.3 Methods 69
5.1.6.2.3.1 Determination of number of pound nets by type 70
5.1.6.2.3.2 Calculation of potential revenue change 71
5.1.6.2.3.3 Decision to fish under regulations 73
5.1.6.3 Results of Economic Impacts for Preferred Alternative 74
5.1.6.3.1 Lower Bay 75
5.1.6.3.1.1 Offshore 75
5.1.6.3.1.2 Nearshore 75
5.1.6.3.1.3 Lower Bay Summary 75
5.1.6.3.2 Upper Bay 76
5.1.6.3.3 Summary for PA 76
5.1.7 Social Impacts of the Preferred Alternative 76
5.2 Environmental Consequences of NPA 1 (No Action/Status Quo Alternative) 77
5.2.1 Fishery Resource Impacts of NPA 1 77
5.2.2 Endangered and Threatened Species Impacts of NPA 1 78
5.2.2.1 Benefits to Sea Turtles 78
5.2.2.2 Other Endangered and Threatened Species 79
5.2.3 Marine Mammal Impacts of NPA 1 80
5.2.4 Bird Impacts of NPA 1 80
5.2.5 Habitat Impacts of NPA 1 81
5.2.6 Economic Impacts of NPA 1 81
5.2.7 Social Impacts of NPA 1 81
5.3 Environmental Consequences of NPA 2 - Expanded Geographic Leader Requirement and Leader Mesh Size Restriction 83
5.3.1 Fishery Resource Impact of NPA 2 83
5.3.2 Endangered and Threatened Species Impacts of NPA 2 83
5.3.2.1 Impacts to Sea Turtles of NPA 2 83
5.3.2.2 Other Threatened and Endangered Species 84
5.3.3 Marine Mammal Impacts of NPA 2 84
5.3.4 Bird Impacts of NPA 2 85
5.3.5 Habitat Impacts of NPA 2 85
5.3.6 Economic Impacts of NPA 2 85
5.3.6.1 Lower Bay 86
5.3.6.2 Upper Bay 87
5.3.6.3 Summary for NPA 2 87
5.3.7 Social Impacts of NPA 2 88
5.4 Environmental Consequences of NPA 3 – Gear Modification for Offshore Nets 88
5.4.2.1 Sea Turtle Impacts of NPA 3 88
5.4.2.2 Impacts to other Endangered and Threatened species 89
5.4.6.1 Lower Bay 90
5.4.6.2 Upper Bay 91
5.4.6.3 Summary for NPA 3 91
6.0 POTENTIAL CUMULATIVE EFFECTS 92
6.1 Impacts to Biological Resources 95
6.1.1 Vessel Operations 95

6.1.2 Fishery Operations 97
6.1.3 Dredging Activities 99
6.1.4 Marine Pollution/Water Quality 100
6.1.5 Anticipated Research 101
6.2 Past and Present Conservation and Recovery Actions Impacting Marine Resources 101
6.2.1 Outreach 101
6.2.2 STSSN 102
6.2.3 Protocol for Disentanglement 102
6.3 Economic and Social Environment 102
6.3.1 Cumulative Economic Impacts 104
6.3.1.1 2001 Impacts 104
6.3.1.2 2002 Impacts 105
6.3.1.3 2003 Impacts 106
6.3.1.4 2004 Rule 110
6.3.1.5 Lower Bay 111
6.3.1.5.1 Offshore pound nets 111
6.3.1.5.2 Nearshore pound nets 111
6.3.1.5.3 Summary lower Bay 111
6.3.1.6 Upper Bay 111
6.3.1.7 2006 Proposed Rule 112
6.3.1.8 Summary 112
Summary – Cumulative Impacts 113
7.0 APPLICABLE LAW 119
7.1. National Environmental Policy Act 119
7.1.1. Finding of No Significant Impact for Modification of Pound Net Leaders to Enhance Turtle Protection in Virginia 119
7.2. Endangered Species Act 124
7.3. Marine Mammal Protection Act 124
7.4. Paperwork Reduction Act (PRA) 124
7.5. Magnuson-Stevens Fishery Conservation and Management Act - Essential Fish Habitat 124
7.6. Administrative Procedure Act 124
7.7. Coastal Zone Management Act 124
7.8. EO 13132 (Federalism) 125
7.9. Information Quality Action (Section 515) 125
7.10. REGULATORY IMPACT REVIEW (RIR) 127
7.10.1. Executive Order (E.O.) 12866 127
7.10.1.1. Regulatory Costs to Pound Net Industry 129
7.10.1.2. Small Entity Impacts 131
7.10.1.2.1. Lower Bay 132
7.10.1.2.2. Upper Region 132
7.10.1.2.3. Industry Impacts 132
7.11. Initial Regulatory Flexibility Analysis 133
8.0 Contact Information 135
9.0 REFERENCES 136
Appendix A. Virginia Landings Data for 2003 and 2004 147
Appendix B. Landings data provided by the Virginia Marine Resources Commission show that the following species have been landed in pound nets 150
Appendix C. The cumulative effects analysis steps that were considered in the assessment of cumulative impacts of the PA 151

List of Tables

Table 1 Sea Turtle Strandings by Year 9
Table 2. Summary of turtle interactions with pound net leaders during the modified leader experiment in 2004 and 2005 16
Table 3. Chesapeake Bay, state waters, and ocean landings in the State of Virginia for May, June, and July 2004 by gear type. 23
Table 4. Entangled sea turtles observed during pound net leader monitoring in 2002 and 2003. 43
Table 5. Observed impingements during pound net leader monitoring in 2002 and 2003. 44
Table 6. Observer Effort 45
Table 7: Relationship between location within in Chesapeake Bay, location of nets relative to shore and leader type for four alternatives. All alternatives are for the period May 6 – July 15 each year. 58
Table 8. Number of pound nets identified in annual observer characterization and monitoring program of Virginia Chesapeake Bay, 2002-2004. ; Pound Net Regulated Area I closed to offshore leaders in 2004 regulations. 63
Table 9. Costs of fabrication and installation of modified leader, offshore versus near-shore pound nets. 64
Table 10. Number of pound net fishermen by area and season (number) 66
Table 11. Average pound nets fished per trip by area and season (number with CV in parentheses below) 67
Table 12. Industry landings and revenue for VA Chesapeake pound net fishermen from all sources. 67
Table 13. Total annual landings and revenue (January 1 – December 31) by species by pound net gear for regulated part of Chesapeake Bay, 1998-2004 (Landings (L) - '000 pounds, Revenue (R) in $'000) 68
Table 14. Average landings per fisherman from pound net fishing (lbs/year) for the entire year and the regulated period (May 6 – July 15), for the VA Chesapeake Bay overall, the upper Bay and the lower Bay (CV in parentheses) 69
Table 15. Average revenues per fisherman from pound net fishing (pounds/year) for the entire year and the regulated period (May 6 – July 15), for the VA Chesapeake Bay overall, the upper Bay and the lower Bay (CV in parentheses) 69
Table 16. Allocation of pound nets among fishermen in the upper and lower Bay areas by offshore and nearshore types, for May 6 – July 15 period. 71
Table 17. Average landings and revenues per pound net in the lower Chesapeake Bay, based on average harvest during May 6 - July 15 (1999-2003) and 2004 prices for period. 72
Table 18. Summary of Preferred Alternative (PA) changes in net revenues compared to status quo (NPA1) by area and total industry change, May 6 – July 15. 76
Table 19. Summary of Impacts of the Proposed Action and Alternatives 93
Table 20. Impacts of Past, Present, and Reasonably Foreseeable Future Non-Fishing Activities on Ecosystem Components 103
Table 21. Results of VMRC phone survey of pound net gear in 2001 identifying the number of active pounds with leader mesh less than 8 inches (LM<8"), between 8 and 12 inches, greater than 12 inches and leaders fished with strings by region. 105
Table 22. Impacts of Past and Present Actions on Resources Identified for this Action 107
Table 23. The ratio of harvesters affected by a rule to the number of harvesters active (percentage in parentheses) and the reduction in annual revenues per harvester as a result of the rule, by region of the bay and year 113
Table 24 Summary of Cumulative Impacts to Each Resource Component 117
Table 25. Comparison of four proposed alternatives in terms of number of fishermen in regulated period affected, and impact on average annual revenues by region 132
Table 26. Ratio of fishermen affected to the number of active fishermen during the regulated period, and the net increase in industry revenues (%), and ranking by increased benefits 133

List of Figures

Figure 1. Map showing statistical fishing areas, highlighting the eastern shore (area of high spring sea turtle strandings), and the location of the experimental pound net study. 12
Figure 2. Depiction of Standard/Traditional Pound Net Leader and Modified/Experimental Pound Net Leader 14
Figure 3. Depiction of modified leader, demonstrating height of mesh in relation to water level 15
Figure 4. Geographic Areas of the Alternatives 20
Figure 5. Depiction of Pound Net (FAO-Fish.Tech.Pap.222, p. 45) 37
Figure 6. Water body designations for the affected area 63

List of Acronyms

CFR	Code of Federal Regulations
EA	Environmental Assessment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FR	Federal Register
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson Stevens Fishery Conservation and Management Act
NEFSC	Northeast Fisheries Science Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPA	Non-preferred Alternative
OMB	Office of Management and Budget
PA	Preferred Alternative
PRA	Paperwork Reduction Act
RPM	Reasonable and Prudent Measure
SAV	Submerged Aquatic Vegetation
STSSN	Sea Turtle Stranding and Salvage Network
VAQ	Virginia Aquarium & Marine Science Center (formerly VMSM)
VEC	Valued Ecosystem Component
VIMS	Virginia Institute of Marine Science
VMRC	Virginia Marine Resources Commission
VMSM	Virginia Marine Science Museum

1.0 INTRODUCTION

High strandings of threatened and endangered sea turtles are documented on Virginia beaches each spring, which NOAA's National Marine Fisheries Service (NMFS) has reason to believe are associated in part with the migration of sea turtles into the Chesapeake Bay in the spring, and interactions with fishing gear, including pound net leaders, in the waters of the Chesapeake Bay. All sea turtles that occur in U.S. waters are listed as either endangered or threatened under the Endangered Species Act of 1973 (ESA). The Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) are listed as endangered. The loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered. Over the past several years, NMFS, in conjunction with state and local agencies, not-for-profit institutions and contracted researchers, has carried out both research and monitoring to investigate the cause of the spring strandings. Following the results of ongoing research and monitoring, NMFS is proposing to take action aimed at protecting sea turtles and allowing for the continued operation of the Virginia pound net fishery.

Under the ESA and its implementing regulations, taking sea turtles--even incidentally--is prohibited, with exceptions identified in 50 CFR 223.206 for threatened sea turtles. Under the ESA, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. The term incidental take refers to takings of endangered and threatened species that result from, but are not the purpose of, an otherwise lawful activity. The incidental take of endangered species may only legally be exempted by an incidental take statement or an incidental take permit issued pursuant to section 7 or 10 of the ESA. Existing sea turtle conservation regulations at 50 CFR 223.206(d) exempt the incidental take of threatened sea turtles in fishing activities and scientific research from the prohibition on takes under certain conditions.

2.0 PURPOSE AND NEED FOR ACTION

This action would be implemented under the authority of the ESA (Sections 4(d) and 11 (f)). It is appropriate for the conservation of threatened and endangered sea turtles and to enforce the provisions of the ESA, including the prohibition on takes of endangered sea turtles. This action is needed to respond to new information generated by research on modified pound net leaders while continuing to protect threatened and endangered sea turtles from entanglements in and impingements on Virginia pound net gear. While the current management measures for the Virginia pound net fishery have reduced sea turtle entanglements and impingements, new information is available to NMFS generated by an experiment involving the use of modified pound net leaders that has demonstrated a decrease in entanglements and impingements in pound net gear using the modified leaders.

The purpose of the action is to adapt current management measures to allow the pound net fishery to operate while continuing to reduce sea turtle mortality as a result of impingement on and entanglement in pound net gear in Virginia Chesapeake Bay waters. The proposed action

(preferred alternative) would require the use of modified pound net leaders for any offshore pound net leader set in an area of the Virginia waters of the mainstem Chesapeake Bay that is currently closed to pound net leaders in order to protect threatened and endangered turtles from incidental take in the Virginia pound net fishery during the spring and early summer of each year. Existing pound net leader restrictions for all nearshore leaders and in the remainder of management area would remain in place. This Environmental Assessment (EA) also analyzes several alternative management measures (in addition to the proposed action) to best incorporate the results of the experiment into the management measures of the Virginia pound net fishery.

2.1 Background

2.1.1 Sea Turtle Strandings in Virginia Waters

The Sea Turtle Stranding and Salvage Network (STSSN) has reported high sea turtle strandings in Virginia each spring for 25 years, most notably during the second half of May and the month of June. While the magnitude of the stranding event has increased over the past ten years, reaching an alarming 392 individual strandings in 2003 (Table 1), the stranding numbers declined in 2005. Most of the stranded sea turtles in Virginia have been threatened loggerheads, but endangered Kemp's ridley, hawksbill, leatherback and green sea turtles[1] have also stranded. The majority of the stranded turtles have been of the juvenile life stage.

Table 1 Sea Turtle Strandings by Year

Year	Total (Year)	May -June	May – July 15
1995	158	84	91
1996	164	85	99
1997	243	164	184
1998	294	183	199
1999	232	129	158
2000	293	161	180
2001	381	256	272
2002	321	180	203
2003	392	312	360
2004	360	192	215
2005	174	113	129

While the distribution of sea turtle strandings in Virginia varies slightly from year to year, there has been a high concentration of stranded sea turtles found along the Eastern shore in recent years. Pound nets are a primary fishing gear used along the southern portion of the Chesapeake

[1] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters. Pursuant to NMFS regulations set forth at 50 CFR 223.205, the prohibitions of Section 9 of the ESA apply to all green turtles, whether endangered or threatened.

Bay side of the Eastern shore. Available data indicate that pound net leaders result in sea turtle entanglement and impingements, and that the pound net fishery was a likely cause of sea turtle mortality in the Chesapeake Bay in previous springs (NMFS, 2004). While a cause and effect relationship between pound net interactions and high spring strandings cannot be statistically derived based on the available data, NMFS has documented that fishing with pound net leaders results in lethal and non-lethal takes of sea turtles. NMFS concluded that this constituted sufficient evidence to form the basis for past and current restrictions on pound net leaders.

2.1.2 Monitoring and Regulatory Action in Response to Sea Turtle Strandings

Action in 2002

Based on nature and location of turtle strandings, the type of fishing gear in the vicinity of the greatest number of strandings, the known interactions between sea turtles and large mesh and stringer pound net leaders, and several documented sea turtle entanglements in and impingements on pound net leaders, NMFS concluded that pound nets were a likely contributor to sea turtle strandings in Virginia in May and June 2001. As a result, based upon the best available information at that time, NMFS issued an interim final rule that prohibited the use of all pound net leaders measuring 12 inches and greater stretched mesh and all pound net leaders with stringers in the Virginia waters of the mainstem Chesapeake Bay and portions of the Virginia tributaries from May 8 to June 30 each year (67 FR 41196, June 17, 2002). Included in this interim final rule was a year-round requirement for fishermen to report all interactions with sea turtles in their pound net gear to NMFS within 24 hours of returning from the trip, which was enforceable after OMB approval pursuant to the Paperwork Reduction Act (PRA) was obtained on February 6, 2003 (OMB No. 0648-0470), and a year-round requirement for pound net fishing operations to be observed by a NMFS-approved observer if requested by the Northeast Regional Administrator. The interim final rule also established a framework mechanism by which NMFS could make changes to the restrictions and/or their effective dates on an expedited basis in order to further protect sea turtles by responding to new information, such as the entanglement of a sea turtle in a pound net leader.

NMFS continued to explore the potential mortality sources in Virginia waters during the spring, and also initiated a monitoring program to further evaluate the potential for interactions between sea turtles and pound net leaders. During NMFS pound net monitoring efforts in 2002 and 2003, sea turtle interactions in pound net leaders were documented. In 2002, NMFS monitored the active pound nets throughout the Virginia Chesapeake Bay from April 25 to June 1. Out of 98 nets characterized, 70 nets were actively fishing. A total of 394 surveys were completed on pound net leaders, and the number of times an individual leader was surveyed was dependent upon location and environmental characteristics. As the 2002 interim final rule was not yet in place, approximately 8 of the leaders surveyed had stretched mesh greater than or equal to 12 inches or leaders with stringers. Eleven sea turtles were found in pound net gear (9 loggerheads and 2 Kemp's ridleys), but not all of the mortalities could be attributed to interactions with pound nets. Four sea turtles were found entangled in leaders, including two dead Kemp's ridley and two dead loggerhead sea turtles. Based upon necropsy reports, constriction wounds, and the

magnitude of entanglement, entrapment in pound net leaders was determined to be the likely cause of death of these animals. Two additional loggerhead sea turtles were found alive, impinged on the leader with their head and front flippers through the net. These two animals were observed as not being able to swim off of the leaders under their own ability. One moderately decomposed loggerhead was found entangled in the top line of a leader, but when observed, it was inconclusive as to whether the turtle was entangled before death or whether it washed into the net after having died elsewhere. The turtle's status was inconclusive because the turtle's head and carapace were through the net and it looked entangled, but there were not tight multiple wraps around the turtle. Four moderately to severely decomposed loggerheads were found in leaders, but due to their decomposition state and lack of entanglement in the mesh, it appeared that the animals floated into the nets. These four sea turtles were not considered as entangled in or impinged on the pound net leaders. Five of the 11 incidents involved leaders measuring 18 inches stretched mesh, 4 incidents were in leaders with 14 inch stretched mesh, 1 turtle was found entangled in an 8 inch stretched mesh leader, and 1 turtle was found entangled in a stringer leader. Most of the animals were found in the Eastern Chesapeake Bay but one turtle was found in the Western Bay.

The pound net monitoring efforts represent a minimum record of potential sea turtle entanglements and/or impingements. The sampling effort was confined to two boats in 2002 and one vessel during 2003, and each net could not be sampled during every tidal cycle, every hour, or even every day. Some impingements, and some entanglements, were likely missed. Further, sea turtle interactions in pound net leaders are difficult to detect. The sea turtles observed in leaders were found at depths ranging from the surface to approximately 6 feet under the surface of the water. The ability to observe a turtle below the surface depends on a number of variables, including water clarity, sea state, and weather conditions. Generally, turtles entangled a few feet below the surface cannot be observed due to the poor water clarity in the Chesapeake Bay. In several instances in 2002 and 2003, due to tide state and water clarity, even the top line of the leader was unable to be viewed.

Action in 2003

From April 21 to June 11, 2003, NMFS monitored pound net leaders with stretched mesh measuring less than 12 inches. This monitoring effort resulted in the documentation of 17 sea turtles found in pound net leaders. The first documented sea turtle was found impinged on a pound net leader on May 11, and sea turtles were documented in leaders through June 11 when the NMFS monitoring program ended. In total, 12 sea turtles were found held against, or impinged on, pound net leaders by the current. Of these 12 impingements, 10 were threatened loggerhead sea turtles (one of which was dead), one was an endangered Kemp's ridley sea turtle (alive), and one sea turtle's species identification was unable to be determined. Of the 17 sea turtles, five sea turtles were entangled in pound net leaders, of which two were loggerheads (one dead) and three were Kemp's ridleys (two dead). NMFS believed that there was sufficient information to conclude that the death of these turtles was attributable to entanglement in the pound net leaders given the degree of entanglement and multiple wrapping of line around their flippers, their decomposition state (fresh dead to moderately decomposed), and their buoyancy

(negatively buoyant, which typically suggests recent mortality). Eleven of the 17 total incidents involved leaders measuring 11.5 inches stretched mesh, while six of the sea turtles were entangled or impinged in 8 inch stretched mesh leaders. Most of the observed sea turtles were found in nets along the Eastern shore of Virginia (Figure 1), but two turtles were found in leaders in the Western Bay.

As a result of monitoring results obtained during the spring of 2003, NMFS issued a temporary final rule restricting all pound net leaders throughout the Virginia Chesapeake Bay and portions of the tributaries from July 16 to July 30, 2003, pursuant to the framework mechanism of the 2002 interim final rule (68 FR 41942, July 16, 2003). The rule was enacted because the framework trigger had been met (i.e., one turtle entangled in a leader) and it was apparent that the current restrictions were not protecting sea turtles to the extent intended.

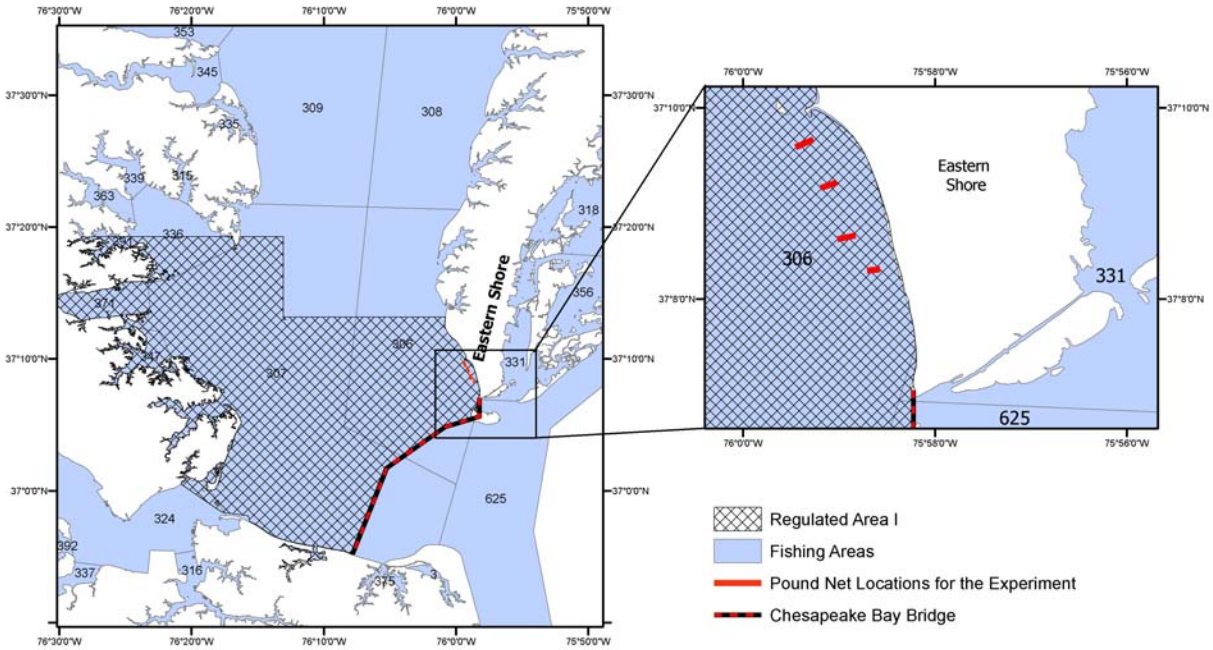

Figure 1. Map showing statistical fishing areas, highlighting the eastern shore (area of high spring sea turtle strandings), and the location of the experimental pound net study.

Action in 2004

The purpose of conducting rulemaking in 2002, 2003 and 2004 was to reduce sea turtle entanglements and impingements in Virginia pound net gear. The documented interactions between sea turtles and pound net leaders, as well as the annual Virginia spring strandings, were, and continue to be, of concern for the following reasons: (1) all of the affected animals are listed as either endangered or threatened under the ESA, which means these species are in danger of extinction or are likely to become endangered in the foreseeable future; (2) the level of strandings

in Virginia have been elevated the last seven years, and there is no reason to believe that high spring strandings will abate in subsequent years without continued monitoring, research and regulatory action; (3) sea turtles have been observed entangled in unmodified leaders; (4) sea turtles have been observed impinged on unmodified leaders by the current and impingements are likely to continue to occur on unmodified small mesh leaders in areas where impingements have been documented; (5) the greatest percentage of strandings in recent years has been along the southern tip of the Eastern shore, where a large number of pound nets are located; (6) approximately 50% of the Chesapeake Bay loggerhead foraging population is composed of the northern subpopulation, a subpopulation that may be declining; and (7) most of the stranded turtles have been juveniles, a life stage found to be critical to the long term survival of the species.

To address these concerns and to address the information collected in 2002 and 2003, NMFS published a final rule on May 5, 2004 that prohibited all offshore leaders, south of 37° 19.0' N. lat. and west of 76° 13.0' W. long., and all waters south of 37° 13.0' N. lat. to the Chesapeake Bay Bridge Tunnel (approximately 37° 02' N. lat., 76° 05' W. long.) at the mouth of the Chesapeake Bay. The closure extended into the James River downstream of the Hampton Roads Bridge Tunnel (I-64) and in the York River downstream of the Coleman Memorial Bridge (Route 17). For the purposes of this proposed rule, this area will be called "Pound Net Regulated Area I." Offshore leaders are defined as those nets set with the inland end of their leader greater than 10 horizontal feet from the mean low water line. Additionally, the rule retained status quo outside this closed area, which for the purposes of this proposed action, will be called "Pound Net Regulated Area II," and prohibited all leaders with stretched mesh greater than or equal to 12 inches and leaders with stringers. The area where this leader restriction was in effect included the Virginia waters of the Chesapeake Bay outside the aforementioned Pound Net Regulated Area I and applied to nets set with the inland end of the leader 10 horizontal feet or less from the mean low water line. The measures included in this action are in effect from May 6 to July 15 each year.

The 2004 rule also contained a framework mechanism. This enables NMFS to make changes to the restrictions based upon new information, and extend the effective date of the restrictions until July 30 on an expedited basis. The framework mechanism is necessary to respond to any new information on the interactions between sea turtles and pound nets and ensure that sea turtles can be protected from additional take. NMFS recognizes that delays have been experienced with the framework mechanism, as observed in 2003. To alleviate some of the temporal delays associated with the issuance of a framework measure, NMFS will prepare portions of the required documents ahead of time, in the event that a framework action is necessary.

2.1.3 New Information - Modified Pound Net Gear Experiment

Subsequent to the implementation of the 2004 final rule prohibiting the use of pound nets in an area of Chesapeake Bay, a modified pound net leader, designed to reduce sea turtle entanglement and impingement, was tested within the area closed to pound net leaders in 2004 and 2005 (Pound Net Regulated Area I). Traditional pound nets are fixed gear that uses a leader,

effectively a fence of diamond shaped webbing (i.e. mesh), with mesh sizes up to 30 cm (roughly just less than 12 inches). The leader is attached to poles affixed to the seabed and is used to direct fish into the pound, or trap, of the gear. The leader section of the pound net is oriented perpendicular to shore and generally range in length from 150 to 350 m. The Code of Virginia § 28.2-307 restricts the length of fixed fishing gear to 1,200 feet (365.8 m). The pound section of the gear is located at the offshore end of the leader in deeper water. The modified pound net leader design used in the experiment (Figure 2) consisted of a combination of mesh and stiff vertical lines. The mesh size was equal to or less than 8 inches (20.3 cm). The mesh was positioned at a depth that was no more than one third the depth of mean low water (Figure 3). The vertical lines were 5/16 inches (0.8 cm) in diameter strung vertically at a minimum of every 2 feet (61 cm). The vertical lines rose from the top of the mesh up to a top line to which they were attached. The stiffness of the vertical lines in the modified leader was achieved by coating them with paint (2004) and using painted, twisted, hard lay lines (2005). The design was based on the premise that the sea turtles would pass through the upper 2/3 of the leader, through the stiff vertical lines, without entangling in or impinging on the leader.

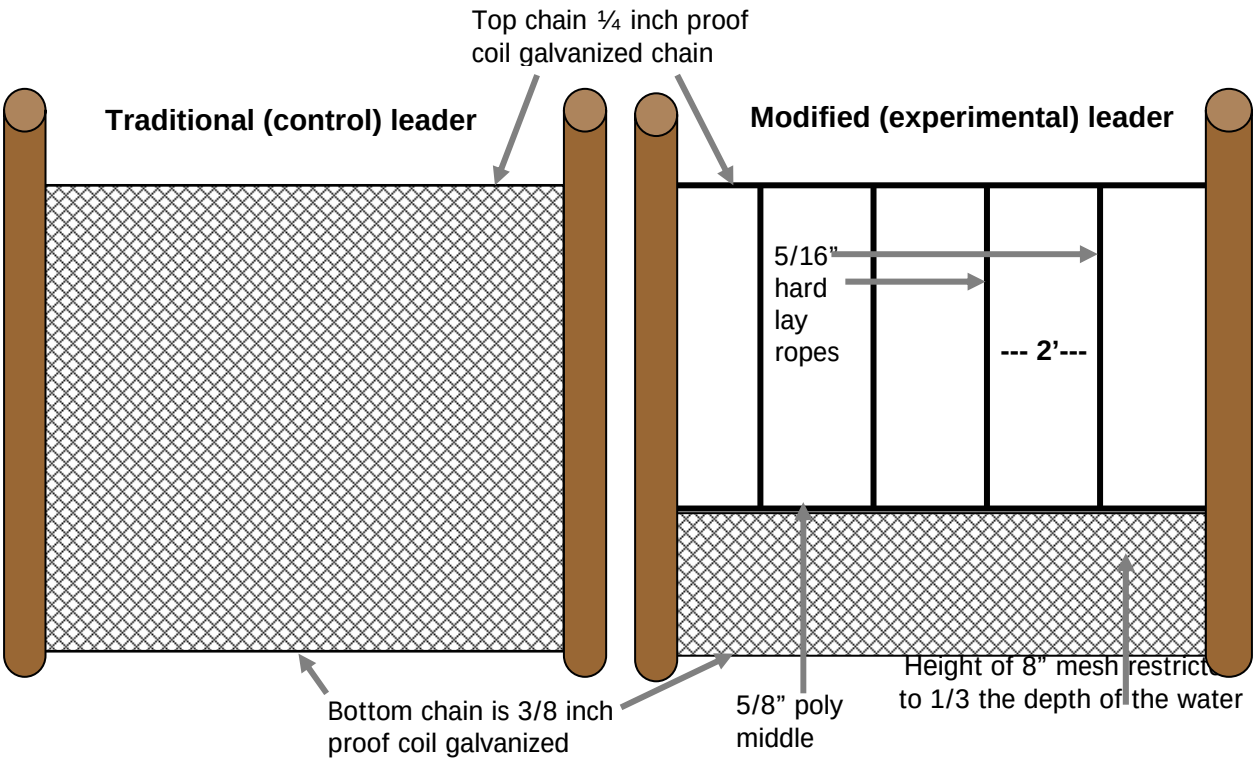

Figure 2. Depiction of Standard/Traditional Pound Net Leader and Modified/Experimental Pound Net Leader

In 2004, the gear was tested for 42 days in May and June by two pound net fishermen using nets near Kiptopeke, VA. Four offshore pound net leaders and two nearshore pound net leaders were used in the study. The four offshore pound nets were alternatively rigged with modified and unmodified leaders. The two nearshore pound nets were rigged with unmodified leaders. All

pound net leaders were monitored at least twice each day using visual and side scan sonar inspection to detect sea turtle interactions for a total of 1,568 observations over the 42 day study period. Unmodified leaders are leaders that consist only of mesh from the seabed to the top line near the surface of the water (Figure 2). A total of 61 individual pound net heart catch observations were made during the study period. While statistical analysis of turtle interactions was not conducted due to the limited number of replicated experiments, the interaction rate on the unmodified leader (8 interactions) was sevenfold greater than the rate of interaction in the modified leader (DeAlteries et al., 2004). One leatherback turtle was entangled in a modified leader (refer to discussion in Section 5.1.2.4). However, there were no interactions with hardshell sea turtles and the modified leader (Table 2). Similarly, while the limited observations from comparison of the modified and unmodified leader prevented statistical analysis of the study results, overall comparison for the catch of four finfish species (weakfish, croaker, threadfin shad, and harvestfish) observed suggested that the modified leader design caught similar quantities and size distributions of finfish as the unmodified leader design (DeAlteries et al., 2004).

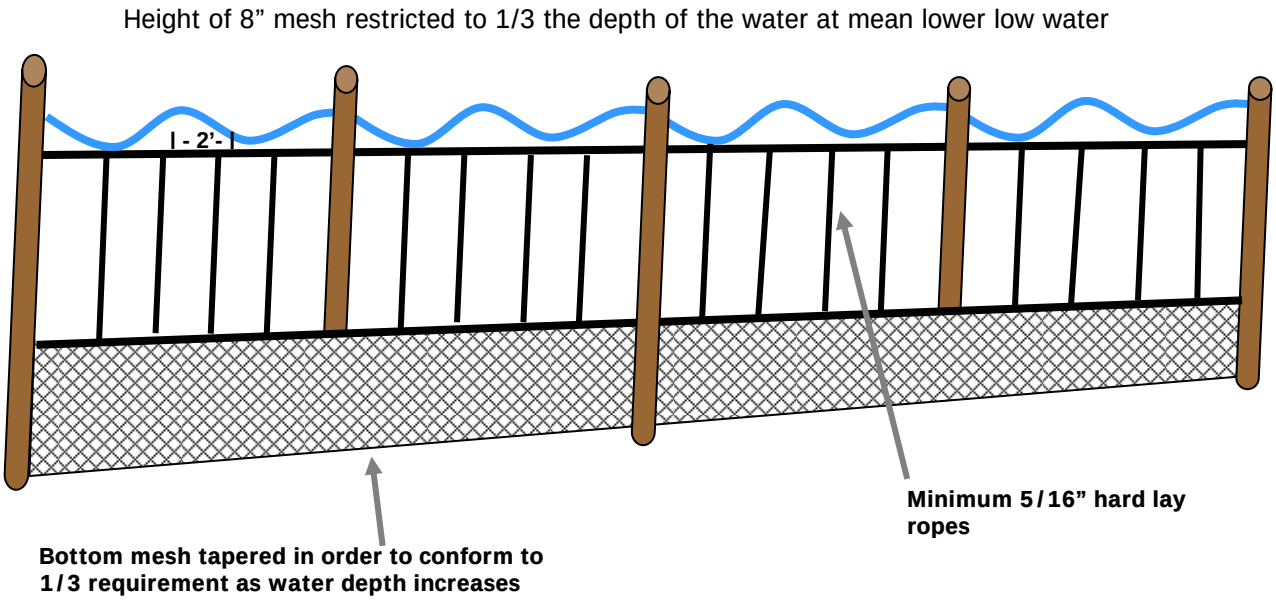

Figure 3. Depiction of modified leader, demonstrating height of mesh in relation to water level

In 2005, four offshore pound net leaders were tested for 55 days from May 6 through June 29. The nets were rigged alternatively with modified and unmodified leaders and were monitored twice daily for sea turtle interactions using visual and side scan sonar. A total of 2,208 observations of the leader were made. Fifty-four pound net heart catch observations were conducted in addition to the twice daily monitoring of the pound net leaders. During this period, 15 sea turtles were observed to have interacted with the leaders of the pound nets (Table 2), 5 dead sea turtles were observed floating in the vicinity of the study area, and 3 live sea turtles were observed in the heads of pound nets. Of the 15 turtles observed to interact with the leaders

of pound nets, all were captured in unmodified leaders. During the last 25 days of the 2005 study, the unmodified leaders were removed (the modified leaders were not) because the takes of sea turtles in the unmodified leaders exceeded the amount allowed under the ESA permit authorizing the study. When the unmodified leaders were removed, the ability to compare the performance of the modified leader to the unmodified leaders was lost during this 25 day period. However, sea turtles were known to be present in the area during this 25 day period and no sea turtles were observed to interact with a pound net leader using the modified leader design (DeAlteris, et al., 2005).

Because the results of the experiment testing the modified gear generated new information regarding pound net and turtle interactions, NMFS has initiated rulemaking to evaluate the impacts of requiring the use of the modified gear in any leaders set in Virginia waters of Chesapeake Bay, and to compare the environmental impacts of requiring the use of the modified gear to other alternatives, such as maintaining the current management measures.

Table 2. Summary of turtle interactions with pound net leaders during the modified leader experiment in 2004 and 2005

Date	Species	Leader Type	Interaction	Location of Interaction	Condition
5/15/04	Kemp's ridley	Control	Entangled	Right front flipper	Dead
5/17/04	Kemp's ridley	Control	Entangled	Right front flipper	Dead
5/17/04	Loggerhead	Control	Entangled	Left front flipper	Dead
5/18/04	Loggerhead	Control	Impinged	--	Alive
5/19/04	Kemp's ridley	Control	Entangled	Left front flipper	Dead
5/21/04	Loggerhead	Control	Entangled	Flipper and neck	Alive
6/21/04	Loggerhead	Control	Entangled	Unknown	Dead
6/23/04	Leatherback	Modified	Entangled	Left front flipper	Dead
5/24/05	Loggerhead	Control	Entangled	Left front flipper	Dead
5/27/05	Kemp's ridley	Control	Entangled	Right read flipper	Dead
5/31/05	Loggerhead	Control	Entangled	Front flippers	Alive
5/31/05	Loggerhead	Control	Entangled	Right front flipper, head	Dead
5/31/05	Kemp's ridley	Control	Entangled	Left front flipper	Dead
5/31/05	Loggerhead	Control	Entangled	Unknown	Dead
5/31/05	Loggerhead	Control	Entangled	Front flippers	Alive
5/31/05	Loggerhead	Control	Other, likely impinged	Left front flipper	Dead
5/31/05	Loggerhead	Control	Other, likely impinged	Left front flipper	alive
6/1/05	Kemp's ridley	Control	Other, likely impinged	Unknown	Alive
6/1/05	Kemp's ridley	Control	Entangled	Left front flipper	Dead
6/1/05	Loggerhead	Control	Entangled	Left front flipper	Dead
6/2/05	Loggerhead	Control	Entangled	Left front flipper	Dead
6/2/05	Kemp's Ridley	Control	Entangled	All four flippers, head	Alive
6/4/05	Kemp's ridley	Control	Entangled	Left front flipper, head	Dead

3.0 ALTERNATIVES

Several alternatives are considered to address new information regarding the use of modified pound net gear to reduce potential sea turtle interactions with pound net leaders in Virginia waters of the Chesapeake Bay. The alternatives considered are within the scope of NMFS' authority and are technically feasible. NMFS utilized all available scientific data to develop the Preferred Alternative (PA) and the Non-Preferred Alternatives (NPAs) described below. All of

the alternative considered, aside from the no action alternative, propose a non-substantive, technical change to the definition of the pound net regulated areas that would merely apply titles to the areas to reduce confusion. The following definitions apply to the alternatives:

Pound net leader means a long straight net that directs the fish offshore towards the pound, an enclosure that captures the fish. Some pound net leaders are all mesh, while others have stringers and mesh. An *offshore pound net leader* refers to a leader with the inland end set greater than 10 horizontal feet (3 m) from the mean low water line. A *nearshore pound net leader* refers to a leader with the inland end set 10 horizontal feet (3 m) or less from the mean low water line.

Pound net s*tringers* are vertical lines in a pound net leader that are spaced a certain distance apart and are not crossed by horizontal lines to form mesh.

Modified pound net leader: A pound net leader that is (1) affixed to or resting on the sea floor; (2) made of a lower portion of mesh and an upper portion of only vertical lines such that–(a) the mesh size is equal to or less than 8 inches (20.3 cm) stretched mesh; (b) the height of the mesh from the seafloor at any particular point must be no more than one-third the depth of the water at mean lower low water directly above that particular point; (c) the mesh is held in place by vertical lines that extend from the top of the mesh up to a top line, which is a line that forms the uppermost part of the pound net leader; (d) the vertical lines are equal to or greater than 5/16 inch (0.8 cm) in diameter and strung vertically at a minimum of every 2 feet (61 cm); and (e) the vertical lines are hard lay lines.

Pound Net Regulated Area I: Virginia waters of the mainstem Chesapeake Bay, south of 37°19.0' N. lat. and west of 76°13.0' W. long., and all waters south of 37°13.0' N. lat. to the Chesapeake Bay Bridge Tunnel (extending from approximately 37°05' N. lat., 75°59' W. long. to 36°55' N. lat., 76°08' W. long.) at the mouth of the Chesapeake Bay, and the portion of the James River downstream of the Hampton Roads Bridge Tunnel (I–64; approximately 36°59.55' N. lat., 76°18.64' W. long.) and the York River downstream of the Coleman Memorial Bridge (Route 17; approximately 37°14.55' N. lat, 76°30.40' W. long.) (Figure 4).

Pound Net Regulated Area II: Virginia waters of the Chesapeake Bay outside the area described above, extending to the Maryland-Virginia State line (approximately 37°55' N. lat., 75°55' W. long.), the Great Wicomico River downstream of the Jessie Dupont Memorial Highway Bridge (Route 200; approximately 37°50.84' N. lat, 76°22.09' W. long.), the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3; approximately 37°37.44' N. lat, 76°25.40' W. long.), and the Piankatank River downstream of the Route 3 Bridge (approximately 37°30.62' N. lat, 76°25.19' W. long.) to the COLREGS line at the mouth of the Chesapeake Bay (Figure 4).

3.1 Preferred Alternative (PA)

Under this alternative, NMFS would issue a rule that would require any offshore pound net leader set in Pound Net Regulated Area I to be a modified pound net leader (as defined above)

during the period from May 6 through July 15 each year. The proposed rule would not change current leader restrictions that apply to any pound net leader in Pound Net Regulated Area II and any nearshore pound net leader in Pound Net Regulated Area I. The modified leader would be prohibited from being used in Pound Net Regulated Area II and in any nearshore pound net in Pound Net Regulated Area I.

The proposed rule does not change the existing framework mechanism. Under this framework mechanism, NMFS may make changes to the restrictions and/or their effective dates on an expedited basis in order to respond to new information and protect sea turtles. For instance, under this framework mechanism, if NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after July 15 of any given year, the AA may extend the effective dates of the restrictions established by the regulations (not to extend beyond July 30). Additionally, if monitoring of pound net leaders during the time frame of the gear restriction, May 6 through July 15 of each year, reveals that one sea turtle is entangled alive in a pound net leader or that one sea turtle is entangled dead and NMFS determines that the entanglement contributed to its death, then NMFS may determine that additional restrictions are necessary to conserve sea turtles and prevent entanglements.

The proposed rule would not change the year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(10)(iii) and (iv).

3.2 Non-preferred Alternative 1 (NPA 1): No Action/Status Quo Alternative

Under this alternative, which refrains from taking any additional action, the pound net measures currently in place at 50 CFR 206(d) would remain in effect.

Specifically, any offshore pound net leader in Pound Net Regulated Area I must be removed from the water from May 6 through July 15 each year. Any pound net leader in Pound Net Regulated Area II and any nearshore pound net leaders in Pound Net Regulated Area I must have mesh size less than 12 inches stretched mesh and may not employ stringers from May 6 through July 15 each year.

3.3 Non-preferred Alternative 2 (NPA 2) - Expanded Geographic Area of Pound Net Gear Restrictions

Any pound net leader in Pound Net Regulated Area I or II during the period from May 6 through July 15 each year would be required to be a modified pound net leader.

This alternative would not change the framework mechanism and year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(10)(iii), (iv) and (v).

3.4 Non-Preferred Alternative 3 (NPA 3) – Gear Modification for Offshore Nets

Any offshore pound net leader in Pound Net Regulated Area I or II during the period from May 6 through July 15 each year would be required to be a modified pound net leader. Any nearshore pound net leaders in Pound Net Regulated Area I or II during the period from May 6 through July 15 each year must have mesh size less than 12 inches (30.5 cm) stretched mesh and may not employ stringers.

This alternative would not change the framework mechanism and year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(10)(iii), (iv) and (v).

3.5 Alternatives Considered but Rejected from Further Analysis

3.5.1 Pound Net Gear Restrictions from May 6 through November 30 each year

This alternative is the same as the PA with a modification of the effective dates. The gear restrictions would be in effect from May through November which coincides with the time when the majority of sea turtles are found in this area. Under this alternative, NMFS would issue a rule that would require during the time period of May 6 through November 30 each year any offshore pound net leader set in Pound Net Regulated Area I to be a modified leader. Any pound net leader in Pound Net Regulated Area II and any nearshore leader in Pound Net Regulated Area I during the period from May 6 through November 30 each year must have mesh size less than 12 inches (30.5 cm) stretched mesh and may not employ stringers.

This alternative would not change the year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(10)(iii) and(iv).

Rationale for Rejection

NMFS considered regulating pound net leaders in Virginia's Chesapeake Bay during the period of May through November, which would encompass the full time period when sea turtle presence and pound net fishing in the Chesapeake Bay overlap. However, few direct observations of sea turtle impingement on and entanglement in pound net leaders exist after the spring. A pound net characterization study by VIMS documented the entanglement of one dead juvenile loggerhead sea turtle in a pound net leader (approximately 11 inches) in October of 2000 (Mansfield et al. 2001). Further, one dead loggerhead was found entangled in a pound net leader in August 2001 (Mansfield et al. 2002a). It is not conclusively known if those animals were dead prior to entanglement or if the interaction with the pound net leader resulted in its death. The level of sea turtle strandings is substantially diminished during the summer and fall months. With few direct observations of entanglement in and impingement on pound net leaders and without high levels of strandings, similar to those documented in the spring and early summer, there is not sufficient factual basis at this time to conclude that pound net leaders should be regulated during the mid to late summer and fall months to protect sea turtles.

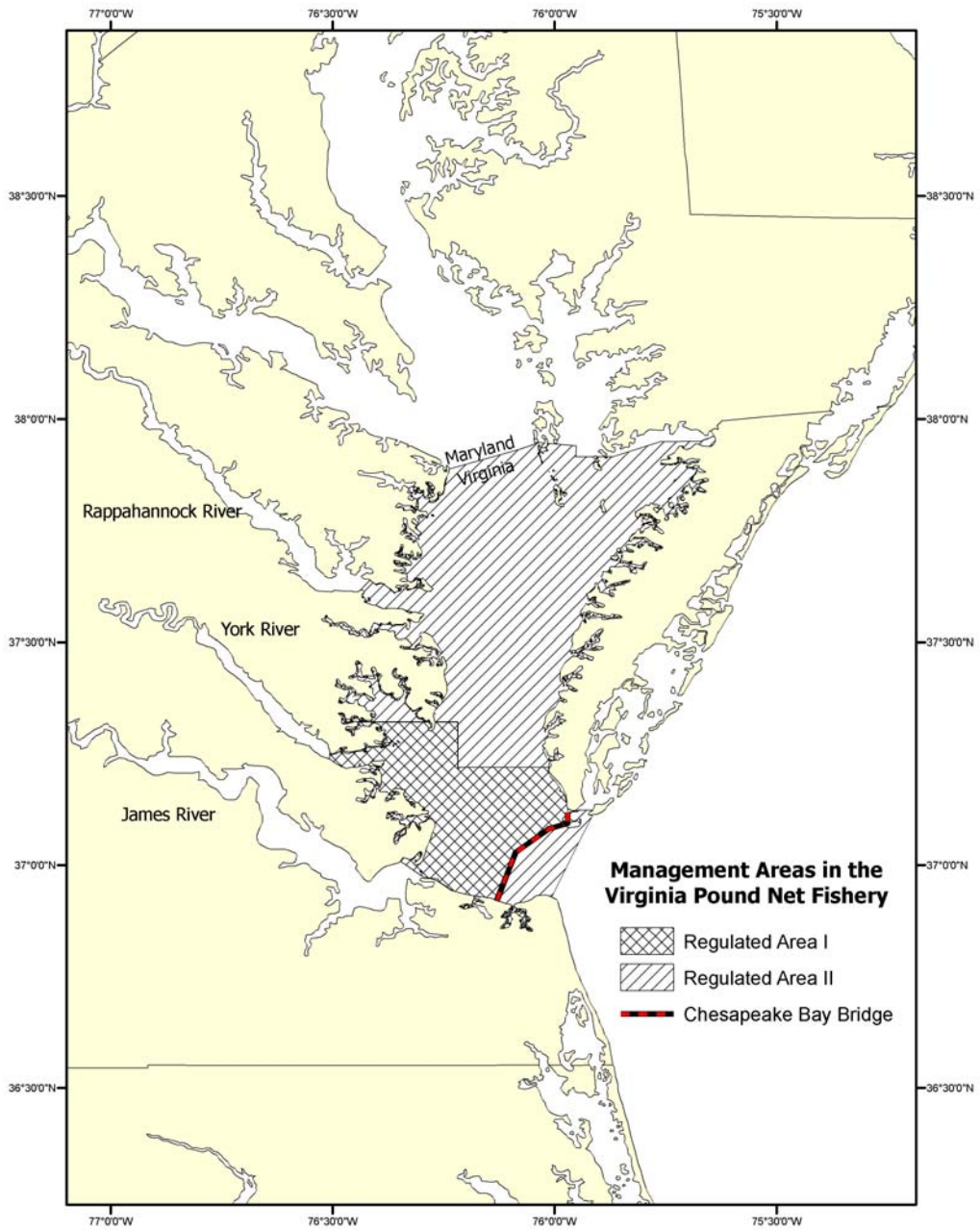

Figure 4. Geographic Areas of the Alternatives

3.5.2 No Federal Regulations in the Pound Net Fishery

This alternative would allow all pound net leaders in the Virginia waters of the Chesapeake Bay and tributaries to be fished in the manner and to the extent determined by the Commonwealth of

Virginia. It would remove the current Federal measures and not impose any Federal measures to minimize potential sea turtle entanglement and impingement in the pound net fishery.

Rationale for Rejection

This measure was rejected from further analysis because NMFS and VMRC have not developed an acceptable plan for regulating the pound net fishery to protect threatened and endangered sea turtles. Taking sea turtles--even incidentally--is prohibited under the ESA, with exceptions identified in 50 CFR 223.206 for threatened sea turtles. The incidental take of endangered species may only legally be exempted by an incidental take statement or an incidental take permit issued pursuant to section 7 or 10 of the ESA.

4.0 AFFECTED ENVIRONMENT

The extent of the geographical area that would be affected by all of the proposed alternatives is the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 37° 55' N. lat., 75° 55' W. long.) to the COLREGS line at the mouth of the Chesapeake Bay; the James River downstream of the Hampton Roads Bridge Tunnel (I-64; approximately 36° 59.55' N. lat., 76° 18.64' W. long.); the York River downstream of the Coleman Memorial Bridge (Route 17; approximately 37° 14.55' N. lat, 76° 30.40' W. long.); the Great Wicomico River downstream of the Jessie Dupont Memorial Highway Bridge (Route 200; approximately 37° 50.84' N. lat, 76° 22.09' W. long.); the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3; approximately 37° 37.44' N. lat, 76° 25.40' W. long.); and the Piankatank River downstream of the Route 3 Bridge (approximately 37° 30.62' N. lat, 76° 25.19' W. long.).

The boundaries of the two regulated areas defined in the 2004 rule remain the same for this action. This action proposes a non-substantive, technical change to the definition of the regulated areas that would merely apply titles to the areas to reduce confusion. Pound Net Regulated Area I means Virginia waters of the mainstem Chesapeake Bay, south of 37°19.0' N. lat. and west of 76°13.0' W. long., and all waters south of 37°13.0' N. lat. to the Chesapeake Bay Bridge Tunnel (extending from approximately 37°05' N. lat., 75°59' W. long. to 36°55' N. lat., 76°08' W. long.) at the mouth of the Chesapeake Bay, and the portion of the James River downstream of the Hampton Roads Bridge Tunnel (I-64; approximately 36°59.55' N. lat., 76°18.64' W. long.) and the York River downstream of the Coleman Memorial Bridge (Route 17; approximately 37°14.55' N. lat, 76°30.40' W. long.). Pound Net Regulated Area II means Virginia waters of the Chesapeake Bay outside of Regulated Area I defined above, extending to the Maryland-Virginia State line (approximately 37°55' N. lat., 75°55' W. long.), the Great Wicomico River downstream of the Jessie Dupont Memorial Highway Bridge (Route 200; approximately 37°50.84' N. lat, 76°22.09' W. long.), the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3; approximately 37°37.44' N. lat, 76°25.40' W. long.), and the Piankatank River downstream of the Route 3 Bridge (approximately 37°30.62' N. lat, 76°25.19' W. long.) to the COLREGS line at the mouth of the Chesapeake Bay.

Valued Ecosystem Components

The subsections below describe the valued ecosystem components (VECs) that have been identified as being important to this is action. These ecosystem components are:

1. Fishery resources (target and non-target)
2. Endangered and Threatened Species
3. Marine Mammals
4. Birds
5. Habitat
6. Economic environment (including the fishery and fishing communities), and
7. Social environment

NMFS staff have determined that the seven ecosystem components listed above are the components that have the potential to be affected by the proposed action based on the ecosystem components that have historically been impacted by the pound net fishery, and statutory requirements to complete assessments of these factors under the Endangered Species Act, Marine Mammal Protection Act, Regulatory Flexibility Act, and several Executive Orders. The VECs are intentionally broad (for example, there is one devoted to fishery resources, rather than just one species of fish, and one on habitat, rather than Essential Fish Habitat) to allow for flexibility in assessing all potential environmental factors that are likely to be impacted by the action.

4.1 Fishery Resources

This section will focus on those fishery resources targeted by the Virginia pound net fishery and that are potentially affected by the proposed action. While there may be other non-commercial species affected by pound net leaders, data is not readily available on such species.

A number of commercial and recreational fisheries exist in the Virginia waters of the Chesapeake Bay and there is a complex mix of fisheries operating during the spring. In addition to finfish resources, clam, crab, oyster, and conch are also targeted in Virginia waters. Appendix A identifies Virginia commercial landings for the 2004 fishing year (and the 2003 fishing year, for comparison) and the species targeted (VMRC web site 2005). Note that these landings data are for all Virginia state waters, not only the Chesapeake Bay. Appendix B identifies the fish species previously landed by pound nets, according to the Virginia Marine Resources Commission (VMRC) landings data. Major species landed by weight are: bait, Atlantic croaker, menhaden, sea trout (weakfish), catfish, spot, striped bass, Spanish mackerel, blue crab, bluefish, shad-gizzard, and summer flounder. During the 2004 and 2005 modified pound net leader experiments the observed catch was dominated by weakfish, croaker, harvestfish, butterfish and threadfin herring (DeAlteris et al. 2004; DeAlteris et al. 2005).

A variety of gear types, including gillnets, pound nets, pots, and purse seines are used in Virginia waters. Table 3 identifies the metric tons landed in May, June and July 2004 by gear type in the Virginia Chesapeake Bay, Virginia nearshore state waters, and, for comparison, the federal

waters off Virginia. May, June and July landings are shown because those months typically have the highest number of sea turtle strandings, and this time period corresponds to the proposed action and alternatives. This data was obtained from the NMFS Dealer Database.

Table 3. Chesapeake Bay, state waters, and ocean landings in the State of Virginia for May, June, and July 2004 by gear type.

May, June, July 2004	Chesapeake Bay		State Waters		Ocean	
	Landings	Percent	Landings	Percent	Landings	Percent
Gear Type	(metric tons)		(metric tons)		(metric tons)	
Fish Trawl					617	6%
Beach Seine	856	1%	14	<0.01%	0	
Gillnet	1,014	1%	249	3.376%	251	
Purse Seine	69,343	89%	2,989	40%	9,404	88%
Scallop Dredge					195	2%
Pound Nets	2,245	3%				
Fish Pots	30	0.04%	68	0.915%	157	1%
Conch Pots	<1	<0.01%	1	<0.01%	7	0.06%
Crab Pots	4,041	5%	873	12%		
Conch Dredge	11	0.01%			3	0.02%
Clam Dredge			3,190	43%		
Total	77,540	100%	7,383	100%	10,632	98%

Note: The landings data are generated based on species landings by gear in May, June, and July 2004, and the 2002 landing pattern by water area for the same season.

Boundary Definitions for: Chesapeake Bay = Mainstem Chesapeake Bay, does not include rivers, small bays, or tributaries.
State Waters = All waters out to 3 miles, including seaside bays.
Ocean = All federal waters beyond 3 miles in which catch was landed in Virginia.

4.2 Threatened, Endangered and Protected Species

Species listed as endangered or threatened under the ESA are found in the geographical area that would be affected by the PA and NPAs. All five species of threatened and endangered sea turtles, endangered shortnose sturgeon, and endangered whales occur in Virginia waters. Furthermore, species that are protected under the Marine Mammal Protection Act (MMPA) also inhabit the geographic area.

Sea Turtles

Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered
Green sea turtle (*Chelonia mydas*)	Endangered
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered
Loggerhead sea turtle (*Caretta caretta*)	Threatened

Fish

Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered

Cetaceans

Northern right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Bottlenose dolphin (*Tursiops truncatus*)	Protected
Harbor porpoise (*Phocoena phocoena*)	Protected

Seals

Harbor seal (*Phoca vitulina*)	Protected

Although all of the species listed above may be found in the general geographical area covered by the proposed action, not all are affected by the pound net fishery. Some species may inhabit areas other than those in which the fishery is prosecuted, prefer a different depth or temperature zone, or may migrate through the area at times when the fishery is not in operation. In addition, certain protected species may not be vulnerable to capture or entanglement with the pound net gear. Therefore, protected species are divided into two groups. The first contains those species not likely to be affected by the proposed action, while the second group is the subject of a more detailed assessment because of potential or documented interactions with protected species.

4.2.1 Protected Species Not Likely Affected

Following a review of the current information available on the distribution and habitat needs of the endangered, threatened, and otherwise protected species listed above in relation to the action being considered, NMFS found that the pound net fishery is unlikely to affect the right whale, humpack whale, and fin whales.

Endangered right, humpback, and fin whales have been documented in Virginia waters, but it is highly unlikely that these species would be present in the geographical area affected by this proposed action. More information on the endangered whale species that could potentially transit the affected area can be found in the 2002 Marine Mammal Stock Assessments (Waring et al. 2002) and the species recovery plans (NMFS 1991a, 1991b, 1998a).

4.2.2 Threatened and Endangered Species Likely to be Affected

Loggerhead turtles are the most abundant sea turtle species in the affected area, followed by Kemp's ridley and green turtles. These species appear to use the Chesapeake Bay waters as important developmental and foraging habitats, as it is primarily juveniles of these species that are encountered (Bellmund 1987; Musick and Limpus 1997). Leatherback and hawksbill turtles are infrequent visitors to the Chesapeake Bay, but they have been documented in Virginia waters. A few leatherbacks strand on Virginia beaches each year (Bellmund 1987).

Aerial surveys conducted by the Virginia Institute of Marine Science (VIMS) between 1982-1985 indicated that 6,500 to 9,700 turtles are found in Virginia's lower Chesapeake Bay waters

in any given season. In 1994, aerial surveys found the number to be 3,000 (Byles 1988, Musick et al. 1984, Keinath 1993 in Mansfield et al. 2002b). The largest numbers of turtles were observed in the spring of the year. It was further estimated that between 5,000 to 10,000 loggerheads and 211 to 1,083 Kemp's ridleys inhabit the Chesapeake Bay each summer (Byles, 1988, Keinath et al., 1987 in Musick and Limpus, 1997). Aerial surveys were reinitiated in 2001 to determine the current distribution and relative densities in the Virginia Chesapeake Bay. In 2001, population estimates for the lower Bay ranged between 549 turtles in early October, to 5,169 turtles in mid-June, while estimates in the upper Bay ranged between 418 and 5,404 turtles (Mansfield et al. 2002a). Aerial surveys in 2002 found an extrapolated average population estimate of 1,844 turtles in the lower Chesapeake Bay and 2,193 turtles in the upper Bay for May through July (Mansfield et al. 2002b). These estimates represent all sea turtles observed and are not broken down by species. See Mansfield et al. (2002a, 2002b) for a discussion on the methods and caveats associated with these surveys and population estimates. VIMS is currently evaluating whether these total population estimates for Virginia Chesapeake Bay sea turtles should be revised based upon recent data.

Several publications discuss the five species of sea turtles potentially impacted by the alternatives considered in this document. NMFS has prepared a comprehensive review of the status of each species of sea turtle (NMFS and USFWS 1991a, 1991b, 1992, 1993, 1995, USFWS and NMFS 1992). A more recent, in-depth analysis of the status of Kemp's ridley and loggerhead sea turtles -- the species most likely to be encountered in Virginia waters -- was conducted by the Turtle Expert Working Group (TEWG 1998, 2000), and an additional stock assessment of loggerhead and leatherback sea turtles was also recently prepared (NMFS SEFSC 2001). The National Academy of Sciences Report, The Decline of the Sea Turtles: Causes and Prevention (NRC 1990) reviewed the scientific and technical information pertaining to the conservation of sea turtles and the causes and significance of turtle mortality. The following sections provide a summary of the status of each of the five sea turtle species found in the geographical area that would be affected by the suite of alternatives considered here.

4.2.2.1 Loggerhead sea turtle

Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans in a wide range of habitats. These include open ocean, continental shelves, bays, lagoons, and estuaries (NMFS and USFWS 1995), foraging primarily on benthic species including crustaceans and mollusks (Wynne and Schwartz 1999). It is the most abundant species of sea turtle in U.S. waters, commonly occurring throughout the inner continental shelf from Florida through Cape Cod, Massachusetts. The loggerhead sea turtle was listed as threatened under the ESA on July 28, 1978, but is considered endangered by the World Conservation Union (IUCN).

Loggerhead sea turtles are generally grouped by their nesting locations. The largest known nesting aggregations of loggerhead sea turtles occurs on Masirah and Kuria Muria Islands in Oman (Ross and Barwani 1982). The southeastern U.S. nesting aggregation is the second largest and represents about 35 percent of the nests of this species.

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the gulf coast of Florida. Based on a review of available genetic studies of loggerheads in relation to mitochondrial DNA, which the turtle inherits from its mother, the Turtle Expert Working Group (TEWG 1998; TEWG 2000) and the NMFS Southeast Fisheries Science Center (NMFS SEFSC 2001) identified five different nesting assemblages, referred to as nesting subpopulations, in the western North Atlantic. The subpopulations are divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida, about 29° N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29° N on the east coast to Sarasota on the west coast (approximately 83,400 nests in 1998); (3) a Florida panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida (approximately 1,200 nests in 1998); (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (approximately 1,000 nests in 1998); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (approximately 200 nests per year). Natal homing to the nesting beach is believed to provide the genetic barrier between these nesting aggregations, preventing recolonization from turtles from other nesting beaches. Although NMFS has not formally recognized subpopulations of loggerhead sea turtles under the ESA, based on the most recent reviews of the best scientific and commercial data on the population genetics of loggerhead sea turtles and analyses of their population trends (TEWG 1998, 2000), NMFS treats the loggerhead turtle nesting aggregations as nesting subpopulations whose survival and recovery is critical to the survival and recovery of the species.

The loggerhead sea turtles in the affected geographical area likely represent turtles that have hatched from any of the five western Atlantic nesting sites, but are probably composed primarily of turtles that hatched from the northern nesting subpopulation and the south Florida nesting subpopulation. Although genetic studies of benthic immature loggerheads on the foraging grounds have shown the foraging areas to be comprised of a mix of individuals from different nesting areas, there appears to be a preponderance of individuals from a particular nesting area in some foraging locations. For example, although the northern nesting group (North Carolina to northeast Florida) produces only about 9 percent of the loggerhead nests, loggerheads from this nesting area comprise between 25 and 59 percent of the loggerhead sea turtles found in foraging areas from the northeastern U.S. to Georgia (NMFS SEFSC 2001; Bass et al. 1998; Norrgard 1995; Rankin-Baransky 1997; Sears 1994; Sears et al. 1995). Loggerheads that forage in the Chesapeake Bay are nearly equally divided in origin between the south Florida and northern subpopulations (TEWG 1998; Bass et al. 1998; Norrgard 1995).

The role of males from the northern subpopulation also needs further investigation. Unlike the much larger south Florida subpopulation which produces predominantly females (80%), the northern subpopulation produces predominantly males (65%; NMFS SEFSC 2001). New results from nuclear DNA analyses indicate that males do not show the same degree of site fidelity as do females. It is possible then that the high proportion of males produced in the northern subpopulation are an important source of males throughout the southeast U.S., lending even more significance to the critical nature of this small subpopulation (NMFS SEFSC 2001).

Based on the data available, it is difficult to estimate the size of the loggerhead sea turtle population in the U.S. or its territorial waters. There is, however, general agreement that the number of nesting females provides a useful index of the species' population size and stability at this life stage. Nesting data collected on index nesting beaches in the U.S. from 1989-1998 represent the best dataset available to index the population size of loggerhead sea turtles. However, an important caveat for population trends analysis based on nesting beach data is that this may reflect trends in adult nesting females, but it may not reflect overall population growth rates. Given this, between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,014 to 92,182 annually, with a mean of 73,751. Since a female often lays multiple nests in any one season, the average adult female population of 44,780 was calculated using the equation [(nests/4.1) * 2.5]. These data provide an annual estimate of the number of nests laid per year while indirectly estimating both the number of females nesting in a particular year (based on an average of 4.1 nests per nesting female, Murphy and Hopkins (1984)) and of the number of adult females in the entire population (based on an average remigration interval of 2.5 years; Richardson et al., 1978)). On average, 90.7 percent of these nests were of the south Florida subpopulation, 8.5 percent were from the northern subpopulation, and 0.8 percent were from the Florida Panhandle nest sites. There is limited nesting throughout the Gulf of Mexico west of Florida, but it is not known to what subpopulation the turtles making these nests belong. Based on the above, there are only an estimated approximately 3,800 nesting females in the northern loggerhead subpopulation, and approximately 40,000 nesting females in south Florida loggerhead subpopulation. The status of this northern population based on number of loggerhead nests, has been classified as stable or declining (TEWG 2000). Based upon annual nesting totals from all beaches over the last 25 years, the South Florida subpopulation of loggerheads appears to be increasing. However, a more recent analysis limited to nesting data from the Index Nesting Beach Survey program from 1989 to 2002, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2002).

It has been estimated that between 5,000 to 10,000 loggerheads inhabit the Chesapeake Bay each summer (Byles 1988, Keinath et al. 1987 in Musick and Limpus 1997). Approximately 95% of the loggerheads in the Chesapeake Bay are juveniles (Musick and Limpus 1997).

4.2.2.2 Kemp's ridley sea turtle

The Kemp's ridley is the most endangered of the world's sea turtle species. Of the world's seven extant species of sea turtles, the Kemp's ridley has declined to the lowest population level. Kemp's ridleys nest primarily on Rancho Nuevo in Tamaulipas, Mexico, where nesting females emerge synchronously during the day to nest in aggregations known as arribadas. Most of the population of adult females nest in this single locality (Pritchard 1969).

Preliminary analysis of data collected Texas A&M University suggests that subadult Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling

waters force them offshore or south along the Florida coast (Renaud, NMFS Galveston Laboratory, pers. comm.). However, at least some juveniles will travel northward as water temperatures warm to feed in productive coastal waters of Georgia through New England (USFWS and NMFS 1992).

Juvenile Kemp's ridleys use northeastern and mid-Atlantic coastal waters of the U.S. Atlantic coastline as primary developmental habitat during summer months, with shallow coastal embayments serving as important foraging grounds. Ridleys found in mid-Atlantic waters are primarily post-pelagic juveniles averaging 16 inches in carapace length, and weighing less than 44 pounds (Terwilliger and Musick 1995). Next to loggerheads, they are the second most abundant sea turtle in mid-Atlantic waters, arriving in these areas typically during late May and June (Keinath et al. 1987; Musick and Limpus 1997). In the Chesapeake Bay, where the summer population of Kemp's ridley sea turtles is estimated to be 211 to 1,083 turtles (Musick and Limpus 1997), ridleys frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation (Lutcavage and Musick 1985; Bellmund et al. 1987; Keinath et al. 1987; Musick and Limpus 1997). Post-pelagic ridleys feed primarily on crabs, consuming a variety of species, and mollusks, shrimp, and fish are consumed less frequently (Bjorndal 1997).

When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963), but the population has been drastically reduced from these historical numbers. However, the TEWG (1998, 2000) indicated that the Kemp's ridley population appears to be in the early stage of a recovery trajectory. Nesting data, estimated number of adults, and percentage of first time nesters have all increased from lows experienced in the 1970's and 1980's. From 1985 to 1999, the number of nests observed at Rancho Nuevo and nearby beaches has increased at a mean rate of 11.3 percent per year, allowing cautious optimism that the population is on its way to recovery. For example, data from nests at Rancho Nuevo, North Camp and South Camp, Mexico, have indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and 702 nests in 1985, then increased to produce 1,940 nests in 1995 and about 3,400 nests in 1999. Total nests for the state of Tamaulipas in 2003 (as of June 13) was 6,925; Rancho Nuevo alone documented 4,457 nests. Estimates of adult abundance followed a similar trend from an estimate of 9,600 in 1966 to 1,050 in 1985 and 3,000 in 1995. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6 to 28 percent from 1981 to 1989 and from 23 to 41 percent from 1990 to 1994. The population model in the TEWG report projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2020, if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular internesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable.

4.2.2.3 Green sea turtle

Green turtles are the largest chelonid (hard-shelled) sea turtle, with an average adult carapace of 36 inches SCL and weight of 330 pounds. Based on growth rate studies of wild green turtles, greens have been found to grow slowly with an estimated age of sexual maturity ranging from 18 to 40 years (Balazs 1982; Frazer and Ehrhard 1985 in NMFS and USFWS 1991b; B. Schroeder, NMFS, pers. comm.). In 1978, the green turtle was listed as threatened under the ESA, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were listed as endangered (NMFS and USFWS 1991b).

Green turtles are distributed circumglobally. In the western Atlantic they range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999). As is the case for loggerhead and Kemp's ridley sea turtles, green sea turtles use mid-Atlantic and northern areas of the western Atlantic Ocean as important summer developmental habitat. Green turtles are found in estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and North Carolina sounds (Musick and Limpus 1997). Limited information is available regarding the occurrence of green turtles in the Chesapeake Bay, although they are presumably present in very low numbers. Like loggerheads and Kemp's ridleys, green sea turtles that use northern waters during the summer must return to warmer waters when water temperatures drop, or face the risk of cold stunning. Cold stunning of green turtles may occur in southern areas as well (e.g., Indian River, Florida), as these natural mortality events are dependent on water temperatures and not solely geographical location.

In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan et al. 1995). Certain Florida nesting beaches where most green turtle nesting activity occurs have been designated index beaches. Index beaches were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of the index beaches in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan et al. 1995). Increased nesting has also been observed along the Atlantic Coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). Recent population estimates for green turtles in the western Atlantic area are not available.

Pelagic juveniles are assumed to be omnivorous, but with a strong tendency toward carnivory during early life stages. At approximately 8 to 10 inches carapace length, juveniles leave pelagic habitats and enter benthic foraging areas, shifting to a chiefly herbivorous diet (Bjorndal 1997). Green turtles appear to prefer marine grasses and algae in shallow bays, lagoons and reefs (Rebel 1974), but also consume jellyfish, salps, and sponges.

Fibropapillomatosis, an epizootic disease producing lobe-shaped tumors on the soft portion of a turtle's body, has been found to infect green turtles, most commonly juveniles. The occurrence of fibropapilloma tumors, most frequently documented in Hawaiian green turtles, may result in impaired foraging, breathing, or swimming ability, leading potentially to death.

4.2.2.4 Leatherback sea turtle

Leatherback sea turtles are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic and Pacific Oceans, the Caribbean Sea, and the Gulf of Mexico (Ernst and Barbour 1972). Leatherback sea turtles are the largest living turtles and range farther than any other sea turtle species. Their large size and tolerance of relatively low temperatures allows them to occur in northern waters such as off Labrador and in the Barents Sea (NMFS and USFWS 1995). In 1980, the global population of adult female leatherbacks was estimated at approximately 115,000 (Pritchard 1982). By 1995, this global population of adult females had declined to 34,500 (Spotila *et al.* 1996). Leatherbacks are predominantly a pelagic species and feed on jellyfish (*i.e.*, *Stomolophus, Chryaora*, and *Aurelia* (Rebel 1974)), and tunicates (salps, pyrosomas). Leatherbacks may come into shallow waters if there is an abundance of jellyfish nearshore. They periodically occur in the Chesapeake Bay and in places such as Cape Cod Bay and Narragansett Bay during certain times of the year, particularly the fall.

Leatherbacks are a long lived species (> 30 years). They mature at a younger age than loggerhead turtles, with an estimated age at sexual maturity of about 13-14 years for females with 9 years reported as a likely minimum (Zug and Parham 1996) and 19 years as a likely maximum (NMFS SEFSC 2001). In the U.S. and Caribbean, female leatherbacks nest from March through July. They nest frequently (up to 7 nests per year) during a nesting season and nest about every 2-3 years. They produce 100 eggs or more in each clutch/nest (Schultz 1975). However, a significant portion (up to approximately 30%) of the eggs can be infertile. Thus, the actual proportion of eggs that can result in hatchlings is less than this seasonal estimate.

Evidence from tag returns and strandings in the western Atlantic suggests that adult leatherback sea turtles engage in routine migrations between boreal, temperate and tropical waters (NMFS and USFWS 1992). An aerial survey estimated the leatherback population for the northeastern U.S. at approximately 300-600 animals (from near Nova Scotia, Canada to Cape Hatteras, North Carolina). However, the estimate was based on turtles visible at the surface and does not include those that were below the surface out of view. Therefore, it likely underestimates the leatherback population for the northeastern U.S. Estimates of leatherback abundance of 1,052 turtles (C.V.= 0.38) and 1,174 turtles (C.V.= 0.52) were obtained from surveys conducted from Virginia to the Gulf of St. Lawrence in 1995 and 1998, respectively (Palka 2000). However, since these estimates were also based on sightings of leatherbacks at the surface, the author considered the estimates to be negatively biased with true abundance of leatherbacks perhaps being 4.27 times the estimates (Palka 2000).

Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1-11.5% increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NMFS SEFSC 2001). The largest leatherback rookery in the western Atlantic remains along the northern coast of South America in French Guiana and Suriname. More than half the present world leatherback population is estimated to be nesting on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana

(Hilterman and Goverse 2004). Nest numbers in Suriname have shown an increase and the long-term trend for the Suriname and French Guiana nesting group seems to show an increase (Hilterman and Goverse 2004). In 2001, the number of nests for Suriname and French Guiana combined was 60,000, one of the highest numbers observed for this region in 35 years (Hilterman and Goverse 2004). Studies by Girondot *et al*. (in press) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing.

Of the Atlantic turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear. Leatherbacks are captured and killed in many kinds of fishing gear and interact with fisheries in U.S. state and federal waters as well as in international waters, including longlines, trawl gear, gillnets, and trap/pot gear. Poaching is a problem and affects leatherbacks that occur in U.S. waters. Leatherbacks also appear to be more susceptible to death or injury from ingesting marine debris than other turtle species.

4.2.2.5 Hawksbill sea turtle

The hawksbill turtle is relatively uncommon in the waters of the continental United States. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. However, there are accounts of hawksbills in south Florida and a surprising number are encountered in Texas. Many captures or strandings are of individuals in an unhealthy or injured condition (Hildebrand 1982). In the north Atlantic, small hawksbills have stranded as far north as Cape Cod, Massachusetts (STSSN database). Many of these strandings were observed after hurricanes or offshore storms. In 2000 there was one hawksbill stranding in the Chesapeake Bay and one was reported as being taken incidentally in a fishery just south of the Chesapeake Bay (Anonymous 1992).

Hawksbills feed primarily on a wide variety of sponges but also consume bryozoans, coelenterates, and mollusks. The Culebra Archipelago of Puerto Rico contains especially important foraging habitat for hawksbills. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands.

4.2.2.6 Shortnose sturgeon

Shortnose sturgeon occur in large rivers along the western Atlantic coast from the St. Johns River, Florida (possibly extirpated from this system), to the Saint John River in New Brunswick, Canada. The species is freshwater anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while northern populations are amphidromous (NMFS 1998b). Population sizes vary across the species' range. From available estimates, smallest populations occur in the Cape Fear (~8 adults; Moser and Ross 1995) and Merrimack Rivers (~100 adults; M. Kieffer, United States Geological Survey, personal communication), while one of the largest populations is found in the Hudson River (~61,000; Bain et al. 2000). The Delaware population is showing signs of improvement, with population numbers estimated to be approximately 12,047 (Brundage et al. 2003). The Kennebec Complex has also shown signs of recovery: in 1977-1981 the

population size was estimated to be 7,222 and 1998-2000 the population size was estimated to have increased to 9,488 (Squires 2003).

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including molluscs, crustaceans, and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979). Shortnose sturgeon are long-lived (e.g., 30 years) and, particularly in the northern extent of their range, mature at late ages. In the north, males reach maturity at 5 to 10 years, while females mature between 7 and 13 years.

Shortnose sturgeon historically occurred in the Chesapeake Bay, but prior to 1996, the best available information suggested that the species was either extirpated or very rare from the area. However, the presence of shortnose sturgeon in the Chesapeake Bay has recently been detected (Skjeveland et al. 2000) due to the initiation of a U.S. Fish and Wildlife Service (FWS) reward program for Atlantic sturgeon in Maryland waters of the Chesapeake Bay in 1996. Before the reward program, there were only 15 published historic records of shortnose sturgeon in the Chesapeake Bay, and most of these were based on personal observations from the upper Chesapeake Bay during the 1970s and 1980s (Dadswell et al. 1984). From 1996 to December 22, 2005, 76 shortnose sturgeon have been reported in Maryland waters through the FWS Atlantic sturgeon reward program (Mark Mangold, US Fish and Wildlife Service, pers. comm.). Most of the shortnose sturgeon were caught in waters in the upper Chesapeake Bay north of Hart-Miller Island (Skjeveland et al. 2000; Kim Damon-Randall, NMFS, pers. comm. 2003), and some of the shortnose sturgeon were collected in pound nets. One shortnose sturgeon tagged in Maryland waters was recaptured by a commercial fisherman in Virginia waters of the Chesapeake Bay.

In the Chesapeake Bay, this species has been more frequently encountered in Maryland waters, but shortnose sturgeon have historically been found as far south as the Rappahannock River (Skjeveland et al. 2000). From February through November 1997, a FWS reward program was in effect for Atlantic sturgeon in Virginia's major tributaries (James, York, and Rappahannock Rivers). Three shortnose sturgeon have been caught during the month of March between 2001 and 2002 in the Potomac River (Atlantic Coast Sturgeon Tagging Database 2004), primarily in pound nets. A sturgeon captured from the Rappahannock River in May 1997 was confirmed as a shortnose sturgeon (Spells 1998). Additionally, during trawling activities to relocate sea turtles near hopper dredging operations in Thimble Shoal Channel (at the mouth of the Chesapeake Bay), a shortnose sturgeon measuring 138 cm total length was taken on October 22, 2003. Several Atlantic sturgeon were captured during the relocation trawling and due to the difficulty in distinguishing these species, this particular fish was initially reported as a shortnose sturgeon by the Endangered Species Observer. The captured fish was reported as 123 cm fork length (FL), which is close to the maximum length of shortnose sturgeon in northern river systems reported in the literature (130 cm FL) and far greater than the maximum length of shortnose sturgeon in southern river systems (97 cm FL). Further analysis of the situation caused the observer to correct the report and state that the fish was actually an Atlantic sturgeon. Nevertheless, distribution and movements of shortnose sturgeon in the Chesapeake Bay are poorly understood,

in part because this species is often confused with Atlantic sturgeon. No population estimates for shortnose sturgeon in the Chesapeake Bay area are available at this time.

4.2.3 Marine Mammals

While endangered whales may infrequently occur in the affected geographical area, the marine mammal species most commonly found in the Virginia waters of the Chesapeake Bay is the Western North Atlantic stock of coastal bottlenose dolphin (*Tursiops truncatus*). The Gulf of Maine/Bay of Fundy stock of harbor porpoise (*Phocoena phocoena*) and the Western North Atlantic stock of harbor seal (*Phoca vitulina*) may occur in Virginia Chesapeake waters during May and June, but these occurrences would be uncommon. The bottlenose dolphin, harbor porpoise, and harbor seal are subject to protection under the Marine Mammal Protection Act, and the harbor porpoise is listed as a candidate species under the ESA.

The bottlenose dolphin has a medium sized, robust body, a moderately falcate dorsal fin and dark coloration, ranging from light gray to black dorsally and laterally, with a light belly. Adult lengths range from 6.5 to 13 feet, and are reached after approximately 12 years for males and 7 to 10 years for females (NMFS 2002a). Females reach sexual maturity at approximately age 5 to 12, and males reach sexual maturity at age 10 to 13. Calves may be born at any time during the year, but are primarily born in the spring or summer. The gestation period is approximately one year, with calves averaging about 46 inches in length at birth. Life spans longer than 40 years for males and longer than 50 years for females have been documented. Limits to the range appear to be directly temperature related, or indirectly through distribution of prey. The stock tends to inhabit waters with surface temperatures ranging from about 50°F to 90°F. They migrate seasonally, with a more southerly distribution in the winter. The minimum population size estimate for the northern migratory coastal bottlenose dolphin stock in the summer (May through October) is 4,640 dolphins (Waring et al. 2002). The 2002 Marine Mammal Stock Assessments (Waring et al. 2002) provides additional information about the stock and geographical range of the coastal bottlenose dolphin.

Harbor porpoise are short, stocky animals with blunt heads, triangular-shaped dorsal fins and short, somewhat rounded pectoral flippers. This species reaches approximately six feet long and 170 pounds in weight. Coloration of this species is variable, but is usually dark brown or gray on the back, fading to white on the belly. Calves are born between spring and mid-summer and are believed to wean at around 6 to 8 months. Lifespan is likely around 15 years. The Gulf of Maine/Bay of Fundy harbor porpoise stock is estimated at 74,695 animals (minimum population estimate; Waring et al. 2003). Harbor porpoise are limited to temperate and subpolar waters in the Northern Hemisphere. They are generally found over the continental shelf and in nearshore waters such as bays and estuaries, but may also travel in deeper, offshore waters. During the fall (October-December) and spring (April-June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south. During the winter (January-March), harbor porpoise can be found in waters off New Jersey to North Carolina (Waring et al. 2002). While it is unlikely that harbor porpoise will be prevalent in the geographical area affected by the proposed action in the spring, this species may periodically occur in the Virginia

Chesapeake Bay during that time. For example, stranded harbor porpoise were documented on Chesapeake Bay beaches in May of 1997 and 1999. The 2003 Marine Mammal Stock Assessments (Waring et al. 2003) provides additional information about the stock and geographical range of the harbor porpoise.

Harbor seals have a rounded head with short, concave snouts. Adults range from approximately 5 to 6 feet in length, and harbor seals become sexually mature at 3 to 6 years. The pupping season occurs from mid-May through June along the Maine Coast. Harbor seals are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally to the Carolinas. Harbor seals are unlikely to occur in Virginia waters during the spring, but there is the potential for this species to be in the geographical area affected by the proposed alternative. For example, from 1996 to 2000, two harbor seals were documented on Chesapeake Bay beaches; one on May 8, 1996, and another on June 14, 1998. The minimum population estimate for the stock is 91,564 seals. The 2003 Marine Mammal Stock Assessments (Waring et al. 2003) provides additional information about the stock and geographical range of the harbor seal.

4.3 Birds

A variety of avian species inhabit the Virginia area, and may potentially be affected by the PA. Ospreys, bald eagles, great blue herons, laughing gulls, wood ducks, Canada geese and American oystercatchers are a few of the most visible resident and migratory birds. The great blue heron is one of six species of colonial nesting waterbirds that inhabit the Chesapeake Bay region. Along with the great egret, the snowy egret, the little blue heron, the green-backed heron and the night heron, the great blue hunts in the shallows, feeding mainly on small fish, amphibians and arthropods.

Bald eagles and ospreys are the Bay's most familiar raptors. The osprey builds its nests along the Bay shoreline and on navigation markers, utility poles or dead trees near the water, and dives for its main food source, finfish. Since the DDT ban in the early 1970s, the population has steadily increased. It has been estimated that as many as 2,000 nesting pairs make their home in the Chesapeake Bay area (Chesapeake Bay Program 2005).

The bald eagle is listed by Fish and Wildlife Service as threatened on the ESA, but is included in this section on birds for the purposes of this assessment. As many as 3,000 pairs of bald eagles may have once inhabited the Chesapeake basin. In 2004, there were 819 nesting pairs in the MD, PA, VA and DC portions of the watershed (as compared to 761 in 2003). These predator-scavengers nest in trees, often loblolly pines, close to a food and water source. The bald eagle is as likely to eat carrion as it is to hunt for live prey. The long-term success of the bald eagle in this region will depend on shoreline habitat management. Eagles require large trees secluded from human intrusion for nesting, roosting, and perching (Chesapeake Bay Program 2005).

Dozens of species of waterfowl (ducks and geese), from the mallard and the Canada goose to the wood duck and red-breasted merganser, also live in the Chesapeake Bay region, or at least for a short period during their migration between Canada and southern habitats. The deterioration of their shallow water habitats, coupled with human activities and loss of wetlands in the US and Canada have reduced the Bay's capacity to support huge populations of these migratory birds. Many other species inhabit the Bay region, including other "aerial gleaners" that consume fish or insects, such as gulls, terns, barn swallows, brown pelicans and cormorants. Other wading birds include the sandpiper, sanderling, willet, black-bellied plover, ruddy turnstone, dowitcher and glossy ibis.

The Chesapeake Bay is located along the Atlantic flyway, which every year channels the annual seasonal flights of millions of migratory birds. The region has always been a favored winter residence or stopover for many species of waterfowl on their way south from their summer breeding grounds. The shallow waters and wetlands of the Bay and its temperate climate offer a fertile and diverse environment for waterfowl. Loss of habitat along waterways poses the biggest threat to most bird species in the Chesapeake Bay watershed. Deforestation, shoreline development and shoreline erosion disrupt nesting activities, and chemical contaminants in the water damage the food source of many Bay birds.

4.4 Habitat

The Chesapeake Bay is the largest estuary in the United States, and hosts a complex ecosystem. While the affected environment of the alternatives includes only Virginia waters, the Chesapeake Bay also extends into the State of Maryland. The entire Bay watershed is 64,000 square miles and the Bay proper is approximately 200 miles long, stretching from Havre de Grace, Maryland, to Norfolk, Virginia. Its widest point is 35 miles near the mouth of the Potomac River, and including its tidal tributaries, the entire Chesapeake Bay has approximately 11,684 miles of shoreline (Chesapeake Bay Program 2002). On average, the Chesapeake Bay holds more than 15 trillion gallons of water. Although the Bay's length and width are dramatic, the average depth is only about 21 feet. Because the Chesapeake Bay is so shallow, its capacity to store heat over time is relatively small. As a result, water temperature fluctuates throughout the year, ranging from 34 to 84 degrees F.

The Chesapeake Bay is a mixture of freshwater and saltwater from the Atlantic Ocean. Fifty major tributaries pour water into the Chesapeake Bay every day. Eighty to 90 percent of the freshwater entering the Bay comes from the northern and western sides. The remaining 10 to 20 percent is contributed by the eastern shore. Nearly an equal volume of saltwater enters the Bay from the ocean. Salinity levels within the Chesapeake Bay vary widely, both seasonally and from year to year, depending on the volume of freshwater flowing into the Bay.

The Virginia waters of the Chesapeake Bay are considered Essential Fish Habitat (EFH) for various life stages of the following species under NMFS jurisdiction pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA): Atlantic butterfish, Atlantic sea herring, Atlantic sharpnose shark, black sea bass, bluefish, cobia, dusky shark, king

mackerel, red drum, red hake, sand tiger shark, sandbar shark, scup, Spanish mackerel, summer flounder, whiting, windowpane flounder, and winter flounder. EFH refers to those waters and substrate necessary for fish to spawn breed, feed, or grow to maturity (MSFCMA, 16 U.S.C. 1801 *et seq.*).

The shallow Virginia waters of the Chesapeake Bay contain submerged aquatic vegetation, or SAV. Underwater grasses provide food and shelter for various species of fish, shellfish, invertebrates and waterfowl. There are 16 species of SAV commonly found in the Chesapeake Bay (both Maryland and Virginia waters) or nearby rivers. The distribution of these species in the shallow waters of the Bay depends greatly on their individual habitat requirements, in which salinity is a primary factor affecting SAV distribution. The submerged grasses commonly found in areas of higher salinity in the Bay include eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*). Other habitat conditions influencing SAV distribution include temperature, light penetration, water depth, water currents and wave action. Historically, up to 600,000 acres of SAV grew along the shoreline of Chesapeake Bay (the first aerial surveys were in the 1930s). In 2003 a total of only 64,709 acres of grasses were estimated to be present in the Bay, which represents a 30 percent decline from the 2002 tally. (Chesapeake Bay Program 2005).

4.5 Economic and Social Environment (including description of the fishery)

The fishing industry that would be affected by this proposed action is the Virginia pound net fishery. The pound net fishery has been previously described in various documents (Kirkely et al. 2001; Mansfield et al. 2001; Bellmund et al. 1987; Dumont and Sundstrom 1961), and the following will serve as a brief summary.

A pound net is a fixed entrapment gear consisting of an arrangement of fiber netting supported upon stakes or piling with the head ropes or lines above the water. Typically, there are three distinct segments: the pound, which is the enclosed end with a netting floor where the fish entrapment takes place; the heart, which is a net in the shape of a heart that aids in funneling the fish into the pound; and the leader, which is a long straight net that leads the fish offshore towards the pound (Figure 5). There may also be an outer compartment or heart, and pound nets fished in deeper water may have a middle compartment (round pound). Fish swimming along the shore are turned towards the pound by the leader, guided in the heart, and then into the pound where they are removed periodically by devices such as dip nets. Pound net leaders can consist of mesh, stringers, and/or buoys. A pound net leader with stretched mesh greater than 12 inches is considered to be a large mesh leader. A stringer leader consists of vertical lines spaced apart in a portion of the leader and mesh in the rest of the leader. Alternatively, a leader that does not have a stringer fishes the first row of mesh at the water surface. VMRC regulations prohibit fishing around any pound net 125 feet from the left and right sides of the centerline of the pound net (VMRC regulation 4 VAC-20-20-10). Further, Section 28.2-307 of the Code of Virginia states that it is unlawful for any person to use a single fixed fishing device having a total length greater than 1,200 feet.

Pound nets are passive fishing devices, as they will trap the fish that swim into the pound. Species of fish that are caught within a net depend upon a variety of factors, including the season and the location of the pound net. Appendix B identifies the species of fish that have been landed using pound net gear in Virginia. Landings by pound nets represented approximately 3 percent of the total landings in the Virginia Chesapeake Bay during May, June and July 2004 (Table 3).

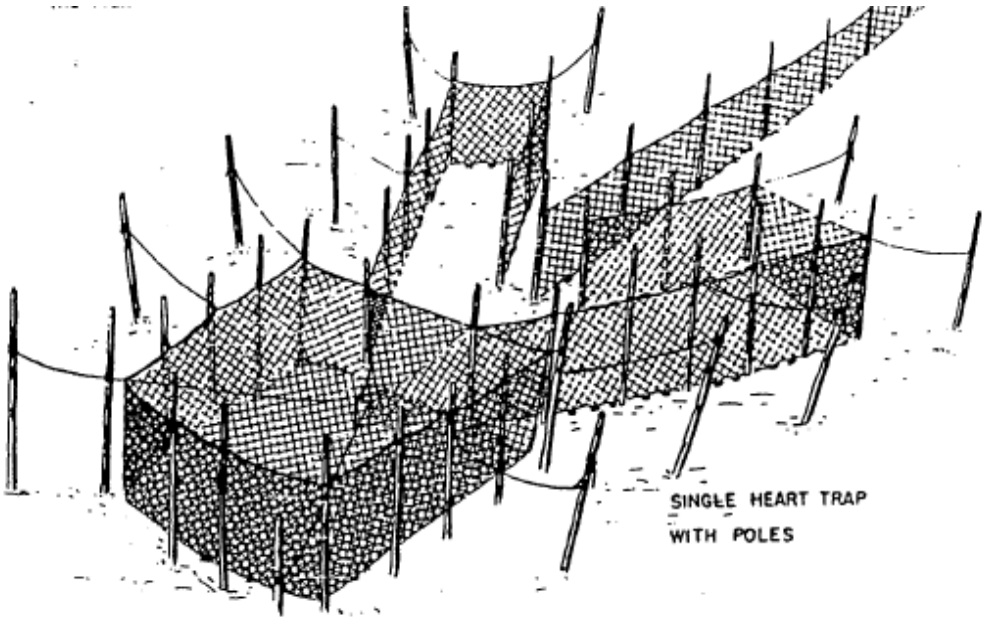

Figure 5. Depiction of Pound Net (FAO-Fish.Tech.Pap.222, p. 45)

Virginia has maintained a limited entry system for pound nets in the mainstem Chesapeake Bay and near reaches of the tributaries since 1994. According to VMRC, only 161 pound net licenses are issued in Virginia, where one license is assigned to each pound net. Annual attrition of licenses results in licenses being transferred to new participants, so it appears that the number of licenses has been relatively stable since 1994. However, due to economic reasons (e.g., expensive fishing gear, labor costs), the number of participants in the pound nets fishery has declined from the 1980s (Mansfield et al. 2001). So while the number of pound nets has apparently decreased since the 1980s, the number of licenses issued (n=161) has been approximately the same since 1994. This suggests that the number of pound nets in the Virginia Chesapeake Bay has been approximately the same since 1994, but NMFS recognizes that the number of active nets in any given season may vary among years.

According to licensee information provided by VMRC, there were 67 licensed Virginia pound net fishermen in 2003. However, not all of these fishermen hang their nets in the area affected by this proposed action. According to VMRC data, there were 53 fishermen fishing pound nets in 2002; however, only 31 fishermen fished pound nets from May 6 to July 15. Most pound net fishermen have more than one license and as such, fish more than one net. On average, each

fisherman fishes approximately 2-3 pound nets. In 2004, there were 34 fishermen who reported landings with pound net gear, 27 (79%) reporting at least some landings from pounds in the regulated part of Chesapeake Bay. From May 6 to July 15 in 2004, approximately 21 pound net fishermen reported landings. Approximately 44% of the pound net annual landings and revenues occur between May and July.

Some Virginia pound net fishermen participate in gillnet and pot fisheries, but these catches represent a small proportion of the total landings by all pound net fishermen (4% and 4%, respectively). In general, it appears fishermen involved in the pound net fishery are dependent upon their pound net catch for their livelihood. The pound net fishery appears to be a family oriented fishery, in which practices are transferred to younger generations. Several families have been involved in the Virginia pound net fishery for generations. It is unclear at this time as to the financial status (e.g., poorer or richer than average) of the communities that are dependent upon pound net catches.

In 2001, the Virginia counties with the highest number of issued pound net licenses were Northumberland (50), followed by Northampton (43), Lancaster (13), Westmoreland (10), and Mathews (10). According to VMRC, pound nets are set almost exclusively offshore of the county in which the license was purchased. As such, the impacts of this action are concentrated in certain areas of Virginia, and the coastal communities in these counties would be the most impacted by management measures imposed on the fishery.

In Virginia, the majority of pound net stands are located around the southern Virginia shore of the mouth of the Potomac River (south of Smith Point), around the mouth of the Rappahannock River to the mouth of the York River/Mobjack Bay, and along the Eastern shore of Virginia (Figure 1). Only a few pound nets are set upriver of the first bridge in the Virginia Chesapeake Bay tributaries. For example, in 2004 there were no pound net landings reported for waters above the first bridge in the James River and York River.

The choice of leader mesh size depends heavily on the currents where the nets are located. Large mesh leaders are utilized in the areas of strong tidal currents to prevent flotsam from washing into the leaders and causing the overburdened nets to drift away. Also, the surface area of large mesh leaders decreases the drag associated with biofouling. In the southern area of the Eastern shore, traditionally large mesh leaders (approximately 12-14 inch mesh) are set in deeper waters (approximately 20-35 ft), while small mesh leaders (approximately 6-8 inch mesh) are set closer to shore in up to 15 ft of water. Current regulations prohibit the use of any leader greater than or equal to 12 inches stretched mesh for all nearshore pound nets and offshore leaders in Pound Net Regulated Area II during the regulated time period (May 6 to July 15). Stringer leaders are also typically used in locations with high currents, typically found in the Western Bay around the tip of Mobjack Bay. The pounds for those stringer leaders are set in 12 to 30 feet of water. Current regulations prohibit the use of leaders with stringers.

Within the Chesapeake Bay, a type of pound net commonly called a peeler pound is used to target blue crabs. The peeler pound nets are configured similarly to the pound nets depicted in

Figure 5, but are of a much smaller scale. The mesh of the leader and pound are typically between 1 and 2 inches, and often are constructed of wire (i.e., chicken wire) as opposed to rope (Gillingham, Lewis, VMRC, pers. comm.). The peeler pounds are fished close to shore (i.e., from the shoreline and extended into several feet of water) and are mostly found in rivers and tributaries, with the leader portion typically 100 feet in length. In 2004, there were 1,719 peeler pound licenses in Virginia waters, as compared to roughly 3,000 licenses in 1980 (Gillingham, Lewis, VMRC, pers. comm.). Because they are located within the affected area and are considered to be pound nets, peeler pound nets would be subject to the restrictions proposed by the alternatives. However, based on the size, specifications, and operation of the net, as well as the location they are fished, peeler pounds are not considered in the analysis of this action. NMFS does not have any information indicating that peeler pounds would be impacted by the proposed action.

5.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

This section outlines the scientific and analytic basis for the comparisons of the alternatives, as well as describes the probable consequences of each alternative on each environmental resource described in the Affected Environment section (Section 4.0). The environmental consequences will be addressed by each alternative outlined in Section 3.0. As described in Section 4.0, the biological resources potentially affected by this action include fishery resources, endangered and threatened species (sea turtles, shortnose sturgeon, whales), marine mammals, birds, and habitat. The main purpose of the PA is to incorporate new information on the use of modified leaders in the pound net fishery management program while continuing to conserve sea turtles listed under the ESA by reducing entanglements and impingements in Virginia pound net leaders. Therefore, the general effect of this action on sea turtles is expected to be neutral, as compared to the current management measures and status of turtles in Virginia's Chesapeake Bay. The impact of the action is expected to be neutral because the expected additional risk of entanglement or impingement of sea turtles on the modified leader is low (Section 5.1.2). The fishing industry directly impacted is the Virginia pound net fishery.

5.1 Environmental Consequences of the Preferred Alternative

Under this alternative, NMFS would issue a rule that would require any offshore pound net leader set in Pound Net Regulated Area I to meet the definition of a modified leader during the period from May 6 through July 15 each year. Current leader restrictions would apply to any pound net leader set in Pound Net Regulated Area II and any nearshore pound net leader in Pound Net Regulated Area I.

5.1.1 Impacts on Fishery Resources of the Preferred Alternative

In Pound Net Regulated Area I (Figure 4), with modified leaders used for offshore pound nets to guide the fish, more fish would likely be caught in these pounds as compared to NPA 1 (status quo), which prohibits leaders. For nearshore nets in Pound Net Regulated Area I and all nets in Pound Net Regulated Area II, there would be no impact to fishery resources as compared to NPA

I, as the PA would maintain current leader restrictions (<12” mesh, no stringers) in this area. The pound net fishery in Virginia Chesapeake Bay accounts for roughly 3% of all landings from this area (Table 3).

The experiment using a modified pound net leader in Pound Net Regulated Area I in 2004 and 2005 demonstrated that fishing with a modified leader resulted in similar catches as fishing with an unmodified (traditional) leader for species that include weakfish, croaker, harvestfish and threadfin shad. There appeared to be minimal differences in landings by pound nets using the modified leader for species composition, length frequency distributions and total amounts as landings by unmodified leaders (DeAlteris et al., 2004; DeAlteris et al., 2005). Over the 42 day study period in the 2004 experiment, 61 pound net catch observations were made. Of the observations, two species of large fish (weakfish and croaker) and two species of small pelagic fish (harvestfish and threadfin shad) dominated the catch. Out of the four net locations tested, one net, the mid-shore net, had dramatically lower catch and was not used in the quantitative comparisons. Furthermore, a small pelagic bat fish excluder was installed in the funnel of one of the pound nets, which may have influenced total catch. For weakfish, croaker, harvestfish and threadfin shad, while the daily catches varied markedly over the study period, the results of paired comparisons indicated no significant differences between the daily catches of the modified and unmodified leaders. In 2005, the catch comparisons between the modified and unmodified leaders was limited because the unmodified leaders were removed after 30 days, however, the limited catch comparisons for three finfish species (weakfish, croaker, and butterfish) suggested that the modified leaders caught similar quantities and size distributions of finfish as the unmodified leader design (DeAlteris et al., 2005).

It would be logical to assume that requiring leaders used in offshore nets in Pound Net Regulated Area I to be modified leaders would result in negative impacts to fishery resources harvested by the pound net fishery, as it would allow an increase in fishing pressure as compared to current conditions (NPA I). However, while this is one logical outcome of the PA, landings information indicate that 2004, the first year of the offshore leader prohibition in Pound Net Regulated Area I, did not result in a difference in pound net landings from the previous year (
Landings and revenues by species for the pound nets in the regulated part of Chesapeake Bay vary between years (388HError! **Not a valid bookmark self-reference.);** however the top species have been consistent. In 2004, baitfish, Atlantic croaker and menhaden (listed in order of importance) made up over 81% of the landings for this fishery. In value terms however, these same three species only accounted for only 61% of value and order of importance switches to croaker, menhaden and baitfish. Total landings were almost 9 million pounds, with a total value of $2.2 million dollars. While landings were up in 2004 over 2003 and 2002, the value of the fishery declined for the third straight year.

Table 13). This is because NFMS does not have data that are accurately representative of the consequences of the 2004 rule in Pound Net Regulated Area I (prohibition on pound net leaders in Pound Net Regulated Area I) against which to compare the impact of the PA in this area, as the data available are influenced by the modified leader experiment. In 2004, at least 4 offshore

nets in Pound Net Regulated Area I landed fish as part of the NMFS modified leader study with a similar frequency as landings prior to 2004.

Some fish species have been found entangled in the pound net gear, rather than captured alive in the pounds. During a VIMS pound net survey in 2001 and NMFS pound net monitoring from 2002 through 2004, many fish species were found entangled in pound net leaders and the mesh of hearts and pounds (Mansfield et al. 2002a; NMFS unpublished data). These species included red drum, bluefish, striped bass, weakfish, black drum, croaker, menhaden, blue crab, spiny dogfish, rays, and other small sharks. Additionally, in 2002, a dead terrapin was found entangled in a leader, and in 2003, one live snapping turtle was found.

The PA would require a modified leader to be used for offshore pound net leaders set in Pound Net Regulated Area I, which could result in entanglement of some fish species in the leader as has been observed in previous years (i.e., prior to 2004). Therefore, the PA may have comparatively negative impacts to fishery resources because, as compared to NPA 1, there would be more mesh in the water capable of entangling fish species. However, the degree to which using the modified leader use would result in more fish entanglements is not expected to be extensive or measurable against the amount of fish that would be captured by pound net fishermen in Pound Net Regulated Area II or by other commercial or recreational fishermen within the regulated area. Furthermore, the modified gear would have 2/3 less mesh in the water than traditional pound net leaders. Therefore, while the leaders are shown to be comparable in effectiveness to traditional gear, as the vertical lines are as effective as mesh at creating visual cues that “herd” fish toward the pound, the leaders are less likely to result in bycatch and discards of fish species caught incidentally in the leader itself. While it is not reasonable to assume that the modified leaders would result in 2/3 less bycatch of fish in the leader mesh, as there may be other factors to bycatch in the leader as just the amount of mesh (i.e., as measured from water surface to floor), it is reasonable to assume that the bycatch would be decreased to some extent.

If NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after July 15 and the regulations are extended via the framework mechanism, the impacts of the extension on fishery resources should not differ from the original gear restriction.

Conversely, if NMFS determines that a prohibition of all pound net leaders is required, all pound net fishermen in the affected area would be required to remove their leaders from the water. While the heart(s) and pound may still be set, resulting in some level of fish catch, it is likely that the catch will be drastically reduced, if not completely eliminated. If the use of all pound net leaders in a certain area is curtailed, fish would not be caught by pounds and would be more plentiful in Virginia waters. Again, these fish may continue to be caught by other commercial and recreational fishing gear. As such, it is unlikely that the prohibition of all pound net leaders would noticeably improve the fish stocks in Virginia waters.

5.1.2 Impacts on Endangered and Threatened Species of the Preferred Alternative

The PA has the potential to impact threatened and endangered sea turtles, and to a minimal extent endangered shortnose sturgeon. This PA was developed to prevent sea turtle interactions with pound net leaders while enabling fishermen to use leaders and to incorporate new information into the pound net fishery management measures. All species of turtles, including loggerhead, Kemp's ridley, leatherback, green and hawksbill, have the same likelihood of entanglement in pound net leaders should they occur in the affected area, though loggerhead and Kemp's ridley are most common in Virginia's Chesapeake Bay. As such, the biological impacts of the PA (and all other alternatives) will be addressed for all sea turtles combined, rather than by each individual species. It should be noted however that individual species characteristics (e.g., life history stage, foraging ecology, diving behavior) may play a role in the potential for entanglement, but NMFS cannot quantify this role at this time.

In the Biological Opinion on the 2004 rule, the implementation of sea turtle conservation measures for the pound net fishery in Virginia waters of the Chesapeake Bay, NMFS anticipated that 505 loggerheads, 101 Kemp's ridley, and 1 green sea turtle would be taken annually in the pound portion of the pound net gear set in the Virginia waters of the Chesapeake Bay. These takes were anticipated to be live, uninjured animals; dead sea turtles in the pounds were not anticipated. Also, that no more than 1 loggerheard, 1 Kemp's ridley, 1 green or 1 leatherback sea turtle will be either entangled or impinged in the leaders from July 16 to May 5 and 1 loggerhead, 1 Kemp's ridley, 1 leatherback or 1 green sea turtle will be entangled in leaders outside of the closed area with less than 12 inches stretched mesh from May 6 to July 15 each year. These takes were considered to result in sea turtle mortality. The estimates of incidental take were determined from data from one fisherman in the Potomac River (northern portion of Virginia waters), the average number of turtles taken, and the maximum number of pound net sites in Virginia waters as observed in 2003 monitoring. That data represented the best available data on turtle captures in pounds, at the time of the preparation of the Biological Opinion.

5.1.2.1 Historical Sea Turtle/Pound Net Interactions

Information regarding the interaction of sea turtles and the pound net fishery was documented in detail in the EA prepared for the 2004 rule, which can be referenced for further information. The information is summarized in the following sections.

High sea turtle mortalities in late May and early June in Virginia waters of the Chesapeake Bay have been attributed to pound net leaders since the 1980's (Lutcavage 1981; Bellmund et al. 1987). Specifically, studies conducted in the 1980s estimated that pound net entanglement may account for up to 33 percent of sea turtle mortality in the Chesapeake Bay during some summers (Lutcavage and Musick 1985), but more turtles are likely entangled in Virginia pound net leaders and drown than are reported (Lutcavage 1981).

5.1.2.2 Recent Sea Turtle/Pound Net Interactions (2001-2003)

In recent years, sea turtles have been documented in Virginia pound net leaders (NMFS, 2004). Forced submergence, that could result from impingement on or entanglement in pound net

leaders, is a concern for sea turtles. Sea turtles forcibly submerged in any type of restrictive gear eventually suffer fatal consequences from prolonged anoxia and/or seawater infiltration of the lung (Lutcavage et al. 1997).

As mentioned earlier, NMFS conducted pound net monitoring in the spring of 2002 and 2003 (Table 6). These efforts documented the entanglement and impingement of sea turtles on pound net leaders with various mesh sizes. Pound net monitoring was conducted from April 25 to June 1, 2002, and then from April 21 to June 11, 2003. A total of 838 surveys were completed in 2002 and 2003 combined and a total of 28 sea turtles were found in association with pound net leaders, of which 9 were entangled, 14 were impinged on the leaders by the current, and 5 were either inconclusive or previously dead. Table 4 provides cursory details on the 9 entangled animals. In total, 2 animals were found alive and 7 were dead, including 5 Kemp's ridleys and 4 loggerheads.

Table 4. Entangled sea turtles observed during pound net leader monitoring in 2002 and 2003.

Date	Species	Disposition	Leader size stretched mesh	Location of entanglement	Geographic location[2]
May 2002	Kemp's ridley	Dead	8"	Neck	Eastern shore, offshore net
May 2002	Loggerhead	Dead	14"	Left front flipper	Eastern shore, offshore net
May 2002	Kemp's ridley	Dead	14"	Left front flipper	Eastern shore, offshore net
May 2002	Loggerhead	Dead	Stringer	Left front flipper	Western Bay, offshore net
May 2003	Loggerhead	Alive	11.5"	Both front flippers	Eastern shore, offshore net
May 2003	Kemp's ridley	Dead	11.5"	Left front flipper	Eastern shore, offshore net
June 2003	Kemp's ridley	Dead	11.5"	Left front flipper	Eastern shore, offshore net
June 2003	Loggerhead	Dead	8"	Left front flipper	Eastern shore, nearshore net
June 2003	Kemp's ridley	Alive	11.5"	Right front flipper	Eastern shore, offshore net

Necropsies were performed on 4 of the 7 dead entangled turtles. Based upon available information, NMFS concluded that the death of these 7 turtles was attributable to entanglement in the pound net leaders given the tight multiple wrapping of line around their flippers, their decomposition state (fresh dead to moderately decomposed), their buoyancy (negatively buoyant, which typically suggests recent mortality), and the necropsy results (when available).

Impingements were also documented during 2002 and 2003 monitoring efforts. Table 5 depicts the instances of sea turtle impingement on pound net leaders. Of the total 14 impingements in 2002 and 2003, there were 12 loggerheads, 1 Kemp's ridley and 1 unidentified species of hard

[2]All but one of these observed entanglements were located within the closed area of the PA.

shelled sea turtle. Only one turtle was found dead. All of the impingements in 2003 occurred on leaders in compliance with the 2002 interim final rule.

Impingements occur when the sea turtles are held against the net by the current. If an animal was impinged on a leader by the current with its flippers inactive, based on observations of impinged sea turtles and other available information, NMFS believes that without any human intervention it could either swim away alive when slack tide occurred, become entangled in the leader mesh when trying to free itself, or drift away dead if it drowned prior to slack tide. Note, however, that if a sea turtle remains alive after an impingement and swims freely, it could become impinged on or entangled in another nearby pound net leader. This animal would likely already be in a compromised state, which would further augment the impacts of forced submergence. Dead animals the drift free of the gear could then strand on nearby beaches, wash into another nearby pound net leader, or drift off with the current. The likelihood that a turtle remains alive after an impingement depends on the stage of the tide cycle and the location of the turtle in the leader. For example, if the turtle becomes impinged at the beginning of the tide cycle and its head is under the surface, it would likely remain that way for several hours and subsequently drown (particularly if it was struggling in the net as turtles were observed to do).

Table 5. Observed impingements during pound net leader monitoring in 2002 and 2003.

Date	Species	Disposition	Leader size stretched mesh	Location of impingement (approx. depth)	Geographic location*
May 2002	Loggerhead	Alive	14"	Surface; head and left front flipper through mesh	Eastern shore, offshore net
May 2002	Loggerhead	Alive	14"	Surface; head and front flipper through mesh	Eastern shore, offshore net
May 2003	Loggerhead	Alive	11.5"	4 ft below surface	Eastern shore, offshore net
May 2003	Loggerhead	Alive	11.5"	3 ft below surface	Eastern shore, offshore net
May 2003	Loggerhead	Alive	8"	Surface	Eastern shore, offshore net
June 2003	Loggerhead	Dead (fresh)	11.5"	5 ft below surface	Eastern shore, offshore net
June 2003	Loggerhead	Alive	8"	Surface	Eastern shore, offshore net
June 2003	Unknown	Alive, but condition unknown**	11.5"	Surface, facing downwards with flippers active	Western Bay, offshore net
June 2003	Loggerhead	Alive	11.5"	Surface, head and flipper through mesh	Eastern shore, offshore net
June 2003	Loggerhead	Alive	11.5"	2 ft below surface, left front flipper through mesh	Western Bay, offshore net
June 2003	Loggerhead	Alive	8"	3+ ft below surface	Eastern shore, offshore net
June 2003	Loggerhead	Alive	8"	3 ft below surface	Eastern shore, offshore net

June 2003	Loggerhead	Alive	8"	3 ft below surface	Eastern shore, offshore net
June 2003	Kemp's ridley	Alive	11.5"	3 ft below surface	Eastern shore, offshore net

* All of these observed impingements were located within Pound Net Regulated Area I.
** Turtle was first observed alive, held against the net facing downward with both of its front flippers active, but when observer went on the other side of the leader to better evaluate the animal, it was gone. It is unknown whether the turtle slipped deeper down the net and could not be seen, or if it became unimpinged by the boat wake or other means.

5.1.2.3 Monitoring in 2004

In 2004, NMFS again monitored the pound net fishery. Out of the 88 nets characterized, 37 were found to be active (Table 6). Four sea turtle interactions were observed over 1,190 surveys conducted, with three turtles entangled in the gear and one turtle impinged. Out of the four turtles that interacted with the pound net gear, one was released alive. Furthermore, three of the turtles interacted with pound net leaders in Pound Net Regulated Area I that were participating in the leader experiment (these three turtles are documented in the results reported in Table 2). The number of surveys (monitoring events) was higher in 2004 than the two previous years, indicating that the fewer interactions observed in 2004, as compared to 2002 and 2003, may not have been a function of observer effort. The lower number of observed turtle interactions could be related to one or more other factors, or a combination of factors. For example the lower number of interactions could be related to the fewer number of active nets, fewer sea turtles present in the affected area in 2004 as a result of localized environmental conditions, and/or the current pound net regulations, which prohibit the use of offshore pound net leaders in Pound Net Regulated Area I from May 6 to July 15, where the majority of sea turtle interactions have been observed in the past.

Table 6. Observer Effort

Year	Number of Nets Characterized	Number of Active Nets	Number of Monitoring Events	Number of Turtle Interactions
2002	98	70	648	11
2003	101	56	815	17
2004	88	37	1190	4

5.1.2.4 2004 Modified Leader Experiment Results and Analysis of Modified Leader Components

Concomitantly to NMFS' pound net observation, NMFS conducted a coordinated research program to test the performance of a modified pound net leader. NMFS Northeast Fisheries Science Center was granted a scientific research permit under section 10(a)(1)(A) of the ESA that authorized the take of 102 loggerheads (2 dead), 39 Kemp's ridleys (3 dead), 1 alive green, and 1 alive leatherback. NMFS was testing the hypothesis that using a modified leader would result in fewer turtle interactions as compared to an unmodified leader without affecting the finfish catch. In 2004, six pound net leaders were tested, four of which are characterized as offshore and two characterized as nearshore, and all test locations were within the area subject to the offshore leader prohibition because the area is known to be high in turtle-pound net interactions (Pound Net Regulated Area I). In 2005, four leaders were tested in the same area.

The modified pound net leader design was presented as an alternative in the 2004 EA (NPA 5). The alternative was proposed by industry representatives during a meeting held at the Virginia Marine Science Museum (VMSM) on October 27, 2003. One of the public comments received on the 2002 proposed rule (67 FR 15160, March 29, 2002) also proposed a similar gear configuration for the Virginia pound net fishery. While not exactly the same, this alternative is also similar to the VMRC/industry alternative (NPA 3) evaluated in the 2002 EA on sea turtle conservation measures for the Virginia pound net fishery, in that the leader mesh would be dropped below the water and stringer-like lines would be spaced a certain distance apart to hold the dropped leader in place and help guide fish. This alternative was also proposed by the pound net industry, in conjunction with VMRC and VIMS. Furthermore, the Biological Opinion that was prepared for the 2004 final rule stated, as a Reasonable and Prudent Measure (RPM), that "NMFS must conduct or fund scientific experiments to evaluate the potential for alternative pound net leaders designs to be employed in Virginia Chesapeake Bay waters. Such experiments may include research and development of new alternatives or testing of gear modifications, and efforts should be made to work cooperatively with the industry." As such, the experiment conducted, and the PA that would require the modified gear, represents an alternative that is supported by industry and interested organizations, as well as an RPM as specified by NMFS.

Previous justification for dropping the mesh of pound net leaders was provided by VIMS in a letter to VMRC dated November 14, 2001:

> "The justification for dropping leaders to nine feet below the water's surface is based on observations of poundnet leaders by VIMS over the course of 22 years. This research was conducted by vessel and by scuba divers, and suggests that the vast majority of turtle entanglements occur in the top two meters of net (Musick et al., 1984). The behavior of sea turtles in the Chesapeake Bay in late May and early June probably explains this pattern. The thermocline at this time of year is still steep with surface temperatures ranging between 18 to 24 C and bottom temperatures between 10 and 14 C. These conditions limit the turtles' preferred habitat to the upper part of the thermocline. As the Bay heats in June and bottom temperatures warm up, loggerheads move onto their preferred foraging areas on the bottom of tidal channels (Byles, 1988). This would explain the large drop in entanglements in late June and beyond. VIMS side scan sonar surveys of poundnet leaders during the summer of 2001 also support the contention that sub-surface entanglements are rare. No potential sea turtle acoustic signatures were observed during surveys conducted after the season's stranding peak."

In the 2004 EA, NMFS noted that they believed that lowering the mesh on leaders in a southern portion of the Chesapeake Bay may allow the sea turtles near the surface to swim over the leader mesh and through the spaced lines, and would likely reduce the potential of sea turtle entanglement in and impingement on these leaders and benefit the species. However, NMFS was concerned that dropping the leader mesh on leaders may not necessarily preclude turtle entanglement in the mesh remaining below the surface. Furthermore, NMFS did not support the implementation of the measure in 2004 because there was not adequate documentation that the

modified gear would reduce sea turtle entanglement in the mesh dropped below the water surface.

NMFS was concerned that in areas with strong current, dropping the leaders below the surface would increase the potential for the net to gap, or billow, between the leader poles, creating an effect like a tie down pocket (similar to what is seen in the monkfish gillnet fishery), which could magnify the potential of sea turtle entanglement. Without adequate monitoring and evaluation, NMFS was concerned that implementing the modified gear would create a situation in which sea turtles become entangled in leader mesh below the water. The 2004 EA noted that if the mesh could be held taut and not gap in the water column, the potential for sea turtle entanglement would likely be reduced. NMFS was also concerned that impingements could still occur on the leaders set 1/3 the depth of the water in areas where impingements have previously been documented.

To address concerns regarding the operation of the proposed modified leader configuration, and to respond to the RPM in the Biological Opinion, NMFS conducted an experiment in 2004 and 2005 to test the gear as proposed in the 2004 EA. The gear configuration is depicted in Figure 2 and is described in section 3.0. The results of the experiment demonstrate that the modified leader is successful in reducing the entanglement and impingement of sea turtles, as compared to the traditional, unmodified leader (Table 2). The results are compelling to the degree that allowing the use of the modified gear within the area currently closed to pound net leaders (Pound Net Regulated Area I) is being proposed by NMFS as an alternative that would protect sea turtles and at the same time support the historic pound net fishery.

Dropped Mesh

The specifications for the experiments in 2004 and 2005 indicated that the height of the mesh is restricted to one-third the depth of the water. However, for purposes of rulemaking, it is important to indicate a common reference point against which the depth of the water may be measured, such as mean lower low water. During the preparation of this action, NMFS staff confirmed with two participants in the experiment that the modified pound net leaders they used were constructed in, or close to, that manner. Therefore, NMFS proposes to state in the definition of a modified pound net leader that the height of the mesh from the seafloor at any particular point must be no more than one-third the depth of the water at <u>mean lower low water</u> at any time during the tidal cycle throughout the regulated period. Furthermore, it is intended that the mesh should not exceed one-third the depth of the water at mean lower low water at any point along the length of the leader (Figure 3); thus, the leader mesh would be tapered to conform to these requirements.

In the spring, sea turtles in the Virginia Chesapeake Bay may be found throughout the water column. Cold blooded sea turtles prefer warmer waters, but species occur in waters as cold as 11˚ C. In fact, in March 1999, an incidental take of a loggerhead sea turtle in the monkfish gillnet fishery off North Carolina occurred in 8.6˚ C water. It is unlikely that sea turtles will only occur in the upper third of the water column during the spring when the bottom temperatures are

cooler than the surface. While they may prefer these warmer surface waters, it is unlikely that all of their prey resources are located in these surface waters. Lutcavage and Musick (1985) and Mansfield et al. (2001) state that entanglements occur when turtles first enter the Bay after the spring migration in areas where currents are strong, and many of the turtles are emaciated and weak. Strandings data from May and June 2000 and 2001 do not indicate that most of the stranded turtles were emaciated or externally compromised. According to STSSN reports, most spring stranded turtles have had relatively good fat stores, indicating that they were likely foraging. Further, NMFS is unaware of data supporting the conclusion that there is a seasonal difference in the number of emaciated turtles found stranded in the Virginia Chesapeake Bay. Byles (1988) and Mansfield et al. (2001) state that turtles are able to forage around the nets with little threat by the end of June. If turtles are emaciated and weak early in the season, and are able to circumnavigate the leaders later in the season (indicating that the turtles are no longer in a weakened state), turtles are likely foraging in the Chesapeake Bay during the spring. Loggerheads, Kemp's ridleys and green turtles are primarily benthic foragers. Musick et al. (1984) found that crustaceans aggregate on large epibiotic loads that grow on the pound net stakes and horseshoe crabs become concentrated at the bottom of the net. Turtles may be more common in the upper water column, but if they are foraging for their preferred prey, which appears to be present around pound nets, they must be periodically near the bottom, thus subject to entanglement in leaders below the surface. Furthermore, Mansfield and Musick (2003b) found that 7 sea turtles (6 loggerheads and 1 Kemp's ridley) tracked in the Virginia Chesapeake Bay from May 22 to July 17, 2002, dove to maximum depths ranging from approximately 13.1 ft to 41 ft. Further, Byles (1988) and Mansfield and Musick (2003b, 2004) found that sea turtles in the lower Chesapeake Bay commonly make dives of over 40 minutes during the day. While the percentage of time spent at each depth range needs to be clarified, it is improbable that turtles, during a 40 minute period, are never found at depths deeper than the depth at which sea turtles were observed entangled and impinged. Traditional pound net leader characteristics are generally consistent from the top of the leader to bottom and, according to field observations and discussions with pound net fishermen, in most nets, leader mesh size appears to be uniform from top to bottom. Because monitoring the entire leader profile has not be conducted full-time on each leader, it is possible that more sea turtles are in pound net leaders than are observed or reported.

Dropping the mesh of the modified leader to 1/3 the depth of mean lower low water and adding vertical lines, spaced 2 feet apart, was proposed to allow sea turtles to pass through the upper 2/3 of the leader, through the vertical lines, without entangling or impinging on the leader. The data presented above indicates that turtles do forage on the benthos and around pound nets, and therefore would be able to interact with the lower leader mesh. Furthermore, turtles have been observed to dive to the bottom regardless of water temperature and loggerheads have been observed to spend up to 90% of time beneath the surface of the water (Mansfield et al., 2005). Despite this information indicating that turtles could interact with the leader mesh near the bottom, all interactions during the 2005 experiment were recorded in the top portion of the leader mesh (at depths within the top 2/3 of the depth of mean lower low water). Furthermore, it is unknown if turtles are likely to become impinged and entangled upon their first contact with the pound net leader or if, once interaction occurs, they attempt to move away (in any direction) from

the interaction site and eventually become impinged or entangled after several interactions. If the second scenario occurs, it is possible that a turtle could interact with the bottom mesh of a modified leader in the lower water column (up to 1/3 depth of mean lower low water) and then move up the leader and through the vertical lines. Note that, in 2005, there were no observed interactions with the modified leaders.

It is possible that interactions could have occurred in the bottom 1/3 of the leader and were not observed during monitoring. In 2001 and 2002, side scan sonar was used to attempt to detect sub-surface sea turtle entanglements; but no verified sea turtle acoustical signatures were observed during these surveys (Mansfield et al. 2002a; Mansfield et al. 2002b). A number of factors are thought to influence the use of side scan sonar, including weather, sea conditions, water turbidity, the size and decomposition state of the animal, and the orientation of the turtle in the net. During the 2004 and 2005 experiment, side scan sonar was again used to detect sub-surface sea turtle interactions. The nets were monitored twice each day, both visually (up to top ten feet of the net) and with sonar, using a diver to visually inspect each suspected sonar contact (DeAleris et.al, 2004). One turtle was uniquely identified by the sonar. Because sonar was shown to be a successful method of sea turtle detection during the experiment, NMFS believes it is unlikely that unobserved interactions occurred in the dropped mesh portion of the modified leaders. However, it is possible that an interaction that did not result in a turtle being impinged or entangled occurred as described above (i.e., the turtle interacted with bottom mesh and then moved up the leader and through the vertical lines). If this occurred, the relatively short duration of the interaction would have decreased the probability of the interaction of being detected by sonar monitoring.

Vertical Lines/Stringers

The modified leader consists of mesh and stiff, vertical lines spaced at a minimum of 24 inches (2 feet) apart (Figure 2) and attached to a top line. While the vertical lines used in the modified leader design meet the definition of a "stringer" in a pound net leader, they cannot be treated separately from the overall design and construction of the modified leader (i.e., line specification, distance apart, and dropped mesh) and therefore NMFS has chosen to refer to them just as "vertical lines." However, because these vertical lines do meet the definition of "stringer," and stringers are prohibited under existing regulations in nearshore leaders in Pound Net Regulated Area I and all leaders in Pound Net Regulated Area II, the modified pound net leader would also be prohibited from being used in nearshore leaders in Pound Net Regulated Area I and all leaders in Pound Net Regulated Area II under the preferred alternative.

Bellmund et al. (1987) found that leaders with stringers set 16 to 18 inches apart entangled turtles, which is only a few inches smaller that the proposed gear configuration. Widening the gap between vertical lines to 2 feet in the modified leader experiment (and the PA) was designed to allow some turtles to pass through the lines unobstructed, thereby decreasing the risk of potential sea turtle interactions with the modified gear. The type of rope proposed for use (e.g., 5/16 inches in diameter), and the average size of sea turtle found in the Chesapeake Bay (e.g., 50-70 cm SCL), and the fact that sea turtles have been found to become entangled in vertical lines,

such as used in other fishing gear (e.g., lobster and crab pot fisheries), indicate that it would be possible for turtles to become entangled in the vertical lines. To address this concern, NMFS used stiff, hard lay line, as the tauter the vertical lines, the smaller the likelihood of sea turtles becoming entangled in the lines.

During the experiment conducted in 2004, the project used stiff lines that were coated with paint and were spaced at 2 foot intervals. Although the vertical lines were designed to allow turtles to pass through this portion of the leader, a large leatherback sea turtle (128 cm SCL), roughly twice the average size of hardshell sea turtles found in the Chesapeake Bay, entangled with an experimental leader. The leatherback turtle was dead when discovered on June 23, 2004, however, the NMFS observers still attempted to revive the animal to ensure that it was indeed dead and not comatose when encountered. The leatherback was entangled by its left flipper about four feet under the surface of the water in the portion of the leader made up of vertical lines. This leatherback turtle represented the only turtle observed to have interacted with the modified pound net leader during the two year study. The necropsy report indicated that the turtle appeared to be in good health and that the cause of death was entanglement in the pound net and drowning (Swingle et al., 2005). Subsequent histological analysis revealed that the leatherback suffered from ependymoma (brain tumor with possible neurological dysfunction), pneumonia, and hepatitis (Swingle et al., 2005). NMFS reviewed the particulars of the interaction and determined that the stiffness of the vertical lines could be increased to further decrease the likelihood of entanglement (i.e., to prevent the lines from gaping to the degree that a large turtle would be able to entangle its flipper in the line). The increased stiffness of the vertical lines in 2005 was achieved by using painted, twisted, 5/16 inch hard lay line. "Hard lay" is a technical term used in the cordage industry to describe line that is purposefully made to be stiff. Results from the 2005 study indicate that there were no sea turtle interactions with the modified leaders.

Mesh Size

It is indeterminate whether reducing mesh size (from less than 12 inches to less than or equal to 8 inches stretched mesh) has a significant benefit to sea turtles and if mesh size is the key component in potential sea turtle interactions with pound net gear. In the 2004 EA, because data analysis regarding the effect of mesh size on sea turtle interaction with pound nets was inconclusive, NMFS did not restrict mesh size to less than 8 inches. In the 2004 and 2005 modified leader experiment, 8 inch dropped stretched mesh was tested. NMFS cannot conclusively deduce which individual feature of the experimental gear resulted in its success at preventing sea turtle entanglements or impingements (i.e., dropped mesh, line specifications, mesh size). Therefore, NMFS does not support revising an element of the modified gear without testing the configuration as a whole. Because no other mesh size was tested as part of the experiment, NMFS supports the implementation of the modified gear in the configuration it was tested, using less than or equal to 8 inches stretched mesh.

It should also be noted that during the public comment period on the 2004 rule, it was recognized that an 8 inch leader may in fact be slightly smaller than 8 inches, after it is coated and hung in

the water. For example, NMFS observers measured nets to the nearest 0.125 inches, so a sea turtle entanglement recorded in an 8 inch stretched mesh leader may have in fact been in a leader with 7.95 inches stretched mesh. Whenever NMFS mentions that sea turtles have been taken in 8 inch stretched mesh leaders, it refers to those nets that may have been slightly smaller or larger (within 0.125 inches) than 8 inches.

5.1.2.5 Geographic Area and Environmental Conditions

The boundaries of the regulated areas defined in the current regulations were determined based on a combination of the locations of observed sea turtle entanglements in or impingements on pound net leaders and the area in which sea turtles may face a greater risk of entanglement in or impingement on pound net leaders due to environmental conditions (NMFS, 2004). Previous research and monitoring indicated that geographic location, which is a proxy for other environmental factors such a temperature and current, may play an important role in the risk of sea turtle entanglement and impingement. The majority of sea turtles observed to have interacted with pound net leaders during the study, either dead drifting turtles or turtles that encountered the leader while alive, approached the leader from the north, and therefore encountered the leaders on an ebb tide, indicating that the offshore leaders found in Pound Net Regulated Area I may be subject to environmental features (current, tide, temperature) that contribute to the risk of the area to sea turtles (DeAlteris et al., 2005).

The 2005 pound net experiment evaluated the strength of the current at different depths and postulated that the difference between the strength of the surface and bottom currents in Pound Net Regulated Area I could account for the greater number of sea turtle interactions in the upper portion of the leader as compared to the lower portion (DeAleris et al. 2005). Sufficient evidence is not available at this time to determine if current is a causative factor.

While some offshore nets within Pound Net Regulated Area I may not have an observed sea turtle interaction, NFMS recognizes that sea turtles interactions that are neither observed nor reported may occur in the future or have occurred in the past. Also recognizing that geographic location, which may be a proxy for other environmental factors such as temperature and current, plays an important role in the risk of sea turtle entanglement in and impingement on pound net leaders, the geographic area of the proposed leader modification is designed to encompass the total area with the most documented takes of turtles to prevent turtle entanglements and impingements in pound net leaders (leading to the potential subsequent drowning of sea turtles). Furthermore, NMFS has evidence that the modified pound net leader does work for offshore pound net leaders set in Pound Net Regulated Area I, as this is where the gear was tested (DeAlteris et al. 2004; DeAlteris et al. 2005).

5.1.2.6 Time Frame of the PA

The time frame of the proposed action remains the same as defined in current regulations and further information regarding the time frame can be found in the EA for the 2004 rule. The regulated period was determined from previous sea turtle strandings data collected on Virginia

beaches and from water temperature preferences of sea turtles. New information to indicate that a different time frame should be analyzed is not available.

Strandings are used in this case to indicate when sea turtles begin to enter the Chesapeake Bay. In one year, the first documented stranding was on April 17 (2005), while in another year, sea turtles were not reported on Virginia beaches until May 19 (2001). From 1994 to 2003, the average date of the first reported stranding in Virginia was May 13. However, sea turtle mortality would have occurred before the animals stranded on Virginia beaches. It is unknown exactly how long it takes a sea turtle in Virginia to strand once the mortality incident has occurred, as the stranding would be dependent upon a number of factors including the location of the mortality, wind patterns, and water currents. A one week estimate from the mortality incident to stranding date appears to be realistic for Virginia Chesapeake Bay waters. In order for the protective measures to be in effect by the time sea turtles are entering the Bay and reduce spring sea turtle interactions with pound net leaders, the proposed measures must go into effect at least 1 week prior to the stranding commencement date, or on May 6. Water temperature data also support the enactment of the proposed measures on May 6. The water temperatures around the mouth of the Chesapeake Bay are well within sea turtles' preferred temperature range in early May (NFMS, 2004) and, therefore, support maintaining the effective date of the PA.

Monitoring for sea turtle strandings has continued outside the time frame of NMFS pound net observations (e.g., from mid-June to July). A study in the 1980's (Bellmund et al. 1987) stated that entanglements in pound net leaders began in mid-May, increased in early June, and reached a plateau in late June. Strandings data show that the peak can occur earlier and later. For instance, in 2003, the stranding peak occurred during the last two weeks of June and strandings remained consistent through the second week of July (e.g., 48 sea turtles stranded from July 1-15, 2003). The 2003 stranding peak rate was 10-15 days later than in 2001 and 2002 (Swingle and Barco 2003). In 2004, the stranding peak occurred the first two weeks of June while in 2005, the peak occurred last two weeks of June. Given that sea turtle presence in the Chesapeake Bay is dependent upon water temperature, which makes the stranding peak somewhat variable, it is important to ensure sea turtles are protected during the period of apparent vulnerability (as indicated by elevated strandings). Given the available data regarding stranding patterns the risk of sea turtle interaction with pound net leaders in the affected area, NMFS does not believe that a revision of the current time period of pound net restrictions are necessary at this time.

5.1.2.7 Benefits to Sea Turtles

NMFS has sufficient evidence to conclude that there is a localized interaction between sea turtles and pound net leaders along the Eastern shore of Virginia and in the Western Chesapeake Bay. Most of the sea turtles have been observed in pound net gear along the Eastern shore in recent years, and NMFS responded to the observed interaction with pound net gear through rulemaking in 2004 that closed this area to offshore pound net leaders during the spring. The proposed action (PA), including requiring the use of the modified leader in any offshore pound net leader set in Pound Net Regulated Area I, would provide a level of protection to sea turtles similar to that of the current closure and restrictions (NPA 1). While it would seem rational to infer that

increasing the amount of pound net leader gear in the water in an area known to be high in turtle interactions would increase the risk to sea turtles, because the modified leader has low predicted turtle bycatch, adding modified gear would not be expected to appreciably increase the risk to turtles. There was only one observed sea turtle entanglement over the two year study in the modified gear, and the gear was further refined to respond to the take. After the gear was further refined, no sea turtles takes were reported in the modified gear. Accordingly, there is a small, unquantifiable chance that a sea turtle may interact with the modified leader. Based upon the results of the experiment, the likelihood of entanglement in or impingement on the modified leader is remote. Consequently, the PA would benefit sea turtles and provide a level of protection to sea turtles that approximates the status quo (NPA I).

The existing framework mechanism remains in place, through which NMFS could enact additional measures to respond to new information. Should monitoring of pound net leaders from May 6 to July 15 document a sea turtle entanglement, NMFS may implement additional restrictions as deemed necessary, including the prohibition of all pound net leaders regardless of configuration or area. If additional measures are enacted, sea turtles would benefit. For instance, if all leaders are prohibited in a certain area or in the entire Virginia Chesapeake Bay, sea turtle interactions with pound net leaders will be prevented as there would be less potentially entangling gear in the water. If additional analysis and data collection determine that there is a significant difference in sea turtle interaction rates between mesh sizes, and a leader mesh size restriction of 8 inches and greater is determined appropriate, this should serve to reduce sea turtle entanglement. If leader restrictions are extended to July 30, this will serve to provide additional protection to sea turtles by minimizing any other entanglements during that 2 week period.

By implementing the PA, which would allow modified leaders in an area with the most documented sea turtle entanglements and impingements, sea turtle interactions with pound net gear are expected to continue to be reduced. As such, the PA would benefit sea turtles found in the Virginia Chesapeake Bay.

5.1.2.8 Other Endangered and Threatened Species

It is unlikely that endangered shortnose sturgeon will be significantly impacted by the proposed action. The occurrence of shortnose sturgeon in Virginia waters is rare. NMFS is not aware of any instances or reports documenting shortnose sturgeon entangled in pound net leaders of any mesh size. However, the potential exists for shortnose sturgeon to become trapped by the pound net like other fish species. From 1996 to 2004, as a result of the U.S. Fish and Wildlife Service reward program for Atlantic sturgeon, shortnose sturgeon have been reported taken in pounds, alive, in the Maryland waters of the Chesapeake Bay. If shortnose sturgeon are present in Virginia waters, they may become trapped in the pounds of pound nets. NMFS is not aware of the documentation of such a take in Virginia, but there is not a shortnose sturgeon or Atlantic sturgeon reward program currently in Virginia that may provide such documentation. Nevertheless, should shortnose sturgeon be subject to entrapment by pound nets or entanglement in pound net leaders, it is unclear whether the PA would minimize the potential. No shortnose sturgeon were captured by pound nets as part of the modified leader experiment, so it is unknown

whether or not the modification to the leader would minimize the risk of sturgeon capture by pound nets or entanglement in pound net leaders as compared to current management measures (NPA 1). The measures included in the PA retain status quo outside of Pound Net Regulated Area I, therefore no impacts outside of what has been analyzed in the 2004 EA are expected.

5.1.3 Impacts of the Preferred Alternative on Marine Mammals

Modifying the configuration of offshore pound net leaders in Pound Net Regulated Area I would have a neutral or negative effect on the marine mammal species most likely found in association with Virginia pound net leaders, the coastal bottlenose dolphin, as compared to NPA 1 (status quo). Bottlenose dolphin are known to become entangled in traditional pound net leaders, and requiring leaders, even modified leaders for offshore leaders set in Pound Net Regulated Area I, may increase the risk of interaction to bottlenose dolphins as compared to the current restriction on leaders in this area.

The Virginia pound net fishery is listed as a Category II fishery on the Marine Mammal Protection Act List of Fisheries (69 FR 48407, August, 10, 2004), due to the documented bottlenose dolphin entanglements in pound net leaders in Virginia. Additionally, stranding data from 1993 to 2005 suggest that this fishery has occasional takes of coastal bottlenose dolphin. Stranding network members who have observed dolphin behavior around pound nets report that dolphins play and feed around pound nets and can become entangled in the leader part of the nets.

The impacts of lowering the mesh on leaders in a specified portion of the Chesapeake Bay is difficult to predict. As bottlenose dolphin may occur throughout the water column, it is likely that they would continue to be subject to entanglement in leader mesh dropped below mean lower low water. Depending on the size class of the species, some bottlenose dolphin may be able to swim through a 2 feet opening in the vertical lines, which may reduce entanglements in the top portion of these leaders as compared to traditional leader design. However, this potential benefit to the species is unknown as there are a number of factors that contribute to marine mammal entanglements in fishing gear, and the ability of bottlenose dolphins to swim through the widened vertical lines remains undetermined. Bottlenose dolphin may continue to become entangled in the dropped leader mesh portion of the offshore modified leaders in Pound Net Regulated Area I and in those leaders set in Pound Net Regulated Area II. Nevertheless, the PA should continue to benefit bottlenose dolphin by eliminating the threat of entanglement in larger mesh leaders during the time frame of this alternative in Pound Net Regulated Area II.

Two bottlenose dolphin carcasses were found entangled in pound net leaders in Virginia from 1993 to 1997. The leader mesh size for these observed entanglements is not available. A third record of an entangled bottlenose dolphin in Virginia in 1997 may have been attributable to this fishery, but this information is not conclusive. This incident involved a bottlenose dolphin carcass found stranded near a pound net with twisted line marks consistent with the twine in the nearby pound net lead rather than with monofilament gillnet gear. Note that marine mammals

exhibit fishing gear entanglement marks much more frequently than sea turtles, due to the differences in body composition.

From 2001 to 2003, four bottlenose dolphin were removed from pound net leaders in the Cape Henry and Cape Charles areas (S. Barco, VMSM, pers. comm.). These animals were moderately decomposed, and the cause of death could not be conclusively determined to be related to the interaction with the pound net leader. Additionally, from 2001 to 2003, there were 9 bottlenose dolphin strandings that had marks consistent with pound net gear (e.g., heavy twisted twine). Most of these strandings were found in the Virginia Beach area. These bottlenose dolphins were found in June, July, August, and September.

Within the affected area in 2004, 9 dead and 2 live dolphins were either removed from pound nets or exhibited line marks consistent with pound net gear (10 coastal bottlenose dolphins and 1 common dolphin) by VMSM from May – August (Northeast Region Stranding Network Database). The two live dolphins found alive in pound net leaders were disentangled and released. During the same year, NMFS observers recorded three bottlenose dolphin carcasses in association with pound net leaders in Virginia. One otherwise healthy bottlenose dolphin was found dead and entangled, with the mesh wrapped tightly around its head and neck in a 6 inch stretched mesh pound net leader. One bottlenose dolphin was found dead and impinged upon the leader mesh. In addition, one common dolphin was found dead and entangled in the mesh of 7.5 stretched mesh leader. In 2005, the Virginia Aquarium and Marine Science Center (formerly the VMSM) removed 8 bottlenose dolphins from pound nets from June – September ((Northeast Region Stranding Network Database). One dolphin was released alive. The dolphin interactions observed by VAQ were located in the lower portion of Pound Net Regulated Area II (Virginia Beach area), where leaders (less than 12 inch stretched mesh and no stringers) are allowed.

Data from the Chesapeake Bay suggest that the likelihood of bottlenose dolphin entanglement in pound net leaders may be influenced by the mesh size of the leader but the information is not conclusive (Bellmund et al. 1997 in NMFS 2001; K. Wang, NMFS, pers. comm.). A study conducted in North Carolina from 1988 to 1999 observed pound nets with 8 inches and smaller stretched mesh leaders for sea turtles; no bottlenose dolphin entanglements were observed (NMFS 2001). Bottlenose dolphin appear to be more likely to become entangled in leaders with larger mesh due to their body morphology. If the leader is stretched tight between the poles and has small stretched mesh, these characteristics may preclude bottlenose dolphin entanglements. Therefore, while the PA may prevent some entanglements or impingements in offshore nets in Pound Net Regulated Area I, there is still risk of interaction. Based upon the mesh size of the nets in which the dolphins were discovered, further interactions could occur in Pound Net Regulated Area II and nearshore nets in Pound Net Regulated Area I. Nevertheless, requiring the use of the offshore modified leader in Pound Net Regulated Area I should serve to limit the interactions between pound net gear and bottlenose dolphin and any subsequent entanglements.

Harbor porpoise and harbor seals may interact with pound net leaders, but there is no documentation of these species' entanglements in pound net leaders. These species are not likely to be frequent visitors to the Virginia Chesapeake Bay during May, June and early July, but there

remains the potential for harbor porpoise and harbor seals to interact, and potentially become entangled, in pound net leaders should the species occur in this area. This alternative has the potential to minimize the potential entanglement threat as compared to traditional leaders, as the mesh is dropped to 1/3 the depth of mean lower low water, however, risk of interaction could still occur as these species may interact with gear in the lower water column. If widening the vertical lines in some leaders allows harbor porpoise and harbor seals to pass through the top portion of the leader (should they be in contact with the leader), there may be benefits of this alternative to these species but the magnitude is uncertain.

5.1.4 Impacts on Birds of the Preferred Alternative

Birds inhabiting the Chesapeake Bay area have been documented entangled in pound net leaders Dropping the mesh of offshore leaders and widening the spaces between the vertical lines in a Pound Net Regulated Area I of Chesapeake Bay may have a neutral effect on the birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants, as compared to NPA 1.

While avian entanglements may still occur in other parts of the modified pound net leader, the PA may reduce some of the bird entanglement as compared to traditional leaders. However, as compared to NPA 1 (status quo), the PA would present greater risk for entanglement in leaders in offshore nets in Pound Net Regulated Area I as leaders are currently prohibited in this area. This risk cannot be quantified, as the degree to which the modified leader would decrease or prevent avian interaction is unknown. It is likely that birds would not become entangled in the stiff, vertical lines of the modified leader and could easily maneuver through the 2 feet spacing between the lines. Additionally, dropping the leader mesh would further preclude the potential for avian entanglement because the leader mesh would likely be at a sufficient depth to reduce bird interactions with the leaders.

Leaders would continue to be fished, providing a potential beneficial foraging resources to birds. However, birds foraging in Chesapeake Bay may exploit pound nets for prey but they are not dependent on this source of forage.

Not all avian species have the potential to interact with pound net leaders and those that do not forage for fish or come in contact with the water should not be impacted by the PA. While all birds spending some time in the water may interact with pound net leaders, the species that would likely be impacted the most from the PA include brown pelicans and cormorants. Monitoring efforts in 2002 through 2004 documented several dead birds entangled in leaders, hearts or pounds with varying mesh sizes, including 16 pelicans, 12 cormorants, 7 gulls, 2 gannets, 2 common loons, 1 royal tern, and 132 unidentified bird species. Since individual nets were surveyed multiple times, and since it is difficult to individually identify decomposing birds, some birds may have been counted multiple times. Surveys from 2002 through 2004, cormorants were commonly observed to be swimming and fishing within the pound. Several species of birds were observed interacting with pound net gear (alive), including ospreys, terns, gulls, pelicans, cormorants, egrets, gannets, and common loons. In 2002, one cormorant and one pelican were

removed from leaders and released alive, and in 2003, one common loon and one cormorant were disentangled and released alive. In 2004, one brown pelican was removed from a leader and released alive.

Retaining status quo in Pound Net Regulated Area II would result in the continuation of avian entanglement as experienced in the past. NMFS is not aware of any data supporting differences in avian entanglements between leader mesh sizes, so if fishermen switch to a smaller leader, entanglements of birds in those leaders could still occur.

Note that a public comment received on the 2004 proposed rule stated that pound net operations are critical sources of food for birds, protected under the Migratory Bird Treaty Act, in the Virginia Chesapeake Bay, and this biological benefit should be considered. A variety of birds have been observed feeding on the catch and discards from the pound net fishery, and this fishery may provide food for these species. NMFS observers have documented mainly brown pelicans and cormorants in association with pound nets (entangled in leaders and live on poles and nets), so these species would appear to forage the most on this fishery's catch. Birds foraging in Chesapeake Bay may exploit pound nets for prey but they are not dependent on this source of forage. The avian mortality documented by observers does not represent total mortality to these species, as surveys documented only a portion of total fishing effort. NMFS believes that the risk of mortality, disruption of normal feeding behaviors, and other unknown ecological effects to avian species resulting from pound nets outweighs any perceived benefit of concentrating prey resources.

5.1.5 Impacts on Habitat of the Preferred Alternative

NMFS believes that the PA would have only minor impacts on bottom vegetation and habitat. If any impact occurs, it may result when the fishermen replace their leaders to comply with the measures. Removing and replacing leaders is a difficult task since the bottom of the mesh is typically buried in the bottom. The fishermen may disrupt bottom habitat (EFH or SAV) for a short period of time while they remove their leaders (typically taking from approximately 1-2 days to a week, depending on the length of the net, location, weather conditions, etc.) and replace their leaders with the modified leaders. This disruption would also occur when fishermen replace their leaders with traditional leaders (if they choose to do so) after the restriction period has expired. Nevertheless, the duration of this disruption is extremely short. Fishermen remove and replace their leaders on a periodic basis (usually every year), so these bottom habitat disruptions occur during normal fishing activities. Therefore, PA would not impose any different impacts to habitat other than those that would occur during the current fishing activities or as compared to the alternatives. The magnitude of the habitat disruption is also relatively small; the PA would have additional impact, at maximum, to approximately 10 pound net fishermen throughout the Virginia Chesapeake Bay waters (offshore nets in Pound Net Regulated Area I). Further, it does not appear that these pound nets are set in pristine areas of notable concern for EFH or SAV. As such, the preferred alternative may result in some temporary disruption of already affected bottom habitat to a nature and degree (that is, removal and/or replacement of the leaders) that is considered minimal and already occurs in the industry. Cumulative impacts are not expected

because the leaders would need to be eventually replaced regardless of the proposed regulation. Consequently, the PA is unlikely to adversely impact EFH or SAV.

5.1.6 Economic Impacts of the Preferred Alternative

Under the preferred alternative NMFS proposes to require any offshore pound net leader set in Pound Net Regulated Area I (Figure 4) to be a modified leader during the period May 6 – July 15, described in section 3.0. As this area and time are currently closed to fishing with offshore pound nets leaders, this would increase fishing opportunities for this gear type as long as the modified gear was used. For nearshore pound nets within Pound Net Regulated Area I and all pounds nets in Pound Net Regulated Area II, existing regulations concerning the use of leaders with mesh less than 12 inches and no stringers would remain in effect.

5.1.6.1 Comparison of All Management Alternatives

The following section provides information relevant to the analysis of all four alternatives, as described in Section 3.

The following alternatives as well as the PA, summarized in Table 7, are examined:

a) "Status quo" or non-preferred alternative 1 (NPA1) in which the designated area remains closed to offshore pound net leaders during the period May 6 – July 15 of each year, while all other pound net leaders in both the designated southern area and the rest of Virginia waters in the Chesapeake Bay must continue to use mesh less than 12 inches during the May 6 – July 15 period.
b) Non-preferred alternative 2 (NPA 2) which would require use of the modified leader for all pound net leaders fishing in the Virginia waters of Chesapeake Bay during the period May 6 – July 15.
c) Non-preferred alternative 3 which would require use of the modified leader by all offshore pound net leaders fishing in the Virginia waters of Chesapeake Bay during the period May 6 – July 15.

Table 7: Relationship between location within in Chesapeake Bay, location of nets relative to shore and leader type for four alternatives. All alternatives are for the period May 6 – July 15 each year.

Area of Bay	Location of pound net relative to shore	Preferred Alternative (PA)	Status Quo (NPA 1)	Non-preferred Alternative 2 (NPA 2)	Non-Preferred Alternative 3 (NPA 3)
Lower Bay	*Nearshore*	Alternative leader[a]	Alternative leader[a]	Modified leader	Alternative leader[a]
	Offshore	Modified leader	Closed	Modified leader	Modified leader
Upper Bay & South of Bay Bridge	*Nearshore*	Alternative leader[a]	Alternative leader[a]	Modified leader	Alternative leader[a]
	Offshore	Alternative leader[a]	Alternative leader[a]	Modified leader	Modified leader[a]

a – Alternative leader refers to a leader with stretch mesh of less than 12 inches and no stringers, as prescribed in the 2004 rule (Status Quo, NPA1)

An evaluation of the economic impacts of these four alternatives requires an understanding of both the benefits and the costs from the proposed regulations. The baseline used for analysis is the status quo (NPA 1). A complete quantitative analysis of benefits and costs is not possible due to data limitations, and so qualitative descriptions are used for several components. The benefits from the proposed alternatives come from two primary sources, reduced risk to sea turtles and increased harvest opportunities for fishermen. The costs are primarily from materials and labor required to change to the modified leader gear as described in Section 3.0 and Section 4.0.

5.1.6.1.1 Benefits

There is neither a measure of willingness-to-pay of sea turtle protection, nor a quantitative measure of the absolute magnitude of protection provided by the four regulatory alternatives. As such, we are unable to quantitatively measure the change in consumer surplus anticipated from the alternatives. Past analyses have used increased protection to turtles to provide an ordinal ranking of alternatives as a proxy for benefits, which implicitly assumes a positive willingness-to-pay for sea turtle protection. This analysis however, assumes that we are unable to differentiate between the four alternatives in terms of turtle protection and the associated benefits.

The inability to differentiate the alternatives in terms of turtle protection benefits is the result of two factors. First, the majority of turtle protection appears to have been captured in the 2004 regulatory changes, described by the status quo (NPA 1). The low levels of continuing sea turtle interactions suggests that the proposed changes as described by NPA 2 and NPA 3 in would result in very small additional benefits, which, some would argue, are so small as to be indistinguishable from zero. Thus moving from the existing gear (<12’ mesh, no stringers) to the modified leader in areas with very low interactions (nearshore Pound Net Regulated Area I and all nets in Pound Net Regulated Are II) may provide some reduction in risk to turtles, however it is presently unmeasured and likely very small.

The second concern is the risk to turtles in the lower Bay from offshore pound nets. Logic suggests that any leader in the water will provide a greater risk than no leader (status quo NPA 1). However, experimental work with the modified leader with offshore pound nets in the south-east Bay indicate that any increase in risk is very small, and may not be significantly different from zero. Thus, the four alternatives cannot be distinguished in term of benefits from sea turtle protection.

The other potential source of benefits for the alternatives is an increase in fish harvest as a result of requiring that offshore pound net leaders in Pound Net Regulated Area I, which are currently not allowed, be modified leaders (PA, NPA 2 and NPA 3). This analysis assumes that fishing without a leader results in no harvest. Assuming standard demand and supply responses for fish an increase in fish could increase both consumer and/or producer surplus. The size of the change for both groups will depend on the slope of the demand and supply functions. The small size of

the affected fishery in terms of the overall seafood market suggests that the affect of an increase in harvest on consumer surplus would be small. This however, cannot be verified without an analysis of demand for relevant species which was not done. Additionally, 3 of the four alternatives (PA, NPA 2 and NPA 3) have the same impacts on harvest.

Producer surplus, or economic profits, could also be positively affected through fishing with a modified offshore pound net leader in Pound Net Regulated Area I during the period of May 6 to July 15. A lack of data on the variable and fixed costs of harvesting for the pound net fishery, and on price responsiveness to changes in harvest levels, precludes a full analysis of the change in producer surplus. Rather a net change in revenues is used as a proxy. This is estimated using an estimate of value for increased landings, less the cost of implementing the new, modified leader gear.

5.1.6.1.2 Costs

As with benefits several of the potential costs of the four alternative regulations are described qualitatively, due to a lack of quantitative data. However, the principle costs identified for three of the alternatives (PA, NPA 2 and NPA 3) is that of fabricating and installing the modified leader. The assumptions used in the estimation of those costs are detailed in data section below.

Two potential costs were not quantified. First is the possible decrease in catchability of fish with the modified leader compared to the gear currently used (< 12” stretch mesh, no stringers). While testing in the south-east quadrant of the Bay suggests there were no changes in landings between the modified and existing leaders (DeAlteris et al. 2005), this has not been tested in the other areas where the composition of landings may differ. Also, there have not been tests regarding the impact of the modified leader on landings for nearshore pound nets. However, for this analysis it is assumed that there is no difference in the composition or volume of landings between the modified leader and the <12 inch, no stringer leader.

A second potential, but non-quantified costs, is a difference in maintenance costs between the modified leader, the leader with <12” mesh and no stringers, and other leaders that may be used outside the regulated period. Anecdotal evidence suggests that fishermen do not perceive a difference, or at least not one big enough to warrant removal of the modified leader after the prescribed time. Fishermen using the experimental, modified leader with offshore nets in the south-east continued to use the modified gear after the required time (Henry Milliken, NEFSC, pers. comm.). Given this information it is assumed that there is no difference in maintenance costs between the two types of leaders for either offshore or nearshore nets, and for all areas of the Bay. Thus this cost is not considered in the analysis.

5.1.6.2 Data and Methods Used in Economic Analysis of All Alternatives

This section provides the data and methods used to analyze the economic impacts of all of the management alternatives

5.1.6.2.1 Data

Three data sources were used for this analysis: i) trip level landings data from the VMRC for 1998-2004[3]; ii) pound net survey data collected in 2002-2004 by the Domestic Fisheries Observer Program of the NEFSC, Woods Hole, Massachusetts; and, iii) current cost data from a local harvester fishing pound nets in the Virginia Chesapeake Bay (Henry Milliken, NEFSC, pers. comm.).

5.1.6.2.1.1 VRMC Landings Data

The data supplied by the state of Virginia includes a confidential identifier for the pound net owner allowing comparisons between years, the reporting date, landings in pounds and value by species, the type of gear fished, amount of gear fished, and the water body fished. The data covers landings by all gear types for individuals landing at least some catch with pound net gear. The value of landings is computed by the state using monthly dockside prices which are the average of prices paid by all dealers within the state. The landings reported by the fishermen are multiplied by the appropriate species/month price to determine a value of landings. Thus, the revenues for individual fishermen may differ from the reported value as individuals may receive higher or lower prices than the state average. Additionally, the value may be bias downward for fishermen that process their own product, as their revenue may be several times the dockside price (Henry Milliken, NEFSC, pers. comm.).

The proposed management alternatives have different gear requirements for two areas of the Virginia Chesapeake Bay designated as Pound Net Regulated Areas I and II (see Section 3.0). These areas differ from the areas used in the economic analysis due to data limitations. The VMRC data is linked to water bodies, which do not map directly to Pound Net Regulated Areas (see Figure 4). To highlight this difference, an alternative nomenclature is used, specifically "upper" and "lower" Bay." The upper (north) region consists of areas 308, 309, 315, 317, 335, 345, 346, 353, 358 and 374[4]. The lower (south) region consists of areas 306, 307, 336, 339, 347, 363, 371 and 391(Figure 4 and Figure 6)[5]. For areas 306 and 307, harvesters in the northern part of areas and south of the Chesapeake Bay Bridge would come under the same management action as Pound Net Regulated Area II; however their landings data could not be separated from landings for the rest of the lower Bay. Landings south of the Chesapeake Bay Bridge would be reported in areas 306 and 307 as well as landings in state waters on the ocean side (areas 625 and 631). However, there were no landings from the pound net fishery in the ocean side waters in any of the years (1998-2004).

5.1.6.2.1.2 NEFSC Gear Survey

[3] The 2004 data is preliminary data that may be subject to revision after December 2005.
[4] During the period May 6 – July 15, 2004 there were no pound net landings reported for the areas 308, 315, 317, 335, 345 or 358.
[5] During the period May 6 – July 15, 2004 there were no pound net landings reported for the areas 336, 339, 347, 363, 371 or 391.

Data collected by NEFSC observers included an initial evaluation of all pound nets, as well as varying levels of on-going monitoring during May and June. The initial gear survey included the location of the pound, the tag number of the pound, the stretched mesh size of the leader, location of the leader relative to the shore (offshore or nearshore) and the status of the pound (active or inactive). Monitoring data includes information on turtle entanglements and mortalities, as well as changes in the pound arrangement from initial monitoring (e.g. addition of leaders). Pound nets classified as active during the initial characterization do not change status during monitoring. However, pounds designated as inactive during the initial characterization were reclassified as active if they were observed to be fished or leaders were attached during the monitoring period. In 2004 the gear information was collected in early May. The data used in the calculation of the impact of the four alternatives are summarized in Table 8[6].

[6] Because 2004 data, collected in early May, was used to determine the percent of offshore nets, the estimates for offshore nets in the lower Bay may be biased low if some offshore nets in Pound Net Regulated Area I prepared for the upcoming regulated period (May 6 – July 15) by either removing their leaders or delaying the installation of their leaders.

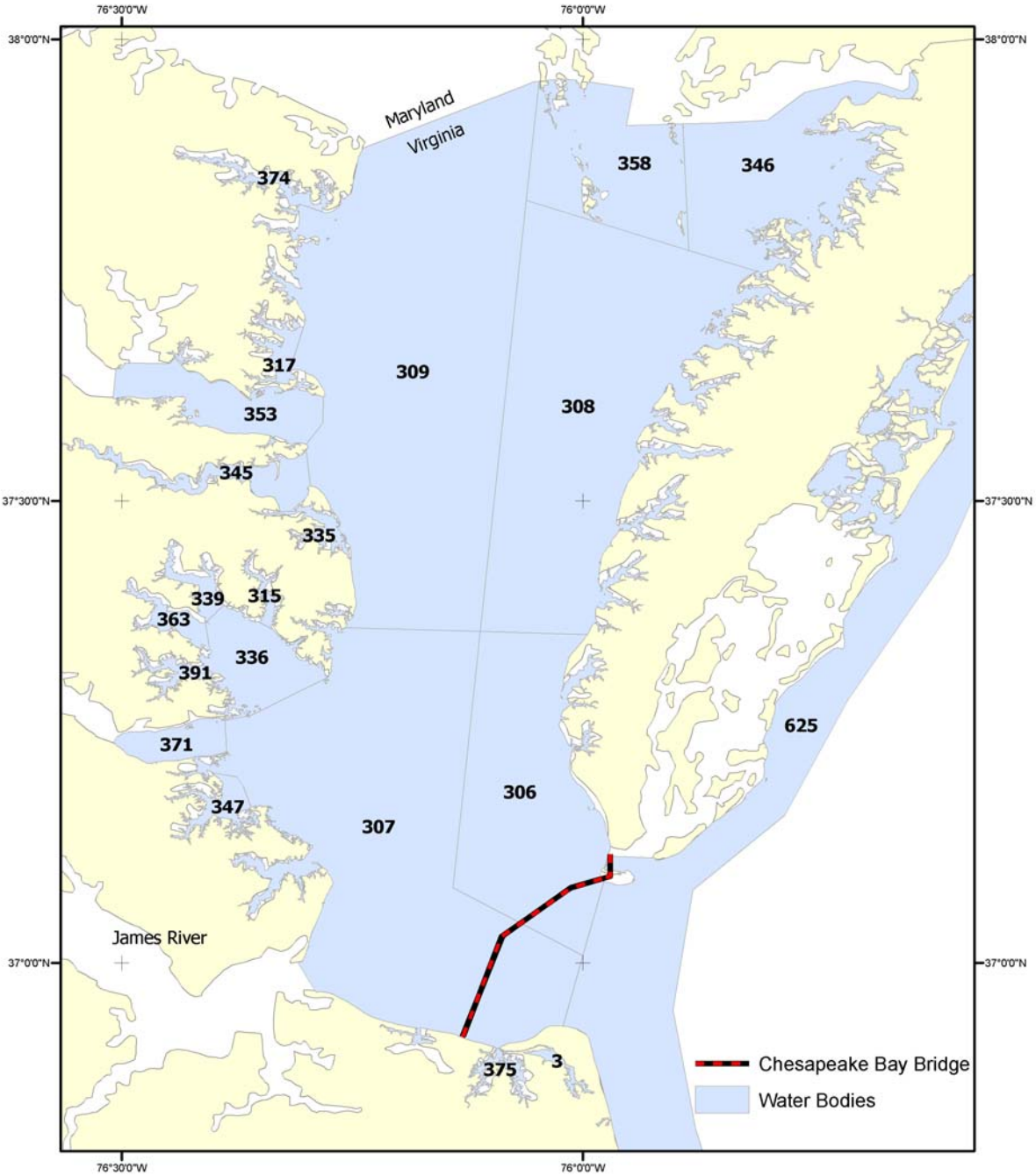

Figure 6. Water body designations for the affected area

Table 8. Number of pound nets identified in annual observer characterization and monitoring program of Virginia Chesapeake Bay, 2002-2004. ; Pound Net Regulated Area I closed to offshore leaders in 2004 regulations.

	2002			2003			2004		
	Reg Area II	Reg Area I	Total	Reg Area II	Reg Area I	Total	Reg Area II	Reg Area I	Total
Active Pound nets									
Nearshore	3	9	12	6	11	17	5	10	15
Offshore	47	9	57	31	8	39	28	7	36
Total active	*50*	*18*	*69*	*37*	*19*	*56*	*33*	*17*	*51*
Inactive	15	13	28	34	20	54	24	14	37
Total	65	31	97	71	39	110	57	31	88

In 2004 there were six active pound nets identified in Pound Net Regulated Area II that would fall in the lower Bay as designated by water body (see Section 5.1.6.3.1). Three of these were in the northern part of areas 306 and 307 (Figure 6), while three were south of the Chesapeake Bay Bridge. By including these pound nets in the lower Bay the landings and revenues for the lower Bay are biased upward. In 2003 there were 4 active pound nets in these areas, and in 2002 there were 5.

5.1.6.2.1.3 Leader Cost Data

The cost data used in this analysis is based on personal conversations with several local pound net harvesters in the Chesapeake Bay (Henry Milliken, NEFSC, pers. comm.). The specific tasks of interest were i) cost of removing and installing a leader; and, ii) the cost of fabricating the modified leader. A cost differential was identified between nearshore and offshore pound net leaders, with offshore pound net leaders having higher costs for both tasks. The data used in the calculations are listed in Table 9. It is assumed that there is no additional cost to fishermen of using the less than 12 inch mesh, no stringers leader type (alternative), as the 2004 regulations required this leader type for all pound net leaders other than offshore in Pound Net Regulated Area I, which were banned. Thus, it assumed that fishermen have this alternative gear available, if they have made the decision to fish.

The total cost of fabricating a modified leader includes materials and labor. Total materials costs are similar between the two types of pound net leaders, $6,403 per leader for offshore nets and $6,103 for nearshore nets. The cost difference is for the poly-steel rope used for vertical lines between the top rope and the mesh panel at the bottom. The deeper depths where the offshore pound net leaderss are placed, relative to the nearshore pound net leaders, requires additional rope. All other costs are the same. This assumes that the average leader for both types of pound net leaders is the same, approximately 1,000 feet in length. We assume that the life of a modified leader is five years, and that materials could be paid over a five year period at 10% interest. This would result in annual payments of $1,389 and $1,317 per leader for offshore and nearshore nets

Table 9. Costs of fabrication and installation of modified leader, offshore versus near-shore pound nets.

		Offshore		Nearshore	
Description	**Cost per unit**	**Quantity**	**Cost**	**Quantity**	**Cost**
Fabrication					
Materials					

	5/16” poly-steel rope	$100/ 1800’ roll	5 rolls	$500	2 rolls	$200
	Hog rings	$40/bag	1 bag	$40	1 bag	$40
	3/8” chain	$2.40/ft	1000 ft	$2,400	1000 ft	$2,400
	1/4” chain	$1/ft	1000 ft	$1,000	1000 ft	$1,000
	8” mesh	$60/lb	200 lbs	$1,200	200 lbs	$1,200
	3/8” poly rope	$0.15/ft	1000 ft	$150	1000 ft	$150
	Copper paint			$500		$500
Labor	Fabrication	$12.25/hour	50 hrs[7]	$613	50 hrs	$613
Installation/Removal						
Labor	On water	$12.25/hour[8]	32 hrs[9]	$392	16 hrs	$196
	Diver	$125/hour	4 hrs	$500	3 hrs	$375
Total Fabrication				***$6,403***		***$6,103***
Subtotal Materials		$/leader		$5,790		$5,490
Subtotal Labor		$/leader		$613		$613
Total Installation/Removal		$/action/leader		***$892***		***$571***

respectively. This results in a first year cost of $2,002 per leader ($1,389 materials payment + $613 labor) for offshore nets, and $1,930 per leader ($1,317 materials payment + $613 labor) for nearshore nets, to move to the modified leader.

Labor is required both for fabrication of the leaders, and for removal and installation of the leaders in the water. The labor wage rate used for all out of water activities, including on the water, was the November 2004 U.S. Bureau of Labor Statistics mean hourly rate for all farming, fishing and forestry occupations in Virginia ($12.25 per hour). Fabrication can be completed on shore, and the estimated time was 40 to 60 hours, with the mean of 50 hours used.

Removal and installation of all leaders is assumed to be the same. Both installation and removal of leaders require a diver, with a quoted rate of $125 per hour. The difference in the dive time required between offshore and nearshore leaders (4 hours verses 3), is due to differences in the depth of water in which the leaders are located.

It was stated earlier that anecdotal reports suggest that pound net fishermen in the south-east Chesapeake Bay may not remove and replace the modified leader after the designated period (May 6 – July 15), and the same may be true for the alternative leader with <12” mesh and no stringer. However, for the estimate of cost it is assumed that outside of the designated period fishermen prefer to used some standard leader which does not conform to the regulated time period requirements. Thus, we assume that at the start of the designated time period the fishermen will remove the standard leader and replace it with the modified leader. At the end of the designated period, fishermen will remove the modified leader and replace it with the standard

[7] Estimated time 40-60 hours.
[8] U.S. Bureau of Labor Statistics. Mean wage for all farming, fishing and forestry occupations Virginia, November 2004.
[9] Four men @ 8 hours for offshore nets, 4 men @ 4 hours for nearshore nets.

leader. The cost of each removal and installation of any type of leader is $1,785 ($892*2 actions) per offshore leader, and $1,142 ($571*2) per nearshore leader.

An alternative leader (<12" mesh, no strings) is required for some pound net leaders in the PA, NPA1 and NPA3. The rule requiring use of this leader type (status quo, NPA1) has been in place since 2004. We assume that all potential affected fishermen have fabricated the leader and so only have the annual cost of the net materials. For consistency with past analyses, costs of $1,408 for offshore and $689 for nearshore nets are used (EA 2004). The cost of installation and removal of this leader type is the same as for the modified leader.

5.1.6.2.2 Pound Net Fishery

In 2004 the Virginia pound net fishery was valued at $2.5 million dollars, or 1.5% of the value of all fishery landings in the state ($170.0 million). The value of the pound net fishery showed a small increase over 2003, however this follows three years of declining value. Additionally, the number of pound net fishermen in Virginia has been declining (Table 10). In 2004 there were 34 fishermen who reported landings with pound net gear, with 27 (79%) reporting at least some landings from pounds in Pound Net Regulated Areas I and II of Chesapeake Bay. Of these 27 fishermen, 18 reported landings from the upper part of the Bay while 9 reported landings from the lower portion of the Bay. The number of fishermen reporting earnings in the regulated time period (May 6 – July 15) is smaller than that for the entire year; however that number has also been declining. During May 6 – July 15, 2004, 16 fishermen reported landings in the upper Bay while only 5 reported landings in the lower Bay. We do not know why there was such a significant drop in fishermen in the lower Bay during this time period. Of the 9 fishermen in the lower Bay that reported any landings in 2004, all had landings in the May 6 – July 15 period in 2003, so it is possible that without the 2004 rule (NPA1) more fishermen might have fished during the regulatory period than actually did. Five fishermen that fished during the regulatory period during the past five years did not do so in 2004, while there was one new fisherman in this time period.

Table 10. Number of pound net fishermen by area and season (number)

Year	January 1 – December 31				May 6 – July 15		
	VA Total	Upper	Lower	CB Total[a]	Upper	Lower	CB Total[a]
1998	66	24	21	45	22	13	35
1999	65	22	21	43	18	16	34
2000	56	22	16	38	18	10	28
2001	60	28	15	43	21	14	35
2002	53	22	15	37	20	11	31
2003	39	19	12	31	17	11	28
2004	34	18	9	27	16	5	21

a – Fishermen may fish in multiple areas. They are allocated to an area (upper, lower or other) based on the reporting area with the greatest share of pound net landings .

While the gear survey data provides some information on the distribution of pound nets between areas and by type (nearshore verses offshore), this information cannot be linked to landings data. An alternative measure of the number of pound nets is the average number of pounds fished per

trip per fisherman (Table 11). If fishermen do not harvest all of their pounds on each trip this number would provide and underestimate of the total number of active pound nets. A comparison of the number of active pound nets identified in the gear survey (Table 8) and the total estimate based on average number of pound nets fished times the number of fishermen (Table 10 and Table 11), shows this may be the case. This value has not changed significantly over the years for all fishermen in Virginia or within the regulated part of the Chesapeake Bay. In the lower Bay in the regulated period of 2004, there was an increase in the average number of pound nets fished, without any significant change in the coefficient of variation[10]. This coupled with the declining number of active nets within the lower Bay from the gear survey suggests consolidation of pound nets fished amongst a smaller number of fishermen.

Table 11. Average pound nets fished per trip by area and season (number with CV in parentheses below)

	January 1 – December 31				May 6 – July 15		
Year	**VA Total**	**Upper Bay**	**Lower Bay**	**CB Total**	**Upper Bay**	**Lower Bay**	**CB Total**
1998	1.8 (0.5)	1.9 (0.6)	2.0 (0.6)	1.9 (0.6)	1.8 (0.5)	1.8 (0.7)	1.8 (0.6)
1999	1.6 (0.6)	1.7 (0.5)	1.9 (0.6)	1.8 (0.6)	1.8 (0.5)	2.1 (0.6)	1.9 (0.6)
2000	1.6 (0.6)	1.7 (0.6)	2.0 (0.5)	1.9 (0.5)	1.7 (0.5)	2.1 (0.4)	1.8 (0.5)
2001	2.0 (0.9)	1.7 (0.6)	2.8 (0.7)	2.1 (0.7)	2.1 (0.5)	3.0 (0.7)	2.5 (0.7)
2002	1.9 (0.7)	1.8 (0.5)	2.8 (0.7)	2.2 (0.7)	1.9 (0.5)	3.0 (0.7)	2.3 (0.7)
2003	1.8 (0.6)	1.7 (0.6)	2.3 (0.6)	1.9 (0.6)	1.9 (0.6)	2.2 (0.6)	2.0 (0.6)
2004	1.9 (0.6)	1.8 (0.5)	2.4 (0.7)	2.0 (0.6)	1.8 (0.5)	3.4 (0.7)	2.2 (0.7)

Pound net fishermen also fish with other gear types (Table 12), although pound net fishing is their primary source of both landings and fisheries revenue. In 2004 pound net fishermen in the regulated portion of Chesapeake Bay landed 90% of their harvest with pound net gear, however only 72% of annual revenues came from this gear type. Pound net fishermen harvest using gillnet gear (1.7% of landings, 6.6% of revenue), pot gear (7.6% of landings, 19.4% of revenue) and other gear types including various hand gear (0.5% of landings, 1.7% of revenue). While there has been a small decline in pound nets contribution to the landings and revenues for these fishermen over the years, pound nets remain the primary source of both landings and revenues.

Table 12. Industry landings and revenue for VA Chesapeake pound net fishermen from all sources.

	Landings ('000 lbs)					Revenue ('000 $)				
	Pound net	**Gillnet**	**Pot**	**Other Gear**	**Total**	**Pound net**	**Gillnet**	**Pot**	**Other Gear**	**Total**
1998	9,970.4	149.0	240.5	82.5	10,442.4	2,651.5	57.1	187.8	52.1	2,948.5
1999	11,154.0	136.9	100.0	53.6	11,444.5	3,471.4	55.9	76.2	39.5	3,643.1
2000	8,401.2	179.7	195.2	51.0	8,827.2	2,210.4	230.0	161.4	43.9	2,645.7
2001	8,948.5	214.5	339.9	70.7	9,573.6	2,485.6	259.1	301.4	59.3	3,105.3
2002	8,208.0	410.3	347.4	83.5	9,049.3	2,367.0	291.8	208.7	47.6	2,915.1
2003	8,414.1	228.2	389.9	268.5	9,300.6	2,257.7	166.5	302.9	137.8	2,864.9
2004	8,985.5	172.0	761.4	52.5	9,971.5	2,186.6	199.7	587.7	51.8	3,025.8

Landings and revenues by species for the pound nets in the regulated part of Chesapeake Bay vary between years (**Error! Not a valid bookmark self-reference.**); however the top species

[10] The coefficient of variation (CV) measures the percent variation around the mean. A higher CV indicates more variation within the data, while a smaller CV indicates greater confidence in the estimated mean value.

have been consistent. In 2004, baitfish, Atlantic croaker and menhaden (listed in order of importance) made up over 81% of the landings for this fishery. In value terms however, these same three species only accounted for only 61% of value and order of importance switches to croaker, menhaden and baitfish. Total landings were almost 9 million pounds, with a total value of $2.2 million dollars. While landings were up in 2004 over 2003 and 2002, the value of the fishery declined for the third straight year.

Table 13. Total annual landings and revenue (January 1 – December 31) by species by pound net gear for regulated part of Chesapeake Bay, 1998-2004 (Landings (L) - '000 pounds, Revenue (R) in $'000)

	1999		2000		2001		2002		2003		2004	
	L	R	L	R	L	R	L	R	L	R	L	R
Bait fish	3,270.2	197.9	3,515.8	175.9	2,912.3	203.9	2,723.3	156.4	2,698.1	131.2	3,496.5	259.3
Blue Crab	1.1	0.8	0.6	0.6	2.4	7.1	2.0	2.6	1.5	1.2	5.5	3.7
Bluefish	66.8	18.4	49.9	11.0	135.3	32.2	72.6	15.7	44.5	7.3	38.3	10.4
Butterfish	98.9	63.5	45.6	30.5	29.2	16.3	38.1	21.9	27.1	13.1	79.6	45.3
Catfish	0.6	0.1	2.5	0.6	2.0	1.1	2.8	1.8	1.8	0.3	2.1	0.4
Croaker (Atlantic)	4,259.5	1161.7	1,678.2	733.2	3,082.6	771.7	2,650.0	847.9	3,154.9	819.0	2,481.0	789.3
Flounder	29.8	61.7	32.4	57.5	47.6	84.3	37.4	59.4	42.3	64.5	23.6	39.6
Herring	3.5	0.4	7.9	0.8	6.5	3.2	42.3	5.1	7.4	1.6	2.2	0.6
Menhaden	1,547.7	123.0	1,858.1	185.8	1,430.8	198.4	1,402.3	208.2	1,368.7	163.6	2,146.9	281.3
Spadefish	27.2	18.5	16.8	9.9	28.8	16	9.7	7.2	10.3	4.9	6.0	3.0
Spanish Mackerel	198.8	167.8	93.1	66.1	138.1	110.2	77.1	58.0	76.9	70.6	62.5	46.8
Spot	116.7	43.8	135.1	82.4	224.9	98.3	193.1	84.4	288.0	140.5	181.0	94.4
Star (Harvestfish)	33.7	26.7	48.7	37.5	37.2	38.4	48.1	54.4	49.0	59.7	45.1	56.4
Sea Trout	948.6	546.5	543.6	303.4	572.1	386.9	631.7	411.4	292.4	182.0	170.3	109.2
Striped Bass	202.9	412.3	115.6	167.7	86.7	159.8	56.1	112.9	96.8	216.2	66.8	138.2
Shad	4.3	0.4	2.8	0.2	5.3	0.5	16.6	2.7	1.5	0.2	2.8	0.2
White Perch	1.5	1.4	2.3	0.6	2.0	1.1	1.5	0.6	1.4	0.8	5.7	2.9
Misc. Fish	315.3	613.3	252.1	346.7	201.9	354.9	203.3	316.4	207.5	359.7	169.6	305.6
Total	11,126.4	3,458.2	8,401.2	2,210.4	8,945.9	2,484.3	8,208.0	2,367.0	8,370.1	2,236.2	8,985.6	2,186.6

The distributions of landings and revenues within the Bay show a decline in the contribution of the lower Bay fishery to the industry. In 2004, 22% of the landings were from trips in the lower Bay, while this area accounted for 37% of the value. The lower Bay's share of the value of the Chesapeake Bay pound net fishery has gone from 56% of the total in 1999 to its current low. Likewise with landings there has been a decline in the importance of the lower Bay to the pound net fishery, accounting for 48% of total landings in 1999 to the current low.

The smaller number of fishermen in the lower Bay pound net fishery means that lower landings and value for this area do not necessarily result in smaller returns, compared to the upper Bay. First consider landings (Table 14). On an annual basis the upper Bay had higher average landings per fisherman in 2000, 2002 and 2004, and while the lower Bay had higher averages in 1998, 1999, 2001 and 2003. This pattern of switching between higher average landings is mirrored during regulated period (May 6 – July 15); although the years are not the same as the upper Bay has higher average landings in 2000, 2001 and 2003.

Table 14. Average landings per fisherman from pound net fishing (lbs/year) for the entire year and the regulated period (May 6 – July 15), for the VA Chesapeake Bay overall, the upper Bay and the lower Bay (CV in parentheses)

	January 1 – December 31			May 6 – July 15		
	CB overall	Upper CB	Lower CB	CB overall	Upper CB	Lower CB
1998	229,429	159,356	272,484	90,020	56,593	143,800
	(1.3)	(1.2)	(1.4)	(1.2)	(1.2)	(1.0)
1999	258,754	221,095	244,452	111,685	103,084	114,920
	(1.2)	(1.3)	(1.3)	(1.0)	(1.2)	(0.9)
2000	232,160	282,510	133,908	103,314	115,294	78,018
	(1.3)	(1.1)	(1.8)	(1.0)	(0.9)	(1.3)
2001	208,043	204,339	214,958	85,222	91,935	75,633
	(1.4)	(1.3)	(1.5)	(1.2)	(1.1)	(1.4)
2002	221,837	231,520	192,201	97,566	93,075	97,269
	(1.3)	(1.3)	(1.4)	(1.1)	(1.2)	(1.1)
2003	261,564	242,027	294,126	97,226	103,553	87,448
	(1.3)	(1.2)	(1.4)	(1.2)	(1.3)	(1.1)
2004	332,798	387,263	201,482	118,913	104,507	165,013
	(1.0)	(1.0)	(1.2)	(0.75)	(0.8)	(0.6)
Average	249,066	267,076	206,269	99,470	100,849	98,339
2000-04	(0.2)	(0.3)	(0.3)	(0.1)	(0.1)	(0.4)

Table 15. Average revenues per fisherman from pound net fishing (pounds/year) for the entire year and the regulated period (May 6 – July 15), for the VA Chesapeake Bay overall, the upper Bay and the lower Bay (CV in parentheses)

	January 1 – December 31			May 6 – July 15		
	CB overall	Upper CB	Lower CB	CB overall	Upper CB	Lower CB
1998	60,624	41,256	73,056	21,113	14,393	31,672
	(1.1)	(1.0)	(1.2)	(1.0)	(1.1)	(0.8)
1999	80,423	58,817	87,678	36,797	29,705	42,919
	(1.1)	(1.0)	(1.2)	(0.9)	(1.0)	(0.8)
2000	60,794	54,310	62,112	27,237	24,474	33,063
	(1.3)	(0.9)	(1.7)	(1.1)	(1.0)	(1.3)
2001	57,775	45,611	80,481	24,120	17,975	32,898
	(1.4)	(1.2)	(1.4)	(1.5)	(1.0)	(1.5)
2002	63,973	51,579	78,713	25,899	17,277	40,004
	(1.3)	(1.3)	(1.3)	(1.4)	(1.1)	(1.3)
2003	69,882	52,996	98,025	24,066	17,359	34,432
	(1.3)	(1.1)	(1.3)	(1.3)	(1.2)	(1.2)
2004	80,985	76,722	80,560	34,862	25,316	65,408
	(0.9)	(0.8)	(1.1)	(0.8)	(0.6)	(0.6)
Average	66,156	55,772	79,503	27,005	20,323	40,187
2000-04	(0.1)	(0.2)	(0.2)	(0.1)	(0.2)	(0.4)

If one then considers the average revenue per fisherman in the areas of the Bay a very different pattern is apparent (Table 15). In all years the average value of landings by lower Bay pound net fishermen exceeds that for upper Bay fishermen. This pattern occurs over the year as a whole and during the regulated time period May 6 – July 15. In 2004 the average revenue per

fisherman in the lower Bay over the year was $80,560 (CV=1.1) while that for fishermen in the upper Bay was $76,722 (CV=0.8). For the regulated time period the average revenue per fisherman in 2004 was $65,408 (CV=0.6) and $25,316 (CV=0.6) for the lower and upper Bay, respectively. Given the high degree of variability within a year in terms of revenues, for the comparisons of the impact of the four alternatives a five year average value (2000-2004) is used as the point of comparison.

5.1.6.2.3 Methods

The current regulations or the status quo (NPA 1) are the base against which the other alternatives are compared in terms of costs and benefits. It is not necessary for comparative reasons to determine the cost of any actions in an alternative that are also required in the current regulations (NPA 1), as they would simply cancel out in a comparison. To determine the full cost of an alternative, relative to a situation of no regulations, one need only take the cost of the status quo (NPA 1) and add the additional costs (or benefits) described by the alternative.

Three primary calculations are required to evaluate the four regulatory alternatives. First, in three of the four alternatives (PA, NPA 2 and NPA 3) some fishermen would be required to implement the modified leader during the regulatory period, and this may differ between offshore and nearshore pounds. This requires the calculation of the number of affected pound nets by type in each area.

Second, in all four alternatives some fishermen would be required to remove their standard leaders during the regulatory period (May 6 – July 15) and either replace them with either the modified leader or an alternative (<12 in. mesh, no stringers) or place no leader in the water, which we assume means they do not fish. The fishermen then need to make a decision which course of action they will follow, to fish or not fish. How we model this decision rule is covered in section 5.1.6.2.3.3.

Finally, in three of the four regulatory alternatives (PA, NPA 2 and NPA 3) offshore pound net fishermen in the lower Bay would be required to use the modified leader, resulting in an increase in revenues should they decide to do so. The costs for fabrication of the modified leader, and the cost of switching gears differ by pound net type (offshore verses nearshore). Section 5.1.6.2.3.1 discusses the determination of the number of affected pound nets and fishermen. This is followed by a discussion of the determination of increased fishing revenues for the offshore pound net fishery in the lower Bay. And finally, there is a brief discussion on the decision used to determine if fishermen would choose to fish under the regulations.

5.1.6.2.3.1 Determination of number of pound nets by type

The number of affected pound net leaders is determined using a combination of the proportion of active offshore to nearshore pound nets as reported in the gear survey (Table 8) and the average

number of pound nets fished per trip calculated from the VMRC trip landings data[11]. In 2004 in the lower Bay, 41% of the active pound nets were described as offshore, while 59% were nearshore. For the upper Bay these values were 85% and 15% for offshore and nearshore, respectively. In 2004, during the regulated time period fishermen in the lower Bay fished an average of 3.4 pound nets per trip, while fishermen in the upper Bay fished an average of 1.8 pound nets per trip.

With 5 fishermen fishing in the regulated time period in the lower Bay, and 16 in the upper Bay this results in 17 pound nets in the lower Bay (5 fishermen * 3.4 pounds/fisherman) and 29 in the upper Bay (16 fishermen * 1.8 pounds/fisherman). Using the allocation between offshore and nearshore nets in the gear survey, this results in 7 offshore nets and 10 nearshore nets in the lower Bay, and 25 offshore nets and 4 nearshore nets in the upper Bay, during the May 6 – July 15 period.

When an action affects all nets that a fisherman may have (e.g., <12" mesh, no stringers) in upper Bay under PA, NPA1 and NPA2), then the average number of nets is used. However when the actions differ by net type (e.g. lower Bay in PA, NPA1 and all areas in NPA3) then an allocation is necessary. One way to allocate the nets would be on a proportional basis for each fisherman; however fishermen cannot fish partial pound nets so the following allocation laid out in Table 16 was used.

Table 16. Allocation of pound nets among fishermen in the upper and lower Bay areas by offshore and nearshore types, for May 6 – July 15 period.

Number of fishermen	Offshore pounds (#)	Nearshore pounds (#)	Total pounds (#)
Lower Bay			
3	1	2	3
2	2	2	4
Total lower Bay			
5	7	10	17
Upper Bay			
3	1	0	1
4	1	1	2
9	2	0	2
Total upper Bay			
16	25	4	29
Industry Total			
21	32	14	46

5.1.6.2.3.2 Calculation of potential revenue change

Under the existing regulations, implemented in 2004, offshore nets in the lower Bay cannot use leaders during the regulated time period (May 6 – July 15). It is assumed that the affected pound

[11] Note that the designations of lower and upper Bay do not strictly conform to the designations Pound Net Regulated Areas I and II, as discussed in section 5.1.6.2.1.1

nets were not fished during this time and there was an associated loss in landings and revenues for affected fishermen. However, during 2004, experimental trials with the proposed modified leader were underway with 4 of the 7 active offshore nets, and so they were fished. This means that 2004 landings in the regulatory time period in the lower Bay cannot be used to identify the change in landings attributable to a loss of fishing opportunity.

During a trip fishermen may land fish from more than one pound net, and these pound nets may be a combination of offshore and nearshore pound nets. The VMRC data does not allow for an allocation of landings between the pound net types. There is no experimental data to indicate whether there is a difference in either species composition or volume of landings between pound net types within the given area. This analysis assumes that average landings per pound net are the same for offshore and nearshore pound nets, during the regulatory time period.

To calculate the potential gain in revenues for fishermen in the lower Bay, the five year average landings per pound net were calculated using total landings in the lower Bay for the period May 6 – July 15. The total number of pound nets was calculated as the average number of pound nets fished per trip times the number of fishermen. Annual landings per pound net (lower Bay, May 6 – July 15) were averaged over 1999 to 2003. This was converted to an annual value of landings using the average price for each species, calculated based on reported values for lower Bay landings for May 6 – July 15 2004. Based on these values an average pound net in the lower Bay, during May 6 – July 15 could be expected to produce approximately 38,160 pounds in landings, with a 2004 value of $17,194 per pound net (Table 17). It is estimated that in 2004 there were 7 offshore pound nets that would not be allowed to use leaders during the regulated period. If these pound nets were fished with leaders the estimated revenue would have been $120,358 over the regulated period.

An alternative measure would simply be a share of revenue based on share of offshore pound net observed. However, based on the average number of pound nets fished and the number of active fishermen in the lower Bay, the total number of pound nets has been declining.

This suggests that a more appropriate measure is an average per pound net, to partially account for this change.

Table 17. Average landings and revenues per pound net in the lower Chesapeake Bay, based on average harvest during May 6 - July 15 (1999-2003) and 2004 prices for period.

	2004 avg price ($/lb)	Average landings (lbs/pound)		Estimated revenues (2004 $/pound)	
		Upper Bay	Lower Bay	Upper Bay	Lower Bay
Bait fish	0.08	24,970	6,181	1,948	482

Blue Crab	0.68	11	3	7	2
Bluefish	0.35	303	412	106	144
Butterfish	0.53	7	483	4	258
Catfish	0.26	9	0	2	0
Croaker (Atlantic)	0.27	8,992	16,732	2,471	4,598
Flounder	1.68	137	226	231	379
Herring	0.33	14	262	5	87
Menhaden	0.13	16,642	727	2,185	95
Spadefish	0.39	83	282	33	111
Spanish Mackerel	0.75	474	1,768	355	1,326
Spot	0.59	753	293	441	171
Star (Harvestfish)	1.25	3	940	4	1,176
Sea Trout	0.64	716	8,450	461	5,435
Striped Bass	2.93	553	329	1,618	964
Shad	0.08	35	58	3	5
White Perch	0.42	5	0	2	0
Misc. Fish	1.94	1,385	1,012	2,683	1,960
Total		55,090	38,158	12,557	17,194

5.1.6.2.3.3 Decision to fish under regulations

Under the various alternatives fishermen have the option of adopting the required change in the leader, or remove all leaders from the water. It is assumed that without leaders the pounds do not capture fish. Thus, fishermen are faced with the alternatives of removing the leaders from the water and not fishing, or adopting the change and continue fishing.

If full information were available we would model this decision based on expected profits and the option that yielded the highest profits or lowest losses would be selected. However, we do not have information on the variable costs of fishing pound nets. Thus, the decision rule modeled is choosing the option that yields the greatest net revenues, or lowest cost. In the case of not adopting the alternative leader during the regulated time period, fishermen incur the costs of removing the standard leaders from the water and an opportunity cost of lost harvest revenues. If the alternative leader is adopted, the fishermen must consider the costs of removing the standard leader and installing the alternative leader (including the cost of fabrication in the case of the modified leader), against the revenues of fishing during this time period.

When the alternative is to use the modified leader the costs of adopting the leader are:

i) removing the <u>standard</u> leader at the beginning of the period, and then re-installing the <u>standard</u> leader at the end of the period
   a. offshore nets = $892 per action * 2 actions = $1,784/leader
   b. nearshore nets = $571 per action * 2 actions = $1,142/leader

ii) fabrication of the modified leader (materials and labor)
   a. offshore nets = $2,002
   b. nearshore nets = $1,930

iii) installation of the modified leader at beginning of period and removal at the end of the period
   a. offshore nets = $892 per action * 2 actions = $1,784/leader
   b. nearshore nets = $571 per action * 2 actions = $1,142/leader

iv) anticipated revenue per pound during regulated period
   a. lower Bay = $17,194
   b. upper Bay = $12,557

This results in the follow comparisons for each pound net:

i) Offshore lower Bay
   a. Install modified leader = (revenues = $17,194) – (costs = $1,784 + $2,002 + $1,784) = $11,624 expected revenue per pound
   b. Don't install = (costs = $1,784 + $17,194) = $18,978 expected losses per pound

ii) Nearshore lower Bay
   a. Install modified leader = (revenues = $17,194) – (costs = $1,142 + $1,930 + $1,142) = $12,980 expected revenue per pound
   b. Don't install = (costs = $1,142 + $17,194) = $18,336 expected losses per pound

iii) Offshore upper Bay
   a. Install modified leader = (revenues = $12,557) – (costs = $1,784 + $2,002 + $1,784) = $6,987 expected revenue per pound
   b. Don't install = (costs = $1,784 + $12,557) = $14,341 expected losses per pound

iv) Nearshore upper Bay
   a. Install modified leader = (revenues = $12,557) – (costs = $1,142 + $1,930 + $1,142) = $8,343 expected revenue per pound
   b. Don't install = (costs = $1,142 + $12,557) = $13,699 expected losses per pound

Based on the above it is apparent, that in all cases when the decision is to either remove leaders from the water and not fish, or install modified leaders and fish, fishermen will make the decision to adopt the modified leader and fish.

In the case of the decision to either adopt the alternative leader (<12" mesh, no stringers) or not fish, the decision is similar. The costs of removal and installation of leaders is the same, the only difference is in the cost of the alternative leader. So again, it is assumed that when faced with the decision to either remove leaders from the water and not fish, or install the alternative leader and fish, fishermen will make the decision to fish.

5.1.6.3 Results of Economic Impacts for Preferred Alternative

During the regulated period any fishermen using an offshore pound net leader set in the lower Bay would be required to use a modified leader. All other fishermen would be required to use the alternative leader with less than 12 inch mesh and no stringers. This is part of the current regulations and so there are no additional costs for these fishermen. As described above (Section

5.1.6.2.3.3), it is assumed that all affected fishermen will adopt the changes required and continue to fish. As the changes affect fishermen in the upper and lower Bay differently, and the costs differ by nearshore and offshore pound net leaders, each component is discussed separately, followed by a summary. Details on the calculation of costs and revenues are provided in sections 5.1.6.2.1 (Data) and 0 (Methods).

5.1.6.3.1 Lower Bay

5.1.6.3.1.1 Offshore

Offshore pound net fishermen in the lower Bay would be allowed the opportunity to fish during the regulated period, if they adopt the modified leader. The expected change in net revenues of adopting the modified leader is $11,642 per pound net. In the absence of the option to fish, the expected losses are $18,978 per pound net. The average annual revenue over five years (2000-04) per fisherman in the lower Bay is $79,503 (CV=0.2). Three fishermen will have 1 affected pound net, while 2 fishermen will have 2 affected pound nets.

The basis of comparison for the alternatives is the status quo (NPA1) in which fishermen cannot fish during the regulated period, and must remove the standard leaders from the water. In this case, the fishermen would expect $17,194 in revenues per pound net while having to incur additional costs of $2,002 to fabricate the modified leader and $1,784 to install and remove the modified leader. This is a net increase in revenues over the status quo of $13,408 per pound net. Thus, for fishermen with one affected pound net 16.9% of their annual revenues (= $13,408 net revenue increase / $79,503 average annual revenues) would be restored, while for those with two affected pound nets 33.7% of annual revenues (= $26,816 / $79,503) would be restored.

5.1.6.3.1.2 Nearshore

The costs discussed below are relevant from the perspective of cumulative effects discussed in section 6.0. However, when comparing the change in net benefits for the preferred alternative (PA) to the status quo (NPA 1), there are no additional costs for these fishermen over the current regulations (NPA 1). From a cumulative perspective these fishermen do incur costs, which are covered in section 6.0.

5.1.6.3.1.3 Lower Bay Summary

There were 5 fishermen during the regulated period (May 6 – July 15) in 2004, fishing 17 pound nets (3.4 pounds/fisherman * 5 fishermen). Based on the 2004 gear survey, 41% of the pound nets in the lower Bay were offshore nets, with the rest nearshore. This results in an estimate of 7 offshore pounds nets and 10 nearshore pounds. Each fisherman was assumed to have 2 near shore pound nets, while 3 of the fishermen also had one offshore pound net and 2 of the fishermen had 2 offshore pound nets. Table 12 summarizes the change in net benefits by area for the PA compared to the status quo (NPA1).

5.1.6.3.2 Upper Bay

Upper Bay pound net fishermen would be required to use the alternative leader (<12” mesh, no stringers) during the regulated time period. This is the same as for the status quo existing regulations (NPA 1). Thus, from a comparative perspective, the additional costs to the 16 fishermen in this area are zero.

5.1.6.3.3 Summary for PA

For nearshore pound net fishermen in the lower Bay and all pound net fishermen in the upper Bay, the preferred alternative will not result in additional costs over the existing regulations (status quo, NPA 1). However, for offshore fishermen in the lower Bay there are considerable net benefits from being allowed to fish using the modified leader during the regulated period. Based on 2004 data five fishermen would be affected with 3 fishermen being able to recapture approximately $13,408 of revenues foregone under the current regulations (16.9% of annual revenues), while 2 fishermen would see an increase of $26,816 in revenues (33.7% of annual revenues).

While the preferred alternative would result in a significant net benefit for the 5 affected fishermen, the overall impact on the industry is relatively small. The total expected increase in net revenues is $93,856 ([$13,408*3]+[$26,816*2]), which is 4.3% of the 2004 pound net revenues for all pound net fishermen in the regulated part of the Virginia Chesapeake Bay ($0.094M/$2.187M).

Table 18. Summary of Preferred Alternative (PA) changes in net revenues compared to status quo (NPA1) by area and total industry change, May 6 – July 15.

# fishermen	Offshore pounds		Nearshore pounds		Total change ($/fisherman)	Change in annual revenues
	# affected	Net revenue increase/fisherman	# affected	Additional cost/fisherman		
Lower Bay						
3	**1**	**$13,408**	2	$0	$13,408	+16.9%
2	**2**	**$26,816**	2	$0	$26,816	+33.7%
Upper Bay						
16	25	$0	4	$0	$0	0%
Total change: 5 affected	7	$93,856 (total)			$93,856 (total)	+4.3%

5.1.7 Social Impacts of the Preferred Alternative

The economic analysis indicates that the pound net industry will be impacted by this alternative. Under the PA, fishing practices are affected, but perhaps not to the same extent as with other alternatives. The pound net industry was involved in developing this alternative, and have

proposed the use of the modified leader for the history of rulemaking since 2001. Consequently, the projected social impacts to the fishing industry are anticipated to be beneficial, as compared to some of the other alternatives, such as NPA 1 (No Action/Status Quo), because the fishing industry and other interested organizations support the PA. Furthermore, the development of the PA represents a multi-level, cooperative effort to develop a solution to a fishery management issue that serves the needs of all parties.

The affected fishermen must modify their leader configuration. Complying with these actions would create additional expenses and effort by the fishermen, which would intuitively result in negative social impacts to the industry, but because the industry was instrumental in the creation of the PA, the social impacts would be positive. Though it is unlikely, if fishermen choose to remove their leaders rather than modifying their leader configuration, more of a net negative impact on fishing communities would result. Fish dealers and processors may also be impacted if fishermen decide not to fish using the modified leader, as reduced landings would result in a much lower level of fish catch passing through their facilities and available for purchase. If the fishing community's direct income is reduced, unemployment may ensue. As mentioned, if fishermen change their fishing gear configuration as anticipated, the negative social impacts to the fishery should be small as fish catch would be retained.

5.2 Environmental Consequences of NPA 1 (No Action/Status Quo Alternative)

The impacts of this alternative were analyzed in the 2004 EA. The information presented in this section represents a summary of that information, and represents the baseline against which the impacts of the alternatives are compared (PA, NPA 2, NPA 3).

5.2.1 Fishery Resource Impacts of NPA 1

In Pound Net Regulated Area I, with no leaders to guide the fish, fewer fish would likely be caught in these pounds (as compared to the PA). While the heart(s) and pound may still be set, resulting in some level of fish catch, it is likely that the catch will be drastically reduced, if not eliminated altogether. If fewer fish are caught in pound nets, the fishery resources may benefit as there may be more fish in Virginia waters. Over the past two years (since implementation of the current leader prohibition in Pound Net Regulated Area I), the modified leader experiment was conducted in Pound Net Regulated Area I, resulting in the continuation of leader assisted fishing in this area for fishermen participating in the study. Therefore, overall direct impacts to fishery resources from status quo (NPA 1) regulations in this area are not truly a continuation of impacts, but rather a change in impacts as compared to conditions that existed during the past two years of the experiment. For analysis purposes (i.e., for comparison to the alternatives presented for this action), the impacts of NPA 1 are considered to be impacts of NPA 1 without the experiment in Pound Net Regulated Area I, unless otherwise noted.

In Pound Net Regulated Area II, there will be no additional impacts to fishery resources beyond those impacts that have occurred and were analyzed in the 2004 EA and are ongoing. In both areas, fish may continue to be caught by other commercial and recreational fishing gear. As

such, NPA 1 may temporarily (during the restricted time period) result in fewer fish caught in pound nets and an increased abundance, but given the number of nets involved, the temporary nature of the proposed regulation, and the potential for fish to be caught by other means, it is unlikely that this action would greatly improve the fish stocks in Virginia waters. If other commercial and recreational fisheries do not increase their effort or catch more fish during May, June and the first half of July, the benefits to Virginia fish resources would be greater.

Some fish species have been found entangled in the pound net gear, rather than captured alive in the pounds. During a VIMS pound net survey in 2001 and NMFS pound net monitoring in 2002 and 2003, many fish species were found entangled in pound net leaders and the mesh of hearts and pounds (Mansfield et al. 2002a; NMFS unpublished data). These species included red drum, bluefish, striped bass, weakfish, black drum, croaker, menhaden, blue crab, spiny dogfish, rays, and other small sharks. Additionally, in 2002, a dead terrapin was found entangled in a leader, and in 2003, one live snapping turtle was found.

In the closed area, prohibiting leaders may have a beneficial effect on fishery resources by reducing the threat of entanglement in leaders. Further, if the affected fishermen elect to curtail the use of leaders rather than switching to smaller mesh leaders in the leader restricted area, the occurrence of fish entanglement in leaders would be reduced.

If NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after July 15 and the regulations are extended via the framework mechanism, the impacts of the extension on fishery resources should not differ from the original gear restriction.

For example, if NMFS determines that a prohibition of all pound net leaders is required, all pound net fishermen in the affected area would be required to remove their leaders from the water. While the heart(s) and pound may still be set, resulting in some level of fish catch, it is likely that the catch will be drastically reduced, if not completely eliminated. If the use of all pound net leaders in a certain area is curtailed, fish would not be caught by pounds and would be more plentiful in Virginia waters. Again, these fish may continue to be caught by other commercial and recreational fishing gear. As such, it is unlikely that the prohibition of all pound net leaders would noticeably improve the fish stocks in Virginia waters.

5.2.2 Endangered and Threatened Species Impacts of NPA 1

5.2.2.1 Benefits to Sea Turtles

This alternative was thoroughly analyzed in the 2004 EA, and the analysis is summarized here. The no action/status quo alternative would provide protection to sea turtles in Pound Net

Regulated Area I and Pound Net Regulated Area II. By implementing NPA 1, which would continue to prohibit offshore leaders in an area with the most documented sea turtle entanglements and impingements, sea turtle interactions with pound net gear are expected to continue to be reduced. As such, NPA 1 would benefit sea turtles found in the Virginia Chesapeake Bay.

NMFS has sufficient evidence to conclude that there is a localized interaction between sea turtles and pound nets along the Eastern shore of Virginia and in the Western Chesapeake Bay. Most of the sea turtles have been observed in pound net gear along the Eastern shore in recent years. Sea turtles have also been found impinged on and entangled in leaders in the Western Bay, during recent monitoring studies as well as surveys in the 1980s. Impingements occur when the sea turtles are held against the net by the current, which could happen with any mesh size in areas where impingements were previously documented (e.g., offshore nets set in the southern portion of the Eastern shore and in the Western Bay). The area where leaders would continue to be prohibited was defined to exclude pound nets in locations where sea turtles are not likely to interact with pound net gear and to prevent turtle entanglements and impingements in pound net leaders (leading to the potential subsequent drowning of sea turtles) in the area with the most documented takes of turtles.

The NPA 1 also contains a framework mechanism in which NMFS could enact additional measures to respond to new information or extend the end date of the restrictions. Should monitoring of pound net leaders from May 6 to July 15 document a sea turtle entanglement, NMFS may implement additional restrictions as deemed necessary, including the prohibition of the prohibition of all pound net leaders regardless of configuration. If additional measures are enacted, sea turtles will benefit. For instance, if all leaders are prohibited in a certain area or in the entire Virginia Chesapeake Bay, sea turtle interactions with pound net leaders will be prevented as there would be less potentially entangling gear in the water. If additional analysis and data collection determine that there is a significant difference in sea turtle interaction rates between mesh sizes, and a leader mesh size restriction of 8 inches and greater is determined appropriate, this should serve to reduce sea turtle entanglement. If leader restrictions are extended to July 30, this will serve to provide additional protection to sea turtles by minimizing any other entanglements during that 2 week period.

5.2.2.2 Other Endangered and Threatened Species

It is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 1. The occurrence of shortnose sturgeon in Virginia waters is rare. NMFS is not aware of any instances or reports documenting shortnose sturgeon entangled in pound net leaders of any mesh size. However, the potential exists for shortnose sturgeon to become trapped by the pound net like other fish species. From 1996 to 2004, as a result of the U.S. Fish and Wildlife Service reward program for Atlantic sturgeon, shortnose sturgeon have been reported taken in pounds, alive, in the Maryland waters of the Chesapeake Bay. If shortnose sturgeon are present in Virginia waters, they may become trapped in the pounds of pound nets. NMFS is not aware of the documentation of such a take in Virginia, but there is not a shortnose sturgeon or Atlantic

sturgeon reward program currently in Virginia that may provide such documentation. Nevertheless, should shortnose sturgeon be subject to entrapment by pound nets or entanglement in pound net leaders, NPA 1 would minimize this potential because prohibiting offshore leaders in Pound Net Regulated Area I would likely reduce fish catch in pound nets in the Virginia Chesapeake Bay. Should the affected fishermen choose to switch to leaders with stretched mesh smaller than 12 inches in the leader restricted area, instead of electing to remove their leaders, the potential benefits to shortnose sturgeon would continue to be reduced to an unknown amount.

5.2.3 Marine Mammal Impacts of NPA 1

It is possible that bottlenose dolphin entanglements could continue in nearshore leaders in Pound Net Regulated Area I and all leaders in Pound Net Regulated Area II during the regulated period. Nevertheless, restricting the use of certain leaders in Pound Net Regulated Area II and all offshore leaders in Pound Net Regulated Area I of the Chesapeake Bay should serve to limit the interactions between pound net leaders and bottlenose dolphin and any subsequent entanglements. As bottlenose have been found entangled in pound net leaders in Virginia waters, any measure that limits the amount of gear in the water should benefit these marine mammals.

Harbor porpoise and harbor seals may interact with pound net leaders, but there is no documentation of these species' entanglements in pound net leaders. These species are not likely to be frequent visitors to the Virginia Chesapeake Bay during May, June and early July, but there remains the potential for harbor porpoise and harbor seals to interact, and potentially become entangled, in pound net leaders should the species occur in this area. As such, it is likely that this

alternative would continue to provide some benefit to these species, but the magnitude of the benefit cannot be determined.

5.2.4 Bird Impacts of NPA 1

Prohibiting the use of all pound net leaders in a portion of the Chesapeake Bay and retaining the restriction of leaders with 12 inches stretched mesh in another portion of the Bay should benefit birds that inhabit the Chesapeake Bay area during the regulated period. However, not all avian species have the potential to interact with pound net leaders and those that do not forage for fish or come in contact with the water should not be impacted by the PA. Monitoring efforts in 2002 to 2004 documented several dead birds entangled in leaders, hearts or pounds with varying mesh sizes, including 16 pelicans, 12 cormorants, 7 gulls, 2 gannets, 2 common loons, 1 royal tern, and 132 unidentified bird species. Since individual nets were surveyed multiple times, and since it is difficult to individually identify decomposing birds, some birds may have been counted multiple times. Surveys from 2002 to 2004, cormorants were commonly observed to be swimming and fishing within the pound. Several species of birds were observed interacting with pound net gear (alive), including ospreys, terns, gulls, pelicans, cormorants, egrets, gannets, and common loons. In 2002, one cormorant and one pelican were removed from leaders and released alive, and in 2003, one common loon and one cormorant were disentangled and released alive. In 2004, one brown pelican was removed from a leader and released alive.

Retaining status quo in Pound Net Regulated Area II would result in the continuation of avian entanglement as experienced in the past, and the continued prohibition on offshore leaders in Pound Net Regulated Area I during the spring would continue to protect birds from the risk of entanglement in offshore leaders during that time period.

5.2.5 Habitat Impacts of NPA 1

NMFS believes that the NPA 1 would have minimal and temporary impacts on bottom vegetation and habitat, and the impacts were fully analyzed in the 2004 EA. If any impact occurs, it may result when the fishermen remove and replace their leaders to comply with the restriction. Removing and replacing leaders is a difficult task since the bottom of the mesh is typically buried in the bottom. The fishermen may disrupt bottom habitat (EFH or SAV) for a short period of time while they remove their leaders (typically taking from approximately 1-2 days to a week, depending on the length of the net, location, weather conditions, etc.). This disruption would also occur when fishermen replace their leaders after the restriction period has expired. Nevertheless, the duration of this disruption is extremely short. Fishermen remove and replace their leaders on a periodic basis (usually every year), so these bottom habitat disruptions occur during normal fishing activities. Therefore, PA would not impose any different impacts to habitat other than those that would occur during the current fishing activities. The magnitude of the habitat disruption is also relatively small; NPA 1 would impact, at maximum, approximately 5 pound net fishermen that fish offshore pound nets in Pound Net Regulated Area I, who would be required to remove their leaders prior to the start of the regulated period and would replace them after the regulated period. Further, it does not appear that these pound nets are set in pristine areas of notable concern for EFH or SAV. As such, NPA 1 may result in some temporary disruption of already affected bottom habitat to a nature and degree (that is, removal and/or replacement of the leaders) that is considered minimal and already occurs in the industry.

5.2.6 Economic Impacts of NPA 1

Non-preferred alternative one (NPA1) describes the current regulations for the regulated portion of the Virginia Chesapeake Bay, described in Section 3.2. Under this alternative offshore pound net fishermen in the lower Bay[12] may not use leaders during the regulated time period (May 6 – July 15), while all other pound net fishermen in the regulated part of the Bay (nearshore in lower Bay, both offshore and nearshore in upper Bay) must use an alternative leader (<12” mesh, no stringers) during this time period. As this is the base against which the other alternatives are compared, there are no additional costs or benefits associated with this alternative.

5.2.7 Social Impacts of NPA 1

[12] The areas of the upper and lower Bay are detailed in section Figure 4 and Figure 6. While roughly corresponding to Pound Net Regulated Areas II and I, there are differences as areas 306 and 307 lay within both areas. Landings and revenues could not be allocated by the Pound Net Regulated Area boundaries.

All offshore pound net fishermen in the closed area (offshore pound nets in Pound Net Regulated Area I) would continue to be prevented from fishing with their leaders from May 6 to July 15. While the heart(s) and pound may still be set, resulting in some level of fish catch, it is likely that the catch will be drastically reduced, if not completely eliminated, as compared to the PA. If several fishermen cannot fish with their leaders, this could result in a net negative social impact on fishermen and fishing communities. For instance, if the community's direct income is reduced as a result of a number of pound net fishermen being unable to fish for 10 weeks, and fish dealers and processors have less business, unemployment is likely to increase during the months of May, June, and July. With a loss in revenue from approximately 2 ½ months of unemployment, the fishermen may experience negative consequences (e.g., marital or domestic problems). The loss of income during this time may also deter fishermen from continuing in the pound net industry and they may need to find other jobs. The months of the proposed restrictions comprise a notable component of the fishermen's annual income; annual revenues in the lower Bay would be lower (Section 5.2.6) than the other three alternatives considered. It is uncertain whether pound net fishermen would switch to other fisheries. Pound net fishermen may attempt to switch to a different type of fishing gear, but it is unknown whether this is practical given the start up costs associated with purchasing new gear and fish license availability. We assume that fishermen would not switch to a different fishery for the 10 week period. As such, fishermen are particularly vulnerable to these prohibitions on pound net fishing. Pound net fishermen also employ individuals to assist with their fishing activities; these workers and their families will also be negatively affected by the management measures.

Fish dealers and processors would also be impacted by the NPA 1, as there would be a lower level of fish catch passing through their facilities and available for purchase. While target species catch rates would likely be lower than other alternatives considered (i.e., the PA) due to the inability to use the leaders on the pound nets, the heart(s) and pound may still be set, which may result in a small amount of catch. Fish dealers and processors may also obtain fish catch from those nearshore nets set outside the closed area. This may slightly reduce the negative impacts to the fishing community.

The fishermen most impacted by the NPA 1 are found on the Eastern shore. As such, most of the social impacts would be concentrated in this area. Several other fishermen that may be affected are concentrated in the Western Bay, restricting the social impacts to communities in this area. The relatively short duration of this gear restriction also minimizes the social impacts of the preferred alternative. The pound net fishery operates generally from March to December, and the preferred alternative restricts the use of certain leaders for 2 ½ months. These spring and early summer months appear to provide a notable portion of the pound net fish catch for the year, but fishermen may continue to fish throughout the remainder of the year. They may also fish those nets with the inland end of the leader 10 horizontal feet or less from the mean low water line.

Social benefits may be realized if these measures continue to reduce the entanglement risk to sea turtles, bottlenose dolphin, and birds. If this reduced risk increases the potential for sea turtle recovery, then society (at least those who value biodiversity) would benefit by preventing a loss of a species and preserving biodiversity. Those who do not value biodiversity would not

experience a social benefit from these restrictions. While these gear restrictions place an economic burden on the fishing community, they do not prohibit pound net leaders year-round. Social benefits are realized from the application of management practices that demonstrate that fishing practices and sea turtles can co-exist.

5.3 Environmental Consequences of NPA 2 - Expanded Geographic Leader Requirement and Leader Mesh Size Restriction

The NPA 2 involves requiring the use of the modified pound net leader for all pound nets in both Pound Net Regulated Areas I and II.

5.3.1 Fishery Resource Impact of NPA 2

Section 5.1.1 presents information on the potential impacts of requiring a portion of the fishery to use modified leaders and restricting pound net leaders in other areas, and the information about the operation of the modified leader applies to this alternative as well. The experiment conducted to test the effectiveness of the modified leader on preventing sea turtle interactions also measured the operation of the modified leader as compared to the traditional leader design on fish catch. The experiment found there to be no discernable difference in fish catches between the traditional and modified leader design (DeAlteris et al., 2004 and 2005). Although the mesh of modified leader is dropped below the surface of the water, the visual cues of the stiff vertical lines appear to be equally as effective as mesh at directing fish toward the pound for species that inhabit the upper portion of the water column. The modified leader was only tested in offshore pound nets in Pound Net Regulated Area I, and therefore it is unknown whether the modified leader would work as effectively throughout the regulated area. If one assumes that the modified leader does operate as effectively throughout the regulated area at directing fish toward the pound, this alternative would not result in quantifiable fishery resource impacts that differ from the PA (Section 5.1.1). As compared to NPA 1, this alternative would likely result in more fish catch, as leaders are currently prohibited in Pound Net Regulated Area I during the regulated time period. However, because the pound net fishery only represents 3 % of all landings from Chesapeake Bay (Table 3), the overall impact on the fishery resources (species identified in Appendix B), of this alternative are not expected to be measurable.

5.3.2 Endangered and Threatened Species Impacts of NPA 2

5.3.2.1 Impacts to Sea Turtles of NPA 2

Requiring the use of modified pound net leaders throughout the regulated area should result in a neutral impact to sea turtles. Within Pound Net Regulated Area I, this alternative should provide the same impact to sea turtles as the PA (analyzed in Section 5.1.2), as the requirement to use the modified leaders within this area is the same and the modified leader has been demonstrated to prevent entanglement and impingement of sea turtles at a level that is not quantifiably different from a prohibition on the use of leaders (NPA 1).

The 2004 EA notes that available data support that there is a difference in takes between offshore and nearshore leaders, which may be applied to the analysis of this alternative. There has been a demonstrated difference in sea turtles takes between offshore and nearshore leaders. NPA 2 would require the modified gear for all leaders, in Regulated Areas I and II and for offshore and nearshore leaders. The data do not demonstrate that this requirement is necessary. The risk of impingement and entanglement is considered to be related to location of the pound net leader, which serves as a proxy for environmental conditions such as temperature or currents (Section 5.1.2.1). These factors may influence encounter rates.

It may not be appropriate to require the modified leader in areas that the modified was not tested. It is unknown whether the demonstrated success of the modified leader was a result of the location in which the modified leader was tested (which may interact with the configuration of the gear) or solely the design of gear. As such, when considering the lack of observed takes in Pound Net Regulated Area II and in nearshore nets, and the absence of experimental data indicating the success of the modified gear in these areas, it does not appear that requiring the modified leader would provide conservation benefits that would outweigh the PA.

5.3.2.2 Other Threatened and Endangered Species

It is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 2. Section 5.1.2.8 describes the potential interactions between pound net leaders and shortnose sturgeon, and that information also applies to this alternative. If shortnose sturgeon are subject to entrapment by pound nets or entanglement in leaders, this alternative would minimize this potential by requiring the use of the modified leader throughout the regulated area. The NPA 1 may result in a larger potential benefit to shortnose sturgeon than NPA 2 because the status quo alternative would result in less gear in the water, and this would intuitively decrease the potential for interactions. However, while shortnose sturgeon have been reported as taken in pound net gear, no such interaction has been observed or reported in Virginia waters.

5.3.3 Marine Mammal Impacts of NPA 2

Requiring the use of modified leaders throughout the regulated area may have a beneficial effect on the marine mammal species most likely found in association with Virginia pound nets, the coastal bottlenose dolphin. The data presented in Section 5.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders, and that information and analysis also applies to this alternative.

Restricting the use of unmodified leaders throughout the entire regulated area from May 6 to July 15 should serve to further limit the interactions between pound net leaders and bottlenose dolphin (as compared to the PA). However, the experiment testing the effectiveness of the modified leader focused on it’s interaction with sea turtles and fish landings, not on it’s interaction with marine mammals, so the impact to marine mammals of this measure is undocumented. As bottlenose dolphins have been found entangled in pound net leaders in Virginia waters, it is

possible that any measure that limits the amount of leader gear in the water (i.e., through dropping the mesh and using stiff vertical lines) should benefit these marine mammals.

As described in Section 5.1.3, harbor porpoise and harbor seals may infrequently occur in the Virginia Chesapeake Bay waters during the spring and interact with pound net leaders. While there is no documentation of these species' entanglements in pound net leaders, there remains the potential for harbor porpoise and harbor seals to interact, and potentially become entangled, in pound net leaders. As such, it is likely that this alternative will provide some benefit to these species but the magnitude of the benefit cannot be determined.

5.3.4 Bird Impacts of NPA 2

Requiring the use of modified leaders throughout the regulated area should provide additional benefit to birds that inhabit the Chesapeake Bay area as compared to the PA, in particular brown pelicans and cormorants. The data presented in Section 5.1.4 indicate that birds inhabiting the Chesapeake Bay area become entangled in pound net leaders.

Requiring the use of modified leaders is anticipated to reduce some of the bird entanglements observed in the pound net fishery. The dropped mesh and vertical "hard lay" lines, which, spaced at 2 feet, diving birds would likely be able to swim through, should limit the opportunity for birds to become entangled in the pound net leader as compared to leaders made up of consistent webbing (i.e., as currently allowed in Pound Net Regulated Area II). Any measure that limits the amount of leader gear in the water should benefit avian species. As compared to the PA, therefore, this alternative should provide a level of protection to birds that is greater. However, while it is rational to conclude that this alternative would provide greater protection against entanglement, the level of additional protection is neither measurable nor quantifiable.

5.3.5 Habitat Impacts of NPA 2

NMFS believes that the NPA 2 would have less than minimal and temporary impacts on bottom vegetation and habitat. The habitat impacts would result from the removal and replacement of pound net leaders. The anticipated impacts of this alternative would be similar to those described in the PA. While unquantifiable and minimal, the impacts would be greater than the PA, as the geographic area that would require leader replacement is larger.

5.3.6 Economic Impacts of NPA 2

Under non-preferred alternative 2 (NPA2) both types of pound nets, nearshore and offshore, in all regulated areas of the Virginia Chesapeake Bay would be required to use the modified leader during the regulatory period, May 6 – July 15. As was discussed in Section 5.1.6.2.3.3, fishermen must make the decision to either switch to the modified leader during the regulatory period and fish, or they may choose to not fish if the cost of modifying their gear is higher than the potential loss in revenues. It is assumed that without a leader a pound cannot be fished and all revenues are lost. Further, it is assumed that based on the information in Section 5.1.6.2.3.3

that all affected fishermen will choose to modify their gear and fish as the net revenues with modifying their gear and fishing with the modified leaders are greater than not fishing.

The point of comparison for this alternative is the current regulatory situation, as described by the NPA1 (status quo). Under this situation offshore fishermen in the lower Bay may not fish with leaders during the regulatory period May 6 – July 15. All other pound nets must use the alternative leader (<12" mesh, no stringers) during this period. For this alternative we consider only the additional costs and revenues above those imposed by the status quo (NPA 1). For offshore fishermen in the lower Bay this includes fabricating the modified leader as well as installing and removing it. Additionally these fishermen may increase their revenues by being allowed to fish during the regulated period. For all other fishermen who must currently install and remove an alternative leader during this period, the additional cost is the cost of fabrication of the modified leader.

There are differences in costs between offshore and nearshore pounds for modified leader implementation. As well, there are differences between the upper and lower Bay[13], so each area is discussed below separately.

5.3.6.1 Lower Bay

All lower Bay pound net leaders would be required to be the modified leader during the regulatory period May 6 – July 15. For the offshore pound nets, which are currently not allowed to use any leader during the regulatory period, there are costs from implementing the modified leader, as well as a potential increase in revenues due to increased harvest opportunities during the regulated period. For nearshore pound nets the consideration is the cost of implementation of the modified leader compared to that of implementing the alternative leader required under the existing regulations (NPA1).

During the regulated period in 2004 there were 5 fishermen in lower Bay, fishing an average of 3.4 pounds per trip, for a total of 17 pound nets in the lower Bay. Based on 2004 observer coverage, 41% of these nets were offshore; it is assumed that there were 7 active offshore pound nets and 10 nearshore pound nets. These were allocated to individual fishermen (see Section 5.1.6.2.2 for discussion of allocation), with 3 fishermen having 2 nearshore pound nets and 1 offshore pound net, and 2 fishermen having 2 nearshore pound nets and 2 offshore pound nets. The average annual revenue for lower Bay fishermen was $79,503.

Offshore pound net fishermen in the lower Bay would be allowed the opportunity to fish during the regulated period, if they adopt the modified leader. The estimated revenue per pound net in the lower Bay during the regulated period is $17,194. The cost of implementing a modified leader (above the current cost of having to remove and re-install the standard leader) is $2,002

[13] The areas of the upper and lower Bay are detailed in section Figure 4 and Figure 6. While roughly corresponding to Pound Net Regulated Areas II and I, there are differences as areas 306 and 307 lay within both areas. Landings and revenues could not be allocated by the Pound Net Regulated Area boundaries.

for fabrication (labor + materials) and $1,784 to install and remove the modified leader. The net revenue is $13,408 (=$17,194 - $2,002 - $1,784) per leader.

For the nearshore pound nets, which must already install and remove the alternative leader, the cost of the NPA2 over NPA1 (status quo) is the cost of fabricating the modified leader, which is $1,930 for a nearshore leader.

The total increase in net revenues for each of the 3 fishermen in the lower Bay who fish 1 offshore and 2 near shore leaders would be $9,548 (=$13,408 – [$1,930*2]) or 12.0% of annual revenues ($9,548/79,503). The total impact on net revenues for the two fishermen assumed to have 2 offshore pound nets and 2 nearshore pound nets would be $22,956 (=[$13,408*2]-[$1,930*2]) or an increase of 28.9% in net revenues (=$22,956/$79,503).

5.3.6.2 Upper Bay

All pound nets in the upper Bay would be affected similarly by this alternative; however there are cost differences between offshore and nearshore pound nets. In all cases, the cost to pound net fishermen above the current regulations (NPA1) is the cost of fabrication the modified gear, including materials and labor. For offshore pound nets this cost is $2,002 per leader, and for nearshore pound nets the cost is $1,930 per leader. The average annual income for fishermen in the upper Bay is $55,772.

In 2004 the VMRC data indicates there were 16 pound net fishermen in the upper Bay fishing an average of 1.8 pound nets per trip for a total 29 pound nets. Based on the 2004 NEFSC gear survey 85% of these pound nets were offshore, for a total of 25 offshore pound nets and 4 nearshore pound nets (Section 5.1.6.2.1.2). For the 4 fishermen with 1 offshore and 1 nearshore pound net the total cost of the alternative over current regulations is $3,932 (=$2,002 + $1,930) or 7.1% of annual revenues (=$3,932/$55,772). For the 3 fishermen with only a single offshore pound net the cost is $2,002 or 3.6% of annual revenues (=$2,002/$55,772). For the 9 fishermen with 2 offshore pound nets the total cost is $4,004 or 7.2% of annual revenues ($4,004/$55,772).

5.3.6.3 Summary for NPA 2

For lower Bay fishermen the NPA 2 would result in an increase in net revenues, as the opportunity to fish offshore pound nets during the regulated period more than off-sets the costs of implementing the modified leader. For the five lower Bay fishermen the increase in net revenues would range from $9,548 to $22,956, or between 12.0% and 28.9% of annual revenues. The total net increase in revenues for the lower Bay would be $74,556 (=[3*$9,548]+[2*$22,956]). For upper Bay fishermen there would only be costs to implement this alternative, above the existing regulations (NPA1). The costs would range from $2,002 to $4,002, or 3.6% to 7.2% of annual revenues, with a total cost of $57,770 (=[4*3,932]+[3*$2,002]+[9*$4,004]).

Overall the increase in net revenues for offshore fishermen in the lower Bay would off-set the increase in costs for other fishermen to implement the modified leader on all other pound nets.

The industry would see a net increase in revenue of $16,786, or 0.8% of 2004 pound net revenues (=$0.017M/$2.187M).

5.3.7 Social Impacts of NPA 2

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. The geographical distribution of the social impacts would be more widespread compared to the PA, as some nets in the northern portion of the Virginia Chesapeake Bay would be affected by NPA 2.

The social impacts described in Section 5.1.3 also apply to this alternative. For instance, if gear modifications throughout the regulated area reduce the entanglement risk to sea turtles and increase the potential for sea turtle recovery, then the portion of society valuing biodiversity will benefit by preventing a loss of a species and preserving biodiversity. This alternative may have a smaller, larger or equal social benefit than the PA, as the leader management measures aimed at protecting sea turtles provide a benefit to turtles may not be distinguished.

5.4 Environmental Consequences of NPA 3 – Gear Modification for Offshore Nets

Any offshore pound net leader in Pound Net Regulated Area I or II must use a modified leader from May 6 through July 15 each year. Any nearshore pound nets in Pound Net Regulated Area I or II must have mesh size less than 12 inches (30.5 cm) stretched mesh and may not employ stringers from May 6 through July 15 each year. This non-preferred alternative is similar to the PA, but the modified leader area is larger with this alternative.

5.4.1 Fishery Resource Impacts of NPA 3

The type of impacts to fishery resources from this alternative would be the same as the PA (Section 5.1.1), but the magnitude of the benefits to fishery resources would be different since more of the fishery is restricted. The benefits to fishery resources would be less than NPA 2 (Section 5.3.1), as the geographic area and corresponding number of affected nets would be less for this alternative.

5.4.2 Endangered and Threatened Species of NPA 3

5.4.2.1 Sea Turtle Impacts of NPA 3

The information presented in Sections 2.0 and. 5.1.2 identify that sea turtles become entangled in and impinged on pound net leaders. Data presented in both sections applies to this alternative as well.

Sea turtles would be affected by this alternative in a similar manner as the PA (described in Section 5.1.2), namely that the threat of entanglement and impingement in modified pound net leaders approaches that of a prohibition on pound net leaders. This alternative may provide for

an increased level of protection for sea turtles in comparison to the PA. More pound net leaders would be required to be modified, reducing the chance of interaction with those leaders. The risk of entanglement in a nearshore leader is low, supporting the gear modification for offshore nets only. However, outside of offshore nets in Pound Net Regulated Area I, there have been very few turtle interactions observed. The risk of impingement and entanglement may be related to location of the pound net leader, which serves as a proxy for environmental conditions such as temperature or currents. These factors may influence encounter rates. Furthermore, it may not be appropriate to require the use of the gear in areas that the gear was not tested. It is unknown whether the demonstrated success of the modified leader during the experiment was related to the location in which the modified leader was tested (which may interact with the configuration of the gear) or solely the design of gear. Therefore, requiring that all offshore pound net leaders be modified leaders in Pound Net Regulated Area II in addition to Regulated Area I may not provide protection to sea turtles from the risk of entanglement or impingement in ways not achieved by the PA.

5.4.2.2 Impacts to other Endangered and Threatened species

As with the preferred alternative (Section 5.1.2), it is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 3. Should shortnose sturgeon be subject to entrapment by pound nets or entanglement in leaders, this alternative should reduce this threat in all offshore leaders, as these leaders would be modified.

5.4.3 Marine Mammal Impacts of NPA 3

Requiring the use of modified leaders in all offshore pound nets may have a beneficial effect on the coastal bottlenose dolphin. The data presented in Section 5.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders, and that information further applies to this alternative. As more leaders would be modified with this alternative as compared to the PA, the beneficial impacts to bottlenose dolphin would likely be larger than with the implementation of the PA, though less than for NPA 2.

Harbor porpoise and harbor seals may interact with pound nets, but there is no documentation of these species' entanglements in pound net leaders. The potential benefits to harbor porpoise and harbor seals from the implementation of the PA (Section 5.1.3) would be similar for this alternative. It is likely that the NPA 3 will provide some benefit to these species, by reducing potential entangling gear, but the magnitude of the benefit cannot be determined.

5.4.4 Bird Impact of NPA 3

Section 5.1.4 presents information on the potential impacts of the pound net fishery on birds, and that information will apply to this alternative as well. The type of impacts to birds from this alternative would be the same as the PA, but the magnitude of the benefits to avian species would be different since more leaders would be modified in the affected area.

Birds have been documented entangled in the pounds, hearts and leaders of pound net gear. Prohibiting the use of pounds and hearts, as well as leaders, would further reduce the potential for bird entanglement, which leads to subsequent mortality. The NPA 3 would benefit avian species, to a greater degree than with the PA, because more of the entangling gear would be modified. As far as the impacts of restricting leader mesh size in a portion of the Chesapeake Bay, it is likely that birds could continue to become entangled in nearshore leaders. As such, some level of avian entanglement may continue with this alternative.

5.4.5 Habitat Impacts of NPA 3

NMFS believes that the NPA 3 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.5 describes the potential impacts to habitat resulting from the removal and replacement of pound net leaders. The type of anticipated impacts would be the same as for the PA, but the magnitude would be greater for this alternative. With this alternative, the leaders would be replaced in all offshore nets, resulting in fishermen disrupting a larger geographical area. Typically, fishermen remove their gear at the end of the season (leaving their poles intact), so this disruption occurs on an annual basis. However, instead of performing this activity once a year, this alternative would result in removing and replacing the entire suite of pound net leaders twice (should fishermen choose to use unmodified leaders during the balance of the fishing year). Albeit, the duration of the habitat disruption would be short and this alternative may result in some temporary disruption of already affected bottom habitat to a nature and degree (that is, removal of the leaders, hearts, and pounds) that already occurs in the industry. As such, the NPA 3 is unlikely to adversely impact EFH or SAV.

5.4.6 Economic Impacts of NPA 3

Under non-preferred alternative 3 (NPA3), all offshore pound net leaders in both the upper and lower Bay[14] must be a modified leader during the regulated period (May 6 – July 15). Nearshore pound nets in the upper and lower Bay do not have to implement any changes beyond those required by current regulations (i.e., use of alternative leader with <12” mesh and no stringers). The point of comparison for the alternatives are differences from the status quo (NPA1), so only changes to fishermen with offshore pounds are considered, with lower and upper Bay impacts discussed separately.

5.4.6.1 Lower Bay

During the regulated period in 2004 there were 5 fishermen in lower Bay, fishing an average of 3.4 pounds per trip, for a total of 17 pound nets in the lower Bay. Based on 2004 observer coverage, 41% of these nets were offshore; it is assumed that there were 7 active offshore nets. These were allocated to individual fishermen (described in Section 5.1.6.2.3.1), with 3 fishermen

[14] The areas of the upper and lower Bay are detailed in section Figure 4 and Figure 6. While roughly corresponding to Pound Net Regulated Areas II and I, there are differences as areas 306 and 307 lay within both areas. Landings and revenues could not be allocated by the Pound Net Regulated Area boundaries.

each having 1 offshore net, and 2 fishermen each having 2 offshore nets. The average annual revenue for lower Bay fishermen was $79,503.

Offshore pound net fishermen in the lower Bay would be allowed the opportunity to fish during the regulated period, if they adopt the modified leader. The estimated revenue per pound net in the lower Bay during the regulated period is $17,194. The cost of implementing a modified leader (above the current cost of having to remove and re-install the standard leader) is $2,002 for fabrication (labor + materials) and $1,784 to install and remove the modified leader. The net revenue is $13,408 (=$17,194 - $2,002 - $1,784) per leader. For the 3 fishermen fishing 1 offshore pound net the total net revenue increase from the proposed regulation change would be $13,408 or 16.9% of annual revenues (=$13,408/$79,503). For the 2 fishermen fishing 2 offshore pound nets the total cost would be $26,816 or 33.7% of annual revenues (=$26,816/$79,503).

5.4.6.2 Upper Bay

Offshore fishermen in the upper Bay would also be required to switch to the modified leader during the regulated period, in order to continue fishing with a leader. Under current regulations these fishermen must switch to the alternative leader (<12” mesh, no stringers) in order to continue fish. Thus the only additional cost of this alternative, over the current regulations, is the cost of fabricating the modified leader. This cost is $2,002 per offshore leader (materials and labor). The average annual revenue in the upper Bay is $55,772 per fisherman.

In 2004 the VMRC data indicates there were 16 pound net fishermen in the upper Bay, fishing an average of 1.8 pound nets per trip, for a total of 29 pound nets. According to the 2004 observer data 85% of the active pound nets in the upper Bay were offshore. In Section 5.1.6.2.3.1we allocated these nets such that 7 fishermen each had 1 offshore pound net, and 9 fishermen each had 2 offshore pound nets. The additional cost for the 7 fishermen would be $2,002 each or 3.6% of annual revenues (=$2,002/$55,772), while for the other 9 fishermen the cost would be $4,004 or 7.2% of annual revenues (=$4,004/$55,772).

5.4.6.3 Summary for NPA 3

Implementation of the NPA 3 would result in a net increase in revenues for the lower Bay fishermen, and for the industry overall, as compared to the current regulations (NPA 1). For the 5 lower Bay fishermen the net revenue increase would range from $13,408 to $26,816 or an increase in net revenues of 16.9% to 33.7% of annual revenues. For 16 upper Bay fishermen affected by this alternative, the cost over the current regulations would be from $2,002 to $4,004 or 3.6% to 7.2% of annual revenues.

The total impact of the pound net industry would be positive as there would be an increase in net revenues over the status quo (NPA1). The total increase in net revenues for lower Bay fishermen would be $93,856 (=[3*$13,408]+[2*$26,816]), while the total cost to the upper Bay fishermen

would be $50,050 (=[7*$2,002]+[9*$4,004]). This provides a net increase in industry revenues of $43,806 or 2.0% of 2004 industry revenues (=$0.044M/$2.187M).

5.4.7 Social Impacts of NPA 3

The economic analysis indicates that the pound net industry will be impacted by this alternative. Under the NPA 3, fishing practices are affected in the same manner as outlined in Section 5.1 (the PA) and the type of social impacts would be the same, but the magnitude of the impacts would be greater as more gear is restricted.

The social benefits described in Section 5.1 also apply to this alternative. For instance, the pound net industry was involved in developing the modified gear, and have proposed the use of the modified gear for the history of rulemaking since 2001. Consequently, the projected social impacts to the fishing industry are anticipated to be beneficial, as compared to some of the other alternatives, such as NPA 1 (No Action/Status Quo), because the fishing industry and other interested organizations support the use of the modified leader.

6.0 POTENTIAL CUMULATIVE EFFECTS

The concept behind cumulative effects analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective but rather, the intent is to focus on those effects that are truly meaningful. This section analyzes the potential direct and indirect effects of the proposed action (summarized from Section 5.0 and presented in Table 19) together with past, present, and reasonably foreseeable future actions as well as factors external to the VA pound net fishery that affect the physical, biological, and socioeconomic resource components of the VA pound net fishery. Although predictions of synergistic effects from multiple sources are inherently less certain than predicted effects of individual actions, cumulative effects analyses are intended to alert decision makers to potential “hidden” consequences of the proposed actions.

Table 19. Summary of Impacts of the Proposed Action and Alternatives

Fishery Resources	Endangered & Threatened Species	Marine Mammals	Birds	Habitat	Economic Environment	Social Environment
PA – Modified Leaders in Pound Net Regulated Area I and Leader and Mesh Restrictions in Pound Net Regulated Area II						
Low Negative - more fish caught, but very minor difference from PA	**Neutral** – modified leader prevents entanglement and impingement, but cannot measure difference between alternatives	**Neutral** – modified leader prevents entanglement and impingement, but cannot measure difference between alternatives	**Potentially Low Negative** – more gear in water as compared to status quo in which to become entangled, not measurable	**Neutral** – pound net gear impacts are not more than minimal and temporary in nature	**Low Positive** –in offshore nets, increase landing opportunities compared to status quo	**Low Positive –** support by fishing community
NPA 1 – No Action/Status Quo; Leader Prohibition in Pound Net Regulated Area I and Leader and Mesh Restrictions in Pound Net Regulated Area II						
Neutral – fewer fish caught without leader in Reg Area I, but may be caught elsewhere	**Low Positive** – measures prevent entanglement and impingement	**Low Positive** – measures prevent entanglement and impingement	**Low Positive** – less gear in water means fewer entanglements	**Neutral** – pound net gear impacts are not more than minimal and temporary in nature	**Neutral** – loss of revenue in Reg Area I, but status quo condition	**Neutral/Low Negative**– lack of support by fishing community; benefit to nation
NPA2 – Expanded Geographic Area for Modified Gear Requirements						
Low Negative - more fish caught, but very minor difference from PA	**Neutral** – modified leader prevents entanglement and impingement, but cannot measure difference between alternatives	**Neutral** – modified leader prevents entanglement and impingement, but cannot measure difference between alternatives	**Potentially Low Negative** – more gear in water as compared to status quo in which to become entangled, not measurable	**Neutral** – pound net gear impacts are not more than minimal and temporary in nature	**Low Positive** – modified leader use in offshore nets, increase landing opportunities compared to status quo	**Neutral –** support by fishing community, but may be overly precautionary
NPA 3 – Gear Modification for Offshore Nets						
Low Negative - more fish caught, but very minor difference from PA	**Neutral** – modified leader prevents entanglement and impingement, but cannot measure difference between alternatives	**Neutral** – modified leader prevents entanglement and impingement, but cannot measure difference between alternatives	**Potentially Low Negative** – more gear in water as compared to status quo in which to become entangled, not measurable	**Neutral** – pound net gear impacts are not more than minimal and temporary in nature	**Low Positive** – modified leader use in offshore nets, increase landing opportunities compared to status quo	**Neutral –** support by fishing community, but may be overly precautionary

The information presented in Sections 2.0 and 4.0 (Purpose and Need for Action and Affected Environment) describes the relevant history, natural history and current status of the environmental components that helps characterize the environmental baseline against which to evaluate cumulative effects and serve as a starting point for the cumulative effects analysis. The baseline does not represent a static 'snapshot' of the resource. Instead, it represents the trend of the resource, incorporating the past history of influences on the resource. The cumulative past effects of sea turtle conservation measures in the Chesapeake Bay, as well as effects external to the VA pound net fishery such as other fishery impacts, human-induced impacts, and climatic events influencing the resource, all contribute to the state of the baseline condition.

Valued Ecosystem Components

The cumulative effects analysis focuses on valued ecosystem components (VECs) identified as important to this is action and described in the Affected Environment section.

1. Fishery resources (target and non-target)
2. Endangered and Threatened Species (incidental catch and bycatch)
3. Marine Mammals
4. Birds
5. Habitat
6. Economic environment, including the economics of the fishery and fishing communities, and
7. Social environment

NMFS staff determined that the seven VECs (fishery resources, endangered and threatened species, marine mammals, birds, habitat, economic environment, social environment) are appropriate for the purpose of evaluating cumulative effects of the proposed action based on the environmental components that have the potential to be affected by the proposed action, and statutory requirements to complete assessments of these factors under the Magnuson-Stevens Act, Endangered Species Act, Marine Mammal Protection Act, Regulatory Flexibility Act, and several Executive Orders. The VECs are intentionally broad (for example, there is one devoted to threatened and endangered species, rather than just specific species of sea turtles, and one on habitat, rather than Essential Fish Habitat) to allow for flexibility in assessing all potential environmental factors that are likely to be impacted by the action.

The PA would require modified offshore pound net leaders in a southern portion of the Virginia Chesapeake Bay (Pound Net Regulated Area I), and would retain the restriction on the use of pound net leaders measuring 12 inches or greater and leaders with stringers for nearshore pound net leaders and in the remainder of the mainstem Virginia Chesapeake Bay from May 6 to July 15 each year. The PA also includes the current framework mechanism that may be used to extend the restrictions or enact additional restrictions based upon new information. The subsequent analysis was conducted by following the cumulative effects assessment procedural steps (Council on Environmental Quality 1997), as noted in Appendix C.

Several actions and activities have impacted and will likely continue to impact the resources found within this geographic area, including vessel operations, hopper dredging, fisheries, and marine pollution/water quality. The biological resources most likely impacted by these actions include sea turtles, a variety of fish species, bottlenose dolphin, several bird species, and habitat. Endangered shortnose sturgeon, harbor porpoise and harbor seals may be impacted to a lesser extent. As the intent of the proposed measure is to protect listed sea turtles, the majority of the following discussion will focus on the cumulative impacts to those species. The pound net fishery, associated fish dealers and processors, their respective families, and their communities, represent the human community of concern. A summary of the cumulative effects is presented in Table 24.

Geographic and Temporal Scope

The geographical area affected by this proposed action is the Virginia Chesapeake Bay (the action area). Specifically, the impacted area includes the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 38 N. lat.) to the COLREGS line at the mouth of the Chesapeake Bay; the James River downstream of the Hampton Roads Bridge Tunnel (I-64); the York River downstream of the Coleman Memorial Bridge (Route 17); the Great Wicomico River downstream of the Jessie Dupont Memorial Highway Bridge (Route 200); the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3); and the Piankatank River downstream of the Route 3 Bridge. For endangered and protected species the geographic range is the total range of each species (Section 4.0). The geographic range for the social environment is defined as those fishing communities bordering the range of the action area as described above, although society as a whole is also considered. The geographic scope is further defined in Section 4.0. In terms of past actions for fisheries, habitat and the human environment, the temporal scope of this analysis is primarily focused on actions that have taken place since NMFS began to take conservation measures in the VA pound net fishery in 2002. For endangered and other protected species, the context is largely focused on the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ, and when NMFS began to document spring stranding events in the Chesapeake Bay. In terms of future actions, the analysis examines the period for five years into the future.

6.1 Impacts to Biological Resources

A number of both fishing and non-fishing activities have had and will continue to have impacts on the VECs identified for this action. These impacts are described in this section. The non-fishing impacts are summarized in Table 20.

6.1.1 Vessel Operations

Potential adverse effects from federal vessel operations in the area include operations of the U.S. Navy and the U.S. Coast Guard, which maintain the largest federal vessel fleets, the EPA, the National Oceanic and Atmospheric Administration (NOAA), and the Army Corps of Engineers

(ACOE). NMFS has conducted formal consultations pursuant to section 7 of the ESA with the Coast Guard and the Navy, and is currently in early phases of consultation with the other federal agencies on their vessel operations. These consultations have evaluated the impacts of vessel operations on listed species throughout the Atlantic. The operation of federal vessels in the area may have resulted in collisions with sea turtles and marine mammals, and their subsequent injury or mortality.

Private and commercial vessels also operate in the area and have the potential to interact with sea turtles and marine mammals, especially those that participate in high speed marine events. These activities have the potential to result in lethal (through entanglement or boat strike) or non-lethal (through harassment) takes of listed species that could prevent or slow a species' recovery. The magnitude of these marine interactions is not currently known. The STSSN also reports regular incidents of vessel interaction (e.g., propeller-like injuries, carapace damage) with sea turtles. From January through October 2002, 52 sea turtles in Virginia were found with propellor-like or crushing injuries. In 2004 and 2005, 11 turtles exhibited possible vessel strike wounds. However, it is unknown as to how many of these injuries were pre or post-mortem. It is likely that interactions with commercial and recreational vessels result in a higher level of sea turtle mortality than what is documented on Virginia beaches, as some impacted animals may not strand.

Effects of fishing vessels on sea turtles or marine mammals may involve disturbance or injury/mortality due to collisions or entanglement in anchor lines. Marine species or critical habitat may also be affected by fuel oil spills resulting from fishing vessel accidents. No collisions between commercial fishing vessels and sea turtles or adverse effects resulting from disturbance have been documented. However, the commercial fishing fleet represents a significant portion of marine vessel activity. Due to differences in vessel speed, collisions during fishing activities are less likely than collisions during transit to and from fishing grounds. Because most fishing vessels are smaller than large commercial tankers and container ships, collisions are less likely to result in mortality. Although entanglement in fishing vessel anchor lines has been documented historically, no information is available on the prevalence of such events.

Fuel oil spills could affect animals directly or indirectly through the food chain. Fuel spills involving fishing vessels are common events. These spills typically involve small amounts of material that are unlikely to adversely affect listed species. Larger spills may result from accidents, although these events would be rare and involve small areas. Any type of spill may impact bottom habitat and benthic resources, but it is unknown as to what extent. No direct adverse effects on marine resources in the affected geographical area or critical habitat resulting from vessel fuel spills have been documented. Given the current lack of information on prevalence or impacts of interactions, there is no basis to conclude that the level of interaction represented by any of the various vessel activities discussed in this section would be detrimental to the existence of the biological resources considered with this action.

It is not possible to predict whether additional impacts from these vessel activities will increase or decrease in the future. In other areas of the Northeast, various initiatives have been planned to expand or establish high-speed ferry service. At this time, NMFS is not aware of high-speed ferry services planned for the area in question. NMFS will continue to monitor the development of the high speed vessel industry and its potential threats to listed species and critical habitat. In any event, it is likely that vessels (both federal and private, commercial and recreational) will continue to operate in the area, so the impacts described above will likely persist.

6.1.2 Fishery Operations

Several commercial fisheries operating in the area use gear which is known to impact marine resources. For all fisheries for which there is a federal fishery management plan (FMP) or for which any federal action is taken to manage that fishery, impacts have been evaluated through the ESA section 7 process. However, many fisheries in the area are not subject to section 7 consultations as they operate solely in state waters.

Very little is known about the level of listed species take in fisheries that operate strictly in state waters. However, depending on the fishery in question, many state permit holders also hold federal licenses; therefore, section 7 consultations on federal actions in those fisheries address some state-water activity. Impacts on sea turtles and shortnose sturgeon from state fisheries may be greater than those from federal activities in certain areas due to the distribution of these species. Nearshore entanglements of turtles have been documented; however, information is not available on whether the vessels involved were permitted by the state or by NMFS. NMFS is actively participating in a cooperative effort with the Atlantic States Marine Fisheries Commission (ASMFC) and member states to standardize and/or implement programs to collect information on level of effort and bycatch of protected species in state fisheries.

As identified previously in, there is a complex mix of fisheries operating in Virginia Chesapeake Bay waters during the spring. Appendix A identifies Virginia commercial landings for 2004 and 2003 and the species targeted (VMRC web site 2005). This landings data is for all Virginia state waters, not only the Chesapeake Bay (the area considered in the PA). The targeted species are landed by a variety of gear types, including gillnets, pound nets, pots, and haul seines. As such, fishery resources may be impacted by the fishing effort ongoing in the spring. Gillnet, seine, dredge, pound net and pot fisheries may interact with sea turtles in the Virginia Chesapeake Bay.

In the spring, gillnets in the area target a number of species including black drum, Atlantic croaker and dogfish. The black drum 10-14 inch mesh anchored sink gillnet fishery occurs in state waters, along the tip of the Eastern shore. While depending on fish migrations, this fishery occurs from approximately mid-April to mid-May. These fisheries may take sea turtles given the gear type, but no interactions have been observed during alternative platform observer coverage from 2000 to 2003. No large mesh gillnet fishing in the vicinity of the mouth of the Chesapeake Bay occurs from June 1 to June 30; during this time, gillnets with a stretched mesh size greater than 6 inches are prohibited in Virginia's portion of the Chesapeake Bay south of Smith Island (VMRC regulations 2001).

The amount of gillnet effort occurring in the Chesapeake Bay waters during the spring appears to be relatively small (e.g., approximately 2 percent of total Virginia Chesapeake Bay landings (Table 4.2.1.1 and 4.2.1.2)). Further, aerial surveys were conducted by VIMS in the Virginia Chesapeake Bay and minimal gillnet effort was observed during May and June 2001 and 2002. Most of the gillnet effort in the Chesapeake Bay uses small mesh. While these gillnet fisheries are suspected to take turtles, no interactions have been observed in Virginia. For example, in May and June 2001, NMFS observed 2 percent of the Atlantic croaker fishery and 12 percent of the dogfish fishery (which represent approximately 82% of Virginia's total small mesh gillnet landings from offshore and nearshore waters during this time), and no turtle takes were observed. Nevertheless, small mesh gillnets may entangle sea turtles (and perhaps marine mammals) in Virginia waters.

VMRC restricted the use of trawls in Virginia's portion of the Chesapeake Bay in 1989. No trawling effort occurs in the Chesapeake Bay, so marine species interactions with this gear type do not occur in the area.

A whelk fishery using pot/trap gear is known to occur in Virginia. This fishery operates when sea turtles may be in the area and may contribute to turtle mortality. Sea turtles (loggerheads and Kemp's ridleys in particular) are believed to become entangled in the top bridle line of the whelk pot, based upon a few documented entanglements of loggerheads in whelk pots, the configuration of the gear, and the turtles' preference for the pot contents. However, the majority of the whelk pot effort is found offshore, particularly outside Virginia's state waters, and few fishermen set their pots inside the Chesapeake Bay (Mansfield et al. 2001). The peak spring months for the whelk pot fishery are April and May. Research is underway to determine the magnitude of these interactions and to develop gear modifications to reduce these potential entanglements. In New England waters, leatherbacks have been found entangled in whelk pot lines, so if leatherback turtles overlap with this gear set in the area, entanglement may occur.

The blue crab fishery using pot/trap gear also occurs in the area. Crab pot fishing occurs throughout the Chesapeake Bay, including along the Eastern shore and tip of the Delmarva Peninsula. Approximately 5 percent of the total Virginia Chesapeake Bay landings in May, June, and July 2004 were from crab pots. Sea turtles may become entangled in crab pot gear, but due to the nature of the gear and manner in which it's fished, interactions are difficult to detect. For instance, given the size of the fishing vessels, traditional observers are not feasible for the crab pot fishery, and sea turtle interactions with crab pot gear at depth are not able to be observed at the surface. The magnitude of interactions with these pots and sea turtles is unknown, but loggerheads and leatherbacks have been found entangled in this gear. For instance, in May and June 2002, three leatherbacks were documented entangled in crab pot gear in various areas of the Chesapeake Bay. Given the plethora of crab pot gear throughout the action area, it is possible that these interactions are more frequent than what has been documented. Currently there is a moratorium on crab gear in Virginia waters.

NMFS is also currently investigating the Virginia whelk dredge fishery and the haul seine fisheries to determine the interactions between these fisheries and sea turtles, and their potential contribution to spring sea turtle strandings. Menhaden purse seines also operate in the spring and comprise the majority of the spring landings (Table 3), but VIMS has previously observed this fishery and determined it was not a notable problem with respect to sea turtle interactions (Austin et al. 1994).

Recreational fishermen may also impact sea turtles. Sea turtles have been caught on recreational hook and line gear. For example, from May 24 to June 21, 2003, five live Kemp's ridleys were reported as being taken by recreational fishermen on the Little Island Fishing Pier near the mouth of the Chesapeake Bay. The Virginia Marine Science Museum recovered, treated, and released these animals. There have also been anecdotal reports that several Kemp's ridleys were caught each week earlier in the spring of 2003. These animals are typically alive, and while the hooks should be removed whenever possible and when it would not further injure the turtle, NMFS suspects that the turtles are probably often released with hooks remaining. Through discarded line and subsequent entanglements, bottlenose dolphin may also be impacted by recreational (and commercial) fishing gear.

It is expected that future commercial and recreational fishing activities in the Virginia Chesapeake Bay will continue and as such, continue to impact several protected species (e.g., sea turtles, bottlenose dolphin). While it cannot be certain, it is expected that in the future, the fisheries will affect protected resources to the same extent in years past. Obviously, fishing activities impact fish resources of the Virginia Chesapeake Bay, and these impacts are expected to continue in the future.

6.1.3 Dredging Activities

Whole sea turtles and sea turtle parts have been taken in hopper dredging operations in the area. Dredging operations in Cape Henry Channel, York Spit Channel, and Thimble Shoals Channel (in the Virginia Chesapeake Bay) have incidentally taken sea turtles. The impacts of hopper dredging in these channels on listed species were previously considered via formal section 7 consultations (NMFS NER 2002, NMFS NER 2003). From July 2000 to October 2003, 54 sea turtles have been taken by Virginia dredge operations. Some of the incidents involved decomposed turtle flippers and/or carapace parts, but most of these takes were fresh dead turtles. As such, hopper dredging in the action area has resulted in the mortality of a number of sea turtles, most of which were loggerheads. There have also been several strandings (e.g., 13 in 2002, 3 turtles in 2003) with injuries consistent with dredge interactions. Dredging in the surrounding area could have influenced the distribution of sea turtles and/or disrupted potential foraging habitat.

While dredging activities in the action area have not documented the incidental take of any shortnose sturgeon to date, dredging activities may also entrain (and subsequently kill) shortnose sturgeon and disrupt their benthic foraging habitat. Marine mammals (given their size and

behavior) and fish species (given their behavior and distribution throughout the water column) are less likely to be impacted by hopper dredging.

Dredging impacts to sea turtles (and potentially other marine species) are likely to continue in the future.

6.1.4 Marine Pollution/Water Quality

Within the area, marine resources and habitat most likely have been impacted by pollution/debris. For example, marine debris (e.g., discarded fishing line, lines from boats, plastics) can entangle sea turtles and marine mammals in the water and drown them. Turtles commonly ingest plastic or mistake debris for food, as observed with the leatherback sea turtle. The leatherback's preferred diet includes jellyfish, but similar looking plastic bags are often found in the turtle's stomach contents (NRC 1990). Given that most of the Chesapeake Bay shoreline is populated, it would not be unexpected to find debris in the water.

Excessive turbidity due to coastal development and/or construction sites could also influence marine resources, including sea turtle foraging ability. Turtles are not very easily directly affected by changes in water quality or increased suspended sediments, but if these alterations make habitat less suitable for turtles and hinder their capability to forage, eventually they might tend to leave or avoid these less desirable areas (Ruben and Morreale 1999). SAV may also be affected by excessive turbidity in the area, as light is a limiting requirement for adequate growth. Turbidity has likely occurred to some extent in the area and may have impacted marine resources.

Sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial development. Chemical contamination may have an effect on marine species reproduction and survival. While the effects of contaminants on sea turtles is relatively unclear, pollution may also make sea turtles more susceptible to disease by weakening their immune systems. Furthermore, the Bay watershed is highly developed and may contribute to impaired water quality via stormwater runoff or point sources. However due to the volume of water in the mainstem Chesapeake Bay, the impacts of pollutants may be slightly reduced compared to certain tributaries. In a characterization of the chemical contaminant effects on living resources in the Chesapeake Bay's tidal rivers, the mainstem Bay was not characterized due to the historically low levels of chemical contamination, but the James River was characterized as an area with potential adverse chemical contaminant effects to living resources (Chesapeake Bay Program Office 1999).

Toxins introduced to the water column become associated with the benthos and can be particularly harmful to benthic organisms (Varanasi 1992), like sturgeon and other benthic fish species. Heavy metals and organochlorine compounds are known to accumulate in fat tissues of sturgeon, but their long term effects are not yet known (Ruelle and Henry 1992; Ruelle and Keenlyne 1993). Available data suggest that early life stages of fish are more susceptible to

environmental and pollutant stress than older life stages (Rosenthal and Alderdice 1976). Although there have not been any studies to assess the impact of contaminants on shortnose sturgeon, elevated levels of environmental contaminants, including chlorinated hydrocarbons, in several other fish species are associated with reproductive impairment (Cameron et al. 1992; Longwell et al. 1992), reduced egg viability (Von Westernhagen et al. 1981; Hansen 1985; Mac and Edsall 1991), and reduced survival of larval fish (Berlin et al. 1981; Giesy et al. 1986). Some researchers have speculated that PCBs may reduce the shortnose sturgeon's resistance to fin rot (Dovel et al. 1992). Several characteristics of shortnose sturgeon (i.e., long lifespan, extended residence in estuarine habitats, benthic predator) predispose the species to long-term and repeated exposure to environmental contamination and potential bioaccumulation of heavy metals and other toxicants (Dadswell 1979).

While dependent upon environmental stewardship and clean up efforts, impacts from marine pollution, excessive turbidity, and chemical contamination on marine resources and the Chesapeake Bay ecosystem are expected to continue in the future.

6.1.5 Anticipated Research

NMFS plans to continue to attempt to determine the cause of the spring stranding event in the Chesapeake Bay through research, monitoring and observation of fisheries. As noted above and in Section 4.0 several other fisheries operate within the Chesapeake Bay, such as gillnet and purse seine fisheries, and over the next several years, NMFS plans to dedicate observer effort to evaluate the risk of these fisheries operations to sea turtles.

6.2 Past and Present Conservation and Recovery Actions Impacting Marine Resources

Past and present regulatory actions are describe in Sections 2.1 and 4.0 (Background and Affected Environment) and are summarized in Table 22. A number of additional activities are in progress that ameliorate some of the negative impacts on marine resources (sea turtles in particular) posed by activities summarized above. Education and outreach activities are considered one of the primary tools to reduce the risk of collision represented by the operation of private and commercial vessels.

6.2.1 Outreach

NMFS regulations require fishermen to handle sea turtles in such a manner as to prevent injury. As stated in 50 CFR 223.206(d)(1), any sea turtle taken incidentally during fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to a series of procedures. In addition, NMFS has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. NMFS has developed a recreational fishing brochure that outlines what to do should a sea turtle be hooked and includes recommended marine mammal and sea turtle conservation measures.

6.2.2 STSSN

The Virginia STSSN has been established since 1979 and includes an extensive volunteer network. This group not only collects data on dead sea turtles, but also rescues and rehabilitates live stranded turtles. Data collected by the STSSN are used to monitor stranding levels and compare them with anthropogenic activities in order to determine whether conservation measures need to be implemented on a particular activity. These data are also used to monitor incidence of disease, study toxicology and contaminants, and conduct genetic studies to determine population structure. All of the states that participate in the STSSN are collecting tissue for and/or conducting genetic studies to better understand the population dynamics of the loggerhead subpopulations. Since the spring of 2002, the Virginia STSSN has improved sea turtle stranding response on Virginia's Eastern shore. This increased level of training, outfitting with equipment, and effort has enabled timely and effective response to strandings, which has contributed to the better understanding of sea turtle strandings in this area. There is also a Virginia marine mammal stranding network that collects information on stranded marine mammals.

6.2.3 Protocol for Disentanglement

There is currently no organized, formal program for at-sea disentanglement of sea turtles. However, recommendations for such programs are being considered by NMFS pursuant to conservation recommendations issued with several recent section 7 consultations. Protocols for sea turtle disentanglement in pot gear are currently being developed at the NMFS Northeast Region. Entangled sea turtles found in recent years have been disentangled on an ad hoc basis by STSSN members, the USCG, and fishermen.

6.3 Economic and Social Environment

The fishery affected by the PA is the Virginia pound net fishery. The pound net fishery lands several different species throughout the year. Major species landed by weight are: bait, Atlantic croaker, menhaden, sea trout (weakfish), catfish, spot, striped bass, Spanish mackerel, blue crab, bluefish, shad-gizzard, and summer flounder. The Virginia pound net fishery is already affected by fishing regulations, imposed by VMRC. The most up to date regulations for commercial fishing in Virginia waters can be found on the VMRC web site (http://www.mrc.state.va.us/commercialfinfishingrules.htm). In summary, size and/or limit regulations are in place for amberjack, American eel, black drum, cobia, red drum, scup, Spanish mackerel, speckled trout, summer flounder, and tautog. Total allowable catch (TAC) limits are in place for bluefish and summer flounder. The tautog closed season is from May 1 through August 31. Pound nets are prohibited from catching gray trout (weakfish) from May 1 to May 22 and from September 13 through March 31. However, if a harvester fishes 2 or 3 pound nets, a harvester can forfeit one pound net and be exempt from the gray trout fishing restriction (i.e., closure). The pound net fishery is only able to land up to 5% tolerance of speckled trout by weight.

Table 20. Impacts of Past, Present, and Reasonably Foreseeable Future Non-Fishing Activities on Ecosystem Components

Fishery Resources	Endangered & Threatened Species	Marine Mammals	Birds	Habitat	Economic Environment	Social Environment
Vessel Operations [P,Pr,RFFA]						
Low Negative	**Negative at Site** – inshore species impacted by collisions	**Negative at Site** – inshore species impacted by reduced water quality and haul out activity	**Potentially Negative** – may lead to destruction of habitat or feeding opportunities	**Potentially Negative** – may lead to destruction of habitat	**Positive/Negative** – potential loss of fishing opportunities; support businesses	**Positive -** supports commerce and recreation
Dredging Activities [P,Pr,RFFA]						
Negative at Site – may displace fish, remove benthic prey and increase mortality of early life stages	**Negative at Site** – dredging activity increases noise and reduces water quality, turtles susceptible to impacts from beach nourishment	**Negative at Site** – dredging activity increases noise and reduces water quality	**Negative at Site** – dredging activity increases noise and beach nesting birds susceptible to impacts of beach nourishment	**Negative at Site** – may lead to destruction of habitat in and around borrow site, structures that serve as foraging or shelter sites	**Positive/Negative** – potential loss of fishing opportunities; support commerce	**Positive at Site** – restoration of an eroding shore may protect or restore recreational beaches
Marine Pollution/Water Quality [P,Pr,RFFA]						
Negative at Site – impacts primarily inshore	**Negative at Site** – inshore species impacted by impaired biological food chain and poor water quality due to nutrient loading	**Negative at Site** – inshore species impacted by impaired biological food chain and poor water quality due to nutrient loading	**Negative at Site** – inshore species impacted by impaired biological food chain and poor water quality due to nutrient loading	**Negative at Site** – impacts primarily inshore, leads to destruction of habitat and EFH	**Positive/Negative** – potential loss of fishing opportunities; support commerce	**Negative at Site** – potential human health issues
Research [P,Pr,RFFA]						
Neutral – results may impact fishing effort and opportunities	**Neutral** – results may	**Neutral** – modified leader prevents entanglement and impingement	**Neutral** – modified leader prevents entanglement and impingement	**Neutral** – pound net gear impacts are not more than minimal and temporary in nature	**Low Negative/Neutral –** catches are same with modified leader, but must obtain new gear (short term)	**Neutral –** support by fishing community, but may be overly precautionary

P, Pr, RFFA –Past, Present, and Reasonably Foreseeable Future Action

6.3.1 Cumulative Economic Impacts

This section estimates the cumulative economic impacts of any federal management action or previous preferred alternative (PA) plans that have been imposed on the Virginia Chesapeake Bay pound net fishery with the intention of protecting sea turtles. The following management actions have been imposed on the Virginia Chesapeake Bay pound net fishery: 1) a temporary rule was published on June 22, 2001 prohibiting nets with leaders measuring 8 inches or greater stretched mesh and leaders with stringers to tie up such leaders from June 19 to July 19, 2001; 2) on June 17, 2002, an interim final rule was published prohibiting the use of all pound net leaders measuring 12 inches and greater stretched mesh and all pound nets with stringers from May 8 to June 30; 3) on July 16, 2003 a temporary final rule was published which prohibits the use of all pound net leaders from July 16 to July 30; and 4) in May 2004 a final rule was published that prohibited the use of leaders for off-shore pound nets in the lower Bay between May 6 and July 15 and required all other pound nets to use leaders with less than 12 inch stretched mesh and no stringers during this period.

6.3.1.1 2001 Impacts

On June 22, 2001 an emergency rule was published, prohibiting leaders with mesh 8 inches or greater and the use of stringers from June 19 to July 19, 2001. The timing of the rule did not allow harvesters enough time to replace leaders with new mesh, which would have minimized economic losses. Therefore, harvesters incurred revenue losses with lost harvest opportunities, and the cost of removing the leader and placing it back in the water. Based on 1998-2000 VMRC data, average revenues per harvester from June 19 to July 19 were $6,645 (CV=0.2) and $27,476 (CV=0.2) in the upper and lower Bay, respectively.[15] Average annual revenues for 2004 were $45,611 (CV=1.2) per pound net fisherman in the upper Bay, and $80,481 (CV=1.4) per fisherman in the lower Bay[16]. Assuming larger mesh leaders are in offshore waters, the cost of removing one leader and putting back in the water is estimated at $1,784[17].Based on VMRC data, from June 19 to July 19 there were 36 (=19 harvesters in 2001*1.9 pounds per harvester) and 22 (=8 harvesters in 2001* 2.7 pounds per harvester) active pounds nets in the upper and lower bay, respectively.[18] Using the 2001 VMRC gear survey data (Table 21), approximately 7 pounds (=[10/50] pounds with leaders prohibited*36 active pounds) and 14 pounds (=[15/23]

[15] Estimated seasonal revenue losses were calculated using an average for those fishing during the time period, in the previous three years. Annual 2001 revenue estimates are based on harvesters that were fishing during the restriction. This captures revenue losses incurred by those not fishing during the restricted time period.

[16] The areas of the upper and lower Bay are detailed in section Figure 4 and Figure 6. While roughly corresponding to Pound Net Regulated Areas II and I, there are differences as areas 306 and 307 lay within both areas. Landings and revenues could not be allocated by the Pound Net Regulated Area boundaries.

[17] See the data section under the PA for details on the determination of costs (section 5.1.6.2.1).

[18] Details on the calculation of the average number of active pounds are in section 5.1.6.2.3.1.

pounds with leaders prohibited*22 active pounds) in the upper and lower Bay were affected by the 2001 rule, respectively. Of the 19 active harvesters in the upper bay, 7 harvesters must remove one leader. In the lower Bay 6 fishermen must remove 2 leaders, while 2 fishermen must remove 1 leader.

Table 21. Results of VMRC phone survey of pound net gear in 2001 identifying the number of active pounds with leader mesh less than 8 inches (LM<8"), between 8 and 12 inches, greater than 12 inches and leaders fished with strings by region.

Area of Chesapeake Bay	LM < 8"	8" ≤ LM < 12"	LM ≥ 12"	Stringer & LM < 8"	Total
Upper	40	2	2	6	50
Lower	8	5	7	3	23
Total	48	7	9	9	73

In the upper Bay, annual revenues for each of the 7 affected fishermen were reduced by approximately 50% during the time frame (1 affect pound with average of 1.9 pounds). The total affect on annual net revenues would be a reduction of 11.2% (=[$3,323+$1,784]/$45,611) for these 7 fishermen. In the lower Bay, 6 fishermen would have revenues reduced by approximately 75% during the time frame (2 affected pounds with average of 2.7 pounds), for a total reduction in annual revenues of 30.0% (=[$20,607+$3,568]/$80,481). Additionally, two fishermen in the lower Bay would see revenues during the period reduced by approximately 40% (1 affected pound with average of 2.7 pounds), for a total affect on annual revenues of 15.9% (=[$10,990+$1,784]/$80,481). Thus, all 8 fishermen in the lower Bay would be affected with annual revenues reduced by between 15.9% and 30.0%.

Industry revenues in 2001 were $2.486 million. Total industry profits were reduced by 8.3% (=[$0.206M]/[$2.486M]) under the 2001 rule. The total industry cost for the 2001 rule was $0.206 million, with $35,749 (=7 harvesters*$5,107) and $170,598 (=[6 harvesters*$24,175]+[2 fishermen*$12,774]) in the upper and lower Bay, respectively.

6.3.1.2 2002 Impacts

The 2002 interim final rule required harvesters fishing with leader mesh 12 inches or greater, or with stringers, to either not fish from May 8 to June 30 or to replace their leaders with smaller mesh and no stringers. If the rule had been published early enough, fishermen would have minimized their economic losses by implementing the new leader requirements. However, the 2002 rule was published in the middle of the season (June 17, 2002), and so harvesters had to incur the cost of removing and later replacing their leader. As well, there was a loss in revenue, as it is assumed harvesters are not able to fish a pound without a leader[19]. Based on 1999-2001

[19] Throughout the analysis it is assumed that pound nets without a leader were not fished.

VMRC data, average revenues per harvester for the period June 17 to June 30 were $4,186 (CV=0.1) and $12,248 (CV=0.1) for the upper and lower Bay, respectively. Average revenues in 2002 per pound net fisherman were $51,579 (CV=1.3) and $78,713 (CV=1.3) in the upper and lower Bay, respectively. Assuming larger mesh leaders are in offshore waters, the cost of removing one leader and putting it back in the water is estimated at $1,784.

Based on 2002 VMRC data, from May 8 to June 30 there were 34 (=17 fishermen * 2.0 pounds per fisherman) and 20 (=8 * 2.5) active pounds in the upper and lower Bay, respectively. Using the 2001 VMRC gear survey data (Table 21), 5.4 pounds (=[8/50] pounds with leaders prohibited*34 active pounds) in the upper Bay and 8.7 pounds (=[10/23] pounds with leaders prohibited*20 active pounds) in the lower Bay were affected by the 2002 rule. Rounding the estimated pounds affected, of the 17 active harvesters in the upper Bay, 5 harvesters must remove one leader. Similarly, for the lower Bay, of the 8 harvesters, 7 harvesters must remove one leader and 1 harvester must remove 2 leaders from the water.

There are 13 harvesters that may have been affected by the 2002 rule. Annual profits for each of the 5 affected harvesters in the upper Bay may have been reduced by 7.5% (=[$2,093 in revenue losses + $1,784 per leader removal]/$51,579). In the lower Bay, the 7 harvesters removing one offshore leader may have incurred annual profit losses of 8.5% (=[$4,899 in revenue losses + $1,784 per leader]/$78,713) and for the harvester removing 2 offshore leaders the loss would have been approximately 17.0% (=[$4,899 in revenue losses + $1,784 per leader*2]/$78,713).

Total industry profits were reduced by 3.4% (=[$0.080M]/[$2.367M industry revenues]) under the 2002 rules. The total industry cost was $0.080 million, with $19,385 (=5 harvesters*$3,877) and $60,147 (=[7 harvesters*$6,683] + [1 harvester*$13,366]) in the upper and lower bay, respectively.

6.3.1.3 2003 Impacts

By the 2003 season harvesters had time to meet the 2002 rule requirements, which called for an alternate leader design during the period May 8 – June 30. Changing the mesh on the leader before May 8 would minimize the economic impacts on a fisherman. However, additional costs were incurred on fishermen when all leaders were prohibited from July 16 to July 30, 2003 under the temporary final rule published on July 16, 2003. Revenue was lost, and additionally the fishermen had the cost of removing and later re-installing the leader after the regulated time period. The cost of following the 2002 rule was that of removing standard gear, installing the alternative leader, the cost of the alternative leader, removing the alternative leader, and replacing the standard leader. Additional costs for 2003 were lost revenues between July 16 and July 30, and the additional cost of removing and reinstalling the leader. Average annual revenues in 2003 were $52,996 (CV=1.1) and $98,025 (CV=1.3) in the upper and lower Bay, respectively.

Table 22. Impacts of Past and Present Actions on Resources Identified for this Action

Impacts on Fishery Resources	Impacts on Endangered & Threatened Species	Impacts on Marine Mammals	Impacts on Birds	Impacts on Habitat	Impacts on Econ Environ	Impacts on Social Environment
ESA ACTIONS						
2002 Pound net rule						
P, **Neutral** – prohibited leader mesh 12 inches or greater	P, **Low Positive** – prohibited leader mesh 12 inches or greater	P, **Low Positive**– prohibited leader mesh 12 inches or greater	P, **Neutral** – birds still able to become entangled	P, **Neutral** – less than minimal and temporary impacts	P, **Neutral** – prohibited leader mesh 12 inches or greater	P, **Neutral** – prohibited leader mesh 12 inches or greater
2003 Pound Net Rule						
P, **Positive** – fewer fish caught during	P, **Positive**– prohibited leaders, prevent sea turtle takes	P, **Neutral** – prohibited leader mesh 12 inches or greater	P, **Neutral** – prohibited leader mesh 12 inches or greater	P, **Neutral** – less than minimal and temporary impacts	P, **Neutral** – prohibited leader mesh 12 inches or greater	P, **Neutral** – prohibited leader mesh 12 inches or greater
2004 Pound Net Rule						
P, Pr **Low Positive/Neutral –** fewer fish caught in pound nets, but may be caught in other gear	P, Pr **Positive** – sea turtle takes prevented in Reg Area I and Reg Area II	P, Pr **Low Positive**	P, Pr **Low Positive/Neutral**	P, Pr, **Neutral** – less than minimal and temporary impacts	P, Pr **Low Negative** – loss of harvesting capacity in Reg Area I	P, Pr **Low Positive/Neutral**
SUMMARY OF IMPACTS FROM ESA ACTIONS- Overall positive impacts from regulations to protect sea turtles in the pound net fishery						
Neutral	**Positive**	**Positive**	**Low Positive**	**Neutral**	**Low Positive**	**Low Positive**
MARINE MAMMAL ACTIONS						
P, Pr Harbor Porpoise TRP - Contains measures to reduce interactions of harbor porpoise in gillnet fisheries in the Gulf of Maine and Mid-Atlantic						
Unknown – measures affect gillnet gear which is used in the affected area; ecosystems effects are unclear	**Positive** – TRP measures to reduce takes of porpoise in gillnet fisheries may also be protective of turtles	**Positive** – TRP measures reduce takes of porpoise in gillnet fisheries	**Unknown** – unknown impacts on birds	**Neutral** – limits on gillnet gear in affected area could impact habitat	**Negative** – if the affected fishermen use gillnet gear that is subject to TRP gear and time/area restrictions	**Negative** – if the affected fishermen use gillnet gear that is subject to TRP gear and time/area restrictions
P, Pr Large Whale TRP - Contains measures to reduce interactions between right, humpback, fin and minke whales in certain gillnet and pot fisheries. Not applicable						

to affected area						
SUMMARY OF IMPACTS FROM PROTECTED RESOURCES ACTIONS- Impacts overall are positive or neutral. Some negative impacts may accrue as the result of specific measures implemented to reduce protected species entanglements in fishing gear						
Unknown	**Positive**	**Positive**	**Unknown**	**Neutral**	**Negative**	**Negative**
FISHERY OPERATIONS						
P, Pr,RFFA Commercial fishery operations in Chesapeake Bay t						
Negative – mortality of target and non-target species	**Negative –** few takes of turtles have been observed in VA Chesapeake Bay, but may be taken in fisheries in other areas	**Negative –** marine mammals, such as dolphin and porpoise, can be taken in fishery operations	**Low Negative –** risk of entanglement in fishing gear	**Low Negative –** some commercial fishing activities result in negative impacts to habitat	**Positive –** fishing activities support a wide variety of businesses and communities	**Positive**
P, Pr,RFFA Recreational fishery operations in Chesapeake Bay t						
Negative – mortality of target and non-target species	**Negative –** recreational fishing known to take turtles	**Negative –** marine mammals, such as dolphin and porpoise, can be taken in fishery operations	**Neutral**	**Neutral**	**Positive –** fishing activities support a wide variety of businesses and communities	**Positive**
SUMMARY OF IMPACTS FROM FISHERY OPERATIONS – Overall negative impacts to the biological environment with positive impact to the economic and social environment						
Negative	**Negative**	**Negative**	**Low Negative**	**Low Negative**	**Positive**	**Positive**
PHYSICAL ENVIRONMENT AND EFH ACTIONS						
P, Pr Habitat Omnibus Amendment - EFH designations for all managed species t						
Neutral	**Neutral**	**Neutral**	**Neutral**	**Positive**	**Neutral**	**Neutral**
SUMMARY OF IMPACTS FROM PHYSICAL ENV/EFH ACTIONS – Overall positive impacts from protecting habitat						
Neutral	**Neutral**	**Neutral**	**Neutral**	**Positive**	**Neutral**	**Neutral**

First consider the costs of implementing the 2002 rule, in 2003. The 2003 NEFSC gear survey was conducted just prior to the start of the regulated time when fishermen would be required to switch to leaders with mesh less than 12 inches and no stringers. Thus the data does not fully reflect the share of pound nets affected by the 2002 rule. To estimate the number of pound nets which would have had to change the leader prior to the regulatory period, the ratio from the 2001 gear survey was used. The 2001 data indicated that 16% (8/50) of the upper Bay leaders may have been affected, while 43% (10/23) of the lower Bay leaders may have been affected. In 2003 there were approximately 30 active pound nets in the upper Bay (=15 fishermen * 2.0 pounds) and 24 active pound nets in the lower Bay (=11 fishermen * 2.2 pounds) during the May 8 to June 30 period. This suggests 5 and 10 affected pounds in the upper and lower Bay respectively. These were allocated as 1 affected pound each to 5 fishermen in the upper Bay, 1 affected pound for 10 fishermen in the lower Bay. We assume that the affected pound net leaders are in the deeper water, offshore pounds.

The estimated annual cost of replacing one offshore leader with new mesh is $3,192 ($1,408 in materials and labor + $1,784 for installation and removal) assuming materials are paid over a 5 year period given a 5% annual interest rate (see section 5.1.6.1.2 for cost data). For each of the 15 affected fishermen the total cost is $3,192.

Second, consider the cost of the temporary restriction on the use of all leaders. During the closure all fishermen not only face a loss in revenue, but also the additional costs of removing leaders from the water due to the temporary closure of the fishery from July 16 – July 30, 2003. Based on 2000-2002 VMRC data, the average revenues per fisherman for the July 16 to July 30 period were $6,892 (CV=0.3) and $36,367 (CV=0.2) for the upper and lower Bay, respectively. It is assumed that a closure would result in a total loss of expected revenue during the time period.

Using the number of fishermen and pounds from the May 8-June 30 period, the VMRC data indicates that in the upper Bay there were 15 fishermen with a total of 30 active pound nets. Based on the 2003 NEFSC gear survey 16.2% of the active pounds were offshore and 83.8% were nearshore. This suggests 4 nearshore pounds and 25 were offshore pounds. These are allocated as 10 fishermen with 2 offshore pounds, 4 fishermen with 1 offshore and 1 nearshore pound, and 1 fisherman with 1 offshore pound. In the lower Bay the 11 fishermen had 24 active pound nets, with 14 nearshore (57.9%) and 10 offshore (42.1%). These are allocated as 8 fishermen with 1 nearshore and 1 offshore pound, 1 fisherman with 2 nearshore pounds, and 2 fishermen with 2 nearshore pounds and 1 offshore pound. The cost of removing or installing a nearshore was estimated at $571 per action for a total of $1,142 per leader. The cost for an offshore leader is $1,784 (=$892*2 actions).

In the upper Bay the closure would have the following impacts. For 10 fishermen the total cost would be $10,460 (=$6,892 lost revenue+[$1,784*2 offshore pounds for leader removal and replacement]), 4 fishermen would have total costs of $9,818 (=$6,892+$1,784+$1,142), and 1 fisherman would have total costs of $8,676 (=$6,892+$1,784). The 2003 average revenue per upper Bay fisherman was $52,996, so the costs of the closure ranged from 16.4% to 19.7% of annual revenues.

In the lower Bay the closure would cost each of 8 fishermen $39,293 (=$36,367+$1,784+$1,142), would cost one fisherman $39,935 (=$36,367+[$1,784*2]), and would cost two fishermen $41,077 (=$36,367+[$1,784*2]+$1,142). The average revenue in 2003 for lower Bay fishermen was $98,025 so the closure cost fishermen between 40.1% and 41.9% of annual revenues.

The determination of the total cost of sea turtle regulation in 2003 to individual fishermen is complicated by the fact that the 2002 rule applied similarly to all pound net types (nearshore and offshore), although it was assumed that more of the affected pound nets would be of the offshore type. The closure also applied equally to all leader types, but the cost of implementation differed by leader type. While the allocation of costs among individual fishermen will not impact the total cost to the industry, it does matter for projecting a range of impacts on individuals. In this case, the costs of the 2002 rule were allocated to fishermen allocated the most offshore nets. This leads to the following range of impacts:

i) Upper Bay
   a. 5 fishermen total cost $22,423 (=$3,192 rule + $10,460 closure)
   b. 5 fishermen total cost $10,460 (closure only)
   c. 4 fishermen total cost $9,818 (closure only)
   d. 1 fisherman total cost $8,676 (closure only)
ii) Lower Bay
   a. 2 fishermen total cost $44,269 (=$3,192 rule +$41,077 closure)
   b. 1 fisherman total cost $43,127 (=$3,192 rule + $39,935 closure)
   c. 7 fishermen total cost $42,485 (=$3,192 rule + $39,293 closure)
   d. 1 fisherman total cost $39,293 (closure only)

Given the 2003 annual revenues for the upper and lower Bays, this indicates sea turtle protection cost individual fishermen in the upper Bay between 16.4% and 42.3% of annual revenues, and lower Bay fishermen between 40.1% and 45.2% of annual revenues. The majority of the cost was a result of the two week closure, July 16 – July 30.

Total industry profits were reduced by 28.2% (=[$0.637M]/[$2.258M]) under the 2002 rule. The total industry cost under the 2003 rules was $0.637 million. Implementing the 2002 rule during the 2003 season cost a total of $47,880; $15,960 in the upper Bay (5 harvesters*$3,192 per pound) and $31,920 in the lower Bay (=[10*$3,192]). The closure cost a total of $588,981, with $152,548 in the upper Bay (all 15 fishermen affected) and $436,433 (all 11 fishermen affected) in the lower Bay.

6.3.1.4 2004 Rule

The 2004 rule required the removal of all leaders on offshore pound nets in the lower Bay between May 6 and July 15. Additionally, during this time period all other pound net leaders had to have less than 12 inch stretched mesh and no stringers. It is assumed that without a leader pound nets are not fished, and so fishermen with offshore pounds in the lower Bay had a reduction in revenues due to decreased harvest opportunities. Additionally these fishermen had to remove their leaders from the water and then re-install them. For all other pound nets (nearshore in the lower Bay, and all pounds in the upper Bay), fishermen had to incur water-

based costs to switch leaders at the beginning and end of the regulated period, and also the cost of fabricating the alternative leader (<12" mesh, no stringers). The cumulative impacts of this rule are discusses by area (upper and lower Bay) and leader type (nearshore and offshore).

6.3.1.5 Lower Bay

6.3.1.5.1 Offshore pound nets

In 2004 there were 5 fishermen fishing 7 active offshore pound nets in the lower Bay. These nets were allocated as 3 fishermen with one each, and 2 fishermen each with 2 offshore pound nets (see section 0 for a discussion of the allocation procedure). There are two costs associated with this action for these fishermen. First, there are the costs of removing the standard leader from the water at the beginning of the period and then replacing it after July 15. This totals $1,784 ($892 * 2 actions) per pound. Additionally the fishermen lose the potential harvest from these pound nets estimated at $17,194 per pound (section 5.1.6.3). The average annual revenue for fishermen in the lower Bay is $79,503 per fisherman.

The total cost for this action for lower Bay fishermen with one offshore pound net is $18,879 or 23.9% of their annual revenue (=$18,879/$79,503). For fishermen with 2 offshore pound nets the cost is $37,758 or 47.5% of their annual revenues from pound net fishing (=$37,758/$79,503).

6.3.1.5.2 Nearshore pound nets

Under this alternative fishermen with nearshore pound nets must switch from the standard leader to the alternative leader (<12" mesh, no stringers) during the regulated period. So while these fishermen may continue to fish, they must remove the standard leader, install the alternate leader, remove the alternate leader and re-install the standard leader. These 4 actions have an estimated cost of $2,284 ($571*4 actions) per leader. As well, these fishermen will have an annual cost for the alternative leader, estimated at $689 per leader. This results in a total cost of $2,973 per leader. We estimate 10 nearshore pound nets in the lower Bay, and allocate these as 2 nearshore pound nets for each of the 5 fishermen fishing during the May 6 – July 15 period. This indicates a total cost of $5,946 per fisherman, or 7.5% of their annual revenues (= $5,946 cost/ $79,503 average annual revenues).

6.3.1.5.3 Summary lower Bay

As there were only five fishermen reported by VMRC during the May 6 – July 15 period it is expected that the existing regulations (NPA1) impact all five to varying degrees. For fishermen estimated to have one offshore pound net and 2 nearshore pound nets the cost would be $24,825 ($18,879 offshore + $5,946 nearshore) or 31.2% of their annual revenue (=$24,825/$79,503). For fishermen with two offshore nets and two nearshore nets the total cost would be $43,704 ($37,758 offshore + $5,946 nearshore) or 55.0% of their annual revenue (=$43,704/$79,503).

6.3.1.6 Upper Bay

All fishermen in the upper Bay would be required to switch to the alternative leader during the regulated period, May 6 – July 15. In May 6 – July 15, 2004 there were 16 fishermen in the upper Bay with an average of 1.8 nets per fisherman, for a total of 29 pound nets of which 25 were offshore and 4 nearshore pound nets (Section 5.1.6.2.3.1). We allocated these nets such that 4 fishermen each had 1 offshore and one nearshore net, 3 fishermen each had one offshore net and 9 fishermen each had 2 offshore nets.

The cost of complying with the regulation (NPA 1) and changing leaders during the May 6 – July 15 period differ between offshore and nearshore nets. For offshore nets the estimated cost is $3,568 for leader removals and replacements ($892*4 actions) plus $1,408 for annual cost of the alternative leader, for a cost of $4,976 per leader. For nearshore nets the cost is $2,284 for leader removal and replacement ($571*4 actions) plus $689 annual cost for alternative leader for a total of $2,973 per leader. Annual average revenues for fishermen in the upper Bay are $55,772.

For the 4 fishermen with one net of each type the annual additional cost is $7,949 ($4,976 offshore + $2,973 nearshore) or 14.3% of annual revenues (=$7,949/$55,772). For the 3 fishermen with just one offshore pound the cost is $4,976 or 8.9% of annual revenues (=$4,976/$55,772). For the 9 fishermen with 2 offshore pounds the total cost is $9,952 ($4,976 * 2 offshore) or 17.8% of annual revenues (=$9,952/$55,772).

6.3.1.7 2006 Proposed Rule

Under the proposed rule fishermen of offshore pound nets in the lower Bay would be required to use a modified leader (described in section 2.1), in order to fish during the regulated period (May 6 – July 15). Fishermen of other pound nets would be required to use an alternative leader (<12" mesh, no stringers) during the regulated period. Under the proposed alternative 18.5% of fishermen (=5/27), all in the lower Bay, would see a positive increase in net revenues. Annual revenues for these fishermen would be increased by between 16.9% and 33.7%, over the 2004 rule levels. This includes the expected increase in revenues from reopening the area and time to offshore net leaders, less the cost of fabricating and implementing the modified leader.

The industry level change is a restoration of $93,856 in 2004 revenues. This 4.3% increase (=$0.094M/2.187M), would go to the 5 fishermen in the lower Bay who were not able to fish their offshore pound nets in 2004 or 2005.

6.3.1.8 Summary

In summary, to protect sea turtles, total industry profits earned by the Chesapeake Bay pound net fishery were reduced by 8.38%, 3.4%, 28.2% and 13.6% from 2001 to 2004[20], respectively. The current proposed PA, is expected to restore 4.3% of industry revenues which were foregone as a result of the 2004 rule.

In the upper region of the Bay, 25% to 89% of the harvesters have had a reduction in their annual profits since regulations to protect sea turtles began (Table 23). Profit reductions have ranged between a low of 8.9% under the 2004 rule, to a high of 42.3% in the 2003 rule. In the lower

[20] Data for 2005 is not available so it is assumed that the annual affect was the same for 2004 and 2005.

region of the Bay, 50-92% of the harvesters have had a reduction in their profits over the same years. Annual profit reductions per harvester have ranged between a low of 8.9% under the 2002 rule to a high of 55.0% under the 2004 rule.

The proposed alternative would reverse some of these losses experienced by fishermen in the lower Bay in previous years. There would be no additional costs to fishermen in the upper Bay beyond those imposed by the 2004 regulations.

Table 23. The ratio of harvesters affected by a rule to the number of harvesters active (percentage in parentheses) and the reduction in annual revenues per harvester as a result of the rule, by region of the bay and year.

	Upper Bay		Lower Bay		Industry Total	
	Ratio fishermen affected	Change in revenue	Ratio fishermen affected	Change in revenue	Ratio in fishermen affected	Change in revenue
2001	7/28 (25%)	(-) 11.2%	8/15 (53%)	(-) 15.9-30.0%	15/43 (35%)	(-) 8.3%
2002	5/22 (23%)	(-) 7.5%	8/15 (53%)	(-) 8.5-17.0%	13/37 (35%)	(-) 3.4%
2003	15/19 (80%)	(-) 16.4-42.3%	11/12 (92%)	(-) 40.1-45.2%	26/31 (90%)	(-) 28.2%
2004	16/18 (89%)	(-) 8.9-17.8%	5/9 (56%)	(-) 31.2-55.0%	21/27 (78%)	(-) 13.6%
2005	Same as 2004		Same as 2004		Same as 2004	
2006			5/9 (56%)	(+) 16.9-33.7%	5/27 (19%)	(+) 4.3%

Summary – Cumulative Impacts

To determine the magnitude and extent of cumulative impacts, the incremental impacts (the additive impacts of direct and indirect impacts) of the action proposed in this document are considered, for each VEC together with past, present, and reasonably foreseeable future actions. The direct and indirect impact analyzed in Section 5.0 are summarized in Table 19. The effects from non-fishing activities are summarized in Table 20, and past, present, and reasonably foreseeable future actions are summarized in Table 22. The cumulative impacts are summarized in Table 24.

Fishery Resources

This analysis has considered the potential impacts of the proposed action on the fishery resources (analyzed in Section 5.1.1), in combination with relevant past, present and reasonably foreseeable future action as well as applicable non-fishing impacts. The proposed action is not expected to result in substantial changes to overall harvest levels. Because harvest levels would not appreciably change, this action would not result in substantial impacts to the population of any species known to be caught in pound nets and therefore would not contribute to cumulative

impacts. Negative impacts experienced by fishery resources from non-fishing activities, such as impacts from reduced water quality, and from the operation of other fisheries are expected to continue in the future.

Endangered and Threatened Species

This analysis has considered the potential impacts of the proposed action on endangered and threatened species, in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. Past regulations in the pound net fishery have had net positive impacts on sea turtles by reducing the risk of entanglement in or impingement on pound net leaders. When the PA is considered together with past and current actions, substantial additive or incremental impacts are not likely to be measurable, either positive (i.e., reducing sea turtle take below current levels) or negative (i.e., increasing sea turtle takes above current levels). Non-fishing impacts, such as pollution and vessel collisions, are expected to continue to result in lethal and non-lethal takes of turtles, and these actions and resultant impacts are expected to continue with little or no synergistic impacts from this action. Table 24 provides a summary of the impacts that led to this determination.

Marine Mammals

This analysis has considered the potential impacts of the proposed action on marine mammals, in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. In summary (and as depicted in Table 24), it is likely that past and present activities will have the same impact on marine mammals in the future. Conservation measures implemented by the PA in Pound Net Regulated Area I are expected to have a neutral impact on marine mammals when considered in conjunction with activities occurring within the area, though this impact cannot be quantified as the focus of the gear research was on sea turtles.

Birds

This analysis has considered the potential impacts of the proposed action on birds (Section 5.0), in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. The proposed action is expected to reduce the threat of entanglement of birds in pound net leaders as compared to traditional leaders, however the magnitude of these impacts are unknown. While it is possible that the PA may result in some take of birds as compared to NPA 1, this is not quantifiable nor is the minor impact to birds expected to contribute to cumulative impacts.

Habitat

This analysis has considered the potential impacts of the proposed action on the physical environment and EFH (Section 5.0), in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. Because there are no direct or indirect impacts expected from the PA that are more than minimal and temporary, cumulative impacts would not result from this action.

Economic Environment

This analysis has considered the potential impacts of the proposed action on other fisheries, in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. The proposed action is expected to restore 4.3% of industry revenues that was forgone as a result of the 2004 rule. Section 6.3.1 of this analysis details the cumulative impacts of the proposed action.

Social Environment

This analysis has considered the potential impacts of the proposed action on the social environment, in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. The primary social impacts that would result from the proposed action relate to the dual benefit of protecting endangered and threatened species while supporting the pound net fishery; the pound net industry was involved in developing the modified gear, and have proposed the use of the modified gear for the history of rulemaking since 2001. Consequently, the projected cumulative social impacts are anticipated to be beneficial because the fishing industry and other interested organizations support the use of the modified leader.

Summary

This analysis has considered the potential impacts of the proposed action on other fisheries, in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. There are no significant cumulative effects on fishery resources expected from the proposed action (Table 24).

In summary (and as depicted in Table 20 and Table 22), sea turtles, other endangered and threatened species, fishery resources, marine mammals, birds, habitat and the human community have been impacted by past and present actions in the area, and are likely to continue to be impacted by those actions in the future. Vessel operations, fishing operations, dredging activities, and marine pollution and impaired water quality have all had a net negative impact to the biological resources found in the area. Those same activities, besides marine pollution and impaired water quality, have likely had a positive impact on the human community. It is likely that those same activities would continue to produce the same impact on the same ecosystem components in the future. On the other hand, conservation measures implemented by the PA in the area will have either a net beneficial or neutral impact to ecosystem components when considered in conjunction with activities occurring within the area. In particular, the pound net leader modification and restrictions included in the PA, and in previous and current actions affecting the pound net fishery, have likely had a net positive or neutral impact on all ecosystem components, except for the human community, which has experienced net negative impacts through past actions.

Biological resources, sea turtles in particular, have been, are, and will continue to be negatively impacted by a variety of past, present, and future activities. These cumulative impacts may be impacting the recovery of the species, although the extent cannot be quantified. However, the pound net leader modification and restrictions and other conservation measures enacted in the area have protected, and will continue to protect, sea turtles, benefiting the species as a whole.

These positive impacts may outweigh the other negative cumulative impacts experienced in the area, as the pound net fishery is a likely contributor to the high sea turtle mortality documented each spring. Note that those other activities that are negatively impacting the species should continue to be addressed to ensure sea turtles are protected.

Similarly, the other biological resources in the area (i.e., fishery resources, other endangered and threatened species, marine mammals, birds, and habitat) likely have been, are, and will continue to be negatively impacted by a variety of past, present, and future activities, although the extent cannot be quantified. However, the pound net leader restrictions and other conservation measures enacted in the area have likely benefited these resources. These positive impacts may outweigh the other negative cumulative impacts experienced in the area. The human community will likely experience positive impacts from requiring the use of the modified pound net leader, while some conservation measures, and marine pollution and impaired water quality will create negative impacts, and it is unknown if those impacts will outweigh the benefits experienced from the other past, present, and future activities.

Table 24 Summary of Cumulative Impacts to Each Resource Component

	Direct and Indirect Impacts of Alternative	Non-Fishing Impacts	Impacts from Past, Present, and RFFAs	Cumulative Impacts
Fishery Resources				
PA – Modified Leader in Pound Net Regulated Area I	**Low Negative**	**Low Negative**	**Neutral**	**Low Negative**
NPA 1 – No Action/Status Quo	**Neutral**			**Low Negative**
NPA 2 – Modified Leader in Reg Areas I and II	**Low Negative**			**Low Negative**
NPA 3 – Modified Leader in Offshore Nets	**Low Negative**			**Low Negative**
Endangered and Threatened Species				
PA – Modified Leader in Pound Net Regulated Area I	**Neutral**	**Negative**	**Low Positive/Neutral**	**Low Positive/Neutral**
NPA 1 – No Action/Status Quo	**Low Positive**			**Low Positive/Neutral**
NPA 2 – Modified Leader in Reg Areas I and II	**Neutral**			**Low Positive/Neutral**
NPA 3 – Modified Leader in Offshore Nets	**Neutral**			**Low Positive/Neutral**
Marine Mammals				
PA – Modified Leader in Pound Net Regulated Area I	**Neutral**	**Negative**	**Low Positive/Neutral**	**Low Positive/Neutral**
NPA 1 – No Action/Status Quo	**Low Positive**			**Low Positive/Neutral**
NPA 2 – Modified Leader in Reg Areas I and II	**Neutral**			**Low Positive/Neutral**
NPA 3 – Modified Leader in Offshore Nets	**Neutral**			**Low Positive/Neutral**
Birds				
PA – Modified Leader in Pound Net Regulated Area I	**Neutral/Low Negative**	**Negative**	**Low Positive/Neutral**	**Neutral**
NPA 1 – No Action/Status Quo	**Low Positive**			**Neutral**
NPA 2 – Modified Leader in Reg Areas I and II	**Neutral/Low Negative**			**Neutral**
NPA 3 – Modified Leader in Offshore Nets	**Neutral/Low Negative**			**Neutral**
Habitat				
PA – Modified Leader in Pound Net Regulated Area I	**Neutral**	**Negative**	**Low Positive**	**Neutral**
NPA 1 – No Action/Status Quo	**Neutral**			**Neutral**
NPA 2 – Modified Leader in Reg Areas I and II	**Neutral**			**Neutral**
NPA 3 – Modified Leader in Offshore Nets	**Neutral**			**Neutral**
Economic Environment				
PA – Modified Leader in Pound Net Regulated Area I	**Low Positive**	**Neutral (Positive/Negative)**	**Low Positive**	**Low Positive**
NPA 1 – No Action/Status Quo	**Neutral**			**Neutral/Low Negative**
NPA 2 – Modified Leader in Reg Areas I and II	**Low Positive**			**Low Positive**
NPA 3 – Modified Leader in Offshore Nets	**Low Positive**			**Low Positive**
Social Environment				
PA – Modified Leader in Pound Net Regulated	**Low Positive**	**Neutral**	**Low Positive**	**Low Positive**

Area I				
NPA 1 – No Action/Status Quo	**Neutral/Low Negative**			**Neutral/Low Negative**
NPA 2 – Modified Leader in Reg Areas I and II	**Neutral**			**Low Positive**
NPA 3 – Modified Leader in Offshore Nets	**Neutral**			**Low Positive**

7.0 APPLICABLE LAW

7.1. National Environmental Policy Act

7.1.1. Finding of No Significant Impact for Modification of Pound Net Leaders to Enhance Turtle Protection in Virginia

National Oceanic and Atmospheric Administration Administrative Order 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?

The geographic area impacted by the rule contains submerged aquatic vegetation, essential fish habitat, and coastal habitats. The preferred action may result in some temporary disruption, through removal and replacement of offshore leaders in Pound Net Regulated Area I, of already affected bottom habitat to a nature and degree that already occurs in the industry under current regulations and is considered minimal and temporary (Section 5.1). Thus, the proposed action is not reasonably expected to cause substantial damage to ocean and coastal habitats and/or essential fish habitat. The value of this area was considered in the essential fish habitat consultation process and described in this document (Section 4.0), and the habitat components will be not be significantly impacted by this action.

2) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

The proposed action is not expected to have a substantial impact on biodiversity or ecosystem function within the affected area. The proposed action would not result in changes in impacts to sea turtles or marine mammals as compared to the current management measures. The proposed action is expected to continue to protect sea turtles from entanglement in and impingement on pound net leaders (Section 5.0). Because of the minimal impacts to habitat, neutral impacts to sea turtles, marine mammals and birds, and minor, if any, change in expected fish catches, the proposed action is not anticipated to substantially impact the function of these ecosystem components in the affected area.

3) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

Public health and safety is not expect to have a substantially adverse impact by implementation of the proposed action. The gear restrictions involve modifying pound net leaders during the spring and early summer. As the fishing industry removes their leaders during certain months for maintenance and replacement, without creating a significant public health and safety concern, this alternative would not impose any additional public health and safety issues.

4) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

The basis for this action is to incorporate new information into management measures while continuing to provide protection to endangered and threatened sea turtles. The proposed gear modifications are expected to have a neutral effect on threatened and endangered sea turtles, as well as bottlenose dolphin and certain bird species, by continuing to limit the risk of serious injury and mortality in the event of an entanglement in or impingement on a pound net leader. While there is no evidence that threatened or endangered species will be adversely affected specifically by these gear requirements, a section 7 consultation on the proposed action will be completed. Previous section 7 consultations undertaken by NMFS on the Virginia pound net fishery have included the provision of an incidental take statement in the biological opinion that addressed the effect of the incidental takes, typically of live, uninjured sea turtles in pounds, and provides terms and conditions to minimize the impact of that take. No critical habitat for endangered or threatened species under NMFS' jurisdiction has been designated in Virginia waters, so none will be affected by the proposed gear restrictions. Furthermore, it is anticipated that the use of modified offshore leaders within Pound Net Regulated Area I will not result in adverse impact to endangered shortnose sturgeon or other non-target (finfish) species (Section 5.0, Environmental Consequences).

5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

Implementation of gear modification requirements, as described in this document, are expected to have a net positive change in revenues for a portion of the pound net fishing industry (5 harvesters), while another portion of the industry would not experience any net change to revenues (16 harvesters). While the positive impacts to the pound net fishing industry are not considered to be significant, they are related to environmental effects in that they relate to providing protection to sea turtles. The proposed action, however, would not result in impacts to sea turtles that differ from the impacts of current regulations (Section 5.0) and therefore would not result in additional impacts to the environment.

6) Are the effects on the quality of the human environment likely to be highly controversial?

The effects on the human environment of the proposed gear modification is not likely to be highly controversial. The impact of gear restrictions are not likely to be controversial to the pound net fishing community, as the fishing community was involved in both the development and testing of the proposed action, and the overall effects on the human environment are not expected to be highly controversial. These gear restrictions are limited in geographic area and

time period, and are implemented in an effort to facilitate the coexistence of fishing activity and sea turtles. These factors restrict the scope of the effects on the human environment.

7) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

The proposed action would not result in substantial impacts to unique areas, such as historic or cultural resources, park land, wetlands, farmlands or ecologically critical areas, as no such areas are designated within the geographic affected area (Section 4.0). Essential fish habitat is present within the affected area and the preferred action may result in some temporary disruption, through removal and replacement of the leaders, of EFH to a nature and degree that already occurs in the industry under current regulations and is considered minimal, temporary and minimized to the extent practicable.

8) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

The degree to which the effects of the proposed action are highly uncertain or involve unique or unknown risks is small. The proposed gear modification was tested over two years during the proposed regulated time period and within the proposed regulated area and the modified leader was found to be effective at reducing sea turtle interactions while continuing to maintain fish catch (Section 5.1). Because the modified leader would be required to be employed using the same materials, in the same manner, and in the same area in which it was tested, the effects of using the modified leader are expected to be analogous to the effects documented during the experiment. Therefore, the impacts on the human environment of the modified leader are not considered to be uncertain or to involve unique or unknown risks.

9) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

The proposed action is not related to other actions with individually insignificant but cumulatively significant impacts. It is an independent action being proposed to achieve a specific objective, that is, to continue to protect sea turtles while maintaining an acceptable level of catch in the pound net fishery, given local conditions and issues. The proposed action is taken in response to new information generated by pound net leader research and the action would supersede current pound net restrictions. The action is not related to other natural resource management actions.

10) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

There is no evidence that the implementation of gear restrictions will adversely affect entities listed in or eligible for listing in the National Register of Historic Places or will cause loss or destruction of significant scientific, cultural, or historic resources. Compliance with these restrictions is not likely to result in the permanent loss or destruction of resources.

11) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

The implementation of gear restrictions would not result in any actions that would be expected to result in the introduction or spread of a nonindigenous species.

12) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

The implementation of gear modifications to reduce the risk of entanglement and impingement to sea turtles is a commonly used management tool and as such, does not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. The use of gear modifications as a management tool has been determined to be important in order for the agency to meet objectives under the ESA. It is an independent action being proposed to achieve a specific objective given local conditions and issues, and is therefore not expected to establish a precedent for future actions. In the future, NMFS intends to evaluate the potential for sea turtles to be taken in pound nets in other states. While monitoring and evaluating the interactions between sea turtles and pound nets in Virginia may provide valuable information on how and why turtle entanglement in leaders occurs, which may be applied to pound nets in other states, NMFS recognizes that specific gear characteristics and environmental conditions may vary between state and waterbody. Therefore, applicable information obtained from pound net studies in areas with similar conditions may be considered in future assessments, but sea turtle interactions with pound nets in each state will be evaluated separately based upon its own unique factual situation. As such, this action would not establish a precedent for the forthcoming analysis.

13) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

There is no evidence that implementation of gear modifications is likely to result in a violation of a Federal, state or local law for environmental protection. In fact, gear modifications would be expected to support Federal, state and local laws for environmental protection.

14) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

This action would require the use of modified offshore pound net leaders in a portion of the Virginia Chesapeake Bay. Previously established leader restrictions outside the modified leader area and the framework mechanism for future action designed to protect sea turtles based upon new information would not be change as a result of this action. The cumulative impacts of the initial restriction and any possible additional restrictions have been analyzed with regard to both context and intensity. Given that the proposed action is expected to result in positive impacts to both sea turtles and the human environment, as well as the short duration and limited scope of possible cumulative impacts, such impacts are not expected to be substantial (Section 6.0).

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the Sea Turtle Conservation Measures for the Pound Net Fishery in Virginia Waters of Chesapeake Bay, it is hereby determined that the proposed action will not significantly impact the quality of the human environment as described above and in the Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

_____ _____

William T. Hogarth Date
Assistant Administrator for Fisheries, NOAA

7.2. Endangered Species Act

Section 7 of the ESA requires Federal agencies conducting, authorizing, or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. It is expected that NMFS would initiate a consultation on this action under section 7 of the ESA.

7.3. Marine Mammal Protection Act

The proposed action to allow the use of modified pound net leaders would not adversely affect marine mammals because the proposed rule would not substantially increase the risk of serious injury and mortality due to entanglement in pound net leaders.

7.4. Paperwork Reduction Act (PRA)

The purpose of the PRA is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. This action does not propose to modify any existing collections, or to add any new collections; therefore, no review under the PRA is necessary.

7.5. Magnuson-Stevens Fishery Conservation and Management Act - Essential Fish Habitat

The area affected by the preferred alternative has been identified as Essential Fish Habitat (EFH) for the following species: Atlantic butterfish, Atlantic sea herring, Atlantic sharpnose shark, black sea bass, bluefish, cobia, dusky shark, king mackerel, red drum, red hake, sand tiger shark, sandbar shark, scup, Spanish mackerel, summer flounder, whiting, windowpane flounder, and winter flounder. NMFS conducted an analysis of the impacts on EFH pursuant to 50 CFR 600.920(h), and determined that adverse impacts to EFH are minimal and temporary and have been minimized to the extent practicable.

7.6. Administrative Procedure Act

Section 553 of the Administrative Procedure Act establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process, and to give the public adequate notice and opportunity for comment. At this time, NMFS is not requesting any abridgement of the rulemaking process for this action.

7.7. Coastal Zone Management Act

Section 307(c)(1) of the Federal CZMA of 1972 requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management

programs to the maximum extent practicable. NMFS reviewed the approved coastal zone management plans of Virginia and Maryland to determine the consistency of the proposed action with the enforceable policies of their state programs. NMFS has determined that the proposed action is consistent to the maximum extent possible with the enforceable policies of the coastal zone management programs of these states and has notified them of this determination, providing them also with a copy of this document. A letter requesting their concurrence in NMFS initial determination was sent on [*insert date letters were sent*]. A list of the specific state contacts and a copy of the letters are available upon request.

7.8. EO 13132 (Federalism)

This E.O. established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The E.O. also lists a series of policy making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications. A letter, pursuant to E.O. 13132, is being sent to the governor to VA.

7.9. Information Quality Action (Section 515)

Pursuant to NOAA guidelines implementing section 515 of Public Law 106-554 (the Information Quality Act), all information products released to the public must first undergo a Pre-Dissemination Review to ensure and maximize the quality, objectivity, utility, and integrity of the information (including statistical information) disseminated by or for Federal agencies. The following section addresses these requirements.

Utility

The information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the proposed action is included so that intended users may have a full understanding of the proposed action and its implications.

This document is available in several formats, including printed publication and online through the NMFS web page. The Federal Register notice that announces the proposed rule and the final rule and implementing regulations will be made available in printed publication, on the website for the Northeast Regional Office, and through the Regulations.gov website. The Federal Register documents will provide metric conversions for all measurements.

Integrity

Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NMFS adheres to the standards set out in Appendix III, "Security of Automated Information Resources," of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g., dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity

For purposes of the Pre-Dissemination Review, this document is considered to be a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Endangered Species Act; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and mortality) reported in this product are based on either assessments subject to peer-review through the Stock Assessment Review Committee or on updates of those assessments prepared by scientists of the Northeast Fisheries Science Center. Landing and revenue information is based on information collected through the Commercial Dealer databases and VMRC. Information on the pound net fishery is based on reports collected by the NMFS observer program, VMSM/VAQ data, and reports on the modified leader experiment. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from accepted sources, and the analyses have been reviewed by appropriate NMFS staff.

Despite current data limitations, the conservation and management measures proposed for this action were selected based upon the best scientific information available. The analyses conducted in support of the proposed action were conducted using information from the most recent complete calendar years, through 2005 (though data for the full 2005 calendar year were not available at the time during which these analyses were conducted). The data used in the analyses provide the best available information on stock status and behavior of protected species, sea turtle interaction with pound nets in Virginias Chesapeake Bay, and pound net fishery information. Specialists who worked with these data are familiar with the most current analytical techniques and with the available data and information relevant to sea turtle protection and to the Virginia pound net fishery.

The policy choices are clearly articulated, in section 4.0 of this document, as the management alternatives considered in this action. The supporting science and analyses, upon which the policy choices are based, are summarized and described in sections 5.0 and 6.0 of this document. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency.

The review process used in preparation of this document involves the NEFSC, the Northeast Regional Office, and NMFS Headquarters. The NEFSCs technical review is conducted by senior level scientists with specialties in population dynamics, stock assessment methods, protected species, population biology, conservation engineering, and the social sciences. NMFS review process will involve a public meeting at which affected stakeholders have an opportunity to provide comments on the document. Review by staff at the Regional Office is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. Final approval of the action proposed in this document and clearance of any rules prepared to implement resulting regulations is conducted by staff at NMFS Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

7.10. REGULATORY IMPACT REVIEW (RIR)

NMFS requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: 1) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem, 2) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action, and 3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are a “significant regulatory action” under certain criteria provided in Executive Order 12866 and whether the proposed regulations will have a “significant economic impact on a substantial number of small entities” and is in compliance with the Regulatory Flexibility Act of 1980 (RFA). The primary purpose of the RFA is to inform the agency, as well as the pubic, of the expected economic impacts of the various alternatives considered on small entities and to ensure that the agency considers alternatives that minimize the expected impacts on these entities while meeting goals and objectives of applicable statutes.

7.10.1. Executive Order (E.O.) 12866

The RIR is intended to assist NMFS decision making by selecting the regulatory action that maximizes net benefits to the Nation.

Framework for Analysis

Net National benefit is measured through economic surpluses, consumer and producer surplus. In this case, consumer surplus is associated with the value of sea turtles and, the seafood products supplied by the pound net industry. The value associated with sea turtles is called a non-consumptive value, which is comprised of a use and non-use value. Definitions are:

- Use values are associated with activities such as viewing sea turtles at an aquarium or on board whale watching boats. Option and bequest values are also a type of non-consumptive use value. Option values represent values people place on having the option to enjoy viewing sea turtles in the future, while bequest values are the values people place on knowing that future generations will have the option of viewing sea turtles in the future.

- Non-use values, also referred to as "passive use" or *existence values* are not associated with actual use (or viewing in this case) but represent the value people place on simply knowing sea turtles exist, even if they will never see one.

Producer surplus is associated with the economic profit earned by businesses engaged in pound net fisheries as well as profits earned by aquariums which provide individuals an opportunity to view sea turtles.

When comparing a regulatory action to the status quo alternative (NPA1), it is the change in net National benefit that becomes the focal point of analysis. Considering turtle protection benefits, this analysis determined that the status quo alternative (NPA1) captured the majority of these benefits. Additionally, the three other alternatives cannot be quantitatively or qualitatively distinguished from the status quo alternative (NPA1). Thus the consumer surplus of turtle protection (non-consumptive use and non-use value) associated with the four alternatives is considered equivalent.

Three alternatives (PA, NPA2 and NPA3) are compared to the status quo alternative (NPA1). All four alternatives focus on the time period May 6 – July 15. Management actions proposed differ by type of pound net (offshore and nearshore) and area (lower Bay, and Upper Bay plus south of the Bay Bridge called upper Bay). Figure 4 identifies the 2 management areas. Under the status quo, offshore leaders in the lower Bay must be removed during the regulated period, while all other leaders must be switched to an alternative leader (<12" mesh, no stringers). The PA allows offshore pounds in the lower Bay to be fished with a <u>modified</u> leader (Figure 2), while all other leaders must continue to follow the requirement of an <u>alternative</u> leader (<12" mesh, no stringers) during the regulated period.

The following alternatives are evaluated:

- The preferred alternative (PA) described above (See Section 3.1)

- Non-preferred alternative 1 (NPA 1), which is the status quo or current regulations. Offshore pound nets in the lower Bay must remove leaders between May 6 and July 15, while all other pound nets must replace their leaders with the alternative leader (<12" mesh, not stringers) during this period.
- Non-preferred alternative 2 (NPA 2) requires all pound net leaders in the regulated area to switch to the modified leader during the time May 6 – July 15.
- Non-preferred alternative 3 (NPA 3) requires offshore pound net leaders in both the upper and lower Bay to be replaced with the modified leader during the period May 6 – July 15, while nearshore leaders in both areas need to use the alternative leader (<12" mesh, no stringers) during the regulated period.

The absolute magnitude of sea turtle protection provided by these regulatory alternatives cannot be quantified, nor can they be ranked. The status quo (NPA 1) appears to offer a significant and appropriate level of sea turtle protection, and the other alternatives cannot be distinguished from the status quo in terms of protection. Thus, the four alternatives are considered equivalent in terms of sea turtle protection and consumer surplus.

Both consumer surplus and producer surplus for seafood products supplied by the pound net fisheries will be affected by these sea turtle protection measures. It is assumed that without leaders fishermen do not fish pound nets. Under the PA, offshore fishermen in the lower Bay will be able to fish with a modified leader, while under the current regulations (NPA1) they do not. While the fishermen incur costs of implementing the modified leader, they also increase their revenues due to increased fishing opportunities. The additional revenues more than off-set the additional costs, so there is a net increase in revenues to fishermen from the PA. Additionally, the availability of additional seafood could increase consumer surplus, however the contribution of this harvest to the Virginia seafood market is small at about 0.3% of 2004 Virginia seafood landings (=0.267 million lbs/84,548 million pounds), so the effect on the regional seafood market is likely to be negligible, both in terms of prices and consumer surplus. In summary, the effects of the PA on consumer surpluses are small.

7.10.1.1. Regulatory Costs to Pound Net Industry

Regulatory benefits to the pound net industry are measured by estimating the changes to net revenue due to increased fish opportunities less the labor and materials costs of implementing the modified leader. These costs are measured per fisherman. The change in net revenues per fisherman is the ratio of additional revenues minus costs to total revenues. To determine the regulatory cost of the entire industry, the cost per fisherman is expanded by the number of fishermen. The change in industry profits is the ratio of industry net revenue change to industry revenues. For each alternative we evaluate the impact on the individual fisherman and the entire industry. The results are then compared.

Four alternatives are evaluated here, including the status quo alternative (see Section 3.0 for a detailed list). In general, the alternatives either require the use of a modified leader for some groups of fishermen during the regulated time May 6 – July 15.

In the case where leaders are currently prohibited (offshore pounds in lower Bay), we assume the fisherman increases revenues but also incurs costs to implement the modified leader. Under the status quo (NPA1), where offshore leaders in the lower Bay are prohibited, we assume that fishermen do not fish if a leader is not in place. Thus, fishermen used the modified leader and harvest increases based on a five year average landings during that period in that area.

In the case where leaders are not currently prohibited (nearshore pounds in lower Bay, and all pounds upper Bay), the regulations require an alternative leader (<12" leader, no stringers) during the regulated period. We assume the only additional costs of regulations requiring a modified as opposed to alternative leader, are the costs of fabrication of the modified leader. That is, the costs of switching leader gear at the beginning and end of the regulated period are already incurred under the status quo (NPA1). We also assume that given the choice of using the modified leader or not fishing, all fishermen will choose to incur the cost of the change and fish (see section 5.1.6.2.3.3 for discussion of this decision).

To analyze these alternatives the following data were sources used: 1) the Virginia Marine Resource Commission (VMRC) trip levels landing data, 1998 - 2004; 2) the NEFSC gear survey for years 2002-2003; and 3) cost data for leader fabrication and installation based on discussions with a local pound net fisherman. The number of active fishermen, revenue and landings per fisherman were estimated from the VMRC data. The 2004 gear survey data were used to estimate the number of pound nets and fishermen that would be impacted by the various alternatives. For example, under the PA, the number of fishermen with offshore pounds in the lower Bay is based on VMRC data and the 2004 gear survey data (section 5.1.6.2.1.2) The cost data were used to estimate the cost of: 1) removing a leader from the water and placing it after management restrictions are lifted; and 2) the total cost of fabricating the modified leader. For details see the data section under the PA (section 5.1.6.2.1).

Potential biases may exist in the estimate of the number of fishermen impacted and revenue estimates. The estimate of fishermen impacted in the lower region may be upwardly biased because those fishing in the northern portion of the lower bay or south of the Chesapeake Bay south of the Bay Bridge (Figure 1, parts of areas 306 and 307), are not required to adopt the modified leader. However, for data reasons these harvesters could not be separated out of the lower region. Revenue estimates may by downwardly biased since harvesters only report landings. VMRC estimates revenues by multiplying an average monthly dockside price based on all dealer prices and reported landings. Some harvesters process their own fish landings and therefore may receive a price two to three times greater than the monthly dockside price.

The total number of fishermen in the lower region is biased up by one to two harvesters. These fishermen are not prohibited from fishing with leaders during the regulated period. This results in industry gains being upwardly biased. However, the average revenue per pound net used to estimate the increase in revenues from renewed fishing by offshore fishermen in the lower Bay, may be bias downward.

There also appears to a reduction in the total number of pound nets fished over the years. It seems probable that fishermen would retire those pounds with the lowest harvests or revenues. Thus, the remaining active nets likely have a higher average harvest then that calculated over all nets over 5 years. Overall, it is possible that the multiple biases may cancel each other out, but it is more likely that they ensure that the estimates in do not over estimate the economic impacts. Additionally, there are several fishermen that have fished in the lower Bay during the regulatory period, but did not do so in 2004, even though they did fish at other times in the year. This suggests that there may be additional fishermen that may benefit from the option of fishing with a modified leader, but are not captured in the data[21]. This would result in an increase in the net revenue increase of this alternative.

The Regulatory Flexibility Analysis (RFA) is designed to assess the impact that various regulatory alternatives would have on small entities. Therefore in Section 7.10.1.2, the economic impacts on the individual fishermen are presented. We can then sum up the RFA impacts to determine the RIR impacts. Section 7.10.1.1 presents the industry impacts.

7.10.1.2. Small Entity Impacts

Economic impacts on individual fishermen are evaluated here. All four alternatives cover the same time period for changes in restrictions, May 6 - July 15. Two management areas are defined, the upper and lower bay region of the Chesapeake Bay, and remain constant under all the alternatives. Management actions to these two management areas vary over the alternatives. The three alternatives that describe changes from the current regulations (PA, NPA2 and NPA3) are compared to the status quo (NPA1) in terms of changes in net revenues and costs. The economic impacts on individual harvesters are presented by region, and summarized in Table 14.

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[21] In the lower Bay during 2004 ten fishermen reported pound net landings, however, only 5 of those reported landings during the May 6 - July 15 period. Of the 10, 9 fished during the May 6 – July 15, 2003 but only 4 fished during May 6 – July, 2004. One fisherman who had not fished in 2003 began fishing during May 2004. It seems likely that the lower number of fishermen in the lower Bay during the regulated period is the result of the 2004 prohibition on offshore pound net leaders in the lower Bay in 2004. If this prohibition is removed it seems likely that some fishermen will return to fish during the regulated period, perhaps as many as 5 fishermen. This higher number was not used as the calculated number of pound nets (average number of pounds fished * fishermen) was similar to the number reported in the 2004 NEFSC gear survey.

As the net revenue affects are calculated on a per pound net basis, any changes that keep the number of affected pounds the same will not change the industry affects. So, increasing the number of affected fishermen, but not the number of affected pounds would result in lower individual effects but the same industry effects. Increasing both the number of fishermen and total number of pounds would increase the industry affects, with indeterminate impacts on individuals.

7.10.1.2.1. Lower Bay

In the lower region, three of the four alternatives (PA, NPA2 and NPA3) allow offshore fishermen to harvest with a modified leader, while under the status quo (NPA1) these fishermen are not allowed to use any leader during the regulated period. It is assumed that pounds are not fished if they do not have leaders, so these three alternative (PA, NPA2 and NPA3) result in net increases in revenues for the fishermen in the lower Bay. The PA and NPA3 do not impose any additional restrictions to the current regulations (NPA1) on nearshore nets fished by lower Bay fishermen. However, NPA2 requires all pound nets to use the modified leader in both the lower and upper Bay, so additional costs are imposed on fishermen that reduce total net revenues.

Under the PA and NPA3 the net increase in revenues for the 5 lower Bay fishermen who fish during the regulated period (May 6 – July 15) varies from 16.9% to 33.7% of annual revenues. For NPA2 the net revenue increase for the 5 lower Bay fishermen is reduced to 12.0% to 28.9%, due to the additional cost of implementing the modified leader on nearshore pound nets without an increase in revenues, as these nets are fished under the existing regulations (NPA1) with an alternative leader (<12" mesh, no stringers).

7.10.1.2.2. Upper Region

There were 16 fishermen in the upper Bay during the May 6 – July 15, 2004 period. Under the current regulations (NPA1) all fishermen in this area must use an alternative leader (<12" mesh, no stringers) during the regulated period. Only NPA2 and NPA3 have proposed actions that impact upper Bay fishermen beyond the current regulations. Both regulations would impact all upper Bay fishermen, as each is assumed to have at least one offshore pound. Under NPA2 all pound nets must switch to the modified leader during the regulated period. As these fishermen are currently allowed to fish with the alternative leader, the requirement does not impact revenues but does increase costs by 3.6% to 7.2% of annual revenues. The NPA 3 would only require the modified leader for offshore nets, however the majority of the pounds in this area are offshore (85%) so the impact on fishermen in terms of annual revenues is also a reduction by 3.6% to 7.2%. For details, see Sections 5.1.6 (PA), 5.2.6 (NPA 1), 5.3.6 (NPA 2), and 5.4.6 (NPA 3).

Table 25. Comparison of four proposed alternatives in terms of number of fishermen in regulated period affected, and impact on average annual revenues by region

Alternatives	Lower Bay		Upper Bay	
	No. Harvesters	Net change in revenues	No. Harvesters	Net change in revenues
PA	5/5	(+) 16.9 to 33.7%	0/16	0%
NPA 1 (status quo)	-	-	-	-
NPA 2	5/5	(+)12.0 to 28.9%	16/16	(-) 3.6 to 7.2%
NPA 3	5/5	(+) 16.9 to 33.7%	16/16	(-) 3.6 to 7.2%

7.10.1.2.3. Industry Impacts

Industry revenues for the regulated part of the Virginia Chesapeake Bay were $2.2M for the pound net fishery. Under the PA, 5 fishermen of 21 are affected (Table 25). Industry profits are increased by 4.3% (=$0.094M/$2.2M) under the PA, which allows fishermen of offshore pounds to fish using a modified leader. Under the NPA 2, and NPA 3, 21 of 21 fishermen are affected, and industry profits are increased by 0.8% (=$0.0.017M/$2.2M) and 2.0% (=$0.0.044M/$2.2M), respectively. As NPA1 is the status quo, it is the basis against which the other alternatives are evaluated. The costs of the current regulations are addressed in section 6.0(Cumulative Effects).

The majority of sea turtle protection appears to have been captured by the current regulations (NPA1), and the other three alternatives (PA, NPA2 and NPA3) cannot be distinguished from the status quo in terms of turtle protection. Thus, the comparison between the alternatives is in terms of the net increase in industry revenues. While the PA affects the smallest number of fishermen, it has the greatest impact on industry revenues, with both additional costs and revenues concentrated with the five fishermen who fish in the lower Bay during the regulated period (May 6 – July 15). Under NPA2 and NPA3 all 21 fishermen who fish during the regulated period would be affected, with increased revenues concentrated among the 5 fishermen in the lower Bay, and costs shared by all.

Table 26 summarizes the industry impacts of the 4 alternatives. The PA results in the greatest increase in net revenues to the industry with a similar level of turtle protection. NPA3 provides the next highest level of increase in net revenue, followed by NPA2. The status quo (NPA 1) results in neither an increase in revenue nor any additional costs over those imposed by existing regulations. Alternatives can now be ranked by forgone industry profits and turtle protection.

Table 26. Ratio of fishermen affected to the number of active fishermen during the regulated period, and the net increase in industry revenues (%), and ranking by increased benefits

Alternative	Total Industry		Ranking by change in net revenues (high [1] to low [4])
	# of affected fishermen	Change in revenues	
PA	5/21	+ 4.3%	1
NPA1	-	-	4
NPA2	21/21	+ 0.8%	3
NPA3	21/21	+ 2.0%	2

7.11. Initial Regulatory Flexibility Analysis

The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. This analysis is conducted to primarily determine whether the proposed action would have a “significant economic impact on a substantial number of small entities”. In addition to analyses conducted for the Regulatory Impact Review (RIR), the regulatory flexibility analysis provides: 1) a description of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for the proposed rule; 3) a description and where feasible, an

estimate of the number of small entities to which the proposed rule applies; 4) a description of impacts of the proposed rule and alternatives; 5) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and 6) an identification, to the extent practical, of all relevant Federal rules which many duplicate, overlap, or conflict with the proposed rule.

Description of the reasons why action by the agency is being considered: The need and purpose of the action are set forth in Section 2.0of this document and are included herein by reference.

Statement of the objectives of, and legal basis for the proposed rule: The specific objective of the action is to: reduce injuries or mortalities of sea turtles attributable to entanglements in and impingement on pound net leaders. The Endangered Species Act provides the legal basis for this rule.

Description and estimate of the number of small entities to which the proposed rule will apply:
According to the 2004 VMRC data, there were 21 harvesters actively fishing pound nets from May 6 to July 15. Of these 21 harvesters, 24% (=5/21) are affected by the PA. These 21 fishermen fish approximately 29 pound nets in the upper bay (=16 harvesters*1.8 pounds/fisherman) and 17 pound nets in the lower bay (=5 harvesters*3.4 pounds/fisherman). Approximately 7 pound nets are affected by the PA, all in the lower Bay.

Description of impacts of the proposed rule and alternatives:
The impact of the proposed rule and alternatives is analyzed and described in sections 3.0, 5.0, and 6.0. These sections are incorporated by reference herein.

Description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records:
The proposed rule would not impose any additional reporting, record-keeping, or compliance requirements. Thus, no new skills would be required for compliance.

Identification of all relevant Federal rules which many duplicate, overlap, or conflict with the proposed rule: No duplicative, overlapping, or conflicting Federal rules have been identified.

Substantial Number of Small Entities Criterion:
All commercial fishing operations that fish in the manner and location of the proposed rule would be affected. All such operations, where they exist are assumed to be small business entities, given the information provided above and the standard that a fish harvesting business is considered a small business if it is independently owned and operated and not dominant in its field of operation, and if it has annual receipts not in excess of $3.5 million. The impact of the PA would be a positive net increase in revenues for the affected fishermen, and so would have a positive opposed to negative impact on affected fishermen.

Significant Economic Impact Criterion:
The outcome of "significant economic impact" can be ascertained by examining two issues: disproportionality and profitability.

Disproportionality: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities? All small business entities participating in the pound net fisheries are considered small business entities, so the issue of disproportionality does not arise.

Profitability: Do the regulations significantly reduce profit for a substantial number of small entities? The proposed regulation affects 7 pound nets fished by all 5 fishermen who fish during the May 6 – July 15 time frame. This is considered a substantial number of entities within affected time frame. We estimate a lower Bay fisherman's annual revenues may be increased by between 16.9% and 33.7%. This is considered a significant increase.

Description of significant alternatives to the proposed rule and discussion of how the alternatives attempt to minimize economic impacts on small entities: Three alternatives in addition to the proposed rule have been considered. The current regulations (NPA1) appear to have captured the majority of the benefits in terms of sea turtle protection. The other three alternatives provide a level of protection that is indistinguishable from the status quo (NPA1). Given the inability to distinguishable quantitatively and qualitatively in terms of sea turtle protection, the objective is to maximize net benefits to the industry. Net benefits were measured as the difference between increased fishing revenues and the costs of implementing required leader gear changes.

The PA provides the greatest net increase in revenues, to both the individual fishermen and the industry, while providing a level of sea turtle protection similar to that of NPA 1, NPA 2 and NPA 3. Under NPA 2 and NPA 3 the increase in fishing revenues would be the same as under the PA, however costs would be higher as more fishermen would be required to use the modified gear. This results in a lower level of net revenues for NPA 2 and NPA 3, as compared to the PA.

8.0 Contact Information

Preparers:	Sarah Gurtman NMFS Northeast Region One Blackburn Drive Gloucester, MA 01930 (978) 281-9328	Gisele Magnusson Northeast Fisheries Science Center 166 Water Street Woods Hole, MA (508) 495-2137

Individuals and/or agencies contacted:

National Marine Fisheries Service (NMFS)
Virginia Marine Resources Commission
Virginia Marine Science Museum

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Appendix A. Virginia Landings Data for 2003 and 2004

Virginia Landings Bulletin

COMMERCIAL FISHERIES STATISTICS
ANNUAL REPORT 2004
(Preliminary)

SPECIES	CURRENT YEAR 2004			PRIOR YEAR 2003		
FINFISH	POUNDS	VALUE($)	$/LBS	POUNDS	VALUE($)	$/LBS
ALEWIFE	222755	23467	0.11	227294	24883	0.11
AMBERJACK	340	214	0.63	314	134	0.43
ANGLER	525844	541680	1.03	821181	878258	1.07
BASS, BLACK SEA	482069	1116291	2.32	507674	1306460	2.57
BASS, STRIPED	1954773	3300641	1.69	2122951	3419016	1.61
BLUEFISH	410785	101963	0.25	375893	78328	0.21
BONITO	55	36	0.65	2	1	0.50
BUTTERFISH	107700	64429	0.60	30627	15239	0.50
CARP	17453	2223	0.13	10752	1629	0.15
CATFISH, BLUE	29696	2798	0.09	21208	5303	0.25
CATFISH, BULLHEAD	35598	6765	0.19	40237	7654	0.19
CATFISH,UNCLASSIFIED	1883726	641951	0.34	1764852	365483	0.21
COBIA	5778	10890	1.88	7387	13958	1.89
COD	40	12	0.30	24	28	1.17
CREVALLE	46	46	1.00	180	180	1.00
CROAKER, ATLANTIC	8601258	2785967	0.32	10936641	2822769	0.26
CUNNER	0	0	0.00	35	9	0.26
DOGFISH, CHAIN	1039	490	0.47	0	0	0.00
DOGFISH, SMOOTH	601235	513169	0.85	694251	320957	0.46
DOGFISH, SPINY	227502	27677	0.12	9336	1639	0.18
DOGFISH, UNCLASSIFIED	21573	31946	1.48	209372	64469	0.31
DOLPHIN FISH	1030	1990	1.93	711	1089	1.53
DRUM, BLACK	66325	39689	0.60	113858	34598	0.30
DRUM, RED	650	844	1.30	2839	2162	0.76
DRUM, UNCLASSIFIED	10	5	0.50	0	0	0.00
EEL, AMERICAN	140878	192256	1.36	124848	135521	1.09
EEL, CONGER	9495	5142	0.54	11143	5702	0.51
EEL, UNCLASSIFIED	200	78	0.39	0	0	0.00
FLOUNDER, SAND-DAB	165	71	0.43	50	50	1.00
FLOUNDER, SOUTHERN	0	0	0.00	309	679	2.20
FLOUNDER, SUMMER	4128078	5488119	1.33	3178317	3784360	1.19
FLOUNDER, WITCH	1317	642	0.49	1395	1019	0.73
GARFISH	16738	3464	0.21	704	278	0.39
GROUPER,SNOWY	0	0	0.00	54	97	1.80
HAKE, RED	385	92	0.24	144	48	0.33
HAKE, SILVER	1567	519	0.33	584	311	0.53
HAKE, WHITE	7	2	0.29	0	0	0.00
HARVESTFISH	45274	56625	1.25	44064	53561	1.22
HERRING, ATLANTIC	9446	1798	0.19	13037	2644	0.20
HERRING, BLUEBACK	1672	167	0.10	699	68	0.10
HOGFISH	0	0	0.00	84	30	0.36
JOHN DORY	1614	734	0.45	1805	631	0.35
MACKEREL, ATLANTIC	122440	33034	0.27	113117	18001	0.16

MACKEREL, KING	1158	2306	1.99	256	410	1.60
MACKEREL, SPANISH	66473	49653	0.75	103401	86168	0.83
MENHADEN	6179490	2113845	0.34	3492422	288250	0.08
MULLET	6579	4440	0.67	20626	7492	0.36
PERCH, WHITE	141320	89037	0.63	110022	68264	0.62
PERCH, YELLOW	17171	11749	0.68	10447	8767	0.84
PIGFISH	29	10	0.34	363	98	0.27
PLAICE, AMERICAN	0	0	0.00	40	24	0.60
POLLOCK	25	5	0.20	138	77	0.56
POMPANO, COMMON	1347	2261	1.68	2402	5175	2.15
PORGY, RED & PINFISH	98	95	0.97	854	549	0.64
PUFFER, NORTHERN	24001	43482	1.81	23005	55960	2.43
PUFFER, UNCLASSIFIED	52	208	4.00	0	0	0.00
RIBBON FISH	4061	1996	0.49	523	272	0.52
SCUP	414995	189556	0.46	551580	369085	0.67
SEA ROBINS	1636	318	0.19	653	98	0.15
SEABASS, UNCLASSIFIED	130	223	1.72	0	0	0.00
SEATROUT, GREY	325918	230054	0.71	459671	362237	0.79
SEATROUT, SPOTTED	10486	11817	1.13	5325	6682	1.25
SEATROUT, UNCLASSIFIED	163	252	1.55	0	0	0.00
SHAD, AMERICAN	55125	25289	0.46	51520	25602	0.50
SHAD, GIZZARD	365823	26905	0.07	327293	21240	0.06
SHAD, HERRING	5666	433	0.08	4700	94	0.02
SHAD, HICKORY	7963	1748	0.22	10674	2668	0.25
SHARK, BLACKTIP	8732	3977	0.46	2316	1186	0.51
SHARK, BULL	0	0	0.00	453	114	0.25
SHARK, DUSKY	0	0	0.00	13323	4757	0.36
SHARK, HAMMERHEAD	0	0	0.00	437	90	0.21
SHARK, LARGE COASTAL	0	0	0.00	40425	29852	0.74
SHARK, LEMON	326	10	0.03	85	0	0.00
SHARK, MAKO	28	49	1.75	551	1495	2.71
SHARK, MAKO SHORTFIN	2044	4088	2.00	596	1062	1.78
SHARK, SAND TIGER	387	96	0.25	481	108	0.22
SHARK, SANDBAR	16189	12306	0.76	11149	10726	0.96
SHARK, THRESHER	6441	3194	0.50	11128	5983	0.54
SHARK, TIGER	0	0	0.00	186	47	0.25
SHARK, UNCLASSIFIED	180030	121496	0.67	275188	140580	0.51
SHEEPSHEAD	1892	764	0.40	9820	2794	0.28
SKATE, BARNDOOR	872	408	0.47	0	0	0.00
SKATE, CLEARNOSE	23786	4105	0.17	0	0	0.00
SKATE, WINGS	12468	2630	0.21	40920	4796	0.12
SPADEFISH	7518	3794	0.50	9808	4459	0.45
SPOT	3363355	2456225	0.73	3471520	1687596	0.49
STRIPED MULLET	110	56	0.51	0	0	0.00
SUNFISHES	14	0	0.00	4	0	0.00
SWORDFISH	0	0	0.00	9898	32335	3.27
TAUTOG	12388	17440	1.41	10705	14706	1.37
TILEFISH	1512	1438	0.95	2029	2037	1.00
TILEFISH, BLUELINE	797	993	1.25	1778	2407	1.35
TILEFISH,GOLDEN	251	289	1.15	698	1027	1.47
TOADFISH, OYSTER	399	600	1.50	1522	3424	2.25
TRIGGERFISHES	1141	1125	0.99	326	249	0.76

TRIPLETAIL	22	12	0.55	45	23	0.51
TUNA, ALBACORE	799	497	0.62	1643	1433	0.87
TUNA, UNCLASSIFIED	33	22	0.67	0	0	0.00
TUNA, YELLOWFIN	6369	10228	1.61	4157	5373	1.29
WAHOO	21	42	2.00	0	0	0.00
WHITING, BLACK	65	13	0.20	0	0	0.00
WHITING, KING	15556	13023	0.84	20985	11090	0.53
WINTER FLOUNDER	310	243	0.78	0	0	0.00
FISH, OTHER (FOOD)	616	230	0.37	795	439	0.55
FISH, OTHER (INDUSTRIAL)	4272508	5125146	1.20	4108934	220929	0.05
TOTAL FINFISH	**34624003**	**16899440**	**0.49**	**34955511**	**17267717**	**0.49**

SPECIES	CURRENT YEAR 2004			PRIOR YEAR 2003		
SHELLFISH	POUNDS	VALUE($)	$/LBS	POUNDS	VALUE($)	$/LBS
BLOOD ARK, CLAM	7118	5625	0.79	2938	1764	0.60
CRAB, BLUE	27624231	49151840	1.78	21498182	19150471	0.89
CRAB, RED	0	0	0.00	22	0	0.00
HORSESHOE CRABS	223718	130822	0.58	257609	92809	0.36
LOBSTER	25265	114287	4.52	15176	74643	4.92
OCTOPUS	0	0	0.00	1249	1949	1.56
OYSTERS	23804	100972	4.24	77639	263001	3.39
QUAHOG, PUBLIC	341535	1660625	4.86	313625	1876949	5.98
SCALLOPS, BAY	400	1400	3.50	0	0	0.00
SCALLOPS, SEA	19437934	92500430	4.76	17433325	67931074	3.90
SCALLOPS, UNCLASSIFIED	48164	170431	3.54	0	0	0.00
SQUID (ILLEX)	1275713	214769	0.17	78083	15597	0.20
SQUID (LOLIGO)	64671	43978	0.68	87584	50940	0.58
SQUIDS (NS)	30526	16881	0.55	492	253	0.51
TURTLE, SNAPPER	4240	0	0.00	3450	0	0.00
UNKNOWN	3	0	0.00	0	0	0.00
WHELK, CHANNEL	52907	146797	2.77	434358	776006	1.79
WHELK, KNOBBED	11774	18505	1.57	1087	923	0.85
WHELK, LIGHTNING	262	751	2.87	0	0	0.00
WHELK, UNCLASSIFIED	131945	173610	1.32	255836	383864	1.50
TOTAL SHELLFISH	**49304210**	**144451723**	**2.93**	**40460655**	**90620243**	**2.24**
FINFISH & SHELLFISH	**84547644**	**170041274**	**2.01**	**75084466**	**107519856**	**1.43**

PUBLISHED BY THE
VIRGINIA MARINE RESOURCES COMMISSION
In cooperation with the National Marine Fisheries Service and the Potomac River Fisheries Commission

Appendix B. Landings data provided by the Virginia Marine Resources Commission show that the following species have been landed in pound nets

Alewife (*Alosa pseudoharengus*)
Bluefish (*Pomatomus saltatrix*)
Bonito (*Sarda sarda*)
Butterfish (*Peprilus tricanthus*)
Cobia (*Rachycentron canadum*)
Catfish (*Arius* or *Bagre spp*.)
Cod (*Gadus morhua*)
Atlantic Croaker (*Micropogonias undulatus*)
Black Drum (*Pogonius cromis*)
Red Drum (*Sciaenops ocellatus*)
American Eel (*Anguilla rostrata*)
Winter Flounder (*Pseudopleuronectes americanus*)
Summer Flounder (*Paralichthys dentatus*)
Harvest Fish (*Peprilus alepidotus*)
Atlantic Herring (*Clupia harengus*)
Spotted Seatrout (*Cynoscion nebulosus*)
Sheepshead (*Archosargus probatocephalus*)
Spanish Mackerel (*Scomberomorus maculates*)
White Perch (*Morone Americana*)
Red hake (*Urophycis chuss*)
Silver Hake (*Merluccius bilinearis*)
Amberjack (*Seriola spp*.)
Spadefish (*Chaetodipterus faber*)
Sturgeon (*Acipenser spp*.)
Scup (*Stenotomus chrysops*)
Tautog (*Tautoga onitis*)
Spot (*Leiostomus xanthurus*)
Dogfish (*Squalus acanthias*)
Mullet (*Mugil spp*.)
Menhaden (*Brevoortia spp*.)
Hickory Shad (*Alosa mediocris*)
Striped Bass (*Morone saxatilis*)
Skipjack Tuna (*Euthynnus pelamis*)
Gizzard Shad (*Dorosoma cepedianum*)
Northern Puffer (*Sphoeroides maculates*)
Little Tunny (*Euthynnus alletterathus*)

Appendix C. The cumulative effects analysis steps that were considered in the assessment of cumulative impacts of the PA

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope for the analysis.
3. Establish the time frame for the analysis.
4. Identify other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to changes and capacity to withstand stresses.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Develop a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause and effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.