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

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National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Department of Commerce

Contents

1.0 INTRODUCTION

For the past 25 years, there have been a growing number of spring sea turtle strandings in Virginia, which NOAA Fisheries has reason to believe are associated 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. Sea turtles are known to be entangled in these leaders, causing in some instances the deaths of the animals. 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.

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. 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

The purpose of the action is to impose conservation measures for the pound net fishery in Virginia Chesapeake Bay waters. The proposed action would restrict the use of pound net leaders in the Virginia waters of the mainstem Chesapeake Bay in order to protect threatened and endangered turtles from incidental take in the Virginia pound net fishery during the spring of each year. This document examines the environmental impacts that would result from the issuance of the final rule.

This action is needed to reduce sea turtle mortality as a result of entanglements and impingements in Virginia pound net gear. The current management measures for the Virginia pound net fishery have not effectively reduced sea turtle entanglements and impingements, and as such, endangered and threatened sea turtles continue to be subject to entanglement in and impingement on pound net leaders during the spring, leading to potential mortality.

2.1 BACKGROUND

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. The magnitude of the stranding event has increased in recent years, with the total reported Virginia sea turtle strandings during May and June equaling 84 in 1995, 85 in 1996, 164 in 1997, 183 in 1998, 129 in 1999, 161 in 2000, 256 in 2001, and 180 in 2002. Preliminary data indicate that 312 dead sea turtles stranded on Virginia beaches during May and June 2003, with most of these occurring during the latter half of June. Strandings have also been elevated in July, generally the first half of the month. Most of the stranded sea turtles in Virginia have been loggerheads, but endangered Kemp's ridley and leatherback sea turtles have also stranded. Out of 1,559 total strandings in May and June from 1995 to 2003, 1,372 loggerheads, 108 Kemp's ridleys, 28 leatherbacks, 1 green, and 50 unidentified turtles were found. The majority of the stranded turtles have been of the juvenile life stage.

From mid-May to mid-July 2003, approximately 47 percent of the stranded animals were found along the Chesapeake Bay side of the Eastern shore of Virginia, 23 percent were found in the Virginia Beach ocean area, 15 percent in the Western Bay, 8 percent along the oceanside of the Eastern shore, and 7 percent in the southern Chesapeake Bay areas. 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 the main fishing gear used along the southern portion of the Chesapeake Bay side of the Eastern shore. Note that it is possible that some Virginia Chesapeake Bay turtle strandings are swept into the Chesapeake Bay from elsewhere, as the water patterns and currents entering the Chesapeake Bay could concentrate sea turtle strandings around the mouth with certain wind conditions (Valle-Levinson et al. 2001). Similarly, southwesterly winds result in surface water outflows throughout the entrance to the Chesapeake Bay, which could result in sea turtles being carried out of the Chesapeake Bay. However, it is likely that in the Virginia Chesapeake Bay, most mortalities have occurred relatively close to the stranding location (Lutcavage 1981). A NOAA National Marine Fisheries Service (NOAA Fisheries) observer tagged 6 floating dead sea turtles during the spring of 2003, and 2 turtles were recovered the next day. One turtle was found stranded approximately 500 yards south of the tagging location (along Eastern shore), and the other turtle was found floating approximately 6 to 7 nautical miles south of the tagging location (in the Western Bay).

Determining the cause of death in stranded sea turtles is difficult, given the level of decomposition of most stranded turtles and the lack of evidence, due in part to sea turtles' anatomy (e.g., hard carapace, scaly skin). While some turtles with traumatic carapace injuries, propeller-like wounds or imbedded fish hooks have been documented each year, no single, specific cause of mortality is immediately apparent for the majority of turtles that strand in Virginia. For instance, from May 16 to July 31, 2003, only approximately 26 out of 375 stranded animals were reported with either carapace damage or possible propellor wounds. It should be noted that carapace wounds do not necessarily mean that a vessel collision was the cause of death; it is impossible to determine if the damage was pre- or post-mortem. Many of the circumstances surrounding the spring strandings are consistent with fishery interactions, which include relatively healthy dead turtles, a large number of strandings in a short time period, no external wounds on the majority of the turtles, no common characteristic among stranded turtles that would suggest disease as the main cause of death, and turtles with finfish in their stomach. Sea turtles are generally not agile enough to capture fish under natural conditions, and thus would only consume large quantities of finfish by interacting with fishing gear or bycatch (Mansfield et al. 2002a; Bellmund et al. 1987; Shoop and Ruckdechel 1982).

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. Previously, high turtle mortalities in late May and early June in Virginia have been attributed to entanglement in large mesh pound net leaders in the Chesapeake Bay (Lutcavage 1981; Bellmund et al. 1987). Data collected in 1983 and 1984 found turtle entanglement in pound nets with small mesh leaders (8 to 12 inches stretched mesh) to be insignificant, but in 173 pound nets examined with large mesh leaders (defined as >12 to 16 inches stretched mesh), 30 turtles were found entangled (0.2 turtles per net; Bellmund et al. 1987). This study also found that in 38 nets examined with stringer mesh, 27 turtles were documented entangled (0.7 turtles per net).

Based on nature and location of turtle strandings, the type of fishing gear in the vicinity of the greatest number of strandings, the lack of observed takes in other fisheries operating in Virginia waters during the 2001 stranding period, the known interactions between sea turtles and large mesh and stringer pound net leaders, and several documented sea turtle entanglements in pound net leaders, NOAA Fisheries concluded that pound nets were a likely contributor to sea turtle strandings in Virginia in May and June 2001. While fishery interactions may vary from year to year, NOAA Fisheries believed it was likely that pound nets contributed to the high sea turtle strandings documented in the spring. As a result, based upon the best available information at that time, NOAA Fisheries 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 NOAA Fisheries 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 NOAA Fisheries-approved observer if requested by the Northeast Regional Administrator. The interim final rule also established a framework mechanism by which NOAA Fisheries 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. Under this framework mechanism, if NOAA Fisheries believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30 of any given year, the Assistant Administrator, NOAA, (AA) may extend the effective dates of the restrictions established by the regulations. Additionally, if monitoring of pound net leaders during the time frame of the gear restriction, May 8 through June 30 of each year, reveals that one sea turtle is entangled alive in a pound net leader less than 12 inches stretched mesh or that one sea turtle is entangled dead and NOAA

Fisheries determines that the entanglement contributed to its death, then NOAA Fisheries may determine that additional restrictions are necessary to conserve sea turtles and prevent entanglements.

NOAA Fisheries has 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 NOAA Fisheries pound net monitoring efforts in 2002 and 2003, sea turtle interactions in pound net leaders were documented. In 2002, NOAA Fisheries monitored the active pound nets throughout the Virginia Chesapeake Bay from April 25 to June 1. Out of a total 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 (e.g., current). Note that the number of surveys differs from what was noted in the draft EA on this action (n=648). This modification is a factor of discounting the non-active nets and the nets that were not able to be completed observed due to shallow water depth and lack of boat access. 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.

From April 21 to June 11, 2003, NOAA Fisheries monitored pound net leaders with stretched mesh measuring less than 12 inches. A total of 101 net sites were characterized, but only 56 of these sites were actively fishing (Figure 1). Throughout the project period, a total of 444 surveys were completed, with some nets being surveyed more than others (Figure 2). Survey effort was dependent upon prior entanglement history, location of the nets (e.g., in high current areas or not), and assumed threat to turtles. 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 NOAA Fisheries 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). NOAA Fisheries believes that there is sufficient information to conclude that the death of these turtles is 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, but two turtles were found in leaders in the Western Bay (Figure 1).

As a result of monitoring results obtained during the spring of 2003, NOAA Fisheries 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 necessary.

Sea turtles have been documented entangled in and impinged on pound net leaders and the purpose of conducting additional rulemaking is 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, are of concern for the following reasons: (1) all of the affected animals are listed as either endangered or threatened under the ESA; (2) the level of strandings in Virginia has been elevated the last seven years, and there is no reason to believe that high spring strandings will abate in future years without regulatory action; (3) sea turtles have been observed entangled in leader mesh sizes smaller than what is currently restricted; (4) sea turtles have been observed impinged on leaders by the current, a phenomenon not previously believed to occur with such frequency, and impingements are likely to continue to occur on 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 the information collected in 2002 and 2003, NOAA Fisheries published a proposed rule on February 6, 2004, that would prohibit the use of all pound net 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 at the mouth of the Chesapeake Bay, and the James and York Rivers downstream of the first bridge in each tributary, and all leaders with stretched mesh greater than or equal to 8 inches (20.3 cm) and leaders with stringers outside the aforementioned area, extending to the Maryland-Virginia State line and the Rappahannock River downstream of the first bridge, and from the Chesapeake Bay Bridge Tunnel to the COLREGS line at the mouth of the Chesapeake Bay, from May 6 to July 15 each year. Comments on this proposed action were requested through March 8, 2004. Nineteen comment letters from eighteen different individuals or organizations were received during the public comment period for the proposed rule. Four comment letters provided support for the action, while 14 letters expressed their opposition to the proposed regulations. One comment letter was neither in favor nor against the proposed action. Additionally, a petition signed by 1,077 individuals was received requesting that the proposal be withdrawn and terminated. A public hearing was also held in Virginia Beach, Virginia, on February 19, 2004, and 11 individuals provided spoken comments. Three of the 11 individuals also provided written comments. All of the spoken comments were in opposition to the proposed action. NOAA Fisheries considered these comments on the proposed rule as part of its decision making process.

Based upon public comments received, NOAA Fisheries determined that several modifications to the measures included in the proposed rule (the PA in the February 2004 draft EA on this action) were warranted. Specifically, the area in the southern portion of the Chesapeake Bay where all pound net leaders are prohibited has been reduced, and the nearshore boundary to which the prohibition applies has been moved from the beach to offshore, excluding those nets set with the inland end of the leader 10 horizontal feet or less from the mean low water line. This modification was deemed appropriate given public comments noting that there is a difference between the nearshore and offshore nets along the Eastern shore, and that this difference may impact sea turtle interaction rates, in particular the occurrence of impingements. NOAA Fisheries had originally considered the environmental conditions in the locations where the offshore and nearshore nets are set to be similar, based upon reports from NOAA Fisheries observers and general understanding of the currents in the Chesapeake Bay (e.g., strong along the Eastern shore near the mouth of the Chesapeake Bay). Given the public comments indicating that the currents and take conditions are different between offshore and nearshore nets, NOAA Fisheries considered those potential differences when reanalyzing the take information. The data support this modification, in that in 2002 and 2003, offshore nets accounted for all of the observed impingements ($n=14$) and 8 of the 9 observed entanglements. One dead sea turtle was observed entangled in a nearshore 8 inch (20.3 cm) stretched mesh leader along the Eastern shore. The difference in observed takes between the offshore and nearshore nets is statistically significant with a chi-square value of 3.841 and $p<0.01$. In the lower Chesapeake Bay (encompassing the proposed leader prohibited area), approximately 60 percent (13 of 22) of the active pound nets surveyed in 2003 were nearshore nets. In 2002 and 2003, there were 345 surveys of nearshore nets and 480 surveys of offshore nets throughout the Virginia Chesapeake Bay, and 13 surveys did not specify the location. NOAA Fisheries recognizes that the best available information suggests that the boundary of the leader prohibited area should be modified to account for this distinction between the effects of offshore and nearshore nets on listed sea turtles. As such, the nearshore boundary to which the prohibition applies has been moved from the beach to offshore, excluding those nets set with the inland end of the leader 10 horizontal feet or less from dry shore at mean low tide. The decision to exclude nearshore nets from the leader prohibited area is still considered to be protective of sea turtles, as one turtle was documented in a nearshore net outside the closed area and the revised leader prohibited area includes all areas where sea turtles were documented impinged on pound net leaders.

Generally, areas close to shore are often shallower and have less current than those areas further from shore, but exceptions may occur because environmental conditions vary locally. Distance from shore is likely a proxy for other factors (e.g., water depth, current speed) influencing sea turtle interaction rates. For this action, distance from the mean low water line was used as a common characteristic of those nets considered to be nearshore. NOAA Fisheries will be collecting more data on current strengths in the Virginia Chesapeake Bay, and until additional information indicates otherwise, NOAA Fisheries considers distance from shore to be suitable to separate nearshore and offshore nets.

Another modification is that NOAA Fisheries has determined that the final rule should not change the restricted leader mesh size outside the leader prohibited area from 12 inches to 8 inches stretched mesh. Based upon additional analysis of entanglement to impingement ratios by NOAA Fisheries, it appears that restricting mesh size to less than 8 inches stretched mesh would not necessarily provide the anticipated conservation benefit to sea turtles, over that achieved by prohibiting mesh size of 12 inches or greater. In addition to mesh size, the frequency of sea turtle takes appears to be a function of where the pound nets are set, with pound nets set in certain areas having a higher potential likelihood of takes for a variety of possible reasons, such as depth of water, current velocity, and proximity to certain environmental characteristics or optimal foraging grounds. Additional analyses, and perhaps data collection, will be completed that may provide insights into the relationship between mesh size and sea turtle interactions, because at this time, the mesh size threshold that would prevent sea turtle entanglements cannot be determined for mesh sizes less than 12 inches. As such, at this time NOAA Fisheries is not making an additional modification to leader mesh size and is retaining the mesh size restriction included in the 2002 interim final rule, specifically the restriction of leaders with greater than or equal to 12 inches stretched mesh (as well as leaders with stringers) outside the closed area. While some takes may still occur in less than 12 inches stretched mesh, retaining this mesh size restriction should still provide a conservation benefit to sea turtles (Bellmund et al. 1987).

The final rule also contains a component of the status quo alternative, the framework mechanism. This enables NOAA Fisheries 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 final rule does not reduce the allowable leader stretched mesh size to less than 8 inches as proposed, for reasons identified previously. Takes have been documented in 8 inches and 11.5 inches stretched mesh, with one of these takes occurring outside the leader prohibited area. Therefore, there is the potential for sea turtles to become entangled in leaders less than 12 inches stretched mesh outside the leader prohibited area. NOAA Fisheries intends to continue to monitor sea turtle stranding levels and other fisheries active in the Virginia Chesapeake Bay and ocean waters, including pound net leaders with a stretched mesh size measuring less than 12 inches outside the closed area. Retaining 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 should monitoring document the entanglement of a live or dead sea turtle outside the leader prohibited area. The framework mechanism was excluded from the proposed rule due to difficulties experienced with enacting regulations on a real time basis. NOAA Fisheries 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, NOAA Fisheries will prepare portions of the required documents ahead of time, in the event that a mid-season framework action is necessary.

NOAA Fisheries has also included geographical boundaries for the leader mesh size restrictions in the Great Wicomico River and the Piankatank River in the final rule, based upon a public comment requesting that the geographical areas in those Western Chesapeake Bay tributaries be better defined. This modification is for clarification purposes only and does not change the biological, economic, or social analysis.

Note that the PA included in the draft EA and in the proposed rule is now NPA 6.

3.0 ALTERNATIVES

Several alternatives were considered to reduce potential sea turtle interactions with pound nets in Virginia waters of the Chesapeake Bay. The alternatives considered are within the scope of NOAA Fisheries' authority and are technically feasible. NOAA Fisheries utilized all available scientific data to develop the Preferred Alternative (PA) and the Non-Preferred Alternatives (NPAs) described below. Note that NPA 6 is the PA that was included in the proposed rule and draft EA.

3.1 PREFERRED ALTERNATIVE (PA)

Under this alternative, NOAA Fisheries would issue a final rule that would prohibit 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 will extend 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). 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 would retain status quo outside this closed area and prohibit all leaders with stretched mesh greater than or equal to 12 inches and leaders with stringers. The area where this leader restriction would be in effect includes the Virginia waters of the Chesapeake Bay outside the aforementioned closed area, extending from the Maryland-Virginia State line (approximately 38° N. lat.), 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, to the COLREGS line at the mouth of the 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, the leader restriction applies to those 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 alternative would be in effect from May 6 to July 15 each year. Figure 3 depicts the locations of the management measures.

In addition to these restrictions, this final rule also retains the framework mechanism created by the 2002 interim final rule. Under this framework mechanism, NOAA Fisheries 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 NOAA Fisheries 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 less than 12 inches stretched mesh or that one sea turtle is entangled dead and NOAA Fisheries determines that the entanglement contributed to its death, then NOAA Fisheries may determine that additional restrictions are necessary to conserve sea turtles and prevent entanglements.

This alternative would modify the management measures previously established for Virginia pound net leaders. The year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(2)(iv) would remain in effect.

3.2 NO ACTION ALTERNATIVE

Under this alternative, which refrains from taking any additional action, the measures included in the 2002 interim final rule would remain in effect. Specifically, all pound net leaders measuring 12 inches or 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 would be restricted from May 8 to June 30. The area where this gear restriction would apply 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); and the Rappahannock River downstream of the Robert Opie Norris Jr.

Bridge (Route 3).

In addition to these restrictions, this interim final rule also created a framework mechanism by which NOAA Fisheries 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 NOAA Fisheries believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30 of any given year, the AA may extend the effective dates of the restrictions established by the regulations (for a maximum of 30 days). Additionally, if monitoring of pound net leaders during the time frame of the gear restriction, May 8 through June 30 of each year, reveals that one sea turtle is entangled alive in a pound net leader less than 12 inches stretched mesh or that one sea turtle is entangled dead and NOAA Fisheries determines that the entanglement contributed to its death, then NOAA Fisheries may determine that additional restrictions are necessary to conserve sea turtles and prevent entanglements.

3.3 NON-PREFERRED ALTERNATIVE 1 (NPA 1) – EXPANDED GEOGRAPHICAL LEADER PROHIBITION AND LEADER MESH SIZE RESTRICTIONS FROM MAY 6 TO JUNE 30

Under this non-preferred alternative 1 (NPA 1), NOAA Fisheries would issue a final rule that would prohibit all 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 will extend 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). Additionally, the rule would restrict all leaders with stretched mesh greater than 8 inches and leaders with stringers outside this closed area. The area where this leader restriction would be in effect includes the Virginia waters of the Chesapeake Bay outside the aforementioned closed area, extending from the Maryland-Virginia State line (approximately 38° N. lat.), 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, and from the Chesapeake Bay Bridge Tunnel to the COLREGS line at the mouth of the Chesapeake Bay. The measures included in this alternative would be in effect from May 6 to June 30 each year.

This alternative would modify the management measures previously established for Virginia pound net leaders. The year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(2)(iv) would remain in effect.

3.4 NON-PREFERRED ALTERNATIVE 2 (NPA 2) – RESTRICTION OF LEADERS GREATER THAN OR EQUAL TO 8 INCHES STRETCHED MESH

Under this non-preferred alternative 2 (NPA 2), NOAA Fisheries would issue a rule that would restrict the use of pound net leaders with greater than or equal to 8 inches stretched mesh and leaders with stringers in the mainstem Chesapeake Bay and portions of the tributaries from May 6 to July 15 each year. The area where this gear restriction would apply 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.

This alternative would modify the management measures previously established for Virginia pound net leaders. The year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(2)(iv) would remain in effect.

3.5 NON-PREFERRED ALTERNATIVE 3 (NPA 3) – EXPANDED GEOGRAPHICAL POUND NET GEAR PROHIBITION AND LEADER MESH SIZE RESTRICTIONS

Under this non-preferred alternative 3 (NPA 3), NOAA Fisheries would issue a rule that would prohibit all parts of the pound net gear (pound, heart and leader) 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 Bay (Figure 3). The closure will extend 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). Additionally, the rule would restrict all leaders with stretched mesh greater than or equal to 8 inches and leaders with stringers outside this closed area. The area where this leader restriction would be in effect includes the Virginia waters of the Chesapeake Bay outside the aforementioned closed area, extending from the Maryland-Virginia State line (approximately 38° N. lat.), 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, and from the Chesapeake Bay Bridge Tunnel to the COLREGS line at the mouth of the Chesapeake Bay. The measures included in this alternative would be in effect from May 6 to July 15 each year.

This alternative would modify the management measures previously established for Virginia pound net leaders. The year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(2)(iv) would remain in effect.

3.6 NON-PREFERRED ALTERNATIVE 4 (NPA 4) – PROHIBITION OF ALL POUND NET LEADERS

Under this non-preferred alternative 4 (NPA 4), NOAA Fisheries would issue a rule that would prohibit the use of all pound net leaders regardless of mesh size in the Virginia waters of the mainstem Chesapeake Bay and portions of the Virginia tributaries from May 6 to July 15 each year. The area where this gear modification would apply 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.

This alternative would modify the management measures previously established for Virginia pound net leaders. The year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(2)(iv) would remain in effect.

3.7 NON-PREFERRED ALTERNATIVE 5 (NPA 5) - LEADER MODIFICATION REQUIREMENT FROM MAY 6 TO JULY 15

This non-preferred alternative 5 (NPA 5) would require that pound net 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 would be restricted to a height of one third the depth of the water at the average mean low tide. The allowable leader mesh size would be restricted to less than 8 inches stretched mesh. The panel of the mesh would be held in place with ropes greater than or equal to 3/8” in diameter strung vertically a minimum of every two feet and attached to a top line. The leader modification requirement would extend 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).

Additionally, the rule would restrict all leaders with stretched mesh greater than or equal to 8 inches and leaders with stringers outside this leader modification area. The area where this leader restriction would be in effect includes the Virginia waters of the Chesapeake Bay outside the aforementioned closed area, extending from the Maryland-Virginia State line (approximately 38° N. lat.), 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, and from the Chesapeake Bay Bridge Tunnel to the COLREGS line at the mouth of the Chesapeake Bay. The measures included in this alternative would be in effect from May 6 to July 15 each year.

This alternative would modify the management measures previously established for Virginia pound net leaders. The year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(2)(iv) would remain in effect.

3.8 NON-PREFERRED ALTERNATIVE 6 (NPA 6) - EXPANDED GEOGRAPHICAL LEADER PROHIBITION AND LEADER MESH SIZE RESTRICTIONS

Under this alternative, NOAA Fisheries would issue a rule that would prohibit all 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 will extend 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). Additionally, the rule would prohibit all leaders with stretched mesh greater than or equal to 8 inches and leaders with stringers outside this closed area. The area where this leader restriction would be in effect includes the Virginia waters of the Chesapeake Bay outside the aforementioned closed area, extending from the Maryland-Virginia State line (approximately 38° N. lat.), 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, and from the Chesapeake Bay Bridge Tunnel to the COLREGS line at the mouth of the Chesapeake Bay. The measures included in this alternative would be in effect from May 6 to July 15 each year.

This alternative would modify the management measures previously established for Virginia pound net leaders. The year-round reporting and monitoring requirements currently included in 50 CFR 223.206(d)(2)(iv) would remain in effect.

3.9 EXPANDED GEOGRAPHICAL POUND NET GEAR PROHIBITION AND LEADER MESH SIZE RESTRICTIONS FROM MAY 6 TO NOVEMBER 30 (Alternative Considered but Rejected for Further Analysis)

Pound nets are set in Virginia's Chesapeake Bay during the period of May through November, which coincides with the time when the majority of sea turtles are found in this area. Though strandings occur throughout this time period, they are concentrated significantly in the spring. NOAA Fisheries used direct observations of sea turtle entanglement in and impingement on the leaders of pound nets as a basis for the preferred alternative. These direct observations of entanglements in and impingements on pound net leaders during the spring coupled with the fact that there is a high level of strandings in the Virginia Chesapeake Bay during the spring (although a direct cause and effect relationship between the strandings and pound net fishery interactions is not now known) serve as a reasonable basis to concentrate management measures on this fishery during the spring. Certainly, given the high level of strandings in the spring and the direct observations of entanglements and impingements in and on pound net leaders during this time, it is judicious to draw the inference that pound net leaders in the area where these strandings occur is a factor in such strandings.

NOAA Fisheries 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, there is not a sufficiently defensible basis at this time to conclude that pound net leaders are responsible for high levels of sea turtle mortality during the summer and fall months. Absent such a conclusion, there is no basis to impose gear restrictions on the Virginia pound net fishery during the full time period of May through November.

4.0 AFFECTED ENVIRONMENT

4.1 Physical Environment

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 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.

4.2 Biological Environment

4.2.1 Fishery Resources

The biological resources potentially affected by this action include fishery resources. This section will focus on those fishery resources for which data are readily available, namely those targeted for commercial purposes. There may be other non-commercial species affected by pound nets however.

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 from April through June 2003 and the species targeted, while Appendix B lists the landings from July through September 2002 (VMRC web site 2003). Note that these landings data are for all Virginia state waters, not only the Chesapeake Bay. Appendix C identifies the fish species previously landed by pound nets, according to the Virginia Marine Resources Commission (VMRC) landings data. In 2002, bait fish, Atlantic croaker, and menhaden comprised 83.2% of the total catch (See Table 5.1.2.4). The species identified here are the main fishery resources potentially affected by the proposed action, but note that other types of fish species may become entangled in the pound net leaders themselves (instead of being landed from the pound).

These species are landed by a variety of gear types, including gillnets, pound nets, pots, and haul seines. Table 4.2.1.1 identifies the metric tons landed in May and June 2002 by gear type in the Virginia Chesapeake Bay, Virginia nearshore state waters, and, for comparison, the federal waters off Virginia. May and June landings are shown because those months typically have the highest number of sea turtle strandings. However, for reasons included elsewhere in this document (e.g., as included in Section 5.1.1.2), the time frame of the PA extends into July. As such, Table 4.2.1.2 denotes the metric tons landed in May, June, and July 2002 by gear type in the Virginia Chesapeake Bay, Virginia nearshore state waters, and, for comparison, the federal waters off Virginia. This data was obtained from the NOAA Fisheries NEFSC Dealer Database.

Table 4.2.1.1. Chesapeake Bay, state waters, and ocean landings in the State of Virginia for May and June 2002 by gear type.

Virginia						
May and June 2002	**Chesapeake Bay**		**State Waters**		**Ocean**	
Gear Type	Landings (metric tons)	Percent	Landings (metric tons)	Percent	Landings (metric tons)	Percent
Fish Trawl	0	-	0	-	86.3	0.4
Scallop Trawl	0	-	0	-	2,712.8	12.1
Beach Seine	165.7	0.8	4.4	1.1	0	-
Gillnet	426.8	2.2	142.1	35.6	180.1	0.8
Purse Seine	17,392.4	87.7	0	-	6,009.9	26.8
Scallop Dredge	0	-	0	-	13,311.2	59.5
Pound Nets	956.1	4.8	0	-	0	-
Fish Pots	4.6	0.02	15.6	3.9	37.4	0.2
Conch Pots	1.1	< 0.01	5.4	1.4	43.2	0.2
Crab Pots	864.5	4.4	224.7	56.4	0	-
Conch Dredge	21.6	0.1	0	-	5.1	0.02
Clam Dredge	0	-	6.5	1.6	0	-
TOTAL	19,832.8	100.0	398.7	100.0	22,386.0	100.0

Table 4.2.1.2. Chesapeake Bay, state waters, and ocean landings in the State of Virginia for May, June, and July 2002 by gear type.

Virginia						
May to July 2002	**Chesapeake Bay**		**State Waters**		**Ocean**	
Gear Type	Landings (metric tons)	Percent	Landings (metric tons)	Percent	Landings (metric tons)	Percent
Fish Trawl	0	-	0	-	138.0	0.5
Scallop Trawl	0	-	0	-	3759.2	12.5
Beach Seine	273.1	0.6	4.6	0.2	0	-
Gillnet	726.8	1.5	178.7	7.1	180.1	0.6
Purse Seine	44317.0	92.2	1910.3	75.5	6009.9	20.0
Scallop Dredge	0	-	0	-	19915.2	66.2
Pound Nets	1299.6	2.7	0	-	0	-
Fish Pots	10.2	0.02	23.0	0.9	53.4	0.2
Conch Pots	1.1	< 0.01	5.4	0.2	43.4	0.1
Crab Pots	1415.0	2.9	305.6	12.1	0	-
Picks	0	-	91.3	3.6	0	-
Conch Dredge	22.4	0.05	0	-	5.1	0.02
Clam Dredge	0	-	10.8	0.4	0	-
TOTAL	48065.2	100.0	2529.7	100.0	30104.3	100.0

Boundary Definitions for Tables 4.2.1.1 and 4.2.1.2:
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.

4.2.2 Endangered and Threatened 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.

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. 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.

Aerial surveys conducted by the Virginia Institute of Marine Science (VIMS) between 1982-1985 and 1994 indicated that an estimated 6,500 to 9,700 and 3,000 turtles, respectively, are found in Virginia's lower Chesapeake Bay waters in any given season (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. NOAA Fisheries has prepared a comprehensive review of the status of each species of sea turtle (NOAA Fisheries and USFWS 1991a, 1991b, 1992, 1993, 1995, USFWS and NOAA Fisheries 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 (NOAA Fisheries 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.

Shortnose sturgeon have been historically documented in Virginia waters, but most of the recent reported encounters have been in Maryland waters. Nevertheless, this endangered species may be present in the geographical area affected by the proposed action. While a summary of the status of shortnose sturgeon is provided in section 4.2.2.6, additional information may be obtained from the Shortnose Sturgeon Recovery Plan (NOAA Fisheries 1998b).

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 (NOAA Fisheries 1991a, 1991b, 1998a).

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 (NOAA Fisheries 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 NOAA Fisheries Southeast Fisheries Science Center (NOAA Fisheries 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 29º N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29º 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 NOAA Fisheries 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), NOAA Fisheries 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 (NOAA Fisheries 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%; NOAA Fisheries 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 (NOAA Fisheries 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, NOAA Fisheries 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 NOAA Fisheries 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 NOAA Fisheries and USFWS 1991b; B. Schroeder, NOAA Fisheries, 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 (NOAA Fisheries 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

The leatherback is the largest living turtle and ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NOAA Fisheries and USFWS 1995). Leatherback turtles feed primarily on cnidarians and tunicates and are often found in association with jellyfish. These turtles are predominantly pelagic, but 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.

Nest counts are the only reliable population information available for leatherback turtles. Recent declines have been seen in the number of leatherbacks nesting worldwide (NOAA Fisheries and USFWS 1995; F. Paladino, pers. comm.). The leatherback population was estimated to number approximately 115,000 adult females in 1980 and only 34,500 by 1995 (Spotila et al. 1996). The decline can be attributed to many factors including fisheries as well as intense exploitation of the eggs (Spotila et al. 2000). Spotila et al. (1996, 2000) record that adult mortality has increased significantly, particularly as a result of driftnet and longline fisheries. The status of leatherbacks in the Atlantic is relatively unclear. In 1996, it was reported to be stable, at best (Spotila et al. 1996), but numbers in the Western Atlantic at that writing were reported to be on the order of 18,800 nesting females. According to Spotila (2000, pers. comm.), the Western Atlantic population currently numbers about 15,000 nesting females, whereas current estimates for the Caribbean (4,000) and the Eastern Atlantic (i.e., off Africa, numbering ~ 4,700) have remained consistent with numbers reported by Spotila et al. in 1996. With regard to repercussions of these observations for the U.S. leatherback populations in general, it is unknown whether they are stable, increasing, or declining, but it is certain that some nesting populations (e.g., St. John and St. Thomas, U.S. Virgin Islands) have been extirpated.

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. Although there have been no reports of hawksbills in the Chesapeake Bay, one has been observed 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 anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while northern populations are amphidromous (NOAA Fisheries 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 the largest populations are found in the Saint John (~100,000; Dadswell 1979) and Hudson Rivers (~61,000; Bain et al. 1998).

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 September 2003, over 50 shortnose sturgeon have been reported in Maryland waters through the FWS Atlantic sturgeon reward program. 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, NOAA Fisheries, pers. comm. 2003).

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). 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 was found on October 22, 2003. The shortnose sturgeon was 138 cm total length and was released alive and apparently uninjured. 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 (NOAA Fisheries 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. 2002). 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 2002 Marine Mammal Stock Assessments (Waring et al. 2002) 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 30,990 seals. The 2002 Marine Mammal Stock Assessments (Waring et al. 2002) provides additional information about the stock and geographical range of the harbor seal.

4.2.4 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 more than 500 nesting pairs make their home in the Chesapeake Bay area (Chesapeake Bay Program 2002). 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. 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.

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. 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.

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.

4.2.5 Habitat

The Virginia waters of the Chesapeake Bay are considered Essential Fish Habitat (EFH) for various life stages of the following species under NOAA Fisheries 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). But by 1978, surveys of SAV documented only 41,000 acres. Bottom sediment SAV appeared to be making a comeback recently, but grasses decreased by 5,740 acres, or eight percent, in 1998 (Chesapeake Bay Program 2002).

4.3 Economic and Social Environment

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 4). 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 (Figure 5). 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 C identifies the species of fish that have been landed using pound net gear in Virginia. Landings by pound nets represented approximately 5 percent of the total landings in the Virginia Chesapeake Bay during May and June 2002 (956 metric tons (mt); Table 4.2.1.1), and approximately 3 percent of the total landings from May to July 2003 (1300 mt; Table 4.2.1.2). Based on 2000 to 2002 data, annual landings per fisherman were 280,996 pounds in the upper portion of the Virginia Chesapeake Bay and 257,491 pounds in the southern portion of the Chesapeake Bay (where all offshore leaders are prohibited in the PA). Annual revenues per harvester were $64,483 and $105,298 in the upper and lower region, respectively. Pound net landings from 1990 to 1999 have increased at an annual rate of 8.33 percent, while the annual revenues from pound net landings have increased by 17.31 percent (Kirkley et al. 2001).

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 NOAA Fisheries 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 netters have more than one license and as such, fish more than one net. On average, each fisherman fishes approximately 2-3 pound nets. In 2002, from May 6 to July 15, approximately 60 pound nets were fished in the waters potentially affected by the proposed alternatives. 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 years. 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. The locations of pound net sites observed during monitoring efforts in 2003 are shown in Figure 1. This geographical distribution of sites is consistent with those observed during NOAA Fisheries 2002 monitoring efforts and previous studies (Mansfield et al. 2001; Mansfield et al. 2002a). It is likely that the impacts of restricting pound net practices would be focused in these areas.

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. In the southern area of the Eastern shore, typically 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. In 2003, with the pound net leader restrictions in place, mesh size of leaders along the Eastern shore ranged from 11.5 inches in offshore nets to 6 inches in nets close to the beach.

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. Nets in shallower protected areas are usually equipped with smaller mesh leaders (less than 8 inches stretched mesh). Only a few pound nets are set upriver of the first bridge in the Virginia Chesapeake Bay tributaries. According to information provided by VMRC in 2001, in the Potomac River, three pound nets with 5 inch stretched mesh leaders are located above the Harry W. Nice Memorial Bridge (Route 301), and in the Rappahannock River, nine pound nets with small mesh leaders (approximately 4 inch stretched mesh) are set above the Robert Opie Norris Bridge (Route 3). There are currently no pound nets above the first bridge in the James River and York River.

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 selected environmental resources. 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 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 beneficial. Marine mammals present in the area subject to gear restrictions would also likely benefit from the reduced probability of entanglement. Non-marine mammal species known to be affected by the passive fishing gear are the fish species for which the gear is targeted, and birds, which have also been found to become entangled in pound net leaders. The fishing industry directly impacted is the Virginia pound net fishery.

5.1 PREFERRED ALTERNATIVE

The PA involves prohibiting all offshore pound net leaders in a southern portion of the Virginia Chesapeake Bay (hereby referred to as the "closed area") and retaining the restriction on pound net leaders with stretched mesh 12 inches or greater and leaders with stringers in the remainder of the Virginia Chesapeake Bay (hereby referred to as the "leader restricted area") between May 6 and July 15. Those fishermen that use leaders affected by this alternative must remove their leaders (if they are in the closed area) or if they are in the leader restricted area, retain status quo by remove their 12 inch or greater mesh and stringer leaders from the water during the proposed time period of the regulation or switch to a smaller mesh size. This alternative also contains a framework mechanism by with NOAA Fisheries may change or extend the time frame of the restrictions in order to protect sea turtles on an expedited basis.

The specific gear modifications contained in the preferred alternative are described in the Biological Impacts Section with a description of the risk reduction benefit. The economic and social impacts are also discussed in the associated sections.

5.1.1 Biological Impacts

5.1.1.1 Fishery Resources

In the closed area, with no leaders to guide the fish, fewer fish would likely be caught in these pounds. 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. In the leader restricted area, there will be no additional impacts to fishery resources beyond those impacts that have occurred and were analyzed in years past. For instance, should the fishermen in the leader restricted area using greater than or equal to 12 inches stretched mesh choose to remove their leaders, fewer fish would likely be caught in these pounds as well. However, fish may continue to be caught by other pound nets with smaller mesh sizes. Should the affected industry participants in the leader restricted area switch to smaller leader mesh sizes instead of electing to not fish with leaders, they may catch the same amount of fish as with large mesh leaders. Switching to a smaller mesh leader should not have any notable impacts to fishery resources. In both the closed area and the leader restricted area, fish may continue to be caught by other commercial and recreational fishing gear. As such, the PA may temporarily 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 NOAA Fisheries 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; NOAA Fisheries 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. However, based upon monitoring data, it appears that fishery resources may become entangled in a range of leader mesh size (Mansfield et al. 2002a; NOAA Fisheries unpublished data). Should the affected industry participants switch to smaller leader mesh sizes instead of electing to not fish, they may entangle the same amount of fish as with leaders with 12 inches and larger stretched mesh. Therefore, the PA may benefit fishery resources to some extent, but those benefits are not expected to be extensive as fish may still be captured by pound net fishermen or other commercial or recreational fishermen or become entangled in smaller mesh leaders.

If NOAA Fisheries 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.

If NOAA Fisheries implements additional restrictions to further protect sea turtles, such as either the restriction of leaders greater than or equal to 8 inches stretched mesh or all pound net leaders regardless of mesh size, it is possible that fishery resources will be impacted in a positive manner. There are more fishermen who fish with leaders greater than or equal to 8 inches, than those who fish with leaders greater than or equal to 12 inches. If NOAA Fisheries obtains information that warrants a restriction of pound net leaders greater than or equal to 8 inches, those fishermen may either switch to a smaller mesh leader or elect to stop fishing with leaders. Should the fishermen choose to remove their leaders, fewer fish would likely be caught in these pounds. If fewer fish are caught in pound nets, there may be more fish in Virginia waters. However, these fish may continue to be caught by other pound nets with smaller mesh sizes, or other commercial and recreational fishing gear. As such, it is unlikely that the implementation of additional restrictions on 8 inches or greater stretched mesh, which could reduce fish catches in certain pound nets (if fishermen choose to remove their leaders instead of switching to smaller leaders), would greatly improve the fish stocks in Virginia waters. Furthermore, should the affected industry participants switch to smaller leader mesh sizes instead of electing to not fish, they may catch and entangle the same amount of fish as with leaders smaller than 8 inches stretched mesh.

Conversely, if NOAA Fisheries 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.

5.1.1.2 Endangered and Threatened Species

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 reduce sea turtle interactions with pound net leaders. While threatened loggerheads are the most common species found entangled in and impinged on pound net leaders and stranded on Virginia beaches, endangered Kemp's ridley, leatherback, and green sea turtles have also been documented in Virginia state waters and may become entangled in pound net leaders as well. While hawksbill turtles are not common in the affected area, this species would have the same likelihood of entanglement in pound net leaders as other species should it occur in Virginia waters. 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 NOAA Fisheries cannot quantify this role at this time.

Historical Sea Turtle/Pound Net Interactions
High turtle mortalities in late May and early June in Virginia have previously been attributed to entanglement in large mesh pound net leaders in the Chesapeake Bay (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). A pound net survey in the 1980s documented "many dead loggerheads and one [Kemp's] ridley hung by heads or limbs in area poundnet hedging [leaders]" (Lutcavage 1981). Bellmund et al. (1987) states that entanglements in pound net leaders began in mid-May, increased in early June, and reached a plateau in late June. In 1984, no entanglements were observed after late June. Data collected in 1983 and 1984 found that in 173 pound nets examined with large mesh leaders (defined as >12 to 16 inch stretched mesh), 0.2 turtles per net were found entangled (30 turtles; Bellmund et al., 1987). This study also found that in 38 nets examined with stringer mesh, 0.7 turtles per net were documented entangled (27 turtles). Turtle entanglement in pound nets with small mesh leaders (defined as 8 to 12 inch stretched mesh) was found to be insignificant. It appears that turtles were documented entangled in small mesh leaders during the 1983 and 1984 VIMS sampling seasons, but this report does not identify the number of turtles entangled in small mesh nets that VIMS considered "insignificant". The sampling area was concentrated in the western Chesapeake Bay, with some sampling occurring in other portions of the Virginia Chesapeake Bay.

Surveys conducted in Virginia Chesapeake Bay waters in 1979 and 1980 also found that most pound net leaders that captured sea turtles had large mesh (12 to 16 inches) and were found in the lower Bay (Lutcavage 1981). No turtles were reported entangled in mesh sizes of 8 inches or less, suggesting that some turtles were entangled in mesh between 8 and 12 inches. However, NOAA Fisheries does not have access to those data, and it could be that there were no pound net leaders with mesh ranging from 8 to 12 inches. Lutcavage (1981) also discussed potential turtle entanglement in small mesh leaders: "I believe that any runner [leader] mesh size large enough to accommodate a turtle's fin or head may entangle turtles that swim into it. I observed that smaller mesh size in hedging may snag a turtle carapace but should not immobilize the turtle...It is likely that as sea turtles encounter poundnet mesh, they struggle to escape and further entangle their heads or fins."

While smaller mesh nets were believed to pose an entanglement risk to sea turtles, prior to 2002, the degree of small mesh entanglement in Virginia pound net leaders had not been as adequately documented as entanglement in larger mesh. Small mesh entanglements have been documented in other areas however. Anecdotal information from North Carolina fishermen indicates that turtle entanglement with approximately 8 inch and greater mesh leaders can and has occurred. In the 1980s, North Carolina pound netters switched to mesh smaller than or equal to 7 inches, a coarser webbing (24-30 strand), and floating leaders, largely as a result of interactions with sea turtles in 8 inch and greater mesh leaders, and found that entanglements were reduced. These pound nets are set in shallow, low current waters, which is not the case for many of the pound nets set in the Virginia Chesapeake Bay. While it was considered, data from North Carolina were not used to base the leader mesh size restrictions in the 2002 interim final rule, because NOAA Fisheries recognized that the specific conditions between waterbodies and fishing methods may vary.

Recent Sea Turtle/Pound Net Interactions
In recent years, sea turtles have also been documented in Virginia pound net leaders. During the spring of 2001, with limited monitoring effort, a NOAA Fisheries observer reported finding five moderately to severely decomposed loggerhead turtles against four different large mesh pound net leaders (approximately 13 inch mesh) on the Eastern shore in early June. The turtles were not conclusively determined to be entangled in the leaders, and the cause of death was uncertain. The four pound nets were set in deep water (approximately 25 feet) and were the farthest out in the water relative to the other smaller mesh nets in the area. VMRC law enforcement agents also documented one live and three dead sea turtles in pound net leaders along the Eastern shore during the spring of 2001. The live turtle was entangled in a leader with greater than 12 inches stretched mesh, but the leader mesh size of the other entanglements was not recorded. Additionally, during June of 2000, VMRC law enforcement agents reported disentangling two live sea turtles from two Eastern shore leaders with greater than 12 inches stretched mesh.

As mentioned earlier, NOAA Fisheries conducted pound net monitoring in the spring of 2002 and 2003 to learn more about the interactions between sea turtles and pound net leaders. These efforts documented the entanglement and impingement of sea turtles on pound net leaders with various mesh sizes. During the past two years, 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. As NOAA Fisheries is not certain as to the cause of death of those 5 sea turtles (i.e., mortality may or may not be pound net related) given their decomposition state and lack of wrapped, entangled line around their extremities, they will not be considered further in this section.

Table 5.1.1.2.1 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. There were 6 entanglements in leader mesh sizes not restricted by the 2002 interim final rule (8 and 11.5 inches stretched mesh) and several larger mesh and stringer entanglements prior to the enactment of the 2002 restrictions on greater than or equal to 12 inch mesh leaders and stringers. One of these entanglements occurred in a nearshore net (outside the closed area of the PA), and the rest were found in offshore nets. Again note that pound net monitoring was only 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.

Table 5.1.1.2.1
Entangled sea turtles observed during pound net leader monitoring in 2002 and 2003.

Date	Species	Disposition	Leader stretched mesh size	Location of entanglement	Geographic location[1]
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. One additional Kemp's ridley sea turtle is anticipated to be necropsied (found in May 2003); NOAA Fisheries is waiting for the necropsy results from this animal. The other two dead animals were left in situ to monitor their status. Necropsy results obtained from 3 of the 7 turtles showed that the turtles had adequate fat stores, full stomach and/or intestines, and no evidence of disease. For the case of one of these 3 turtles (Kemp's ridley), a necropsy by the Armed Forces Institute of Pathology found that "the animal was active and in good nutritional condition at the time of death" and concluded that entrapment in fishing gear was the cause of death. One of the 4 necropsy reports only stated that the turtle was female with nematodes and digested tissue in its digestive tract. Based upon available information, NOAA Fisheries concluded that the death of these 7 turtles was attributable to entanglement in the pound net leaders given the tight multiple wrapping of line

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

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 5.1.1.2.2 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 shelled sea turtle. Only one turtle was found dead. All of the impingements in 2003 (n=12) occurred on leaders in compliance with the 2002 interim final rule.

Table 5.1.1.2.2. Observed impingements during pound net leader monitoring in 2002 and 2003.

Date	**Species**	**Disposition**	**Leader stretched mesh size**	**Location of impingement (approx. depth)**	**Geographic location[2]**
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)[3]	11.5"	5 ft below surface	Eastern shore, offshore net
June 2003	Loggerhead	Alive	8"	Surface	Eastern shore, offshore net

[2]All of these observed impingements were located within the closed area of the PA.

[3]Note that in the draft EA, this animal was classified as "Dead (fresh to moderately decomposed)". Based upon a monitoring summary report, it was not clear whether the dead animal was fresh or moderately decomposed, a distinction that is usually easily made. NOAA Fisheries further reviewed the observer report and comments, and revised the condition of this animal as the original report stated that the animal was fresh dead.

June 2003	Unknown	Alive, but condition unknown[4]	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

The observation of impingements is noteworthy given that sea turtles would only remain on the leader, untangled, for the duration of the tidal cycle. If an animal was impinged on a leader by the current with its flippers inactive, based on observations of impinged sea turtles, NOAA Fisheries 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. Those dead animals 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).

Forced submergence 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). A study examining the relationship between otter

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[4]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.

trawl tow time and sea turtle mortality showed that mortality was strongly dependent on trawling duration, with the proportion of dead or comatose turtles rising from 0% for the first 50 minutes of capture to 70% after 90 minutes of capture (Henwood and Stuntz 1987). However, metabolic changes that can impair a sea turtles ability to function can occur within minutes of a forced submergence. While most voluntary dives appear to be aerobic, showing little if any increases in blood lactate and only minor changes in acid-base status, the story is quite different in forcibly submerged turtles where oxygen stores are rapidly consumed, anaerobic glycolysis is activated, and acid-base balance is disturbed, sometimes to lethal levels (Lutcavage and Lutz 1997). While a public comment on the proposed rule noted that sea turtles in Virginia have been found to dive for durations of 40 minutes under normal conditions, it is unlikely that struggling, physiologically stressed animals in fishing gear would do the same. Forcibly submerged turtles rapidly consume their oxygen stores (Lutcavage and Lutz 1997). In forcibly submerged loggerhead turtles, blood oxygen was depleted to negligible levels in less than 30 minutes (Lutz and Bentley 1985 in Lutcavage and Lutz 1997). Forced submergence of Kemp's ridley sea turtles in shrimp trawls resulted in an acid-base imbalance after just a few minutes (times that were within the normal dive times for the species) (Stabenau et al. 1991). The rapidity and extent of internal changes are likely functions of the intensity of underwater struggling and the length of submergence. For instance, oxygen stores were depleted within 15 minutes in tethered green sea turtles diving to escape (Wood et al. 1984 in Lutcavage and Lutz 1997). Recovery times for acid-base levels to return to normal may also be prolonged. Henwood and Stuntz (1987) found that it took as long as 20 hours for the acid-base levels of loggerhead sea turtles to return to normal after capture in shrimp trawls for less than 30 minutes. This effect is expected to be worse for sea turtles that are recaptured before metabolic levels have returned to normal. Respiratory and metabolic stress due to forced submergence is also correlated with additional factors such as size and activity of the turtle, water temperatures, and biological and behavioral differences between species. For instance, the National Research Council (1990) suggested that physical and biological factors that increase energy consumption, such as high water temperatures and increased metabolic rates characteristic of small turtles, would be expected to exacerbate the harmful effects of forced submergence from trawl capture. Forced submergence from impingement on pound net leaders is likely comparable to forced submergence in other kinds of fishing gear, given that both instances involve sea turtles unable to reach the surface in a relatively stressful situation.

In 2002 and 2003, 6 live impingements occurred near the surface, but 7 turtles were found underwater, unable to reach the surface to breathe, with an average of 3 hours until slack tide. Several of the sea turtles were observed struggling. It is likely that if a turtle could not breathe from the position where it was impinged on the net, it would have a low likelihood of survival if it remained on the net for longer than approximately one hour. Besides the one specimen of an unknown species of sea turtle found in June 2003, the turtles observed impinged in 2002 and 2003 were not observed moving vertically on the net, given that in most cases, at least one of their flippers were rendered inactive as they were held against the net. Often these turtles were held against the nets by very slight, almost slack, currents. It is unknown how long those animals were impinged on the net before being observed. It could be that those animals were held against the net for more than approximately an hour and when observed impinged with the slight current, they were already in a compromised state. If a turtle remains alive until slack tide, it can be assumed that it would survive. 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.

Impingements occur when the sea turtles are held against the net by the current. Given that impingements occurred in areas where the currents are considered “strong” and on varying mesh sizes during monitoring efforts in 2002 and 2003, it is reasonable to conclude that impingements could occur on leaders in the areas where impingements have been documented. A leader with 6 or 7.5 inches stretched mesh (or smaller) will likely have the same probability of impinging a sea turtle as an 8 inch mesh leader if it is set in the same area where impingements have been previously documented (e.g., offshore nets in the southern portion of the Eastern shore, where currents appear to be strong). At this time, NOAA Fisheries cannot determine the current strength that results in impingements, but available monitoring data show that impingements have only occurred in certain areas, locations where observer reports and anecdotal information suggest currents are “strong”.

Caveats Associated with Sea Turtle/Pound Net Interactions
It should be noted that 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. 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.

In 2001 and 2002, side scan sonar was used to attempt to detect sub-surface sea turtle entanglements; no verified sea turtle acoustical signatures were observed during these surveys (Mansfield et al. 2002a; Mansfield et al. 2002b). In 2001, 7 days of side scan sonar surveys were completed by VIMS from May 24 through August 3 (with no surveys completed from June 24 to July 22 due to weather), for a total of 825 images for the 55 active pound net leaders surveyed (Mansfield et al., 2002a). In 2002, 9 days of surveys were conducted from May 22 to June 27, for a total of 1848 images for the 61 active pound net leaders surveyed (Mansfield et al., 2002b). In 2001 and 2002, surveys were conducted almost equally in the Western Bay and along the Eastern shore. The use of side scan sonar as a means to detect sub-surface sea turtle entanglements may have potential, but additional research on sub-surface interactions is needed. Mansfield et al. (2002a, 2002b) state that a number of factors may 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. NOAA Fisheries recognizes that survey scheduling was limited by the weather and sea conditions, but considers that side scan survey results may continue to be affected by water turbidity, the size and decomposition state of the animal, and the orientation of the turtle in the net. These issues must be addressed in future surveys before conclusively determining that sea turtles are not in pound net leaders sub-surface. NOAA Fisheries conducted forward searching sonar testing in April 2003 to further explore the issue, but due to technical difficulties (e.g., narrow band width, time needed to familiarize staff with equipment and image interpretation, scheduling), testing had to be curtailed while visual monitoring was conducted. Additional sonar testing is anticipated to be conducted in the spring of 2004. While most of the previously observed sea turtles were found near the surface in NOAA Fisheries surveys, it remains unclear whether the visual surface monitoring biased the location of the take results.

Sea turtles may be found throughout the water column given their preferences for water temperature (e.g., generally greater than 11° C) and foraging (e.g., loggerheads and Kemp’s ridleys in Virginia waters are primarily benthic foragers). For instance, according to STSSN reports, most stranded turtles in Virginia that have been necropsied in recent springs have had relatively good fat stores, suggesting that they have been foraging. 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 (2003) 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 (2003, 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 (e.g., approximately 6 feet). While the percentage of time sea turtles spend at the surface compared to at depth is still being clarified, sea turtles may be found throughout the water column. Pound net leader characteristics are generally consistent from top 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. It is possible that more sea turtles are in pound net leaders than are observed or reported.

A pound net survey in the 1980s determined that based upon constriction features on stranded turtles, some beached carcasses had previously floated free of pound net leaders and that it was plausible that unidentified pound net leader deaths could account for many of the carcasses for which no mortality sources have been identified (Lutcavage 1981). However, if a turtle is moderately to severely decomposed, it is unlikely that constriction wounds would be visible. Five turtles entangled in pound net leaders were examined during 1984 and none of these turtles became disentangled by natural causes, but instead completely decomposed in situ within five weeks (Bellmund et al. 1987). In 2002 and 2003, NOAA Fisheries observers left 3 of the documented dead entangled sea turtles in the leaders to monitor the status. These turtles were fresh dead to moderately decomposed. One of the turtles was gone when observed 3 days later, another fell out after 9 days when its flipper tore away from its body, and another turtle was still in the leader 5 days later but in a severely decomposed condition. While additional information is necessary to adequately determine how often sea turtles become disentangled from pound net leaders, it is plausible that turtles may become dislodged from pound net leaders either by the strong current in certain areas of the Chesapeake Bay, by the decomposition process, or by fishermen disentangling dead sea turtles if detected. This theory needs to be explored. Based upon information such as the decomposition stage of the sea turtle, the position of the turtle in the leader, and the monitoring schedule of pound net leaders, some sea turtles found in association with pound net leaders during 2002 may have washed into the leader post-mortem. However, they may also have become entangled in or impinged on a neighboring pound net leader, drowned, and drifted into a different leader. Nevertheless, there have been several documented sea turtle entanglements in leaders that were determined to have caused mortality by drowning, there have been observations of live turtles entangled in leaders under water, and there have been sea turtles found alive and impinged on leaders both at the surface and under the water.

It should also be noted that during the public comment period, 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, NOAA Fisheries 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 NOAA Fisheries 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.

Time Frame of the PA

The dates of the gear restriction were determined from previous sea turtle strandings data collected on Virginia beaches. 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 21 (2002), 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. Information received from the Commonwealth of Virginia in response to the March 29, 2002 proposed rule (67 FR 15160) shows that in approximately 8 years prior to 2001, the date of the first turtle stranding was earlier than May 15. This also supports the implementation of the leader restrictions in early May.

Water temperature data also support the enactment of the proposed measures on May 6. Mansfield et al. (2001) and Mansfield and Musick (2003) state that VIMS analyses estimated that sea turtles migrate into the Chesapeake Bay when water temperatures warm to approximately 16 to 18° C. 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. Generally, sea turtles frequent waters as cool as 11° C (Epperly et al. 1995). From 1999 to 2003, the average water temperature on May 6 at the NOAA National Ocean Service Kiptopeke, Virginia station was 15.7° C, with average water temperatures increasing to 16.3° C on May 7 and 17.1° C on May 8. An additional analysis conducted by the NOAA Fisheries Southeast Fisheries Science Center found that in week 18 (April 30 to May 6) and week 19 (May 7 to May 13), approximately 85 percent and 90 percent, respectively, of the area encompassing the mouth of the Chesapeake Bay (from the COLREGS line to the 20 m depth contour) contained sea surface temperatures of 11° C and warmer (NOAA Fisheries, unpub. data, 2003). This indicates that water temperatures around the mouth of the Chesapeake Bay are well within sea turtles' preferred temperature range in early May and, therefore, supports the effective date of the PA.

The only directed study on temporal entanglements dates back to the 1980s, and the sampling area was concentrated in the western Chesapeake Bay. 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. In 1984, surveys were conducted through September, and no entanglements were observed after late June. Bellmund et al. (1987) further stated that this data suggest pound nets impose mortality threats to sea turtles in the Chesapeake Bay for a relatively short period of the year even though most sea turtles reside in the Chesapeake Bay from May through October. Monitoring for sea turtle strandings has continued outside the time frame of NOAA Fisheries pound net observations (e.g., from mid-June to July). As mentioned, typically the peak of Virginia strandings has been from mid-May to mid-June, with strandings typically remaining at high elevated levels until June 30. However, 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). 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). Bellmund et al. (1987) state that the "use of string leaders in pound nets should be discouraged or outlawed by appropriate management agencies from May through September through the Chesapeake Bay." Given the available data, NOAA Fisheries does not believe that prohibiting the use of stringer leaders (and other mesh leaders that have been shown to entangle sea turtles) in the later summer months is necessary at this time.

While there is some concern that entanglements could continue throughout the sea turtle residency period in the Chesapeake Bay, based upon the available data on sea turtle entanglements and impingements and stranding patterns, it appears that the greatest potential impact of pound net leaders on sea turtles occurs during May and June, and extends into the first half of July. Given the variability in the stranding peak and the need to be protective of these listed species, the PA extends to July 15. Enacting the proposed gear restriction during this time period should reduce sea turtle takes in the pound net fishery during the spring in Virginia.

Benefits to Sea Turtles
NOAA Fisheries 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. Entanglements in and impingements on pound net leaders have been documented on leaders with as small as 8 inch stretched mesh. 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). During 2003 monitoring efforts, there were few active pound nets found in the southern Chesapeake Bay outside the Eastern shore and Mobjack Bay areas. The area where leaders would be prohibited was defined to exclude those pound nets in locations where sea turtles have never been found impinged, despite monitoring efforts. Only one sea turtle was found entangled in a leader outside the closed area, and that occurred along the Eastern shore in an 8 inch stretched mesh leader. The geographical leader prohibition component of the PA is proposed 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.

As mentioned, based upon available analysis, NOAA Fisheries cannot make a determination of the mesh size threshold, below 12 inches, that would be protective of turtles. It does not appear that reducing mesh size, from 12 inches to eight inches, has a significant conservation benefit to turtles. This statement is based upon the comparison of entanglements to impingements ratios. The probability of a sea turtle interaction with a leader less than 12 inches stretched mesh size may in fact be a function of where the net is set (e.g., offshore in swift moving currents), and if leaders with mesh measuring 7.5 inches can be used in these areas, it is possible that a sea turtle would have the same likelihood of entanglement and impingement. Without additional analysis, and perhaps data collection, NOAA Fisheries is not able to identify the relationship between mesh size and turtle interaction rates, other than the relationship between stretched mesh size of 12 inches and greater and sea turtle entanglements (Lutcavage 1981; Bellmund et al., 1987). Retaining the status quo leader mesh size restrictions outside the closed area should still serve to protect sea turtles to some extent, even though that extent cannot be quantified. It should be noted that sea turtles may continue to be entangled in leaders with less than 12 inches stretched mesh outside the closed area. One turtle was found entangled outside the leader prohibited area in two years of monitoring. Additionally, given that gillnets with less than 8 inches stretched mesh have been found to entangle sea turtles (Gearhart 2002), there is the possibility that entanglements in leader mesh smaller than 8 inches stretched mesh could occur. However, the differences between gillnet gear and pound net leaders (e.g., monofilament vs. multifilament material; drift, set, and runaround vs. fixed stationary gear; gilling vs. herding fishing method) likely factor into the potential for sea turtle interactions and should be considered in any mesh size comparison. NOAA Fisheries believes sea turtle impingements on pound net leaders outside the leader prohibited area would be unlikely, given the lack of observed impingements on pound net leaders in that area, which appears to be related to geographical location and current strength.

NOAA Fisheries recognizes that there were not the same number of entanglements/impingements documented as the number of strandings. Due to the monitoring caveats discussed earlier, one would not expect to find the same number. NOAA Fisheries acknowledges that other factors likely contribute to spring sea turtle mortality in Virginia. The level of sea turtle interactions with other potential mortality sources (e.g., other fisheries or vessels) has not yet been determined as few takes have been documented, but NOAA Fisheries has data showing that pound net leaders result in sea turtle entanglement and impingement. NOAA Fisheries believes that it is likely that pound nets contribute to the high sea turtle strandings documented each spring on Virginia beaches.

The PA also contains a framework mechanism in which NOAA Fisheries 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, NOAA Fisheries may implement additional restrictions as deemed necessary, including the prohibition of pound net leaders with stretched mesh greater than or equal to 8 inches, or the prohibition of all pound net leaders regardless of mesh size. 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.

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

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. NOAA Fisheries 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 2003, 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. NOAA Fisheries 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, the PA would minimize this potential because prohibiting leaders in the closed area will 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 be reduced to an unknown amount. It is likely that the active nets found outside the closed area in 2003 will continue to be active, as the measures included in the PA retain status quo outside the closed area.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, the PA should not affect endangered whales.

5.1.1.3 Marine Mammals

Prohibiting the use of all pound net leaders in a portion of the Chesapeake Bay and retaining the restriction on leaders with 12 inches stretched mesh in another portion of the Bay may have a beneficial effect on marine mammals, in particular bottlenose dolphin. The species most affected by this proposed action is the Western North Atlantic stock of coastal bottlenose dolphin (bottlenose dolphin). Harbor porpoise and harbor seals may be in the Virginia Chesapeake Bay waters during the spring and may be affected by the PA, but their occurrence is anticipated to be relatively infrequent.

The Virginia pound net fishery is listed as a Category II fishery on the Marine Mammal Protection Act List of Fisheries (68 FR 1414, January 10, 2003), due to the documented bottlenose dolphin entanglements in pound net leaders in Virginia. Additionally, stranding data from 1993 to 2003 suggest that this fishery may have 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. Stranding network members have never observed a bottlenose dolphin in the pound itself (M. Swingle, pers. comm.).

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. 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.

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 NOAA Fisheries 2001; K. Wang, NOAA Fisheries, 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 (NOAA Fisheries 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.

It is possible that bottlenose dolphin entanglements could continue in less than 12 inches stretched mesh leaders. Nevertheless, restricting the use of certain leaders in certain areas of the Chesapeake Bay should serve to limit the interactions between pound net gear 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 will provide some benefit to these species, but the magnitude of the benefit cannot be determined.

5.1.1.4 Birds

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. However, not all avian species have the potential to interact with pound nets 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 benefit the most from the PA include brown pelicans and cormorants. Monitoring efforts in 2002 to 2003 documented several dead birds entangled in leaders, hearts or pounds with varying mesh sizes, including 12 pelicans, 10 cormorants, 6 gulls, 2 gannets, 2 common loons, 1 royal tern, and 130 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. During these surveys, 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.

While avian entanglements may still occur in the pound or heart, prohibiting leaders in the closed area should reduce some of the bird entanglement that has previously been documented. The PA would benefit pelicans and cormorants and any other birds that may interact with pound nets. Retaining status quo outside the closed area would result in the continuation of avian entanglement as experienced in 2003. If affected fishermen decide to switch to leaders with smaller than 12 inches stretched mesh in the leader restricted area (which they are likely to have done already), there would not be any change in the number of pound net leaders, rather just a change in the mesh size of those pound net leaders. NOAA Fisheries 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 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. NOAA Fisheries 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 during 2002 and 2003 does not represent total mortality to these species, as surveys documented only a portion of total fishing effort. NOAA Fisheries 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.

5.1.1.5 Habitat

NOAA Fisheries believes that the PA would have only minor impacts on bottom vegetation and habitat. If any impact occurs, it may result when the fishermen remove their leaders to comply with the restriction. Removing 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 normal fishing activities. The magnitude of the habitat disruption is also relatively small; the PA would impact, at maximum, approximately 12 pound net leaders throughout the Virginia Chesapeake Bay waters. 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 of the leaders) that 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.

5.1.2 Economic Impacts

Seven alternatives are evaluated in this document, in addition to the “no action” alternative. Under the PA, management actions are being proposed for two distinct areas of the Virginia Chesapeake Bay. In a southern part of the Chesapeake Bay, all *offshore* pound net leaders would be prohibited from May 6 to July 15 (the “lower bay” or the “closed area”). The PA also retains the restriction on leaders with stretched mesh greater than or equal to 12 inches and leaders with stringers from May 6 to July 15 for *lower bay nearshore* pounds and in the remainder of the Virginia Chesapeake Bay (the “upper bay” or the “leader restricted area”) . A detailed description of these 2 areas is in Section 3.1 of this document and identified in Figure 3.

As noted in Sections 3.1 to 3.7, the following alternatives are evaluated for the Virginia Chesapeake Bay in this document:

- The preferred alternative (PA) described above.

- Non-preferred alternative 1 (NPA 1) prohibits pound net leaders in the lower bay, and requires leader mesh in the upper bay to be less than 8 inches from May 6 to June 30 of each year.
- Non-preferred alternative 2 (NPA 2) requires the mesh of all leaders to be less than 8 inches from May 6 to July 15.
- Non-preferred alternative 3 (NPA 3) is similar the NPA 1, however, the pound and heart must now be removed in addition to the leader in the closed area from May 6 to July 15.
- Non-preferred alternative 4 (NPA 4) requires leaders be removed from all pound nets in the Virginia Chesapeake Bay from May 6 to July 15.
- Non-preferred alternative 5 (NPA 5) allows pound net leaders to be used in the closed area from May 6 to July 15, however, the mesh height is restricted to one third the depth of the water, the mesh must be less than 8 inches and held with ropes 3/8" or greater in diameter strung vertically a minimum of every two feet and attached to a top line.
- Non-preferred alternative 6 (NPA 6) prohibits all pound net leaders in the lower bay and requires leader mesh in the restricted area to be less than 8 inches from May 6 to July 15.
- No action (i.e., status quo).

The absolute magnitude of sea turtle protection provided by these regulatory alternatives cannot be quantified, but they can be ranked. Sea turtle protection alternatives will be ranked in the upper bay and lower bay separately. In ranking the alternatives in the upper bay, the fourth non-preferred alternative (NPA 4) would provide the most protection against sea turtle mortality since pound net leaders would be removed. As a result of removing leaders in an area, the probability of entanglement leading to mortality is considered to be much less compared to an area where leaders are allowed with mesh size restrictions. Therefore, the remaining alternatives provide less protection. At this point in time, we are unable to determine whether leader mesh sizes less than 8 inches have a different catch rate than leaders with mesh between 8 and 12 inches. As such, looking strictly at a mesh size restriction, the remaining alternatives are equivalent in sea turtle protection, except non-preferred alternative 1 (NPA 1) since it has a shorter time period restriction. Therefore, NPA 1 provides less protection than the PA and non-preferred alternatives 2, 3, and 6 (NPA 2, NPA 3, and NPA 6). NPA 5 cannot be ranked. In summary, NPA 4 provides the most sea turtle protection in the upper bay, with the PA equivalent to NPA 2, 3, and 6 providing the next lower level of protection, and NPA 1 providing the least protection.

In the lower bay, non-preferred alternatives 3 (NPA 3) and 4 (NPA 4) provide the most sea turtle protection. The trade-off between these two alternatives is that one alternative (NPA 3) removes more gear from the water (i.e., the leader, heart and pound), and the other alternative (NPA 4) extends the boundary for the removal of leaders to the COLREGS line at the mouth of the Chesapeake Bay. We assume they provide equivalent protection since we have no data to support whether they differ. Non-preferred alternative 6 (NPA 6) provides less protection than NPA 3. These two alternatives are exactly the same except NPA 3 removes more gear from the water and we assume a probability greater than zero exists that a sea turtle can drown if they are entangled or caught in the pound or the heart. We then rank the PA and NPA 1 equivalent and with a lower protection level than NPA 6. The trade off between these two alternatives is the PA removes only offshore leaders and the NPA 1 removes both offshore and nearshore leaders for a shorter time period. In the 2002 and 2003 NEFSC surveys there were 22 turtles caught in 480 offshore surveys, and 1 turtle caught in 345 nearshore surveys. Therefore, a risk of sea turtles being entangled in nearshore leaders still exists under the PA. The NPA 2 provides the least protection since we have no evidence that leaders with mesh less than 8 inches will catch less turtles than leaders with mesh greater than 8 inches. In summary, non-preferred alternatives 3 and 4 (NPA 3 and NPA 4) provide the most protection in the lower bay, followed by non-preferred alternative 6 (NPA 6), then by the equivalent preferred and non-preferred alternative 1 (PA and NPA 1), with the least sea turtle protection under non-preferred alternative 2 (NPA 2).

Both consumer surplus and producer surplus for seafood products supplied by the pound net fisheries will be affected by these sea turtle protection measures. Under the PA, one third of the harvesters in the Virginia Chesapeake Bay must remove their *offshore* leaders from the water. These harvesters will incur revenue losses plus additional labor cost to remove and place the leader back into the water after the restriction is lifted. Some harvesters have the option of modifying their gear. Gear modifications also result in additional costs to the harvesters. These sea turtle protection measures will result in revenue losses also.

A decrease in earned revenues because of not fishing will result in a reduction in quantities of seafood supplied to seafood markets which may result in higher prices to consumers. The magnitude of these changes and how the surpluses will be redistributed between consumers and producers will depend on the slopes of the respective supply and demand functions. In any case, as long as demand functions are downward sloping and supply functions are upward sloping, there is always a loss in economic surplus when regulatory costs are imposed. However, this loss in economic surplus will be minimized by selecting the least costly regulatory alternative which provides a sufficient level of protection.[5]

Since the PA would only affect a portion of the pound net fishery's average annual landings (381,000 pounds or 4.7% of annual landings), the effect on regional seafood markets would probably be negligible, as would the impact on seafood prices and consumer's surplus. In summary, consumer surplus changes are negligible to the PA.

Data

The following data sources were used in the economic analyses: 1) 2002 trip level landings data from the state of Virginia, VMRC; 2) 2003 survey data collected by the Domestic Fisheries Observer Program at the NOAA Fisheries Northeast Fisheries Science Center (NEFSC), Woods

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[5] We choose to minimize cost subject to a sufficient level of protection versus maximizing protection subject to cost, because we can not measure marginal changes in protection between alternatives.

Hole, Massachusetts; and 3) cost data from a local harvester fishing pound nets in the Virginia Chesapeake Bay (Gear specialist, NEFSC, pers. comm.).

VMRC Data

Trip level data supplied by the state of Virginia includes the pound net owner, the reporting date, amount of gear fished, total landings and value by species, and the water body fished. The landings value is determined by the state. A monthly dockside price is computed by averaging the dockside price all dealers payed within the state. The value of a species on a trip ticket is the product of the total landings reported by the owner and the computed average monthly price. This value is potentially downwardly biased since some fishers process their own fish and therefore receive a price two to three times greater than the dockside price (Gear specialist, NEFSC, pers. comm.).

Two areas of the Virginia Chesapeake Bay are being evaluated for two separate management actions. VMRC landings data are subdivided into an upper and lower region of the Virginia Chesapeake Bay. The upper region consists of areas 308, 309, 317, 353, 345, 358, 346 and 374 (Figure 6). The lower region of the bay consists of areas 306, 307, 347, and 371.[6] Harvesters fishing in the northern area of 306/307 and south of the Chesapeake Bay bridge, are under the same management action as harvesters in the upper region, however their landings data could not be separated out from the lower bay region. Landings south of the Chesapeake Bay bridge include landings reported in areas 306/307 and landings in state waters on the ocean side. There were no pound net landings in state waters on the ocean side of the Chesapeake Bay. Data did show that some harvesters fishing pound nets inside the bay also fished gillnet gear in ocean side state waters (Figure 6. Area 631).

2003 NEFSC Gear Survey

Data collected by NEFSC observers include the location of pound nets in the Chesapeake Bay, the tag number of the pound, the mesh size of the leader, the status of the pound (active or inactive), and information on turtle entanglements, impingements and mortalities. Pound nets that are classified as inactive have all netting removed and only the poles are in the water. Active pounds have netting attached to the poles. Gear information was collected at the end of April 2003.

The 2003 gear survey by NEFSC identified 101 individual pounds of which 45 were recorded as in-active and 56 were active at the time of the survey (Table 5.1.2.1). Of the active pound nets, all leaders had mesh less than 12 inches, and 8.8% (=3/34) and 77.0% (=17/22) of the leaders were fished with mesh 8 inches or greater in the upper and lower bays, respectively. Additionally, of the active pound nets surveyed, 88% (=30/34) and 41% (=9/22) of the pounds

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[6]According to the 2002 VMRC data, there are no pound net landings in areas 339, 363 and 336 from May 6 to July 15.

were fished offshore in the upper and lower bays, respectively.

In the 2002 and 2003 NEFSC surveys, pound nets were monitored 838 times. There were 22 turtles impinged/entangled in 480 offshore pound net monitoring trips and 1 turtle was impinged/entangled in 345 nearshore pound net monitoring trips. Thirteen monitoring trips did not specify the location of the net.

Table 5.1.2.1. Number of inactive pound nets and active pound nets surveyed with leader mesh less than 8 inches (L.M. lt 8") and greater or equal to 8 inches (L.M. ge 8") by region.

Region	Inactive Pound nets	Active Pound nets			Total Pound nets Surveyed
		L.M. lt 8"	L.M. ge 8"	Total	
Upper	18	31	3	34	52
Lower	27	5	17	22	49
Total	45	36	20	56	101

Table 5.1.2.2 Number of active offshore and nearshore pound nets surveyed by region in 2003

Region	Offshore	Nearshore	Total Pound nets Surveyed
Upper	30	4	34
Lower	9	13	22
Total	38	17	56

Pound Net Cost Data

The cost data used within this analysis is based on personal conversations with a local harvester. The specific tasks of interest were the cost of (1) removing the leader from the water and placing it back after management restrictions are lifted; 2) removing and replacing the leader, heart and pound; and 3) the total cost of replacing the leader with new mesh. A cost differential was identified between nearshore and offshore pounds, with offshore pounds having higher labor and material costs.

The total cost of replacing the mesh of a leader includes material and labor costs. Total material costs are $3,441 and $6,211 to replace a nearshore and offshore leader, respectively. Materials include the cost of the new mesh, antifoulant paint, bottom chain and a new head rope. The average cost of the mesh for a leader is $1,200 (=200 lbs of mesh @ $6.00 per pound) and

$3,000 (=500 pounds of mesh @ $6.00 per pound) for a nearshore and offshore pound, respectively. Antifoulant paint costs roughly $970 for one 50 gallon drum and a nearshore pound requires one drum and an offshore pound requires two drums. As a result of offshore pounds fishing in deeper waters, the cost is larger compared to nearshore pounds. The cost of the bottom chain is approximately $945 per leader (1050 feet leader @ $0.90 per foot). Headrope materials are approximately $326 (=1050 feet of 5/8 inch headrope @ $0.31 per foot).

Labor is required for the following tasks: 1) removing the leader from the water, 2) hanging the new mesh, bottom chain and head-rope on the leader, 3) painting the mesh with anitfoulant paint, 4) placing the leader back into the water, and 5) removing the pound and heart. One scuba tank dive is needed to remove a leader, pound and heart at $250 per dive (per tide). The dive cost is the same to put a leader into the water. Labor rates are based on the April 2003 U.S. Bureau of Labor Statistics hourly rate of a manufacturing position at $15.57. An eight hour day costs roughly $125. The following costs are estimated:

1. The labor costs of removing a leader are $500 for a nearshore pound (=4 person days @ $125 per person day (pd)) and $750 for an offshore pound (=6 person days @ $125 pd).
2. The cost of hanging the new mesh on one leader is $1,250 (10 person days @ $125 pd) for both nearshore and offshore pounds.
3. The labor for painting antifoulant is $250 for nearshore pounds (2 person days @ $125 pd) and $500 for offshore pounds (4 person days @ $125 pd).
4. The labor to place a leader back into the water is equivalent to removing it.
5. The cost of removing the heart and pound nearshore is $750 (6 person days @ $125 pd) and $2,250 offshore (18 person days @ $125 pd).

The total cost of *removing a leader and putting it back in the water* after management restrictions are lifted are $1,500 for a nearshore pound (= [$500 labor to remove + $250 per scuba tank dive] * 2 actions (i.e., remove and replace)) and $2,000 for an offshore pound (=[$750 labor to remove + $250 per scuba tank dive]* 2 actions).

The total costs of *removing and replacing the leader, heart and pound* after management restrictions have lifted are $3,000 for a nearshore pound (=[$500 labor to remove leader + $750 labor to remove heart/pound + $250 per scuba tank dive]* 2 actions (i.e., remove and replace in water)) and $6,500 for an offshore pound (=[$750 labor to remove leader + $2,250 labor to remove heart/pound + $250 per scuba tank dive]* 2 actions).

The total cost of *replacing the leader with new mesh* is $4,941 for a nearshore pound (=$1,500 for labor + $3,441 for materials) and $7,961 for an offshore pound (=$1,750 hang/painting labor + $6,211 for materials). NEFSC gear data show offshore pounds have larger leader mesh compared to nearshore leaders. We assume the life of a net in a leader is approximately 5 years and materials could be paid over a 5 year period at 5% interest. The annual payment for materials would be $1,408 and $689 for an offshore and nearshore pound, respectively. Therefore, the annual cost to replace the mesh for an offshore pound would be $3,408 (=$2,000 labor + $1,408 materials) and $2,189 (=$1,500 labor + $689 materials) for an offshore and nearshore pound, respectively. Note this cost represents onshore labor and material costs. That is, labor to remove and replace the leader from the water is not included here.

These data sources, VMRC trip landings and NEFSC gear survey and cost data, were used to estimate the economic impacts of the PA in this document.

Pound Net Fishery

According to the VMRC data, there were 53 harvesters fishing pound nets in 2002; however, only 31 harvesters fished pound nets from May 6 to July 15. Since 1998, the number of harvesters fishing has steadily decreased each year. Using 1998 to 2002 data, there are 17 harvesters that have consistently fished the last five years from May to July 15. Other harvesters show landings in some years and no landings in others (Table 5.1.2.3).

Table 5.1.2.3 Number of harvesters fishing pound nets all year and from May 6 to July 15, the average active pound nets fished by year, and the average number of harvesters fishing over several years.

Year	No. of Harvesters		Active Pound nets Fished	Average No. of Harvesters	
	All Year Round	May 6 to July 15	Average (Std)	Years	May 6 to July 15
1998	74	36	1.7 (1.1)	1998-2002	17
1999	73	35	1.9 (1.1)	1999-2002	19
2000	64	30	1.8 (0.9)	2000-2002	22
2001	60	36	2.3 (1.7)	2001-2002	27
2002	53	31	2.3 (1.6)	2002	31

Harvesters within the pound net fishery landed 8.97 millions pounds of fish at a value of $2.73 million in 2002. Of this catch, 91% (8.16 million pounds) were landed by pound net gear, 4 % (0.36 million pounds) by gillnet and 4% by pot gear, with the remaining in other gear types such as hand lining. Approximately 44% of the pound net annual landings and revenues occur between May and July.

In general, the upper bay landed 65% (and 49% of revenues) and the lower bay landed 35% (and 50% of revenues) of the total catch in 2002. From May to July, the upper bay landed 27.7% (and 18.6% of revenues) and the lower bay landed 16.5% (and 24.5% of revenues) of the total catch in 2002 (Table 5.1.2.4).

Table 5.1.2.4. Total 2002 pound net landings (in 1000's of pounds) and value (i.e., estimated revenues in $1000's) with percentages by month and region.

Month	Grand Total		Upper Region				Lower Region			
	Landings	Value	Landings	% of Total	Value	% of Total	Landings	% of Total	Value	% of Total
1										
2	91.3	8.1	85.8	0.011	7.6	0.003	5.5	0.001	0.5	0.000
3	1,023.7	104.6	1,003.7	0.123	102.0	0.045	20.0	0.002	2.6	0.001
4	824.8	300.5	612.0	0.075	208.4	0.092	212.8	0.026	92.1	0.041
5	1,526.9	422.8	1,063.4	0.130	195.0	0.086	463.5	0.057	227.8	0.101
6	1,080.2	244.8	629.2	0.077	103.6	0.046	451.0	0.055	141.2	0.063
7	1,002.7	305.9	570.2	0.070	122.1	0.054	432.5	0.053	183.8	0.081
8	1,369.8	393.5	612.8	0.075	136.8	0.061	757.0	0.093	256.7	0.114
9	722.7	259.3	366.5	0.045	118.0	0.052	356.2	0.044	141.3	0.063
10	391.4	163.4	232.5	0.029	74.5	0.033	158.9	0.019	88.9	0.039
11	89.2	42.1	81.0	0.010	33.8	0.015	8.2	0.001	8.3	0.004
12	32.4	11.3	30.7	0.004	9.0	0.004	1.7	0.000	2.3	0.001
Total	8,155.1	2,256.3	5,287.8	0.648	1,110.8	0.492	2,867.3	0.352	1,145.5	0.508

Bait, Atlantic croaker, and menhaden contribute 83.2% of the total annual catch in 2002. Approximately 2.72 million pounds of bait (33.4%), 2.66 million pounds of Atlantic croaker (32.6%), and 1.4 million pounds of menhaden (17.2%) were landed. However, the ranking of revenues by species does follow the ranking of total landings. For example, 33% of total landings are bait, however bait only contributes 7.9% of revenues. Approximately 80% of revenues are based on landings of Atlantic croaker (37.7%), sea trout (18.2%), flounder (10.0%), menhaden (9.2%) and sea bass (5.0%).

Under the PA time period, May 6 to July 15, all harvesters together (i.e., the industry) earn approximately 31.6% (=$0.351/$1.110 million) and 37.9% (=$0.434/$1.146 million) of their annual revenues in the upper and lower bay (Table 5.1.2.5), respectively. In the upper bay, 94% of the catch landed is comprised of the following 4 species: bait (52.2%), Atlantic croaker (17.8%), flounder (2%), and menhaden (24.0%). These landings account for 85% of the revenues at this time (Table 5.1.2.4). In the lower bay, sea trout contributes the most to total revenues (50%). Approximately 83% of the lower bay catch is comprised of bait (13.4%), Atlantic croaker (39.7%), and sea trout (29.4%). These landings account for 77% of revenues.

Table 5.1.2.5. 2002 pound net landings (LB in 1000's), value (i.e., revenues in $1000's) and average price per pound ($/LB) by region and species.

	May 6 to July 15, 2002									
	Upper Region					Lower Region				
Species Landed	LBs	%	Value	%	$/LB	LBs	%	Value	%	$/LB
Bait	1,018.2	0.522	55.3	0.158	0.05	143.3	0.134	7.3	0.017	0.05
Blue Crab	0.3	0.000	0.3	0.001	1.00	0.5	0.000	0.9	0.002	1.80
Blue Fish	15.2	0.008	3.6	0.010	0.24	9.5	0.009	2.7	0.006	0.28
Catfish	0.3	0.000	0.2	0.001	0.67					
Atl.Croaker	346.7	0.178	101.0	0.288	0.29	424.3	0.397	99.2	0.229	0.23
Flounder	38.9	0.020	73.9	0.210	1.90	11.4	0.011	19.9	0.046	1.75
Herring	0.1	0.000	0.0	0.000		4.2	0.004	0.8	0.002	0.19
Menhaden	467.9	0.240	68.1	0.194	0.15	25.8	0.024	3.7	0.009	0.14
Other	8.0	0.004	4.1	0.012	0.51	55.5	0.052	15.4	0.036	0.28
Spade	1.1	0.001	1.1	0.003	1.00	4.4	0.004	3.7	0.009	0.84
Spanish Mackerel	19.0	0.010	13.7	0.039	0.72	36.8	0.034	27.4	0.063	0.74
Spot	14.4	0.007	8.7	0.025	0.60	6.5	0.006	4.0	0.009	0.62
Star	0.3	0.000	0.4	0.001	1.33	21.0	0.020	23.7	0.055	1.13
Sea Trout	10.3	0.005	8.5	0.024	0.83	314.3	0.294	216.4	0.499	0.69
Sea Bass	5.0	0.003	11.8	0.034	2.36	2.9	0.003	6.7	0.015	2.31
Shad	3.8	0.002	0.3	0.001	0.08	7.2	0.007	1.8	0.004	0.25
White Perch	0.2	0.000	0.1	0.000	0.50					
Total	1,949.7	1.00	351.1	1.000		1,067.6	1.000	433.6	1.000	

<u>Method</u>
The following management actions are evaluated within this document: 1) the leader must be removed from a fishing area; 2) the leader, pound and heart must be removed from a fishing area; and 3) leaders with stretched mesh greater or equal to eight inches are prohibited. The alternatives within this EA are comprised of these 3 actions, however, the temporal application and actions to particular regions will vary across the alternatives. For example, a temporal change could be shortening the closure time period. An action change may involve evaluating the difference between prohibiting leaders from an area or prohibiting the mesh from being eight inches or greater in the same area. This section ends with an explanation of how we measure the impact of these management actions on a harvester’s revenues, cost and profits.

Leaders removed
The first action presented requires the removal of leaders. Although harvesters may catch some fish without leaders, we do not have any data to support the different catch rates. Therefore we assume harvesters will not fish, which is the worst case scenario. VMRC data from 2002 are used to estimate the number of harvesters potentially fishing in the region during the proposed time

period from which we can estimate potential landing and revenue losses.[7] In addition to revenue losses, the harvester must incur the cost of removing the leader and placing it back in the water when restrictions are lifted. The cost of removing a leader was presented in the proceeding data section.

Leader, heart and pound removed
In the second action, the harvester must remove the leader, heart and pound. Revenue losses are the same as those estimated for the removal of the leader. However, additional costs will be incurred to remove the heart and pound. The additional cost for removing the heart and pound are presented in the data section.

Leaders with mesh 8 inches or greater are prohibited
The third action prohibits the use of leader mesh 8 inches or greater. Under this action, a harvester can choose to remove the leader and not fish, or replace the leader with new smaller mesh. Under this scenario we assume the harvester would choose the option that will minimize their revenue losses. Therefore we must evaluate economic impacts of both options. The method to evaluate the first option, not to fish, is described above under the first action.

To estimate the cost of changing the mesh, we must first determine how many harvesters will be affected and the number of leaders per harvester that must be modified. NEFSC gear survey data are used to estimate the number of pounds affected, by multiplying the number of total pounds fished according to VMRC and the percentage of pounds that have mesh 8 inches and greater (Table 5.1.2.1). We assume the catch rate is the same for all mesh sizes, and therefore there are no revenue losses due to changing the leader mesh size.[8] The harvester only incurs the cost of replacing the leader mesh, described in the proceeding data section. We assume mesh has a 5 year life and therefore a 5 year payment loan is set up for material costs. We further assume the harvester will replace the leader mesh when the restriction is lifted. Therefore, the annual cost includes labor to remove and replace a leader in the water, plus the annual payment for materials of the new mesh.

NEFSC gear survey data identifies offshore pounds using larger mesh in the leader compared to nearshore pounds. The cost of removing the leader and not fishing is compared to the cost of replacing the leader with new mesh. The option which minimizes losses to the harvester is

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[7] In theory, although this is a passive gear fishery, harvesters may be able to shift more fishing effort before or after the restriction, by fishing more pounds for example. However, the impacts of shifting effort are not explored at this time.

[8] There may also be an increase in labor cost due to extra time required to remove debris as a result of using a small mesh size. In addition, net losses may increase due to strong currents. These additional costs are mentioned but not included in the analysis, since they are difficult to quantify.

selected.

Measuring revenue, cost and profits
Under the scenario of a closure, we expect a reduction in revenues and an increase in fixed costs. Revenues are reduced since fewer fishing trips will be incurred. Additional costs are incurred as a result of the harvester having to remove and replace their gear from the water in the middle of the season.

Under the scenario of a gear modification, a change in revenues and an increase in cost is expected. A change in the catch rate of fish may occur as a result of a gear modification, which will impact revenues. However, we have no information on the direction (i.e., an increase or decrease), or the magnitude of the change in the catch rate. For simplicity we assume the catch rates before and after the gear modification will be equivalent. We do have information to estimate the additional material and labor costs incurred in relation to a gear modification.

In a perfect world of information, our goal would be to measure how a particular alternative impacts a harvester's annual profits. We would calculate the ratio of the change in profits to profits before the alternative was imposed. However, as a result of data on fixed and variable trips costs not being available for this analysis, we can not calculate the expected change in profits. Therefore, we use changes in total revenue as our comparison point between alternatives. Specifically, we estimate the decrease in revenues and increase in cost as a result of an alternative being imposed. Essentially, an increase in cost has the same affect as a decrease in revenues. Both actions will decrease profits. We then calculate the ratio of this decrease in profits to total revenues prior to the alternative being imposed, and refer to it as the change in total revenues. We could just report the decrease in revenues and increase in costs, however, it is important to put these changes in perspective to total earnings since they vary among fisheries.

The data and method section presented here, under the PA, are used to evaluate the economic impacts of all the proposed alternatives within this document.

<u>General Revenues and Landings</u>
Based on 2002 VMRC data, a total of 31 harvesters fished pound nets between May 6 and July 15, with 10 harvesters located in the lower bay and 21 harvesters located in the upper portion of the Virginia Chesapeake Bay. The majority of active harvesters in 2002 are in the upper bay (Table 5.1.2.6). Based on 2000 to 2002 data, annual landings per harvester were 280,996 pounds in the upper bay and 257,491 pounds in the lower region. Annual revenues per harvester were \$64,483 (CV=0.73) and \$105,298 (CV=0.91) in the upper and lower region, respectively.[9]

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[9] Years 2000 to 2002 VMRC data were used to estimate annual and seasonal landings and revenues per harvester. In 2001 and 2002, some harvesters were not allowed to fish as a result of a short 2 to 4 week restriction on pound net leaders. Harvesters that fished during the restricted time period were not affected by the management restrictions. Therefore, these individuals were

Under the PA, from May 6 to July 15, landings per harvester were 96,946 pounds in the upper region and 95,380 pounds in the lower region. Estimated revenues per harvester were $18,102 (CV=0.88) and $40,474 (CV=1.08) in the upper and lower region, respectively. Revenues are higher in the lower bay compared to the upper bay as a result of large landings of sea trout (50% of landed catch) with a high price ($0.70/lb).

Industry revenue totaled $2.6 million in 2002, according to the VMRC data. This includes the value of all pound net landings in the Chesapeake Bay and its rivers.

Table 5.1.2.6. Number of harvesters fishing pound nets, average pounds fished (P/H), landings (L/H) and revenues (R/H) per harvester based 2000 to 2002 VMRC data, by region and time period.[10] Coefficient of variation (CV) is in parenthesis.

Region	May 6 to July 15				Annual	
	Harvesters	P/H	L/H	R/H	L/H	R/H
Upper	21	1.9 (0.55)	96,946 (1.03)	$18,102 (0.88)	280,996 (0.96)	$64,483 (0.73)
Lower	10	3.0 (0.72)	95,380 (1.09)	$40,474 (1.08)	257,491 (0.95)	$105,298 (0.91)

Results of the PA

Upper Bay

In the 2003 NEFSC gear survey, the mesh in all of the pound net leaders was less than 12 inches in the upper bay. Therefore, there are no economic impacts in the upper bay.

Lower Bay

In 2002, 41% (=9/22) of the pound nets surveyed were considered offshore pounds in the area where offshore leaders are prohibited (Table 5.1.2.2). Therefore, twelve (12.3=0.41*30 pound nets) pounds may be affected by the leader prohibition. That implies, 8 harvesters must remove 1 offshore leader and 2 harvesters must remove 2 offshore leaders.

used to estimate seasonal revenues in order to capture revenues lost during a management restriction.

[10] Since these values are based on three consecutive years of data, these estimates may be lower or higher than those reported for 2002, in the previous section. In addition, these revenues are considered downwardly biased since some harvesters may process their own landings and therefore receive a price two to three times higher than the dockside price used here.

We assume the offshore pound net catch will be zero if the leader is removed. We further assume the catch rate of an offshore and nearshore pound are equal since we have no data to estimate the catch rate differential between offshore and nearshore pounds. A harvester in the lower bay will incur revenue losses due to the removal of the offshore leader, plus the labor cost of removing and placing the offshore leader back into the water when the management restrictions are lifted.

Revenue losses for one offshore pound from May 6 to July 15 is approximately $13,491 (=$40,474/3 pound nets per harvester) per harvester in the lower bay (Table 5.1.2.6). The labor cost of removing and putting an offshore leader back into the water is $2,000. Annual revenue losses per harvester may be reduced by 14.7% (=[$13,491 revenues + $2,000 leader removal/replacement]*1 offshore leader/$105,298) for 8 harvesters and 29.4% (=[$13,491 revenues + $2,000 leader removal/replacement]*2 offshore leaders/$105,298) for 2 harvester fishing in the lower bay.

Summary of the Upper and Lower Bay
Under the PA, 33% of the harvesters (=[0 in the upper bay + 10 in the lower bay]/31 total harvesters) fishing from May 6 to July 15 will be affected. Annual revenue losses per harvester will range between 14.7% and 29.4% in the lower bay.

The 2002 pound net industry revenues total $2.6 million. Therefore, under the PA, total industry revenues will be reduced by 7.3% (=[$0.19M]/[$2.6M]). The total industry cost under the PA is $0.19 million (=[8 harvesters *$15,491 loss per offshore leader] + [2 harvesters*$15,491 loss per offshore leader* 2 offshore leaders) in the lower bay.

5.1.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. The PA does not prohibit fishing with pound nets entirely throughout the Virginia Chesapeake Bay, but instead places additional restrictions on the practices. Only those fishing pound nets with leaders in the closed area will be affected by the PA. Outside the closed area, the PA retains the status quo, and if they have not done so already, fishermen in the leader restricted area may switch to leader mesh less than 12 inches and continue to fish.

All offshore pound netters in the closed area (Figure 3) will 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. 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 and loss of revenue is likely to increase during the months of May, June, and July. The loss of income during this time may 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 decreased by 14.7 to 29.4% under the PA. It is uncertain whether pound net fishermen will 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 will 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. It should be noted that as only offshore pound net leaders are prohibited by the PA, and it is NOAA Fisheries understanding that most fishermen fish both offshore and nearshore nets, nearshore nets may still be set and reduce the social impacts on these fishermen.

Fish dealers and processors would also be impacted by the PA, as there would be a lower level of fish catch passing through their facilities and available for purchase. While target species catch rates will likely decrease 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 PA 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 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 gear modifications are effective at reducing 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) will benefit by preventing a loss of a species and preserving biodiversity. Those who do not value biodiversity will 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 fishing year-round. Social benefits are realized from the application of management practices that demonstrate that fishing practices and sea turtles can co-exist.

5.2 NO ACTION ALTERNATIVE

The no action alternative would result in no additional restrictions to the pound net industry in the Virginia waters of the Chesapeake Bay. As such, the fishery would be restricted in accordance with the measures included in the 2002 interim final rule (67 FR 41196, June 17, 2002). That is, all pound net leaders measuring 12 inches or 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 would be restricted from May 8 to June 30. The interim final rule also established a framework mechanism by which NOAA Fisheries could implement additional restrictions or extend the time frame of restrictions based upon available data. The anticipated biological consequences of this alternative are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.2.1 Biological Impacts

5.2.1.1 Fishery Resources

The no action alternative would not impose any additional measures to pound net fishing practices that have been conducted during the last two spring fishing seasons. As such, there will be no impacts to fishery resources beyond those impacts that have occurred and were analyzed in years past (NOAA Fisheries 2002b). For example, prohibiting pound net leaders with stretched mesh 12 inches or greater and leaders with stringers between May 8 and June 30 may reduce the number of fish caught in the affected pounds and the number of fish entangled in leaders, should the fishermen choose to remove their leaders. If fewer fish are caught in pound nets or entangled in leaders, the fishery resources may benefit as there may be more fish in Virginia waters. However, these fish may continue to be caught by other pound nets with smaller mesh sizes, in the same pound nets if fishermen choose to switch to a smaller leader mesh size, or other commercial and recreational fishing gear. As such, it is unlikely that this alternative, which may reduce fish catches in a relatively small number of pound nets (if fishermen remove their leaders instead of switching to smaller leaders), would greatly improve the fish stocks in Virginia waters.

5.2.1.2 Endangered and Threatened Species

The no action alternative has the potential to impact threatened and endangered sea turtles, and to a minimal extent, endangered shortnose sturgeon. With this alternative, the pound net fishery will continue to fish subject to the leader mesh size restrictions included in the 2002 interim final rule and sea turtles will continue to be subject to potential entanglement in pound net leaders.

As mentioned in Section 5.1.1.2, high spring turtle mortalities in Virginia have previously been attributed to entanglement in large mesh and stringer pound net leaders in the Chesapeake Bay (Lutcavage 1981; Bellmund et al. 1987). High strandings have continued in recent years (since the implementation of the 2002 leader restrictions); in fact, in 2003, the STSSN documented the highest number of Virginia strandings in May, June and July (n=375). During 2002 and 2003, sea turtles were also documented entangled in and impinged on leaders with stretched mesh ranging from 8 to 14 inches and all but one of these interactions were in the closed area defined by the PA. The data on pound net leader and sea turtle entanglement presented in the PA section apply to this alternative as well. This information demonstrates that sea turtles are subject to entanglement in and impingement on pound net leaders with the existing regulations. If pound net leaders with stretched mesh smaller than 12 inches continue to be fished in the area found to have the highest sea turtle takes (e.g., the closed area defined in the PA) during May, June and July, sea turtle entanglement and impingements, with potential subsequent strandings, would be probable results of this alternative.

This alternative does offer some protection to sea turtles, as it appears that large mesh (greater than or equal to 12 inches stretched) and stringer leaders present the greatest threat to sea turtle entanglement (Bellmund et al. 1987). Enacting this alternative would continue to prevent sea turtle entanglements in those leaders. However, as shown during monitoring efforts in 2003, sea turtles may still become entangled in and impinged on leaders with stretched mesh smaller than 12 inches. This alternative would offer no additional protection to sea turtles interacting with leaders smaller than 12 inches. As mentioned previously, based upon additional analysis of impingement and entanglement ratios by NOAA Fisheries, it appears that restricting mesh size less than 12 inches stretched mesh would not necessarily provide the anticipated conservation benefit to sea turtles. In addition to mesh size, the frequency of sea turtle takes may be a function of where the pound nets are set. Additional analyses, and perhaps data collection, will provide insights into the relationship between mesh size and sea turtle interactions, because at this time, the mesh size threshold that would prevent sea turtle entanglements cannot be determined for mesh sizes below 12 inches.

While it cannot be determined whether all of the 2003 spring strandings resulted from interactions with pound nets (and, incidentally, that is unlikely), high strandings have been documented in the vicinity of pound nets and a number of dead floating sea turtles were documented around pound nets. High strandings were documented in 2002 and 2003, and by enacting this no action alternative, it is possible that elevated strandings will continue to occur in future years. The lack of action, when we know turtles are subject to mortality in the existing pound net gear, would not fulfill NOAA Fisheries' responsibility under the ESA.

If pound net leaders are not restricted to reduce sea turtle mortality, the resultant lethal interactions may reduce the ability of the northern nesting subpopulation of loggerheads to recover. Most loggerheads in U.S. waters come from one of two genetically distinct nesting subpopulations. The subpopulation that nests in south Florida is much larger and 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). The increase in documented sea turtle mortalities in Virginia could be a function of the potential increase in the status of the South Florida subpopulation of loggerheads, which make up approximately 50 percent of the loggerheads found in the Chesapeake Bay, but the fact remains that pound nets entangle turtles, some of which are likely from the northern subpopulation. The northern subpopulation that nests from northeast Florida through North Carolina is much smaller and nesting numbers are stable or declining. Genetic studies indicate that approximately one-half of the juvenile loggerheads inhabiting Chesapeake Bay during the spring and summer are from the smaller, northern subpopulation (TEWG 2000; Norrgard 1995). There are only an estimated approximately 3,800 nesting females in the northern subpopulation of loggerhead sea turtles (TEWG 2000). The northern subpopulation produces 65 percent males, while the South Florida subpopulation is estimated to produce 20 percent males (NOAA Fisheries SEFSC 2001). As males do not appear to show the same degree of site fidelity as females, it is possible that the high proportion of males produced in the northern subpopulation are an important sources of males for all loggerheads inhabiting the Atlantic. The loss of the male contribution from the northern subpopulation may restrict gene flow and result in a loss of genetic diversity to the loggerhead population as a whole. The continued loss of females from the northern subpopulation may preclude future reproduction, reducing the likelihood of both future survival and recovery of the northern subpopulation of loggerheads. While the abundance of the South Florida subpopulation of loggerheads appears to be increasing, the level of spring sea turtle mortality in Virginia must be reduced to ensure the South Florida subpopulation of loggerheads will recover. All loggerhead sea turtles are still listed as threatened under the ESA as populations have not yet recovered. To avoid further impacts to the northern and South Florida subpopulations of loggerheads, entanglements and impingements in pound net leaders, as well as the high stranding levels documented in previous years, must be reduced. The no action alternative is unlikely to accomplish this goal.

The potential for sea turtle mortality as a result of the implementation of the no action alternative is of further concern because most of the sea turtles found in Virginia waters are of the juvenile life stage, a life stage found to be critical to the long term survival of the species. Studies have concluded that sea turtles must have high annual survival as juveniles through adults to ensure that sufficient numbers of animals survive to reproductive maturity to maintain stable populations (Crouse et al. 1987, Crowder et al. 1994, Crouse 1999). Relatively small decreases in annual survival rates of both juvenile and adult loggerhead sea turtles may be likely to jeopardize the continued existence of the total loggerhead sea turtle population. As such, the level of mortality in Virginia, coupled with the increase in loggerhead mortality (strandings) during the last several years, may reduce the likelihood of recovery for the loggerhead population.

It is unlikely that endangered shortnose sturgeon will be significantly impacted by the no action alternative. Section 5.1.1.2 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, the no action alternative would not change the potential for this to occur.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, the no action alternative should not affect endangered whales.

5.2.1.3 Marine Mammals

The data presented in the PA section (5.1.1.3) indicate that the marine mammal species most likely found in association with Virginia pound nets, the coastal bottlenose dolphin, may become entangled in pound net leaders. The no action alternative would retain the leader mesh size restrictions in the 2002 interim final rule. While the specific mesh size that presents an entanglement problem for bottlenose dolphin is unclear, larger mesh leaders would probably result in a higher likelihood of bottlenose dolphin entanglements than smaller mesh (K. Wang, NOAA Fisheries, pers. comm.). Theoretically, the smaller the leader mesh size, the lower the probability that bottlenose dolphins would become entangled. It is unclear whether the current leader restrictions are already reducing bottlenose dolphin entanglement and whether entanglements are even a concern in the leaders allowed by the existing regulations. If entanglement does occur in small mesh leaders, under this alterative, bottlenose dolphin would continue to be subject to entanglement in pound net leaders smaller than 12 inches and these species would not be afforded any additional protection. Entanglement of bottlenose dolphin typically results in injury and mortality of the species. As such, this alternative may have an adverse effect on bottlenose dolphin by creating a situation for entanglement, injury, and ultimately, death. Harbor porpoise and harbor seals could also be subject to entanglement and injury by the no action alternative, but the potential impacts would likely be small given the infrequent spring distribution of these species in the Virginia Chesapeake Bay and the lack of documented entanglements in pound net leaders.

5.2.1.4 Birds

The data presented in the PA section (5.1.1.4) indicates that birds inhabiting the Chesapeake Bay area, in particular brown pelicans and cormorants, may become entangled in pound net leaders. The no action alternative would not change the fishing practices as observed in 2003. Various species of birds were found entangled in pound net gear during monitoring surveys in 2003. As such, avian species would continue to be subject to entanglement in pound net leaders under this alternative. Entanglement of birds typically results in injury and mortality of the species. This alternative may have an adverse effect on birds, most likely the brown pelican and cormorant, by creating a situation for entanglement, and ultimately, death.

5.2.1.5 Habitat

The no action alternative should not adversely impact EFH or SAV in Virginia waters beyond what was analyzed in years past. Fishermen replace their leaders on a periodic basis (usually every year), and minor bottom habitat disruptions may occur for a short period of time while they remove their leaders (typically taking approximately 1 to 2 days to a week) or switch to smaller mesh size in order to be in compliance with the 2002 leader restrictions. As these disruptions are relatively minor and short in duration, the continued operation of the pound net fishery would not likely have any significant direct or indirect effect to bottom habitat.

5.2.2 Economic Impacts

To protect sea turtles, total industry revenues earned by the Virginia Chesapeake Bay pound net fishery were reduced by 17.9%, 5.2%, and 15.2% from 2001 to 2003, respectively (see Section 6.3.1 for details). Although several actions have been previously imposed on the pound net fishery, under the no action alternative, fishing practices would not be further modified. Therefore, there would be no additional economic impacts to the pound net fishery under this alternative.

5.2.3 Social Impacts

Under the no action alternative, fishing practices would not be further restricted and therefore, at least in the short term, there will be no additional negative social impacts to pound net fishermen, their families, and the community, besides those previously analyzed with the implementation of the 2002 interim final rule. That is, if several fishermen cannot fish with their preferred leaders (mesh sizes 12 inches and greater and leaders with stringers), 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 7.5 weeks, and fish dealers and processors have less business, unemployment is likely to increase during the months of May and June. If fishermen choose to remove their leaders, fish dealers and processors would also be impacted by the leader restrictions, as there would be a much lower level of fish catch passing through their facilities and available for purchase. If, however, the failure to take action now to minimize impacts on sea turtles results in the need to take more aggressive action at a later date, the consequences to employment, family and community may be increased from that described under the PA.

If the failure to take action results in an increased risk of extinction of endangered and threatened sea turtles, then there are social impacts associated with the failure to take action. The extinction of sea turtles would be a loss to the portion of society that places a value on the protection of all species for its intrinsic value as well as for its contribution to biodiversity. By failing to take action, the Secretary of Commerce would not be carrying out responsibilities imposed on him by society via the ESA, which require him to ensure that all actions must not result in unauthorized incidental take of threatened and endangered species or that the take is not likely to jeopardize the continued existence of a species listed under the ESA.

5.3 EXPANDED GEOGRAPHICAL LEADER PROHIBITION AND LEADER MESH SIZE RESTRICTIONS FROM MAY 6 TO JUNE 30 (NPA 1)

The NPA 1 involves prohibiting all pound net leaders in a southern portion of the Virginia Chesapeake Bay (the "expanded closed area") and restricting the use of pound net leaders with stretched mesh 8 inches or greater and leaders with stringers in the remainder of the Virginia Chesapeake Bay (the "leader restricted area") between May 6 and June 30, instead of from May 6 to July 15 as included in the other alternatives. The anticipated biological consequences of this alternative are described in the following Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.3.1 Biological Impacts

5.3.1.1 Fishery Resources

Section 5.1.1.1 presents information on the potential impacts of prohibiting a portion of the fishery to using leaders and restricting pound net leader mesh size on fishery resources, and that information will apply to this alternative as well. This alternative shortens the time frame of the regulations by 15 days, and affects a larger number of nets than the PA (as it includes nearshore nets and those nets using 8 inches stretched mesh outside the expanded closed area). This alternative may temporarily result in fewer fish caught in pound nets and benefit the fishery resources in Virginia, 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 (other pound nets with smaller mesh sizes in the leader restricted area or by other commercial and recreational fishing gear), 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 during May and June, the benefits to Virginia fish resources would be greater. Compared to the PA, this alternative may have less of a benefit (should there be a notable benefit) to fish resources by shortening the time period, but on the other hand, may have more of a benefit by prohibiting a larger number of leaders (and reducing the pound's catch potential and leader entanglement threat). Shortening the time frame of the leader prohibition/restriction for 15 days would reduce the potential benefits to fish stocks during that 15 day period. After June 30, this alternative would result in fish being caught, and entangled, in pound net gear with the same frequency as in other months and in years prior to 2002.

5.3.1.2 Endangered and Threatened Species

Prohibiting all pound net leaders in the expanded closed area and restricting the use of pound net leaders with stretched mesh 8 inches or greater and leaders with stringers in the leader restricted area between May 6 and June 30 should provide a significant benefit to sea turtles. The information presented in Section 5.1.1.2 identifies that sea turtles become entangled in pound net leaders with various mesh sizes. Data presented in that section apply to this alternative as well. NPA 1 imposes the same restrictions as in the proposed rule (NPA 6), but the difference between the two alternatives is that the restrictions included in NPA 1 would be in effect from May 6 to June 30, instead of May 6 to July 15 as in NPA 6. The closed area in the NPA 1 is larger than the closed area in the PA, as the PA excludes nearshore nets, and the NPA 1 restricts leaders with stretched mesh 8 inches and greater, while the PA does not.

The current regulations restricting leader mesh size in the Virginia Chesapeake Bay (50 CFR 223.206(d)(2)(iv)) are in effect from May 8 to June 30. The justification for changing the start date from May 8 to May 6 in this alternative was presented in Section 5.1.1.2, and further applies to this section.

Establishing an end date of June 30 in the previous regulations was based upon STSSN data and a mid-1980s study on turtle and pound net entanglement. Typically the peak of Virginia strandings has been from mid-May to mid-June, with strandings typically remaining at high elevated levels until June 30. High strandings suggest that sea turtles may be vulnerable to entanglement in and impingement on pound net leaders until this time, as well as subject to other mortality sources. However, strandings data show that the Virginia spring peak can occur earlier and later than the typical mid-May to mid-June time frame. 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). Further, in 1998, 1997, and 1999, the height of the strandings (peak) persisted until late June. Strandings can occur later in some years, which is likely a function of sea turtles delaying entering the Chesapeake Bay due to cool water temperatures during the spring. When their migration is delayed, sea turtles are likely subject to the same mortality source(s) (e.g., interactions with pound nets) that they experience every year, only at a later date. This may be expressed by the stranding peak occurring later in some years. If sea turtle mortality is occurring later in the spring season, it is likely that sea turtles would continue to be subject to these mortality sources into early July.

A previous study found that sea turtle entanglements in pound net gear increased slowly until early June, then increased sharply and reached a plateau by late June (Bellmund et al. 1987). This report states that "these surveys and reports from watermen suggest few entanglements occurred after June". The development of the end date of the restrictions included in NPA 1 relies, in part, on this report. However, since the early 1980s, there has not been a consistent directed pound net monitoring effort after mid-June, so it is not clear if sea turtle entanglements are continuing to drop off after June. Strandings may be an indicator of these interactions.

As sea turtles may be vulnerable to entanglement and impingement after June, this alternative may provide less of a benefit to turtles than the PA. While this alternative may reduce the majority of sea turtle interactions with pound net gear during the spring and provide a significant benefit to sea turtles, depending on the season and weather conditions, the NPA 1 may also result in entanglements and impingements (and strandings) during the first half of July. This alternative would not be as temporally conservative as the PA, but would continue to protect sea turtles during the period of greatest concern (May and June). During the last two monitoring seasons, all of the documented entanglements and impingements have occurred in May and early June, but again, due to a number of logistical reasons, recent monitoring efforts have not been conducted in late June and July.

The PA and the no action alternative in this document contain a framework mechanism in which NOAA Fisheries could extend the end date of the restrictions. Under this framework mechanism, if NOAA Fisheries believes based on, for example, water temperature and the timing of sea turtles' migration, that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30, the AA may extend the effective dates of the regulation to July 30. The framework mechanism was included to ensure sea turtles would be protected to the extent necessary, should environmental conditions vary the typical or predicted stranding and/or entanglement patterns. The framework mechanism has been omitted from this alternative, due to previous difficulties experienced with enacting regulations on a real time basis. As the option for extending the restrictions into July is not included in NPA 1, this alternative may result in less potential protection to sea turtles from entanglement and impingement in pound net leaders in July than the no action alternative.

Also note that the NPA 1 may provide more of a benefit to sea turtles than the PA, as it prohibits more leaders and further restricts leader mesh size. However, as mentioned previously, NOAA Fisheries cannot support restricting the mesh size to less than 8 inches based upon the available analysis, and available data do support that there is a difference in takes between offshore (n=22) and nearshore (n=1) leaders. In both alternatives, leaders are prohibited in the area with all of the documented sea turtle takes, except for one entanglement in an 8 inch leader. As such, both alternatives may provide relatively equal protection to sea turtles, disregarding the time frame differences.

It is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 1. Section 5.1.1.2 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 prohibiting leaders in a portion of the Chesapeake Bay and, outside this area, restricting leader mesh size to less than 8 inches and leaders with stringers. The NPA 1 may have a larger potential benefit to shortnose sturgeon than the PA because a larger number of pound net leaders would be impacted and the potential for interactions would decrease. Should the affected fishermen choose to switch to leaders smaller than 8 inches stretched mesh instead of electing to remove their leaders, the potential benefits to shortnose sturgeon would be reduced to an unknown degree.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.3.1.3 Marine Mammals

Prohibiting the use of all pound net leaders in a portion of the Chesapeake Bay and restricting leaders with 8 inches or greater stretched mesh in another portion of the Bay between May 6 and June 30 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 5.1.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders, and that information further applies to this alternative.

NOAA Fisheries has limited data on the seasonality of bottlenose dolphin entanglements in pound net leaders. Only 2 dolphins have been conclusively determined as being entangled in Virginia pound net leaders from 1993 to 1997; one additional dolphin's death may have been attributable to entanglement in pound net gear, but this information is not conclusive. Four bottlenose dolphin were found in pound net leaders in 2001-2003, but whether interactions with the gear resulted in mortality cannot be determined. These interactions occurred in July (n=2) and August (n=2). From 2001-2003, stranded bottlenose dolphin were found with marks consistent with pound net gear in June (n=1), July (n= 5), August (n=2), and September (n=1). Overall, it appears that more potential bottlenose dolphin interactions have occurred in July and August, and that later in the summer is more of an issue than the spring.

Based on the limited amount of data, it cannot be conclusively determined whether the likelihood of bottlenose dolphin entanglements would increase later in the season. That is, it remains uncertain whether the time frame of NPA 1 would offer less or equal protection to bottlenose dolphin than those similar alternatives that extend into July. It appears that bottlenose dolphin have a higher risk of pound net interaction in July (compared to May and June), so the PA may provide more protection to bottlenose dolphin than the shortened time frame of NPA 1. Also, conceptually, a longer period for leader prohibitions/restrictions would be more protective of marine mammals, as there would be less gear in the water for a longer duration. However, as NPA 1 restricts more of the potentially entangling gear than the PA, by including nearshore nets in the closed area and prohibiting those leaders using 8 and greater stretched mesh, the NPA 1 may offer more protection to bottlenose dolphin.

Nevertheless, restricting the use of certain leaders in certain areas of the Chesapeake Bay in May and June should serve to limit the interactions between pound net gear and bottlenose dolphin and any subsequent entanglements during this time frame. 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.

As described in Section 5.1.1.3, 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.

5.3.1.4 Birds

Prohibiting the use of all pound net leaders in a portion of the Chesapeake Bay and restricting leaders with 8 inches or greater stretched mesh in another portion of the Chesapeake Bay between May 6 and June 30 should benefit birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants. The data presented in Section 5.1.1.4 indicate that birds inhabiting the Chesapeake Bay area become entangled in pound net leaders. The information on avian entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net gear, restricting the use of leaders is anticipated to reduce some of the bird entanglement. NOAA Fisheries has no data on the seasonality of bird entanglements in pound net leaders, but it is likely that most bird species would have the same likelihood of entanglement in July as they would in May and June. As such, this alternative may provide a smaller beneficial impact to birds than the PA, as the NPA 1 would be in effect for 15 days less. However, this alternative may also provide a larger beneficial impact than the PA, as more leaders would be prohibited. Nevertheless, restricting the use of certain leaders in certain areas of the Chesapeake Bay should serve to limit the interactions between pound net gear and birds and any subsequent entanglements during the time frame of the restrictions. Any measure that limits the amount of gear in the water should benefit avian species.

Note that if leaders are prohibited in a portion of the Chesapeake Bay, this would reduce the amount of catch and discards available to these birds as forage species. Birds foraging in Chesapeake Bay may exploit pound nets for prey but they are not dependent on this source of forage. NOAA Fisheries 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.

5.3.1.5 Habitat

NOAA Fisheries believes that the NPA 1 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The anticipated impacts of this alternative would be similar to those described in the PA. The restricted duration is shorter with this alternative, but as fishermen would only remove and replace their leaders one time, the time period would not change the impacts to habitat. That is, whether the fishermen replace their leaders after July 15 (PA) or June 30 (NPA 1) would not vary the impacts to EFH or SAV. More leaders would need to be removed with this alternative however, so the impacts to habitat would be greater with NPA 1 than with the PA. The NPA 1 may result in some temporary disruption of already affected bottom habitat to a nature and degree (that is, removal of the leaders) that already occurs in the industry, but it is unlikely to adversely impact EFH or SAV.

5.3.2 Economic Impacts

Upper Bay
In 2002, there were 21 harvesters fishing 40 pound nets (=21 harvesters @ 1.9 pounds per harvester) from May 6 to June 30 (Table 5.3.2.1). Based on the 2003 NEFSC gear survey data, 8.8% (=3 /34) of the active pounds surveyed had leader mesh 8 inches and greater (Table 5.1.2.1). Therefore, 4 pounds (=40*8.8%=3.5) may have to replace their mesh in 2004 under the NPA 1. Given that each harvester fishes approximately 2 pounds on average, we further assume

each harvester has one pound nearshore and one offshore. The NEFSC gear survey data show offshore pounds have larger mesh compared to nearshore pounds. Therefore, four harvesters will have to convert one leader each.

These four harvesters have the following options: 1) remove the leader and not fish, or 2) replace the leader with new mesh. We assume 50% of revenue losses will be incurred if they choose not to fish since harvesters typically fish 2 pounds each. Therefore, each harvester would lose $7,742 (=0.50*$15,484) in revenues plus $2,000 to remove the leader and put it back into the water (Table 5.3.2.1). Leader mesh offshore is typically larger than leader mesh of pounds fished nearshore. We assume the pounds affected by the NPA 1 in the upper bay are offshore pounds. The total cost of replacing an offshore leader with new mesh is $5,408 (=$2,000 labor to remove/replace leader in water + $3,408 material and labor cost of new mesh). See the data section for details on the material and labor cost of new mesh.

In summary, annual revenues are reduced by 15.1% (=$9,742/$64,483) if these four harvesters choose not to fish. Alternatively, revenues would be reduced by 8.4% (=$5,408/$64,483) if they chose to replace their leader with new mesh. Assuming a harvester would choose the option which minimizes their revenue losses, a harvester would therefore choose to change the leader mesh and continue fishing.

Table 5.3.2.1. Number of harvesters fishing pound nets, average pounds fished (P/H), landings (L/H) and revenues (R/H) per harvester based 2000 to 2002 VMRC data, by region and time period. Coefficient of variation (CV) is in parenthesis.

Region	May 6 to June 30				Annual	
	Harvesters	P/H	L/H	R/H	L/H	R/H
Upper	21	1.9 (0.55)	86,216 (0.81)	$15,484 (0.81)	280,996 (0.96)	$64,483 (0.73)
Lower	10	3.0 (0.72)	73,835 (0.95)	$31,309 (1.13)	257,491 (0.95)	$105,298 (0.91)

Lower Bay

Although harvesters can attempt to fish without leaders in the lower bay, we assume they will lose 100% of their revenues from May 6 to June 30. We assume this worst case scenario because we do not have any data to support the change in catch that will occur without a leader.

In 2002, there were 10 harvesters fishing pound nets in the lower bay from May 6 to June 30. In addition, harvesters must incur the cost of removing their leaders. Given each harvester has one offshore pound and two nearshore pounds, the cost to remove the leaders and put them back into the water is $5,000. Annual revenues per harvester may be reduced by 34.5% (=[$31,309 revenues + $5,000 leader removal/replacement]/$105,298).

Summary of the Upper and Lower Bay
Under the NPA 1, 45% of the harvesters (=[4 in upper bay +10 in lower bay]/31 total harvesters) fishing from May 6 to June 30 will be affected. Annual revenues per harvester will be reduced by a low of 8.4% and a high of 34.5% in the upper and lower bay, respectively.

The 2002 pound net industry revenues totaled $2.6 million. Therefore, under the NPA 1, total industry revenues will be reduced by 14.8% (=[$0.385M]/[$2.6M]). The total industry cost under the NPA 1 is $0.385 million, with $21,632 (=4 harvesters*$5,408) and $363,090 (=10 harvesters*$36,309) in the upper and lower bay, respectively. The methodology for this analysis is described in Section 5.1.2.

5.3.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. Section 5.1.3 describes the potential social impacts associated with prohibiting leaders and restricting leader mesh size and stringers. That information also pertains to this alternative, but the magnitude of the impacts would be different given the shortened duration of this alterative (15 days shorter) and that the closed area is larger with this alternative and leader mesh size is further restricted. A larger number of fishermen, families, and portion of the community would likely be impacted by this alternative, as more leaders are prohibited. The impacts would be relatively the same between both the NPA 1 and NPA 6, but this alternative would lessen those negative impacts by 15 days. 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 1.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these gear modifications are effective at reducing 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 would be in effect for a shorter amount of time, more leaders would be prohibited and leader mesh size would be restricted, and the leaders with the most (22 of 23) takes are prohibited in each alternative.

5.4 RESTRICTION OF LEADERS GREATER THAN OR EQUAL TO 8 INCHES STRETCHED MESH (NPA 2)

This non-preferred alternative 2 (NPA 2) would restrict the use of pound net leaders with greater than or equal to 8 inches stretched mesh and leaders with stringers in the mainstem Chesapeake Bay and portions of the tributaries from May 6 to July 15 each year. The anticipated biological consequences of this alternative are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.4.1 Biological Impacts

5.4.1.1 Fishery Resources

The NPA 2 involves prohibiting pound net leaders with stretched mesh 8 inches or greater and leaders with stringers in the Virginia Chesapeake Bay. Section 5.1.1.1 presents information on the potential impacts of restricting pound net leader mesh size on fishery resources, and that information will apply to this alternative as well. With this alternative, pound net fishermen in the closed area, as designated by the PA, and elsewhere in the Virginia Chesapeake Bay would be able to switch to leaders with less than 8 inches stretched mesh and continue fishing. Should the affected fishermen choose to remove their leaders instead of switching to a smaller mesh size, fewer fish may be caught in pound nets and fewer fish may be entangled in pound net leaders (resulting in a benefit to fish resources). As fishing effort will continue in the Virginia Chesapeake Bay, either by the affected pound net fishermen as they switch to a smaller mesh size, other pound net fishermen not impacted by the 8 inch mesh restriction (currently using small mesh leaders), or by other commercial or recreational fishermen, and fish may continue to become entangled in smaller mesh leaders and caught in pound nets, the NPA 2 is unlikely to result in a large benefit to fish resources in Virginia waters.

5.4.1.2 Endangered and Threatened Species

The information presented in the PA (Section 5.1.1.2) identifies that sea turtles may become entangled in and impinged on pound net leaders. All data presented in that section apply to this alternative as well.

Sea turtles have been found to become entangled in pound net leaders with greater than or equal to 8 inches stretched mesh and leaders with stringers. Sea turtles have also been found impinged on leaders with the same configuration. In 2002 and 2003, NOAA Fisheries observers documented 2 alive and 2 dead sea turtles in leaders with 14 inches stretched mesh, 8 alive and 3 dead sea turtles were found in leaders with 11.5 inches stretched mesh, and 5 alive and 2 dead sea turtles were found in leaders with 8 inches stretched mesh. All of the interactions in 8 inch mesh leaders were found along the Eastern shore of Virginia, and all but one of the interactions took place in the closed area as defined by the PA. No sea turtles were found in leaders with smaller than 8 inches stretched mesh. However, as noted in section 5.1.1.2, an 8 inch leader may in fact be slightly smaller than 8 inches, after it is coated and hung in the water. NOAA Fisheries 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.

This alternative would restrict several pound net leaders set in areas of the Chesapeake Bay where sea turtle interactions have not yet been documented (north of Cape Charles along the Eastern shore and in the northern Virginia Chesapeake Bay). NPA 2 involves restricting leader mesh size to less than 8 inches stretched mesh and prohibiting the use of stringers, based on sea turtles documented entangled in pound net leaders with stretched mesh 8 inches and greater and in leaders with stringers.

Restricting the use of 8 inches and greater stretched mesh may provide protection to sea turtles by reducing potential entanglement and impingement in the leader mesh size found to have interactions with turtles. By reducing the risk of potential sea turtle mortality due to entanglement in and impingement on pound net leaders, the sea turtle populations found in the Chesapeake Bay will benefit.

However, while monitoring data indicate that turtles have been entangled in leaders with 8 inches and greater stretched mesh, this alternative may have some negative consequences. As noted in section 5.1.1.2, based upon additional analysis on impingement and entanglement ratios, it appears that restricting mesh size to less than 8 inches stretched mesh would not necessarily provide the anticipated conservation benefit to sea turtles. In addition to mesh size, the frequency of sea turtle takes may, in part, be a function of where the pound nets are set, with pound nets set in certain areas having a higher potential likelihood of takes for a variety of possible reasons, such as depth of water, current velocity, and proximity to certain environmental characteristics or optimal foraging grounds. For instance, it is possible that takes may continue to occur on 7.5 inch stretched mesh leaders if set in certain geographical areas where sea turtles in pound net leaders have been documented. Additional analyses will be completed that may provide insights into the relationship between mesh size and sea turtle interactions, as at this time, the mesh size threshold that would prevent sea turtle entanglements has not been determined for mesh sizes below 12 inches. As such, restricting mesh size to less than 8 inches throughout the Virginia Chesapeake Bay may impose an additional impact on fishermen but not provide any significant protection to sea turtles. If leaders with less than 8 inches stretched mesh are set in areas where high sea turtle entanglements have been documented (e.g., offshore of the Eastern shore of Virginia), sea turtle takes may continue to occur.

Similarly, this alternative relies on the best available observer reports in the Virginia Chesapeake Bay, but does not consider the likelihood of turtles continuing to be impacted by leaders with less than 8 inches stretched mesh. Sea turtles may become entangled in any type of net that has an opening in which the turtles' head or flipper may fit, or that may snag a nail or ragged piece of carapace. Also, sea turtles have been documented entangled in other gear types (gillnets) with less than 8 inches stretched mesh (Gearhart 2002), so there is the possibility that entanglements in leader mesh smaller than 8 inches stretched could occur. While not documented at this time, sea turtle/pound net interactions have the possibility of occurring with smaller mesh sizes.

Further, it appears that sea turtle impingements on pound net leaders occur with some frequency in certain areas of the Chesapeake Bay. The majority of the documented impingements in 2002 and 2003 were alive and those turtles may have drown if not released by the NOAA Fisheries observer (given the tidal stage). Impingements are a result of turtles being held against the leader by the current, and this could occur on leaders with varying mesh sizes. Conceptually, if a leader is set in an area where previous impingements have been documented, it would not matter if the leader was 8 inches, or 7 ½ inches or smaller. As leaders with less than 8 inches stretched mesh may continue to be set under this alternative, impingements could continue to occur in areas where impingements have previously been documented. As such, sea turtle impingements and potential subsequent mortality are likely to continue with this alternative. It is less likely that impingements will occur on leaders in the northern portion of the Virginia Chesapeake Bay, given the lack of observed impingements on pound net leaders, which appears to be related to geographical location and current strength.

This alternative provides a benefit to sea turtles, but sea turtles may continue to be taken with this alternative, particularly as a result of impingements, and the benefits of reducing leader mesh size to sea turtles remain uncertain.

It is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 2. Section 5.1.1.2 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, and should fishermen choose to remove their leaders instead of switching to a smaller mesh size, this alternative would benefit shortnose sturgeon because prohibiting leaders greater than or equal to 8 inches and leaders with stringers will likely reduce fish catch in pound nets in the Virginia Chesapeake Bay. Should the affected fishermen choose to switch to leaders smaller than 8 inches stretched mesh instead of electing to remove their leaders, the potential benefits to shortnose sturgeon would be reduced to an unknown degree.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.4.1.3 Marine Mammals

There is limited information on bottlenose dolphin entanglements in leaders with varying mesh sizes and it is possible that the level of entanglement may be greater with larger mesh sizes. Bottlenose dolphin appear more likely to become entangled in leaders with stretched mesh greater than 8 inches rather than smaller than 8 inches, and this alternative would reduce larger mesh entanglements. Regardless of mesh size, 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 serve to limit the interactions between pound net gear and bottlenose dolphin and any subsequent entanglements, resulting in a net benefit to these marine mammals. Under this alternative, fishermen have the option to switch to leaders smaller than 8 inches stretched mesh. As the leader mesh size resulting in the most bottlenose dolphin entanglements has not been conclusively determined, if fishermen switch to smaller mesh sizes, bottlenose dolphin entanglement could still occur. Again note that it is probable that more bottlenose dolphin interactions would occur with larger mesh sizes.

As described in Section 5.1.1.3, 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 with greater than or equal to 8 inches stretched mesh and stringers. As such, it is likely that this alternative will provide some benefit to these species, but it cannot be quantified at this time.

5.4.1.4 Birds

Prohibiting leader mesh greater than or equal to 8 inches and leaders with stringers should benefit birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants. The data presented in Section 5.1.1.4 indicate that certain birds inhabiting the Chesapeake Bay area become entangled in pound net leaders. The information on bird entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net, restricting leader mesh size and leaders with stringers may reduce some of the brown pelican and cormorant entanglement. Fewer pound nets will likely be set with this alternative (as in some areas smaller mesh may not be able to be used), which would reduce the amount of gear in the water and help reduce the potential for bird entanglements. However, it appears that birds become entangled in various mesh sizes, so entanglement in mesh smaller than 8 inches could continue to occur. As such, the NPA 2 may benefit avian species, but the exact magnitude of this benefit remains unclear.

This alternative would enable pound net leaders to continue to fish, albeit with smaller mesh size, and as such, birds may continue to forage on the catch and discards from this fishery. Birds foraging in Chesapeake Bay may exploit pound nets for prey but they are not dependent on this source of forage. NOAA Fisheries 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.

5.4.1.5 Habitat

NOAA Fisheries believes that the NPA 2 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The restriction of leaders with 8 inches and greater stretched mesh and leaders with stringers may result in some disruption of bottom habitat, but it is unlikely to adversely impact EFH or SAV.

5.4.2 Economic Impacts

Upper Bay

In the upper bay, this alternative, NPA 2, is similar to NPA 1, but NPA 1 restricts the mesh size of leaders for a shorter period of time. In 2002, there were 21 harvesters fishing 40 pound nets (=21 harvesters @ 1.9 pounds per harvester) from May 6 to July 15 (Table 5.1.2.5). Based on the 2003 NEFSC gear survey data, 8.8% (=3 /34) of the active pounds surveyed had leader mesh 8 inches and greater (Table 5.1.2.1). Therefore, 4 pounds (=40*8.8%=3.5) may have to replace their mesh in 2004 under the NPA 2. Given that each harvester fishes approximately 2 pounds on average, we further assume each harvester has one pound nearshore and one offshore. The NEFSC gear survey data show offshore pounds have larger mesh compared to nearshore pounds. Therefore, four harvesters will have to convert one leader each.

These four harvesters have the following options: 1) remove the leader and not fish, or 2) replace the leader with new mesh. We assume 50% of revenue losses will be incurred if they choose not to fish since harvesters typically fish 2 pounds each. Therefore, each harvester would lose $9,051 (=0.50*$18,102) in revenues plus $2,000 to remove the leader and put it back into the water. Leader mesh offshore is typically larger than leader mesh of pounds fished nearshore. We assume the pounds in the upper bay are offshore pounds. The total cost of replacing an offshore leader with new mesh is $5,408 (=$2,000 labor to remove/replace leader in water + $3,408 material and labor cost of new mesh). See the data section (Section 5.1.2) for details on the material and labor cost of new mesh.

In summary, annual revenues are reduced by 17.1% (=$11,051/$64,483) if these four harvesters choose not to fish. Alternatively, revenues would be reduced by 8.4% (=$5,408/$64,483) if they choose to replace their leader with new mesh. Assuming a harvester would choose the option which minimizes their revenue losses, a harvester would therefore choose to change the leader mesh and continue fishing.

Lower Bay

Under this alternative, leaders with 8 inch mesh or greater and leaders with stringers are prohibited in the lower bay. In 2002, there were 10 harvesters fishing 30 pound nets (=10 harvesters @ 3.0 pounds per harvester) from May 6 to July 15 (Table 5.1.2.5). Based on the 2003 NEFSC gear survey data, 77% (=17/22) of the active pounds surveyed had leader mesh 8 inches and greater (Table 5.1.2.1). Therefore, 24 pounds (=30*77%=23.2) may have to replace their mesh under the NPA 2. Given that each harvester fishes approximately 3 pounds on average, we further assume each harvester has 2 pounds nearshore and 1 offshore. The NEFSC gear survey data show offshore pounds have larger mesh compared to nearshore pounds. Therefore, 6 harvesters will have to convert 2 leaders each (=1 offshore + 1 nearshore), and 4 harvesters will have to convert 3 leaders each (=1 offshore + 2 nearshore).

These harvesters have the following options: 1) remove the leader and not fish, or 2) replace the leader with new mesh. The first option is similar to NPA 1, except NPA 1 restricts leaders for a shorter time period. Given each harvester has one offshore pound and two nearshore pounds, the cost to remove the leaders and put them back into the water is $5,000. Annual revenues for 4 harvesters may be reduced by 43.2% (=[$40,474 revenues + $5,000 leader removal/replacement]/$105,298), given they must remove all 3 pounds they fish. If 2 out of 3 pounds must be removed, we assume 66% (=2/3) of revenues are removed. Annual revenues for 6 harvesters will be reduced by 28.7% (=[0.66*$40,474 revenues + $3,500 leader removal/replacement]/$105,298).

The annual costs to replace the leader mesh for an offshore pound are $3,408 (=$2,000 labor + $1,408 materials) and $2,189 (=$1,500 labor + $689 materials) for an offshore and nearshore pound, respectively. With the additional labor cost of removal and replacement of the leader in the water, the total cost to replace the leader is $5,408 and $3,689 for an offshore and nearshore pound, respectively. Therefore the cost per harvester to replace the leader mesh on 2 pounds (=1 nearshore + 1 offshore) is $9,097, and $12,786 for 3 pounds (=2 nearshore + 1 offshore). Annual revenues per harvester would be reduced by 8.6% (=$9,097/$105,298) and 12.1% (=$12,786/$105,298).

In summary, given harvesters want to minimize their economic losses, they would choose to replace the leader mesh (8.6% to 12.1% reduction in annual revenues) versus choosing not to fish (28.7% to 43.2% reduction in annual revenues).

Summary of the Upper and Lower Bay
Under the NPA 2, 45% of the harvesters (=[4 in upper bay +10 in lower bay]/31 total harvesters) fishing from May 6 to July 15 will be affected. Annual revenues per harvester will be reduced by 8.4%, and 8.6% to 12.1% in the upper and lower bay, respectively.

Total industry revenues will be reduced by 4.9% (=[$0.127M]/[$2.6M]) under the NPA 2. The total industry cost under the NPA 2 is $0.127 million, with $21,632 (=4 harvesters*$5,408) and $105,726 (=[6 harvesters * $9,097] + [4 harvesters * $12,786]) in the upper and lower bay, respectively. The methodology for this analysis is described in Section 5.1.2.

5.4.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. Section 5.1.3 describes the potential social impacts associated with prohibiting leaders in a portion of the Chesapeake Bay. Instead of imposing a total leader prohibition in a portion of the Bay, as in the PA, an 8 inch and greater leader restriction would be in effect in that same area. Under NPA 2, all those fishing pound nets with leaders measuring 8 inches or greater stretched mesh and leaders with stringers will be affected. The type of social impacts would be similar to those in the PA, in that fishermen, their families, their employees, fish dealers and processors, and the portion of the community that relies on the revenues from the pound net fishery will be affected and experience negative consequences as a result. The distribution of the social impacts will be slightly different than the PA, in that impacts will be found wherever those nets with 8 inch leaders are fished and not in a concentrated geographical area like the PA.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these leader mesh size restrictions are effective at reducing 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. The NPA 2 may have a smaller social benefit than the PA, as this alternative's leader management measures will likely result in some level of continued sea turtle impingement and potential entanglement.

5.5 EXPANDED GEOGRAPHICAL POUND NET GEAR PROHIBITION AND LEADER MESH SIZE RESTRICTIONS (NPA 3)

This non-preferred alternative (NPA 3) would restrict all parts of the pound net gear (pound, heart and leader) in the expanded closed area, and outside this area, leaders with 8 inches and greater stretched mesh would be restricted. This non-preferred alternative is similar to the PA, but the closed area is larger with this alternative, more parts of the pound net gear are affected, and mesh size outside the closed area is restricted. The anticipated biological consequences of this alternative are described in the following Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.5.1 Biological Impacts

5.5.1.1 Fishery Resources

Section 5.1.1.1 presents information on the potential impacts of closing a portion of the pound net fishery to using leaders on fishery resources, and that information will apply to this alternative as well. The type of impacts to fishery resources from this alternative would be the same as the PA, but the magnitude of the benefits to fishery resources would be different since more of the gear is restricted.

Prohibiting the use of the pound, heart and leader in the southern Chesapeake Bay (the expanded closed area) would result in no fish being caught in this gear. If fish are not caught in pound net gear, the fishery resources may benefit as there may be more fish in Virginia waters. This alternative will also remove the threat of fish entanglement in the gear in a portion of the Virginia Chesapeake Bay. As such, this alternative may temporarily result in a lack of fish catch by pound nets, eliminated entanglement in the leaders, and an increased abundance of fish resources. However, in this area, fish may continue to be caught by other commercial and recreational fishing gear. 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 effort during May, June and the first half of July, the benefits to Virginia fish resources would be greater to an unknown extent. Compared to the PA, this alternative would have a greater potential benefit to fish resources, as it affects more nets and all of the gear instead of only the leader.

Fishery resources may also benefit from the leader mesh size restriction outside the expanded closed area to some extent, but those benefits are not expected to be drastic as fish may still be captured by pound net fishermen (using leaders with mesh smaller than 8 inches) or other commercial or recreational fishermen, and fish may become entangled in the smaller mesh leaders.

5.5.1.2 Endangered and Threatened Species

Prohibiting all portions of the pound net gear in the expanded closed area and restricting the use of pound net leaders with stretched mesh 8 inches or greater and leaders with stringers in the leader restricted area between May 6 and July 15 should provide a significant benefit to sea turtles. The information presented in Section 5.1.1.2 identifies that sea turtles become entangled in and impinged on pound net leaders with various mesh sizes. Data presented in that section applies to this alternative as well. NPA 3 would affect all portions of the pound net gear (pound, heart, and leader) in the closed area, instead of only prohibiting the leader as in the PA, and the closed area in NPA 3 includes nearshore nets, where the PA does not.

Sea turtles would benefit from this alternative in a similar manner as described in Section 5.1.1.2, namely from a reduced threat of entanglement and impingement in 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 are included in the closed area, reducing any chance of interaction with those leaders. However, only one sea turtle has been entangled outside the closed area of the PA and available data do support that there is a difference in takes between offshore (n=22) and nearshore (n=1) leaders. Also note that the NPA 3 may provide more of a benefit to sea turtles than the PA, as it further restricts the leader mesh size with documented sea turtle entanglements. However, as mentioned previously, NOAA Fisheries cannot support restricting the mesh size to less than 8 inches based upon the available analysis. In both the PA and NPA 3, leaders are prohibited in the area with most of the documented sea turtle takes. As such, the leader restrictions in both alternatives may provide relatively equal protection to sea turtles.

Additionally, sea turtles in Virginia are frequently found in the pound portion of pound net gear. The sea turtles documented in pounds are almost always alive, as the mesh used in the pounds is small (e.g., 2-4 inches stretched mesh), likely precluding sea turtle entanglement, and the top of the pound is open, allowing turtles to surface for air. Therefore, it is improbable that turtles in pounds will be injured or killed.

Researchers at VIMS have received reports of sea turtles trapped in pounds since 1979. VIMS has identified, tagged, measured, and weighed most of the turtles reported from the pounds. These animals have always been reported as alive, with the only documented injuries occurring from previous interactions (e.g., old bite wounds, propellor-like injuries). Prior to 2003, no injuries have been documented from the sea turtles' inhabitancy in the pound itself. Note that the 2002 interim final rule required Virginia pound net fishermen to report all interactions with pound net gear (50 CFR 223.206(d)(2)(iv)), but even with this requirement, it is unknown how many turtles are reported compared to the number caught. As of October 2003, 12 sea turtles have been reported to NOAA Fisheries as being captured alive and uninjured in pounds. One of these turtles was found alive and subsequently died at VIMS. Upon necropsy, foam was discovered in the trachea and both lungs, and blood was found in the left lung. The turtle was underweight with a mostly empty gastrointestinal tract, and, while uncertain, it is improbable that interactions with the pound contributed to its death.

While several pound netters have reported live turtle captures over the years, only one fisherman has fished regularly over time and consistently reported live turtles taken in his pounds to VIMS. Therefore, the most reliable data on sea turtle capture in pounds are from one fisherman who has set approximately 5 to 7 nets (depending on the year) at the mouth of the Potomac River along the Virginia shore. From 1980 to 1999, 457 loggerhead turtles have been caught in this fisherman's pounds (Mansfield and Musick, in press). The smallest number of turtles found in his nets annually was 14, while a high of 92 turtles was caught another year. The average number loggerheads caught per year for that fisherman is 31 (+/- 19.57), with an average of 5 turtles captured per net (assuming an average of 6 nets fished). Note that data were only compiled for years in which turtles were reported consistently to VIMS throughout the season. Most of the loggerhead turtles found within these pounds were juveniles (89%), while a few were adults (7.6%). Most of the turtles (23%) were between 61 and 70 cm curved carapace length.

Incidental captures occurred throughout the sea turtles residency period in the Chesapeake Bay, with 406 of the 457 loggerheads caught from May to October. Captures in the Potomac River began in May, peaked during the second half of June, and tapered off until the fall. Peak incidental capture rates in the 5 to 7 Potomac River pound nets appear to lag behind the peak in Virginia statewide strandings, which typically occur around the mouth/southern portion of the Chesapeake Bay. It is possible that turtle captures in pounds in the lower Chesapeake Bay may be either more frequent or occur earlier in the season, as turtles enter the Bay during the spring to forage and later disperse to northern areas. It is also plausible that there may be a higher concentration of foraging turtles near the mouth of the Potomac River (as suggested by site fidelity to particular nets), or conversely, that the frequency of incidental capture in pounds is consistent throughout the Bay. This needs to be explored. NOAA Fisheries has no consistent annual information on captures in pounds in the rest of the Chesapeake Bay; the information from the Potomac River nets represents the best available data on potential turtle captures in pounds. Further, this information is a minimum estimate of the potential captures in the Potomac River and potentially throughout the Chesapeake Bay, as reporting and response to takes may have varied between years.

A notable number of the turtles found in the Potomac River pounds were recaptured later in the season or in future years; approximately 54 of the 457 turtles found in the Potomac River pounds were subsequently recaptured. Of these 54 turtles, the Potomac River pound net fisherman has reported recapturing these turtles on 160 occasions. While most of the turtles were captured only once, those that did return did so over an average of three to four years. VIMS preliminary tracking data suggests that some sea turtles exhibit strong site fidelity to the mouth of the Potomac River and the area where the sampled pound nets are located (Mansfield and Musick in press).

The majority of the turtles captured in the Potomac River pounds were loggerheads (n=457). However, Kemp's ridley turtles have also been captured, albeit at a much lower level (n=44) (Mansfield and Musick, in press). During some years, 8 or 9 Kemp's ridley turtles were captured, while in other years, only 1 or 2 Kemp's ridley turtles were reported (K. Mansfield, pers. comm.). Over the 20 years of sampling effort, an average of approximately 2 Kemp's ridleys were captured per year. Only two of the 44 Kemp's ridleys have been recaptured (once) since 1980. In addition to their relatively low abundance in Virginia waters, it is possible that few Kemp's ridleys have been captured in these pounds due to the location of the Potomac River nets. These nets are set near the tidal channels, areas where radio tracking data indicate that loggerheads inhabit (Byles 1988 in Mansfield and Musick, in press). Kemp's ridleys have been found to stay within shallower areas less affected by tidal flux, which suggests that Kemp's ridley turtles would be more likely to be found in the pounds of shallow water nets. Until this theory can be supported, the Potomac River pound net information represents the best available data on Kemp's ridley captures in Virginia pounds.

Over the last 20 years, only two green turtles have been captured in the Potomac River pounds. One turtle was found in the mid-1980s, while the other green turtle was captured in 2001. While green turtle capture appears to be relatively infrequent in Virginia pounds, the potential for this take exists.

Sea turtles may be entering the pounds to feed on the fish and crustaceans that may be present. Sea turtles are generally not agile enough to capture finfish under natural conditions, and thus would only consume large quantities of finfish by interacting with fishing gear or bycatch (Mansfield et al. 2002a; Bellmund et al. 1987; Shoop and Ruckdechel 1982). Twenty-three of 66 stranded loggerheads necropsied between May and December 2001 contained fish parts, indicating that these animals may have been inhabiting the pounds of pound net gear or interacting with other fishing gear. As mentioned, VIMS has documented the repeated capture of previously tagged sea turtles in pounds, occasionally documenting the same turtle in the same pound in the same season (Mansfield and Musick, in press). This suggests that these sea turtles may be returning to the pounds to forage. If sea turtles are entering the pounds on their own volition and continue to reoccupy pounds despite their repeated release, this is still considered a take under the ESA definition (e.g., capture). It is unknown what impact pound nets have on the behavior and development of sea turtles in the Chesapeake Bay.

In the Biological Opinion on this action, the implementation of sea turtle conservation measures for the pound net fishery in Virginia waters of the Chesapeake Bay, NOAA Fisheries anticipated that 505 loggerheads, 101 Kemp's ridleys, 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. 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 represents the best available data on turtle captures in pounds.

By implementing this alternative and reducing the possibility that sea turtles may be caught in the pounds (as well as the leaders), the level of harassment and capture experienced by these endangered and threatened species would be reduced. Again note that the take in the pounds in Virginia typically involves live, uninjured animals. It is uncertain whether sea turtle takes in pounds would result in subsequent mortality; while unlikely, it is possible. In any event, this alternative should serve to reduce sea turtle take (by harassment and capture). NPA 3 may therefore benefit these species. The potential benefits are in addition to the ones experienced by prohibiting leaders in the expanded closed area and restricting leader mesh size. It is uncertain whether prohibiting pounds and hearts will further sea turtle recovery in ways not achieved by the PA.

As with the preferred alternative (Section 5.1.1.2), 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 eliminate this threat in the closed area, as there would not be any pound net gear in the water. Restricting 8 inch and greater stretched mesh in the other portion of the Bay should minimize the potential of entrapment and/or entanglement by reducing the number of leaders in the water, which may reduce the fish catch in pound nets in the Virginia Chesapeake Bay. Should the affected fishermen choose to switch to leaders with stretched mesh smaller than 8 inches in the leader restricted area, instead of electing to remove their leaders, the potential benefits to shortnose sturgeon would be reduced to an unknown amount.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.5.1.3 Marine Mammals

Prohibiting the use of all pound net gear in a portion of the Chesapeake Bay and restricting leaders with 8 inches or greater stretched mesh in another portion of the Bay may have a beneficial effect on the coastal bottlenose dolphin. The data presented in Section 5.1.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders, and that information further applies to this alternative. As more leaders would be prohibited and mesh size is further restricted with this alternative, the beneficial impacts to bottlenose dolphin would likely be larger than with the implementation of the PA. Bottlenose dolphin have never been observed in the pound itself and it is doubtful that additionally prohibiting the use of the heart and pound in a portion of the Virginia Chesapeake Bay would have any additional benefit to this species.

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 5.1.1.3) 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.

5.5.1.4 Birds

Section 5.1.1.4 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 of the gear would be restricted.

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 eliminated. 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 leaders with less than 8 inches stretched mesh, as well as in the hearts and pounds, in the leader restricted area. As such, some level of avian entanglement may continue with this alternative.

Note that if pound net gear is prohibited in a portion of the Chesapeake Bay, this would reduce the amount of catch and discards available to these birds as forage species. Birds foraging in Chesapeake Bay may exploit pound nets for prey but they are not dependent on this source of forage. NOAA Fisheries 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.

5.5.1.5 Habitat

NOAA Fisheries believes that the NPA 3 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The type of anticipated impacts would be the same, but the magnitude would be greater. With this alternative, the pounds and hearts would also have to be removed in the closed area, 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 gear twice. 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.

5.5.2 Economic Impacts

Upper Bay
In the upper bay, this alternative, NPA 3 is the same as NPA 2. Out of 21 harvesters, 4 harvesters have 1 leader with the mesh 8 inches or greater. In summary, annual revenues per harvester are reduced by 17.1% (=$11,051/$64,483) if a harvester chooses not to fish. Alternatively, revenues would be reduced by 8.4% (=$5,408/$64,483) if they chose to replace their leader with new mesh. Assuming a harvester would choose the option which minimizes their revenue losses, a harvester would therefore choose to change the leader mesh and continue fishing.

Lower Bay
In addition to the leader, the heart and pound must also be removed from the water with the NPA 3. We assume harvesters will lose 100% of their revenues from May 6 to July 15. In 2002, there were 10 harvesters fishing pound nets in the lower bay from May 6 to July 15.

The labor cost of removing the leader, heart and pound is $3,000 and $6,500 for a nearshore and offshore pound, respectively. Cost details are in the data section of the PA (Section 5.1.2). Given each harvester has one offshore pound and two nearshore pounds, the cost to remove the leaders and put them back into the water is $12,500. Annual revenues per harvester may be reduced by 50.3% (=[$40,474 revenues+$12,500 leader removal/replacement]/$105,298) under the NPA 3.

Summary of the Upper and Lower Bay
Under the NPA 3, 45% of the harvesters (=[4 in upper bay +10 in lower bay]/31 total harvesters) fishing from May 6 to July 15 will be affected. Annual revenues per harvester will be reduced by 8.4% and 50.3% in the upper and lower bay, respectively.

Total industry revenues will be reduced by 21.2% (=[$0.551M]/[$2.6M]), under the NPA 3. The total industry cost under the NPA 3 is $0.551 million, with $21,632 (=4 harvesters*$5,408) and $529,740 (=10 harvesters * $52,974) in the upper and lower bay, respectively. The methodology for this analysis is described in Section 5.1.2.

5.5.3 Social Impacts

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 5.1.3 (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 affected fishermen would have to remove all of their pound net gear, which would consist of a larger undertaking than just removing their leaders. The fishermen would then have to exert more effort and hire the necessary labor for a longer amount of time, resulting in an additional expense. Removing pound net leaders will likely result in significantly reduced fish catch levels, but with this alternative, there would be absolutely no fish catch in the closed area. This total elimination of fish catch would further exacerbate the negative social impacts faced by the pound net fishing community (fishermen, fishermen's families, dealers, processors, etc.). This alternative would put more strain on the social structure of the pound net fishing community, in comparison to the PA.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these gear modifications are effective at reducing 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 result in additional benefits compared to the PA, as live sea turtles would not be captured in the pounds and be subject to harassment. The actual benefits of this reduction in harassment cannot be quantified at this time however.

5.6 PROHIBITION OF ALL POUND NET LEADERS (NPA 4)

The complete prohibition of all pound net leaders, regardless of mesh size, from May 6 to July 15 is recognized as the most risk averse technique for minimizing sea turtle entanglements in pound net gear. The anticipated biological consequences and risk reduction benefits of this alternative are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.6.1 Biological Impacts

The biological benefits to sea turtles and other species at risk of entanglement brought about by the prohibition of all pound net leaders is thought to be the most risk averse option and therefore of the greatest biological benefit.

5.6.1.1 Fishery Resources

The NPA 4 involves prohibiting all pound net leaders in the Virginia Chesapeake Bay. Previous sections present information on the potential impacts of prohibiting pound net leaders on fishery resources, and the information in those sections applies to this alternative as well. The difference is that all leaders would be prohibited with NPA 4 and more fishermen would be affected. As fishermen must curtail all fishing activity with leaders, few fish would likely be caught in the pounds. If fewer fish are caught in pound nets, there may be more fish in the Virginia waters. However, these fish may continue to be caught by other commercial and recreational fishing gear. As fishing effort will continue in the affected area, likely by other commercial or recreational fishermen, the NPA 4 may only slightly benefit fishery resources. If other commercial and recreational fisheries do not increase effort during May, June and the first half of

July, the benefits to Virginia fish resources would be greater to an unknown extent. Eliminating leaders in the Virginia Chesapeake Bay may also have a beneficial effect on fishery resources by reducing the threat of entanglement in the leaders. This alternative would have the highest potential benefit to fishery resources, in comparison to the other alternatives.

5.6.1.2 Endangered and Threatened Species

The information presented in the PA (Section 5.1.1.2) and preceding sections identifies that sea turtles may become entangled in and impinged on pound net leaders. All data presented in those sections apply to this alterative as well. However, the difference from the PA is that NPA 4 prohibits fishing with all leaders, regardless of location, mesh size or structure (buoy, stringer, mesh), to provide additional protection to sea turtles.

Sea turtles have been found to become entangled in and impinged on pound net leaders with greater than or equal to 8 inches stretched mesh and leaders with stringers. Leaders with this construction may account for the largest number of sea turtle interactions, but sea turtles could interact with pound net leaders with smaller mesh, and as a result, entanglements could occur. The mesh size threshold, for mesh sizes below 12 inches, that would prevent sea turtle interactions cannot be determined at this time, as noted previously. It is possible that restricting the mesh size may not have a significant conservation benefit for sea turtles, if the determining factor in potential sea turtle interactions is the location of the net, and the environmental conditions surrounding those nets with documented takes. Sea turtles may become entangled in any type of net that has an opening in which the turtles' head or flipper may fit. For example, from 1998 to September 2003, the average head width of sea turtles stranding in Virginia was 13.67 cm (5.38 inches) for loggerheads (n=182) and 8.63 cm (3.4 inches) for Kemp's ridleys (n=31) (VIMS unpub. data 2003). Entanglements may occur when a turtle gets any body part (e.g., nail, piece of carapace, extremity) caught on a net, and these head widths demonstrate that a turtle's head could poke through stretched mesh sizes less than 8 inches, leading to potential entanglement. Gillnets with less than 8 inches stretched mesh have also been found to entangle sea turtles (Gearhart 2002). Sea turtle entanglement in leaders with stretched mesh below 8 inches has not been documented, but future monitoring studies may address this potential occurrence. There may be other factors that influence potential sea turtle entanglement that NOAA Fisheries is not aware of, such as the tautness of the leader or twine size. Until further information is received, NOAA Fisheries recognizes that turtles may potentially become entangled in leaders with varying mesh sizes.

Impingements on pound net leaders with smaller than 8 inches stretched mesh in areas where sea turtles have previously been documented is more likely. As sea turtles may become impinged on leaders by the current, the mesh size of the leader would not matter if the net was set in an area where impingements are likely to occur (the area were they have been previously documented). If set in the same area, with the same environmental conditions (e.g., strong current), the likelihood of an impingement on a leader with 8 inch mesh compared to a leader with 4 inch mesh would be the same, given our current knowledge of sea turtle impingements on leaders.

This alternative would be the most protective of sea turtles by eliminating all potential sea turtle interactions with pound net leaders. By eliminating the risk of potential sea turtle mortality due to entanglement in and impingement on pound net leaders, the sea turtle populations found in the Chesapeake Bay will likely benefit. The potential reduction in mortality could also help the northern subpopulation of loggerheads recover and ensure the south Florida subpopulation of loggerheads continues to recover.

Information on shortnose sturgeon and pound net interactions is presented in section 5.1.1.2. As with the preferred alternative, it is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 4. Should shortnose sturgeon be subject to entrapment by pound nets or entangled in pound net leaders, this alternative would minimize this potential and benefit the species because prohibiting all leaders will likely reduce fish catch in pounds in the Virginia Chesapeake Bay and all potential interactions with leaders.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.6.1.3 Marine Mammals

Prohibiting the use of pound net leaders regardless of mesh size would 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 5.1.1.3 and subsequent sections indicate that bottlenose dolphin may become entangled in pound net leaders. The information on bottlenose entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

There is limited information on bottlenose dolphin entanglements in varying leader mesh sizes and it is possible that the level of entanglement may be greater with larger mesh sizes. Regardless of mesh size, as bottlenose dolphin have been found entangled in pound net leaders in Virginia waters, any measure that limits the amount of gear in the water would benefit these marine mammals. Prohibiting all leaders regardless of mesh size would serve to eliminate all interactions between pound net leaders and bottlenose dolphin, and any subsequent entanglements. It remains unclear whether this alternative increases the protection of bottlenose dolphin in comparison to other alternatives, because it is possible that bottlenose dolphin entanglements do not occur with mesh sizes smaller than 8 inches. In any event, this alternative provides the greatest potential benefit to bottlenose dolphin as the NPA 4 affects the largest number of pound net leaders.

As described in Section 5.1.1.3, harbor porpoise and harbor seals may infrequently occur in the Virginia Chesapeake Bay waters during May and June 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 benefit these species by eliminating entangling gear in the water.

5.6.1.4 Birds

Prohibiting the use of all pound net leaders regardless of mesh size or composition would benefit birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants. Section 5.1.1.4 indicates that birds inhabiting the Chesapeake Bay area may become entangled in pound net leaders. The information on bird entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net (e.g., pound, heart), prohibiting all leaders will reduce some of the bird entanglement in pound net gear. NOAA Fisheries is unaware of data comparing bird entanglement frequency between the leader and the pound or heart, but with an elimination of all pound net leaders in the Virginia Chesapeake Bay, avian species coming in contact with pound nets should benefit greatly. This alternative provides the greatest benefit to birds, as the NPA 4 affects the largest number of pound net leaders.

Note that if all pound net leaders are prohibited in the Virginia Chesapeake Bay, this would reduce the amount of catch and discards available to these birds as forage species. Birds foraging in Chesapeake Bay may exploit pound nets for prey but they are not dependent on this source of forage. NOAA Fisheries 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.

5.6.1.5 Habitat

NOAA Fisheries believes that the NPA 4 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The anticipated impacts would be greater with this alternative because all pound net leaders would need to be removed regardless of mesh size. The disturbance to bottom habitat would take place wherever there are pound nets throughout the Virginia Chesapeake Bay, as opposed to certain concentrated geographical areas. Regardless, the prohibition of all leaders would result in some temporary disruption of bottom habitat, but it is unlikely to adversely impact EFH or SAV.

5.6.2 Economic Impacts

Upper Bay
In 2002, there were 21 harvesters fishing 40 pound nets (=21 harvesters @ 1.9 pounds per harvester) from May 6 to July 15 (Table 5.1.2.5). Each harvester will incur revenue losses and the cost of removing 2 leaders (=1 offshore + 1 nearshore). Revenues per harvester were $18,102 (CV=0.88) from May 6 to July 15, on average. The cost of removing 2 pounds is $3,500

(=$2,000 per offshore pound + $1,500 per nearshore pound).

In the upper bay, annual revenues per harvester will be reduced by 33.5% (= [$18,102 revenue loss + $3,500 remove/replace leader]/$64,483) under the NPA 4.

Lower Bay
The NPA 4 is similar to the PA, but with NPA 4, nearshore leaders are prohibited as well. Although harvesters can attempt to fish without leaders in the lower bay, we assume they will lose 100% of their revenues from May 6 to July 15. We assume this worst case scenario because we do not have any data to support the change in catch that will occur without a leader.

In 2002, there were 10 harvesters fishing pound nets in the lower bay from May 6 to July 15. In addition, harvesters must incur the cost of removing their leaders. Given each harvester has one offshore pound and two nearshore pounds, the cost to remove the leaders and put them back into the water is $5,000. Annual revenues per harvester may be reduced by 43.2% (=[$40,474 revenues + $5,000 leader removal/replacement]/$105,298). See the data section of the PA (Section 5.1.2) for details on cost and revenue estimates.

Summary of the Upper and Lower Bay
Under the NPA 4, 100% of the harvesters (=[21 in upper bay +10 in lower bay]/31 total harvesters) fishing from May 6 to July 15 will be affected. Annual revenues per harvester will be reduced by a low of 33.5% and a high of 43.2% in the upper and lower bay, respectively.

Total industry revenues will be reduced by 34.9% (=[$0.908M]/[$2.6M]) under the NPA 4. The total industry cost under the NPA 4 is $0.908 million, with $453,642 (=21 harvesters*$21,602) and $454,740 (=10 harvesters*$45,474) in the upper and lower bay, respectively. The methodology for this analysis is described in Section 5.1.2.

5.6.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. The NPA 4 results in the greatest negative impact to the social structure of the pound net fishing community, as this alternative prohibits the use of all pound net leaders. As such, the entire pound net fishery will be affected from May 6 to July 15. If fishermen cannot fish with their leaders, this would result in a net negative impact on fishing communities in all areas of the Virginia Chesapeake Bay. Target species catch rates will likely decrease due to the inability to use the leaders on the pound nets, but the heart(s) and pound may still be set, which may result in some level of catch. This may reduce the negative impacts to the fishing community somewhat, but fishing without leaders will render the pound nets much less effective at catching fish. Fish dealers and processors may also be impacted with a prohibition of all pound net leaders, as reduced landings would result in a much lower level of fish catch passing through their facilities and available for purchase.

The impacts on the pound net fishing community will be greater with this non-preferred alternative than with the PA. This alternative impacts all pound net fishermen in the Virginia Chesapeake Bay, while the preferred alternative impacts a smaller subset of these fishermen. As such, the social impacts described in Section 5.1.3 apply to this alternative, but more fishermen, more families, and a larger number of Virginia communities will be negatively impacted by NPA 4.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these gear modifications are effective at reducing 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.

5.7 LEADER MODIFICATION REQUIREMENT AND LEADER MESH SIZE RESTRICTIONS (NPA 5)

This non-preferred alternative includes restricting pound net leaders in a portion of the Chesapeake Bay to a height of one third the depth of the water at the average mean low tide. In the lower Chesapeake Bay area (the expanded closed area as defined in Section 5.3), the leader panel would be less than 8 inches stretched mesh, and the panel of the mesh would be held in place with ropes greater than or equal to 3/8" in diameter strung a minimum of every two feet and attached to a top line. In the remainder of the Virginia Chesapeake Bay, pound net leaders greater than or equal to 8 inches stretched mesh would be restricted. The anticipated biological consequences and risk reduction benefits of this alternative (which would be in effect from May 6 to July 15) are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.7.1 Biological Impacts

5.7.1.1 Fishery Resources

This alternative should not have any notable impacts to fishery resource catch, because it is likely that the leaders will continue to fish in the same manner as in previous years and fish will continue to be caught in the pounds. It cannot be conclusively determined if the same level of catch will occur with the modified leader configuration as with a"normal" consistent panel of mesh, but according to industry reports, the leaders should still "turn" fish into the pounds.

As described in Section 5.1.1.1, some fish species have been found entangled in the pound net leaders themselves. As leaders will continue to be fished, there is the continued potential for fish entanglement in the leaders. The magnitude of fish entanglement may be reduced by this alternative, compared to the status quo, as there will be less leader in the water (approximately 1/3 the typical height). However, NPA 5 may not have a large beneficial impact on fish resources as they may still become entangled in mesh dropped below the surface.

If any fishery resource may significantly benefit from this alternative, it would be fish species that school close to the surface (e.g., menhaden). Dropping the mesh in leaders in a southern portion of the Virginia Chesapeake Bay may reduce the catch of fish species that occur at the surface, as the pound net leader mesh may not guide those fish into the pound. As such, fewer menhaden or other fish that occur at the surface may be caught in pound nets, and subsequently there may be more of these species in Virginia waters.

Restricting leaders greater than or equal to 8 inches stretched mesh in the other portion of the Virginia Chesapeake Bay is not likely to have a large beneficial impact to fish resources, as fish may be caught in pounds with smaller mesh leaders and continue to be entangled in existing leaders.

As fishing effort will continue in the affected area, either by pound net fishermen with modified gear or by the other commercial or recreational fishermen, and the vertical lines spaced 2 feet apart may continue to guide some of the surface schooling fish into the pound, the NPA 5 should not greatly impact fishery resources in either a positive or negative manner.

5.7.1.2 Endangered and Threatened Species

The information presented in the PA and previous non-preferred alternative sections identifies that sea turtles may become entangled in and impinged on pound net leaders. All data presented in those sections apply to this alternative as well. However, the difference between the alternatives is that NPA 5 modifies the gear configuration of leaders rather than prohibiting the use of leaders or modifying the mesh size.

This alternative was proposed by industry representatives during a meeting held at the Virginia Marine Science Museum (VMSM) on October 27, 2003. Two NOAA Fisheries employees were present at this meeting. 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 will 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.

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."

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 leaders and through the spaced lines. This will likely reduce the potential of sea turtle entanglement in and impingement on these leaders and benefit the species. However, NOAA Fisheries is concerned that dropping the leader mesh on leaders may not necessarily preclude turtle entanglement in the mesh remaining below the surface.

In the spring, sea turtles in the Virginia Chesapeake Bay may be found at the bottom of the water column and in the proximity of the dropped pound net leader mesh. 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, NOAA Fisheries 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 and Kemp's ridleys in Virginia waters 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 set below the surface.

As mentioned previously, in 2001 and 2002, side scan sonar was used to attempt to detect sub-surface sea turtle entanglements; no verified sea turtle acoustical signatures were observed during these surveys (Mansfield et al. 2002a; Mansfield et al. 2002b). A number of factors may 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. NOAA Fisheries recognizes that prior survey scheduling was limited by the weather and sea conditions, but considers that side scan survey results may continue to be affected by water turbidity, the size and decomposition state of the animal, and the orientation of the turtle in the net. Sonar surveys have potential in detecting sub-surface turtle entanglements or impingements, but these issues must be addressed in future surveys before conclusively determining that sea turtles are not in pound net leaders sub-surface. While side scan sonar survey results have not documented the sub-surface entanglement of sea turtles in 2 years of surveys, NOAA Fisheries still believes these results should be treated cautiously, recognizing sea turtle behavior patterns. Further research on the effectiveness and practicality of side scan sonar techniques in observing sea turtle entanglements should be conducted during May and June and include real time verification of sonar surveys by divers, video, or other means.

Adequate monitoring of NPA 5 is imperative, not only to document sea turtle bycatch but to determine the effectiveness in fish catches and how the leader mesh dropped below the surface operates. There is no component of this alternative that establishes a monitoring study. It remains unclear how one can ensure that the leaders are operating effectively at such a depth given the poor water clarity in the Chesapeake Bay. Tie-downs used in other fisheries (e.g., monkfish gillnet fishery) have been found to increase the potential of sea turtle entanglement by creating a “bag” or “pocket” in the net. While tie-downs are used with gillnets and therefore cannot be compared directly to pound net gear, NOAA Fisheries is concerned that in areas with strong current, dropping the leaders below the surface may increase the potential for the net to gap, or billow between the leader poles, creating an effect like a tie down pocket. This may magnify the potential of sea turtle entanglement. Without adequate monitoring and evaluation, this alternative may create a situation in which sea turtles become entangled in leader mesh below the water. Note that leaders set at the surface may billow with the current and create a similar situation for increased turtle entanglement, but this occurrence would be easier to document (and remedy if necessary and possible). If the mesh can be held taut and not gap in the water column, the potential for sea turtle entanglement will likely be reduced. Impingements may still occur on the leaders set 1/3 the depth of mean low water in areas where impingements have previously been documented.

Bellmund et al. (1987) found that leaders with stringers set 16 to 18 inches apart entangled turtles. This alternative would consist of vertical lines spaced 24 inches (2 feet) apart, only a little larger than the distance found to entangle sea turtles in 1983 and 1984. Widening the gap between vertical lines to 2 feet may allow some turtles to pass through the lines unobstructed. This would benefit sea turtles by minimizing potential interactions with those nets with the modified gear. However, there are no data available that ensure sea turtles will not become entangled in the vertical lines. While these interactions may be limited due to the spacing of the lines, the type of rope proposed for use (e.g., 3/8 inches in diameter), and the average size of sea turtle found in the Chesapeake Bay (e.g., 50-70 cm SCL), additional information should be gathered on the potential for this alternative to reduce sea turtle interactions in pound net gear. 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). However, the vertical gear configuration included in NPA 5 is different than the type of vertical lines found in pot fisheries, and the tauter the vertical lines, the smaller the chance of sea turtles becoming entangled in the lines. Industry representatives have stated that the vertical lines could be kept taut, which would help reduce sea turtle entanglement.

The implementation of NPA 5 would likely benefit sea turtles by reducing interactions with leaders. In the area where the leaders would be reconfigured, there would be less entangling mesh in the water, so there would be a smaller chance for sea turtles to come in contact with the gear. However, without adequate documentation that these measures will reduce sea turtle entanglement in the mesh dropped below the water, the specific benefits to sea turtles remain somewhat unclear. The mesh size restriction in the remainder of the Virginia Chesapeake Bay is the same as that in NPA 1, NPA 2, NPA 3 and NPA 6, and should serve to reduce sea turtle entanglements in those leaders, as sea turtles have been documented entangled in greater than or equal to 8 inches stretched mesh. As mentioned in section 5.1.1.2, the available analysis does not necessarily support restricting the mesh size to less than 8 inches, because it is uncertain whether reducing mesh size has a significant benefit to sea turtles and if mesh size is the key component in potential sea turtle interactions with pound net gear. As such, restricting mesh size to less than 8 inches outside the area where leaders would be reconfigured may impose an additional impact on fishermen but not provide any significant protection to sea turtles.

As with the preferred alternative (Section 5.1.1.2), it is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 5. Should shortnose sturgeon be subject to entrapment by pound nets or entanglement in leaders, this alternative may change this potential because there may be fewer leaders in the northern Virginia Chesapeake Bay (if fishermen do not switch to less than 8 inches stretched mesh leaders), but there will be approximately the same number of fishermen using pound net leaders in the southern Chesapeake Bay as in the past. While unlikely, shortnose sturgeon may continue to be subject to take.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.7.1.3 Marine Mammals

Modifying the configuration of pound net leaders and reducing leader mesh size 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 5.1.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders, but the mesh size of the leaders resulting in this entanglement was not determined. The information on bottlenose entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

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 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. 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. As noted in previously described alternatives, bottlenose dolphin may continue to become entangled in leaders with stretched mesh less than 8 inches, in the dropped leader mesh in the lower Chesapeake Bay area and in those leaders set in the northern leader restricted area. Nevertheless, NPA 5 should benefit bottlenose dolphin by eliminating the threat of entanglement in larger mesh leaders during the time frame of this alternative.

As described in Section 5.1.1.3, harbor porpoise and harbor seals may infrequently occur in the Virginia Chesapeake Bay waters during May and June 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. This alternative will not likely minimize the potential entanglement threat as these species may interact with gear below the water. 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.

5.7.1.4 Birds

Dropping the mesh of leaders and widening the spaces between the vertical lines in a certain area of Chesapeake Bay may have a beneficial effect on the birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants. The data presented in Section 5.1.1.4 indicates that birds inhabiting the Chesapeake Bay area have been documented entangled in pound net leaders. The information on bird entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net, the NPA 5 may reduce some of the bird entanglement. Birds would not be as likely to become entangled in vertical lines spaced 2 feet apart. 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. These measures may benefit birds by reducing potential entanglements in those pound net leaders affected by the gear modification component of this alternative.

Restricting leaders greater than or equal to 8 inches stretched mesh in the other portion of the Virginia Chesapeake Bay is not likely to have a large beneficial impact to birds. While entanglement risks in leaders greater than or equal to 8 inches stretched mesh would be minimized, birds would continue to become entangled in those leaders with smaller mesh.

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.

5.7.1.5 Habitat

NOAA Fisheries believes that the NPA 5 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. Leaders in a portion of the northern Virginia Chesapeake Bay would need to be removed and replaced (if fishermen choose to replace their leaders instead of electing to curtail fishing activity) with smaller mesh in the leader restricted area. In the lower bay, fishermen will also have to remove and replace their leaders with the modified nets. Nevertheless, the NPA 5 may result in some temporary disruption of bottom habitat, but it is unlikely to adversely impact EFH or SAV.

5.7.2 Economic Impacts

Upper Bay
This alternative, NPA 5, is exactly the same as NPA 2. That is, leader mesh must be less than 8 inches. Therefore, the results for the upper bay are the same as the NPA 2. In summary, annual revenues are reduced by 17.1% (=$11,051/$64,483) if the four harvesters choose not to fish. Alternatively, revenues would be reduced by 8.4% (=$5,408/$64,483) if they choose to replace their leader with new mesh. Assuming a harvester would choose the option which minimizes their revenue losses, a harvester would therefore choose to change the leader mesh and continue fishing. For analysis details, see the PA (Section 5.1.2).

Lower Bay
In the lower bay, the leader height is restricted to one third the depth of the water with mesh less than 8 inches stretched. The panel of the mesh would be held in place with ropes greater than or equal to 3/8" in diameter strung vertically a minimum of every two feet and attached to a top line.

From May 6 to July 15, we assume each harvester would choose to modify their leaders with this mesh configuration versus choosing not to fish. Modifying their gear minimizes their economic loss. We assume the cost of the gear modification under this alternative (NPA 5) would be the same as the cost of modifying the leader with mesh less than 8 inches.

In 2002, there were 10 harvesters fishing 30 pounds. We assume each harvester fishes one offshore and two nearshore pounds. The cost per harvester to replace the leader mesh is $12,786 for 3 pounds (=2 nearshore + 1 offshore). Therefore, annual revenues per harvester would be reduced 12.1% (=$12,786/$105,298). For analysis details, see the PA (Section 5.1.2).

Summary of the Upper and Lower Bay
Under NPA 5, 45% of the harvesters (=[4 in upper bay +10 in lower bay]/31 total harvesters) fishing from May 6 to July 15 will be affected. Annual revenues per harvester will be reduced by 8.4% and 12.1% in the upper and lower bay, respectively.

Total industry revenues will be reduced by 5.8% (=[$0.150M]/[$2.6M]), under the NPA 5. The total industry cost under NPA 5 is $0.150 million, with $21,632 (=4 harvesters * $5,408) and $127,860 (=10 harvesters * $12,786) in the upper and lower bay, respectively. The methodology for this analysis is described in Section 5.1.2.

5.7.3 Social Impacts

The economic analysis indicates that the pound net industry will be impacted by this alternative. Under the NPA 5, 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, so the projected impacts to the fishing industry are anticipated to be small compared to some of the other alternatives.

The affected fishermen must modify their leader configuration or decrease their leader mesh size. Complying with these actions may create additional expenses and effort by the fishermen, resulting in negative social impacts to the industry. This potential loss of revenue may result in unemployment (and accompanying problems), similar to those described in Section 5.1.3. However, the industry participants determined that leaders could be modified with little extra effort (Gear specialist, NEFSC, pers. comm.), which would minimize the impacts of this alternative on those affected pound net fishermen. 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, 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.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these gear modifications are effective at reducing the entanglement risk to sea turtles and increase the potential for sea turtle recovery, then the portion of society that values biodiversity will benefit by preventing a loss of a species and preserving biodiversity. However, if sea turtles continue to be entangled in the modified pound net leaders and are at an increased risk of extinction, there are different social impacts associated with this alternative. The extinction of sea turtles would be a loss to society which has placed a value on the protection of all species for its intrinsic value as well as for its contribution to biodiversity. The Secretary of Commerce must carry out responsibilities imposed by society via the ESA which require him to ensure that all actions must not result in unauthorized incidental take of threatened and endangered species or that the take is not likely to jeopardize the continued existence of a species listed under the ESA.

5.8 EXPANDED GEOGRAPHICAL LEADER PROHIBITION AND LEADER MESH SIZE RESTRICTIONS (NPA 6)

This non-preferred alternative 6 involves prohibiting all pound net leaders in a southern portion of the Virginia Chesapeake Bay (expanded closed area) and restricting the use of pound net leaders with stretched mesh 8 inches or greater and leaders with stringers in the remainder of the Virginia Chesapeake Bay between May 6 and July 15. This was the preferred alternative considered in the draft EA and in the proposed rule. The difference between this alternative and the PA is that this alternative extends the closed area to the beach, affecting those nearshore nets, while the PA establishes the closed area greater than 10 horizontal feet from the mean low water line. Additionally, the PA does not impose additional mesh size restrictions outside the closed area and retains the framework mechanism by which expedited management measures can be imposed if deemed necessary. Refer to Section 2.1 for more information on the specific changes that were made and why this alternative is no longer the preferred alternative.

The anticipated biological consequences and risk reduction benefits of this alternative are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.8.1 Biological Impacts

5.8.1.1 Fishery Resources

Section 5.1.1.1 presents information on the potential impacts of prohibiting a portion of the fishery to using leaders and restricting pound net leader mesh size on fishery resources, and that information will apply to this alternative as well. This alternative may temporarily result in fewer fish caught in pound nets and benefit the fishery resources in Virginia, 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 (other pound nets with smaller mesh sizes in the leader restricted area or by other commercial and recreational fishing gear), 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 during May and June, the benefits to Virginia fish resources would be greater. Compared to the PA, this alternative may have more of a benefit to fish resources by prohibiting leaders in a larger number of nets, and as such, reducing more fish catch in pounds and potential entanglement in leaders.

5.8.1.2 Endangered and Threatened Species

Prohibiting all pound net leaders in the expanded closed area and restricting the use of pound net leaders with stretched mesh 8 inches or greater and leaders with stringers in the leader restricted area between May 6 and July 15 should provide a significant benefit to sea turtles. The information presented in Section 5.1.1.2 identifies that sea turtles become entangled in and impinged on pound net leaders with various mesh sizes. Data presented in that section applies to this alternative as well. NPA 6 imposes more restrictions than the PA, as the nearshore nets are included in the expanded closed area and leader mesh size is restricted to less than 8 inches outside this area.

Sea turtle entanglements and impingements will be prevented in the expanded closed area, as the area with the most documented sea turtle takes will be closed to the use of all leaders. However, as noted in section 5.1.1.2, there does appear to be a difference between take rates in the offshore and nearshore nets and this alternative restricts those nets with apparently low potential of sea turtle takes (e.g., nearshore nets). Thus, a minimal benefit to sea turtles may be experienced by NPA 6 in comparison to the PA. On the other hand, the act of prohibiting the use of more leaders, than in the PA, would further reduce the potential for sea turtle interactions in those nets and benefit the species.

Also, this alternative will benefit sea turtles by restricting the use of leaders with mesh found to result in sea turtle entanglements (e.g., 8 inches and greater stretched mesh). All leaders with the mesh size with documented sea turtle entanglements and impingements would be prohibited. The NPA 6 may provide more of a benefit to sea turtles than the PA, as it further restricts leader mesh size. However, as mentioned previously, NOAA Fisheries cannot support restricting the mesh size to less than 8 inches based upon the available analysis, as location of the net and associated environmental conditions may be more notable factors in potential turtle/pound net interactions compared to mesh size. In both alternatives, leaders are prohibited in the area with all of the documented sea turtle takes, except for one entanglement. As such, both alternatives may provide relatively equal protection to sea turtles.

It is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 6. Section 5.1.1.2 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 because prohibiting leaders in a portion of the southern Chesapeake Bay and restricting leaders with greater than or equal to 8 inches and leaders with stringers will likely reduce fish catch in some pound nets in the Virginia Chesapeake Bay. The NPA 6 would have a larger potential benefit to shortnose sturgeon than the PA because a greater number of pound net leaders would be impacted and the potential for interactions would be further reduced. Should the affected fishermen choose to switch to leaders smaller than 8 inches stretched mesh instead of electing to remove their leaders in the leader restricted area, the potential benefits to shortnose sturgeon would be reduced to an unknown degree.

Endangered right, humpback, and fin whales are unlikely to be in the project area and interact with pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.8.1.3 Marine Mammals

Prohibiting the use of all pound net leaders in a portion of the Chesapeake Bay and restricting leaders with 8 inches or greater stretched mesh in another portion of the Bay may have a beneficial effect on the coastal bottlenose dolphin. The data presented in Section 5.1.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders, and that information further applies to this alternative.

NPA 6 may provide more protection to bottlenose dolphin than the PA, as more gear is restricted in a southern portion of the Chesapeake Bay and potential interactions with this gear would be prevented. Bottlenose dolphin appear more likely to become entangled in leaders with stretched mesh greater than 8 inches rather than smaller than 8 inches, and this alternative would reduce larger mesh entanglements. Regardless of mesh size, 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 serve to limit the interactions between pound net gear and bottlenose dolphin and any subsequent entanglements, resulting in a net benefit to these marine mammals. Under this alternative, fishermen have the option to switch to leaders smaller than 8 inches stretched mesh. As the leader mesh size resulting in the most bottlenose dolphin entanglements has not been conclusively determined, if fishermen switch to smaller mesh sizes, bottlenose dolphin entanglement could still occur. Again note that it is probable that more bottlenose dolphin interactions would occur with larger mesh sizes, and as such, this alternative will benefit these species.

As described in Section 5.1.1.3, 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.

5.8.1.4 Birds

Prohibiting the use of all pound net leaders in a portion of the Chesapeake Bay and restricting leaders with 8 inches or greater stretched mesh in another portion of the Chesapeake Bay should benefit birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants. The data presented in Section 5.1.1.4 indicate that birds inhabiting the Chesapeake Bay area become entangled in pound net leaders and that information further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net gear, restricting the use of leaders is anticipated to reduce some of the bird entanglement in the expanded closed area. The NPA 6 would benefit avian species, to a greater degree than with the PA, because more of the entangling gear would be eliminated. 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 leaders with less than 8 inches stretched mesh, as well as in the hearts and pounds, in the leader restricted area. As such, some level of avian entanglement may continue with this alternative but any measure that limits the amount of gear in the water should benefit avian species.

Note that if pound net leaders are prohibited in a portion of the Chesapeake Bay, this would reduce the amount of catch and discards available to these birds as forage species. However, birds foraging in Chesapeake Bay may exploit pound nets for prey but they are not dependent on this source of forage. NOAA Fisheries 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.

5.8.1.5 Habitat

NOAA Fisheries believes that the NPA 6 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The type of anticipated impacts would be the same as those described in the PA, but the magnitude would be greater as more leaders are prohibited with this alternative. Additionally, leader mesh size outside the expanded closed area is restricted, so fishermen may have to remove and/or replace their leaders with mesh less than 8 inches, resulting in additional impacts to habitat. As such, the NPA 6 may result in some temporary disruption of already affected bottom habitat to a nature and degree (that is, removal of the leaders) that already occurs in the industry, but it is unlikely to adversely impact EFH or SAV.

5.8.2 Economic Impacts

Upper Bay

In 2002, there were 21 harvesters fishing 40 pound nets (=21 harvesters @ 1.9 pounds per harvester) from May 6 to July 15 (Table 5.1.2.5). Based on the 2003 NEFSC gear survey data, 8.8% (=3 /34) of the active pounds surveyed had leader mesh 8 inches and greater (Table 5.1.2.1). Therefore, 4 pounds (=40*8.8%=3.5) may have to replace their mesh in 2004 under the NPA 6. Given that each harvester fishes approximately 2 pounds on average, we further assume each harvester has one pound nearshore and one offshore. The NEFSC gear survey data show offshore pounds have larger mesh compared to nearshore pounds. Therefore, four harvesters will have to convert one leader each.

These four harvesters have the following options: 1) remove the leader and not fish, or 2) replace the leader with new mesh. We assume 50% of revenue losses will be incurred if they choose not to fish since harvesters typically fish 2 pounds each. Therefore, each harvester would lose $9,051 (=0.50*$18,102) in revenues plus $2,000 to remove the leader and put it back into the water. Leader mesh offshore is typically larger than leader mesh of pounds fished nearshore. We assume the pounds in the upper bay are offshore pounds. The total cost of replacing an offshore leader with new mesh is $5,408 (=$2,000 labor to remove/replace leader in water + $3,408 material and labor cost of new mesh). See the data section for details on the material and labor cost of new mesh.

In summary, annual revenues are reduced by 17.1% (=$11,051/$64,483) if these four harvesters choose not to fish. Alternatively, revenues would be reduced by 8.4% (=$5,408/$64,483) if they chose to replace their leader with new mesh. Assuming a harvester would choose the option which minimizes their revenue losses, a harvester would therefore choose to change the leader mesh and continue fishing.

Lower Bay
Although harvesters can attempt to fish without leaders in the lower bay, we assume they will lose 100% of their revenues from May 6 to July 15. We assume this worst case scenario because we do not have any data to support the change in catch that will occur without a leader. In 2002, there were 10 harvesters fishing pound nets in the lower bay from May 6 to July 15. In addition, harvesters must incur the cost of removing their leaders. Given each harvester is assumed to have one offshore pound and two nearshore pounds, the cost to remove the leaders and put them back into the water is $5,000. Annual revenues per harvester may be reduced by 43.2% (=[$40,474 revenues+$5,000 leader removal/replacement]/$105,298).

Summary of the Upper and Lower Bay
Under the NPA 6, 45% of the harvesters (=[4 in upper bay +10 in lower bay]/31 total harvesters) fishing from May 6 to July 15 will be affected. Annual revenues per harvester will be reduced by a low of 8.4% and a high of 43.2% in the upper and lower bay, respectively.

The 2002 pound net industry revenues totaled $2.6 million. Therefore under the NPA 6, total industry revenues will be reduced by 18.3% (=[$0.476M]/[$2.6M]). The total industry cost under the NPA 6 is $0.476 million, with $21,632 (=4 harvesters*$5,408) and $454,740 (=10 harvesters*$45,474) in the upper and lower bay, respectively.

5.8.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. Section 5.1.3 describes the potential social impacts associated with prohibiting leaders and restricting leader mesh size and stringers. That information also pertains to this alternative, but the magnitude of the impacts would be greater given that the closed area is larger with this alternative and leader mesh size is restricted outside the closed area. A larger number of fishermen, families, and portion of the community would likely be impacted by this alternative, as more leaders are prohibited. The geographical distribution of the impacts would be similar to those experienced with NPA 1, NPA 3, and NPA 5, and be concentrated in the southern Chesapeake Bay but also impact fishermen in the northern Virginia Chesapeake Bay.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these gear restrictions are effective at reducing 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.

6.0 POTENTIAL CUMULATIVE EFFECTS

This section identifies the cumulative effects that may result from implementing the PA. The PA prohibits all offshore pound net leaders in a southern portion of the Virginia Chesapeake Bay (the closed area), and retains the restriction on the use of pound net leaders measuring 12 inches or greater and leaders with stringers in the remainder of the mainstem Virginia Chesapeake Bay (the leader restricted area) from May 6 to July 15 each year. The PA also includes a framework mechanism 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 D.

The geographical area affected by this proposed action is the Virginia Chesapeake Bay (the 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. The time frame for the regulations (the PA) only includes the spring period, from May 6 to July 15, of any given year, but under the framework mechanism, restrictions may be extended to July 30 of any given year. The time frame for this cumulative effects analysis includes past, present and near future actions in the area.

Several actions 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, and the ecosystem components on which these effects impact, is presented in Table 6.0.1.

6.1 Impacts to Biological Resources

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). NOAA Fisheries 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. During the approximate time period of the proposed measures (May 16 to July 31, 2003), a preliminary count of 26 of 375 turtles were found on Virginia beaches with carapace/plastron damage or propellor-like 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, NOAA Fisheries is not aware of high-speed ferry services planned for the area in question. NOAA Fisheries 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 NOAA Fisheries. NOAA Fisheries 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 Tables 4.2.1.1 and 4.2.1.2, there is a complex mix of fisheries operating in Virginia Chesapeake Bay waters during the spring. Appendix A identifies Virginia commercial landings from April through June 2003 and the species targeted (VMRC web site 2003). July 2003 landings were not available at the time of this document preparation, but July 2002 landings are included in Appendix B. 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, NOAA Fisheries 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 3 percent of the total Virginia Chesapeake Bay landings in May, June, and July 2002 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.

NOAA Fisheries 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 (Tables 4.2.1.1 and 4.2.1.2), 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, NOAA Fisheries 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 (NOAA Fisheries NER 2002, NOAA Fisheries 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 Pound Net Research

Through a separate initiative, independent of this final rule, NOAA Fisheries is beginning to implement a coordinated research program with pound net industry participants and other interested parties to develop and test pound net leader modifications with the goal of eliminating or reducing sea turtle interactions while retaining an acceptable level of fish catch. The intent of researching and developing alternative pound net leaders is to eventually allow fishermen to keep fishing in the closed area, after demonstrating that certain types of leaders, or other types of fish turning devices, do not entangle or impinge sea turtles. Extensive monitoring of the leader and pound catch rates is an important component of this initiative. If, in the future, an appropriate leader configuration is developed, NOAA Fisheries will pursue the necessary channels to enable fishermen to use the type of leader in the closed area.

NOAA Fisheries Northeast Fisheries Science Center has applied for a scientific research permit under section 10(a)(1)(A) of the ESA. The proposed research would involve testing an alternative leader design this spring (the leader modification design included in NPA 5), and experiments are anticipated to involve four nets in the closed area and two nets set outside the closed area. Surface and depth monitoring are anticipated to be conducted on the experimental leaders a minimum of two times a day. The decision to issue this research permit is made independent of this action, but it should be noted that, if the permit is issued, sea turtle takes are likely to occur with this research. Based upon the draft analysis, the anticipated annual take of this experimental research includes 102 loggerheads (2 dead), 39 Kemp's ridleys (3 dead), 1 alive green, and 1 alive leatherback.

The biological, social, and economic impacts of this research will be considered in the forthcoming NEPA analysis conducted on that activity, and that EA will consider the cumulative impacts of past, present and future actions in the Virginia Chesapeake Bay as well. Additionally, a formal section 7 consultation will also be completed on the effects of the research on listed species.

6.2 Previous Conservation and Recovery Actions Impacting Marine Resources

A number of 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.

NOAA Fisheries 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, NOAA Fisheries has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. NOAA Fisheries 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.

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.

There is currently no organized, formal program for at-sea disentanglement of sea turtles. However, recommendations for such programs are being considered by NOAA Fisheries 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 NOAA Fisheries NER. Entangled sea turtles found in recent years have been disentangled on an ad hoc basis by STSSN members, the USCG, and fishermen.

6.3 Human Community

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 (March 2003) 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.

6.3.1 Cumulative Economic Impacts

As mentioned previously, pound net fishermen are also currently subject to regulations to protect sea turtles. This section estimates the cumulative economic impacts of any federal management action or previous preferred alternative 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 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 annually; and 3) on July 16, 2003, a temporary final rule was published which prohibited the use of all pound net leaders from July 16 to July 30, 2003.

2001 rule

The emergency rule prohibiting leaders with mesh 8 inches or greater and the use of stringers from June 19 to July 19 resulted in harvesters incurring revenue losses and the cost of removing the leader and placing it back in the water. Based on 2001 VMRC data, revenues per harvester from June 19 to July 19 were $7,507 (CV=0.89) and $30,426 (CV=1.04) on average in the upper and lower bay, respectively.[11] Assuming larger mesh leaders are in offshore waters, the cost of removing one leader and putting back in the water is estimated at $2,000. See data section under the PA for cost details (Section 5.1.2).

Based on VMRC data, from June 19 to July 19 there were 50 (=25 harvesters in 2001*2 pounds per harvester) and 33 (=11 harvesters in 2001* 3 pounds per harvester) active pounds fishing in the upper and lower bay, respectively.[12] Using the 2001 VMRC gear survey data (Table 6.3.1), approximately 10.0 pounds (=[10/50] pounds with leaders prohibited*50 active pounds) and 21.5 pounds (=[15/23] pounds with leaders prohibited*33 active pounds) in the upper and lower bay were affected by the 2001 rule, respectively. Of the 25 active harvesters in the upper bay, 10 harvesters may have had to remove one leader. Rounding the estimated affected pounds fished to 22 in the lower bay, each of the 11 harvesters may have had to remove two leaders.

Annual revenues per harvester were reduced by 14.1% (=$9,507/$67,668) and 25.9% ($34,426/$133,146) in the upper and lower bay, respectively (with 2001 annual revenues in the denominator). The total cost per harvester was $9,507 (=$7,507 in revenue losses + $2,000 per leader removal) and $34,426 (=$30,426 in revenue losses + [$2000 per leader removal*2 leaders]) in the upper and lower bay, respectively.

Total industry revenues were reduced by 17.9% (=[$0.474M]/[$2.653M]) under the 2001 rule, with 2001 industry revenues totaling $2.653 million. The total industry cost for the 2001 rule was $0.474 million, with $95,070 (=10 harvesters*$9,507) and $378,686 (=11 harvesters*$34,426) in the upper and lower bay.

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[11] Seasonal and 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. For details on the upper and lower bay stratification, see the data section on the preferred alternative (Section 5.1.2).

[12] For details of the number of active pounds in 2002, see the results section under the PA (5.1.2).

Table 6.3.1 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 stringers by region.

Region of CB	L.M. < 8"	8" ≤ L.M.<12"	L.M. ≥ 12"	Stringer & L.M. < 8"	Total
Upper	40	2	2	6	50
Lower	8	5	7	3	23
Total	48	7	9	9	73

2002 Rule
In 2002, harvesters fishing with leader mesh 12 inches or greater or with stringers had to either choose not to fish from June 17 to June 30, or to replace the leader with new mesh. If the 2002 rule was published early enough to give harvesters time to order and hang new mesh for their leaders, the option of replacing the leader with new mesh would minimize a harvesters' economic loss. The 2002 rule, however, was published in the middle of the season (June 17, 2002). Therefore, harvesters had to incur the cost of removing their leader and revenue losses. Based on 2000 to 2002 VMRC data, revenues per harvester from June 17 to June 30 were $3,060 (CV=1.03) and $7,688 (CV=1.03) on average 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 $2,000.

Based on 2002 VMRC data, from May 8 to June 30 there were 40 and 30 active pounds fishing in the upper and lower bay, respectively.[13] Using the 2001 VMRC gear survey data (Table 6.1), approximately 6.4 pounds (=[8/50] pounds with leaders prohibited*40 active pounds) and 13.0 pounds (=[10/23] pounds with leaders prohibited*30 active pounds) in the upper and lower bay were affected by the 2002 rule, respectively. Rounding the estimated pounds affected, of the 21 active harvesters in the upper bay, 6 harvesters may have had to remove one leader. Similarly, for the lower bay, of the 10 harvesters, 7 harvesters may have had to remove one leader and 3 harvesters may have had to remove 2 leaders from the water.

There are 16 harvesters that may have been affected by the 2002 rule. Annual revenues per harvester may have been reduced by 7.9% (=[$3,060 in revenue losses + $2,000 per leader removal]/$64,483) in the upper bay. In the lower bay, harvesters removing one offshore leader may have incurred annual revenue losses of 9.2% (=[$7,688 in revenue losses + $2,000 per leader/$105,298) and 11.1% (=[$7,688 in revenue losses + $2,000 per leader*2]/$105,298) for harvesters removing two offshore leaders.

[13] For details of the number of active pounds in 2002, see the results section under the PA (Section 5.1.2).

Total industry revenues were reduced by 5.2% (=[$0.133M]/[$2.555M industry revenues]) under the 2002 rule. The total industry cost was $0.133 million, with $30,360 (=6 harvesters*$5,060) and $102,880 (=[7 harvesters*$9,688] + [3 harvesters*$11,688]) in the upper and lower bay.

2003 Season
By the 2003 season, harvesters were able to prepare for the measures in the 2002 rule. Changing the mesh on the leader before May 8 would minimize the economic impacts on a harvester. However, additional costs were incurred on the harvester when all leaders were prohibited from July 16 to July 30 under the temporary final rule published on July 16, 2003. Revenue losses and the cost of removing all their leaders were added.

Under the 2002 rule, of the 21 active harvesters in the upper bay, 6 harvesters needed to replace the mesh on 1 leader. Similarly for the lower bay, of the 10 harvesters, 7 harvesters needed to replace the mesh on 1 leader and 3 harvesters needed to replace the mesh on 2 leaders. The estimated annual cost of replacing one offshore leader with new mesh is $3,408, assuming materials are paid over a 5 year period given a 5% annual interest rate. For six harvesters in the upper bay and seven harvesters in the lower bay the total cost was $3,408 per harvester. For three harvesters in the lower bay the total cost was $6,816. These 16 harvesters also incurred losses due to the temporary closure to all leaders enacted in July 2003.

The *2003 emergency closure* may have resulted in a total loss of $6,722 (=$3,222 in revenues + $3,500 in leader removal) and $18,222 (=$13,222 in revenues+ $5,000 in leader removal) to harvesters in the upper bay and lower bay, respectively.[14] Based on 2000 to 2002 VMRC data, revenues per harvester from July 16 to July 30 were $3,222 (CV=0.90) and $13,415 (CV=1.29) on average in the upper and lower bay, respectively.

For fifteen harvesters in the upper bay, annual revenues per harvester were reduced by 10.4% (=$6,722/$64,483) due to the 2003 emergency closure. For the remaining 6 harvesters in the upper bay, annual revenues were reduced by 15.7% (=[$3,408 for the mesh change + $6,722 closure losses]/$64,483). In the lower bay, annual revenue loss per harvester ranged between a low of 20.5% (=[$3,408 for the mesh change + $18,222 closure losses]/$105,298) and a high of 23.8% (=[$6,816 for the mesh change + $18,222 closure losses]/$105,298).

Total industry revenues were reduced by 15.2% (=[$0.388M]/[$2.555M]) under the 2003 rule. The total industry cost under the 2003 emergency closure rule was $0.388 million. The closure cost a total of $323,382, with $141,162 (=21 harvesters*$6,722) and $182,220 (=10

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[14] We assume harvesters in the upper bay fish 1 offshore pound and 1 nearshore pound for a total of 2 pounds per harvester. In the lower bay, harvesters fish 1 offshore and 2 nearshore pounds for a total of 3 pounds per harvester. Removal costs are $1,500 and $2,000 per leader in nearshore and offshore pounds, respectively. See the data section under the PA (Section 5.1.2) for cost details.

harvesters*18,222) in the upper and lower bay, respectively. The gear modifications cost a total of $64,753, with $20,448 (=6 harvesters*$3,408) and $44,304 (=[7 harvesters*$3,408]+[3 harvesters*$6,816]) in the upper and lower bay, respectively.

2004 Proposed PA

In 2004, the PA proposes to require all offshore leaders to be removed in a portion of the lower bay and leader mesh to be less than 12 inches in the remainder of the Virginia Chesapeake Bay. Under the PA, 33% of the harvesters (=[0 in upper bay + 10 in lower bay]/31 total harvesters) would be affected. Annual revenues per harvester would be reduced by 0% and 14.7% to 29.4% in the upper and lower bay, respectively.

Total industry revenues may be reduced by 7.3% (=[$0.19M]/[$2.555M]). The total industry cost under the PA is $0.19 million (=[8 harvesters *$15,491 loss per offshore leader] + [2 harvester*$15,491 loss per offshore leader* 2 offshore leaders) in the lower bay.

Summary

In summary, to protect sea turtles, total industry revenues earned by the Virginia Chesapeake Bay pound net fishery were reduced by 17.9%, 5.2%, and 15.2% from 2001 to 2003, respectively. Note that some of these revenue reductions (e.g., 2001 and 2003 rules) were one time reductions, as the measures were temporary in nature. The current proposed PA, is expected to reduce industry revenues by 7.3%.

In the upper region of the bay, 19% to 100% of the harvesters have had a reduction in their annual revenues over the last 3 years (Table 6.2). Revenue reductions have ranged between a low of 7.9% under the 2002 rule, to a high of 15.7% in the 2003 season. In the lower region of the bay, 100% of the harvesters have had a reduction in their revenues over the same years. Annual revenue reductions per harvester have ranged between a low of 9.2% under the 2002 rule to a predicted high of 29.4% in the lower bay under the 2004 PA.

Although several actions have been imposed on the pound net fishery, the PA evaluated here would replace these previous actions.

Table 6.2. The ratio of harvesters affected by a rule to the total number of harvesters active (percentage in parentheses) and the reduction in annual revenues per affected harvester as a result of the rule, by region of the Virginia Chesapeake Bay and year.

Year	Upper Region		Lower Region	
	Ratio of Harvesters	Reduction (%)	Ratio of Harvesters	Reduction (%)
2001	10/20 (50%)	14.1%	11/11 (100%)	25.9%
2002	6/21 (29%)	7.9%	10/10 (100%)	9.2 - 11.1%

2003	21/21 (100%)	10.4-15.7%	10/10 (100%)	20.5 - 23.8%
2004 PA	0/21 (0%)	0%	10/10 (100%)	14.7% - 29.4

Table 6.0.1. Summary of the cumulative impacts of the PA and the affected ecosystem components. P=Past, PR=Present, F=Anticipated future. The "up" and "down" arrows represent the cumulative impacts to that particular ecosystem component, and the arrow in each cell refers to each of the past, present and future impacts (▲=Cumulative positive impacts; ▼=Cumulative negative impacts). A blank cell indicates that there likely have been, are, or will be no known impacts.

	Fishery resources	**Sea turtles**	**Other E&T species (e.g., sturgeon, whales)**	**Marine mammals**	**Birds**	**Habitat**	**Human community (economic and social)**
Vessel operations		▼P, PR, F	▼P, PR, F	▼P, PR, F			▲ P, PR, F
Fishing operations	▼P, PR, F	▼P, PR, F		▼P, PR, F	▼P, PR, F	▼P, PR, F	▲ P, PR, F
Dredging activities		▼P, PR, F	▼P, PR, F			▼P, PR, F	▲ P, PR, F
Marine pollution/water quality	▼P, PR, F	▼P, PR, F	▼P, PR, F	▼P, PR, F	▼P, PR, F	▼P, PR, F	▼P, PR, F
Anticipated pound net research	▼F	▼F		▼F	▼F	▼F	
Conservation measures		▲ P, PR, F	▲ P, PR, F	▲ P, PR, F			▼▲P, PR, F[15]
Pound net leader restrictions	▲ P, PR, F	▲ P, PR, F	▲ P, PR, F	▲ P, PR, F	▲ P, PR, F	▲ P, PR, F	▼P, PR, F

[15]Both positive and negative cumulative impacts have been, are, and will be experienced by the human community from conservation measures.

In summary (and as depicted in Table 6.01), 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 will have 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 a net beneficial impact to ecosystem components when considered in conjunction with activities occurring withing the area. In particular, the pound net leader restrictions included in the PA and in previous and current actions affecting the pound net fishery, have likely had a net positive impact on all ecosystem components, except for the human community, which experienced net negative impacts.

Future anticipated pound net research is likely to further our knowledge on sea turtle and pound net interactions, leading to potentially different management measures impacting the pound net fishery (having a beneficial impact to sea turtles), but in the short term, this future research is likely to have a minor negative impact on fishery resources, sea turtles, marine mammals, birds, and habitat, and may contribute to cumulative impacts, although the impacts will be minor and temporary in nature. Additional analysis will further consider the impacts of this research.

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 restrictions and other conservation measures enacted in the area have protected, and will protect, sea turtles, benefitting 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 benefitted these resources. These positive impacts may outweigh the other negative cumulative impacts experienced in the area. The human community will likely experience negative impacts from the pound net leader restrictions, some conservation measures, and marine pollution and impaired water quality, and it is unknown if those impacts will outweigh the benefits experienced from the other past, present, and future activities.

7.0 FINDING OF NO SIGNIFICANT IMPACT

The preferred alternative involves NOAA Fisheries issuance of a final rule would prohibit the use of all offshore pound net leaders in the Virginia waters of the mainstem Chesapeake Bay south of 37° 19.0' and west of 76° 13.0', and all waters south of 37° 13.0' to the Chesapeake Bay Bridge Tunnel at the mouth of the Chesapeake Bay, and the James and York Rivers downstream of the first bridge in each tributary. Offshore pound net leaders are defined as those leaders with the inland end set greater than 10 horizontal feet from the mean low water line. Additionally, the final rule retains the restriction of all leaders with stretched mesh greater than or equal to 12 inches and leaders with stringers in the Virginia waters of the Chesapeake Bay outside the aforementioned closed area, extending from the Maryland-Virginia State line and the Great Wicomico, Rappahannock, and Piankatank Rivers downstream of the first bridge in each tributary, to the COLREGS line at the mouth of the Chesapeake Bay. These measures would be in effect from May 6 to July 15 each year. The final rule also contains a framework mechanism, and year round reporting and monitoring requirements. This rule is necessary to protect sea turtles listed as threatened or endangered under the Endangered Species Act of 1973 from entanglements and impingements in Virginia pound net gear.

Impacts to the human environment, both beneficial, adverse and cumulative, were evaluated in this document and are not significant.

Implementation of gear restrictions, as described in this document, are expected to have a short-term negative economic impact on the pound net fishing industry. Gear restrictions are expected to have positive effects on threatened and endangered sea turtles, as well as bottlenose dolphin and certain bird species, by reducing serious injury and mortality in the event of an entanglement.

Public health and safety is not expect to be significantly affected by implementation of these gear restrictions. The modifications involve removing pound net leaders during the spring. 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.

The unique characteristics of the geographic area impacted by the rule are the presence of submerged aquatic vegetation, essential fish habitat, and the abundance of life forms of commercial and non-commercial value. The value of this area was considered in the essential fish habitat consultation process and described in this document, and the unique characteristics will be not be significantly impacted by this action.

The effects on the human environment of gear restrictions are not likely to be highly controversial. The impact of gear restrictions may be controversial to the pound net fishing community, but 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.

The degree to which the effects of the proposed alternative are highly uncertain or involve unique or unknown risks is small.

The implementation of gear restrictions to reduce the risk of entanglement 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 implemented 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, NOAA Fisheries 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, NOAA Fisheries recognizes that specific gear characteristics and 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.

This action would prohibit offshore pound net leaders in a portion of the Virginia Chesapeake Bay, as well as retain the previously established leader mesh size restriction, outside the leader prohibited area, and the framework mechanism for future action designed to protect sea turtles based upon new information. The cumulative impacts of the initial restriction and any possible additional restrictions have been analyzed with regard to both context and intensity. Given the short duration and limited scope of possible cumulative impacts, such impacts are not expected to be significant.

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, by definition, not likely to result in the permanent loss or destruction of resources.

The basis for this action is to offer additional protection to endangered and threatened sea turtles. It is expected that protected marine mammals found in the Virginia Chesapeake Bay will also benefit from the imposition of gear restrictions. While there is no evidence that threatened or endangered species will be adversely affected specifically by these gear restrictions, a formal section 7 consultation on the proposed action has been completed. NOAA Fisheries concluded in its biological opinion that the proposed final rule is not likely to jeopardize any listed species. The provision of an incidental take statement in the biological opinion 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 NOAA Fisheries' jurisdiction has been designated in Virginia waters, so none will be affected by the proposed gear restrictions.

There is no evidence that implementation of gear restrictions 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. 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.

In view of the analysis presented in this document, it is hereby determined that the implementation of gear restrictions, as described in section 3.1 of this document, will not significantly affect the quality of the human environment with specific reference to the criteria contained in NAO 216-6 regarding compliance with the National Environmental Policy Act. Accordingly, the preparation of an Environmental Impact Statement for this proposed action is unnecessary.

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William T. Hogarth   Date
Assistant Administrator for Fisheries,
National Marine Fisheries Service

8.0 REGULATORY IMPACT REVIEW (RIR)

A Regulatory Impact Review (RIR) for all regulatory actions that are of public interest is required by NOAA Fisheries. 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 public, 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.

8.1 Executive Order (E.O.) 12866

The RIR is intended to assist NOAA Fisheries 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 or "no action" alternative, it is the change in net National benefit that becomes the focal point of analysis. Given the finding that the status quo alternative does not afford adequate protection to sea turtles, the consumer surplus (non-consumptive use and non-use value) associated with improved sea turtle protection can be expected to be superior to that of the status quo. Further, regulatory alternatives that afford higher protection will yield higher benefits at the margin.

Seven alternatives are evaluated in this document, in addition to the "no action" alternative. Under the PA, management actions are being proposed for two distinct areas of the Chesapeake Bay. In a southern part of the Chesapeake Bay, all *offshore* pound net leaders would be prohibited from May 6 to July 15 (the "lower bay" or the "closed area"). The PA also restricts leaders with stretched mesh greater than or equal to 12 inches and leaders with stringers from May 6 to July 15 for *lower bay nearshore* pounds and in the remainder of the Virginia Chesapeake Bay (the "upper bay" or the "leader restricted area") . A detailed description of these 2 areas is in Section 3.1 of this document and identified in Figure 3.

As noted in Sections 3.1 to 3.7, the following alternatives are evaluated in this document:

- The preferred alternative (PA) described above (See Section 5.1.2).
- Non-preferred alternative 1 (NPA 1) prohibits pound net leaders in the lower bay, and requires leader mesh in the upper bay to be less than 8 inches from May 6 to June 30 of each year.
- Non-preferred alternative 2 (NPA 2) requires the mesh of all leaders to be less than 8 inches from May 6 to July 15.
- Non-preferred alternative 3 (NPA 3) is similar the NPA 1, however, the pound and heart must now be removed in addition to the leader in the closed area from May 6 to July 15.
- Non-preferred alternative 4 (NPA 4) requires leaders be removed from all pound nets in the Virginia Chesapeake Bay from May 6 to July 15.
- Non-preferred alternative 5 (NPA 5) allows pound net leaders to be used in the closed area from May 6 to July 15, however, the mesh height is restricted to one third the depth of the water, the mesh must be less than 8 inches and held with ropes 3/8" or greater in diameter strung vertically a minimum of every two feet and attached to a top line.
- Non-preferred alternative 6 (NPA 6) prohibits all pound net leaders in the lower bay and requires leader mesh in the restricted area to be less than 8 inches from May 6 to July 15.
- No action (i.e., status quo).

The absolute magnitude of sea turtle protection provided by these regulatory alternatives cannot be quantified, but they can be ranked. Sea turtle protection alternatives will be ranked in the upper bay and lower bay separately. In ranking the alternatives in the upper bay, the fourth non-preferred alternative (NPA 4) would provide the most protection against sea turtle mortality since pound net leaders would be removed. As a result of removing leaders in an area, the probability of entanglement leading to mortality is considered to be much less compared to an area where leaders are allowed with mesh size restrictions. Therefore, the remaining alternatives provide less protection. At this point in time, we are unable to determine whether leader mesh sizes less than 8 inches have a different catch rate than leaders with mesh between 8 and 12 inches. As such, looking strictly at a mesh size restriction, the remaining alternatives are equivalent in sea turtle protection, except non-preferred alternative 1 (NPA 1) since it has a shorter time period restriction. Therefore, NPA 1 provides less protection than the PA and non-preferred alternatives 2, 3, and 6 (NPA 2, NPA 3, and NPA 6). NPA 5 cannot be ranked. In summary, NPA 4 provides the most sea turtle protection in the upper bay, with the PA equivalent to NPA 2, 3, and 6 providing the next lower level of protection, and NPA 1 providing the least protection.

In the lower bay, non-preferred alternatives 3 (NPA 3) and 4 (NPA 4) provide the most sea turtle protection. The trade-off between these two alternatives is that one alternative (NPA 3) removes more gear from the water (i.e., the leader, heart and pound), and the other alternative (NPA 4) extends the boundary for the removal of leaders to the COLREGS line at the mouth of the Chesapeake Bay. We assume they provide equivalent protection since we have no data to support whether they differ. Non-preferred alternative 6 (NPA 6) provides less protection than NPA 3. These two alternatives are exactly the same except NPA 3 removes more gear from the water and we assume a probability greater than zero exists that a sea turtle can drown if they are entangled or caught in the pound or the heart. We then rank the PA and NPA 1 equivalent and with a lower protection level than NPA 6. The trade off between these two alternatives is the PA removes only offshore leaders and the NPA 1 removes both offshore and nearshore leaders for a shorter time period. In the 2002 and 2003 NEFSC surveys there were 22 turtles caught in 480 offshore surveys, and 1 turtle caught in 345 nearshore surveys. Therefore, a risk of sea turtles being entangled in nearshore leaders still exists under the PA. The NPA 2 provides the least protection since we have no evidence that leaders with mesh less than 8 inches will catch less turtles than leaders with mesh greater than 8 inches. In summary, non-preferred alternatives 3 and 4 (NPA 3 and NPA 4) provide the most protection in the lower bay, followed by non-preferred alternative 6 (NPA 6), then by the equivalent preferred and non-preferred alternative 1 (PA and NPA 1), with the least sea turtle protection under non-preferred alternative 2 (NPA 2).

Both consumer surplus and producer surplus for seafood products supplied by the pound net fisheries will be affected by these sea turtle protection measures. Under the PA, one third of the harvesters must remove their *offshore* leaders from the water. These harvesters will incur revenue losses plus additional labor cost to remove and place the leader back into the water after the restriction is lifted. Some harvesters have the option of modifying their gear. Gear modifications also result in additional costs to the harvesters. These sea turtle protection measures will result in revenue losses also.

A decrease in earned revenues because of not fishing will result in a reduction in quantities of seafood supplied to seafood markets which may result in higher prices to consumers. The magnitude of these changes and how the surpluses will be redistributed between consumers and producers will depend on the slopes of the respective supply and demand functions. In any case, as long as demand functions are downward sloping and supply functions are upward sloping, there is always a loss in economic surplus when regulatory costs are imposed. However, this loss in economic surplus will be minimized by selecting the least costly regulatory alternative which provides a sufficient level of protection.[16]

Since the PA would only affect a portion of the pound net fishery's average annual landings (approximately 380,000 pounds or 4.7% of annual landings), the effect on regional seafood markets would probably be negligible, as would the impact on seafood prices and consumer's surplus. In summary, consumer surplus changes are negligible to the PA.

8.2 Regulatory costs to Pound Net Industry

Regulatory costs to the pound net industry are measured by estimating revenue losses due to not fishing and additional labor and material costs that may be incurred with gear modifications and gear removal. These costs are measured per harvester. In a perfect world of information, our goal would be to measure how a particular alternative impacts a harvester's annual profits. We would calculate the ratio of the change in profits, to profits before the alternative was imposed. However, as a result of data on fixed and variable trips costs not being available for this analysis, we can not calculate the expected change in profits. Therefore, we use changes in total revenue as our comparison point between alternatives. Specifically, we estimate the decrease in revenues and increase in cost as a result of an alternative being imposed. Essentially, an increase in cost has the same affect as a decrease in revenues. Both actions will decrease profits. We then calculate the ratio of this decrease in profits to total revenues prior to the alternative being imposed, and refer to it as the change in total revenues. We could just report the decrease in revenues and increase in costs, however, it is important to put these changes in perspective to total earnings since they vary among fisheries. To determine the regulatory cost of the entire industry, the revenue loss per harvester is expanded by the number of harvesters. For each alternative we evaluate the impact on the individual harvester and the entire industry. The results are then compared.

Seven alternatives are evaluated here, in addition to the "no action" alternative (see the proceeding section 8.1 for a detailed list). In general, the alternatives either prohibit the use of leaders or require some leaders to be modified.

In the case of leaders being prohibited, we assume the harvester incurs revenue losses and the cost to remove and place the leader back into the water. There are no data to estimate a change in catch if leaders are removed. However, we would expect the catch rate to decline significantly since the purpose of the leader is to lead the fish into the pound. Therefore, under this action, the worst case is assumed, catch and revenues earned are zero.

In the case where leader stretched mesh can not exceed 8 inches, the cost of two potential

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[16] We choose to minimize cost subject to a sufficient level of protection versus maximizing protection subject to cost, because we can not measure marginal changes in protection between alternatives.

behavioral responses are compared. The harvester can either choose not to fish or modify the gear. If the option to not fish is chosen, the harvester incurs revenue losses and additional labor costs associated with removing and replacing the leader from the water. If the harvester chooses to modify the gear, an additional cost of modifying the gear is incurred. The cost of both options are compared and we assume the harvester will choose the option that will minimize their economic losses. Results indicate the harvester would minimize his or her loss by modifying the gear and continuing to fish. See the results section of the NPA 1 (Section 5.3.2) and the NPA 2 (Section 5.4.2) for details.

To analyze these alternatives the following data sources were used: 1) VMRC data from 2000 to 2002; 2) a 2003 NEFSC gear survey; and 3) cost data based on discussions with a local pound net fisher. The number of active harvesters, revenue and landings per harvester were estimated from the VMRC data. The 2003 gear survey data were used to estimate the number of harvesters that would be impacted by the various alternatives. For example, under the PA, the number of harvesters that fish with offshore leaders was based on VMRC data and the 2003 gear survey data. The cost data were used to estimate the cost of: 1) removing the leader from the water and placing it back after management restrictions are lifted; 2) removing and replacing the leader, heart and pound, and 3) the total cost of replacing the leader with new mesh. For details, see the data section under the PA (Section 5.1.2 and Figure 6).

Potential biases may exist in the estimate of the number of harvesters impacted and revenue estimates. The estimate of harvesters impacted in the lower region may be upwardly biased because harvesters fishing in the northern portion of the lower bay or south of the Chesapeake Bay bridge are not required to remove all their leaders. However, for data reasons these harvesters could not be separated out of the lower region. The total number of harvesters in the lower region is biased up by two to three harvesters. That is, these two or three harvesters can modify versus remove their leaders. Revenue estimates may by downwardly biased since harvesters only report landings. VMRC estimates revenues by multiplying a monthly dockside price based on all dealer prices and reported landings. Some harvesters process their own fish landings and therefore receive a price two to three times greater than the monthly dockside price. Although total revenues are considered biased, the percent that annual revenues are reduced, under the various alternatives, is not biased since revenues are underestimated in the numerator and denominator of the ratio (i.e., the change in revenues).

The Regulatory Flexibility Analysis (RFA) is designed to assess the impact that various regulatory alternatives would have on small entities. Therefore in Section 8.2.1, the economic impacts on the individual harvester are presented. We can then sum up the RFA impacts to determine the RIR impacts. Section 8.2.2 presents the industry impacts.

8.2.1 Small Entity Impacts

Economic impacts on an individual harvester are evaluated here. Not including status quo, five of the seven alternatives have the same time period restriction of May 6 to July 15. Two management areas are defined, the upper and lower bay region of the Chesapeake Bay, and remain constant under all the alternatives, except the PA. Under the PA, nearshore leaders are allowed to continue fishing in a portion of the lower bay, while those leaders are prohibited in other alternatives. Management actions to these management areas vary over the alternatives. Therefore, economic impacts on individual harvesters are presented by region.

Upper Region
Under the PA in the upper region, the leader mesh must be less than 12 inches. Based on the 2003 NEFSC survey, all leaders surveyed had mesh less than 12 inches in the upper and lower bay. Therefore, there are no economic impacts under the PA (or under status quo) in the upper bay.

Of the remaining alternatives, four of the seven alternatives are exactly the same. They require the leader mesh to be less than 8 inches. Of 21 harvesters actively fishing, 4 harvesters are affected by these alternatives and they fish 2 pounds each on average. Two potential behavioral responses are choosing to not fish or to modify the leader with smaller mesh. If a harvester chooses not to fish, their revenues decrease by 15.1 to 17.1% (see NPA 1, Section 5.3.2, and NPA 2, Section 5.4.2, for details) since they incur revenue losses and the cost of removing their gear. If a harvester modifies their gear, revenues would be reduced by 8.4%. We assume the harvester will modify their gear since they want to minimize their economic loss. Therefore, in the upper bay region, annual revenues may be reduced by 8.4% per harvester under five of the seven alternatives (Table 8.2.1.1).

Under NPA 4, all leaders must be removed from the Virginia Chesapeake Bay. This alternative impacts all 21 harvesters in the upper region. Annual revenues per harvester may be reduced by 33.5% under NPA 4, since they incur revenue losses and the cost of removing the leader from the water.

In summary, annual revenues range between a low of 0% under the PA, to 8.4% for gear replacement (NPA 1, 2, 3, 5, and 6) to a high of 33.5% under NPA 4 (Table 8.2.1.1).

Lower Region
In the lower region, management actions vary between alternatives. Actions range from prohibiting all leaders (with variations in time), prohibiting only offshore leaders, to allowing leaders if the mesh size is less than 8 inches. Under all the alternatives, all 10 harvesters are impacted (Table 8.2.1.1).

Reduction in annual revenues per harvester range between a low of 8.6% (NPA 2) to a high of 50.3% (under NPA 3) in the lower bay region (Table 8.2.1.1). The PA require offshore leaders to be removed, and NPA 1, NPA 3, NPA 4 and NPA 6 require all leaders to be removed from the water. The other alternatives (NPA 2 and NPA 5) require leader mesh modifications.

Alternatives requiring leader mesh modifications have the least economic impact (NPA 2 and

NPA 5). Alternatives requiring all leaders to be removed have the greatest economic impact. The PA ranks second in economic impact since only offshore leaders are prohibited. NPA 1 is exactly the same as NPA 4 and 6, however the time period is shorter. The prohibited/restricted time period is from May 6 to June 30, versus May 6 to July 15. Therefore NPA 1 ranks third in economic impacts followed by NPA 4 and 6 (34.5% versus 43.2%). The impact under the NPA 3 is larger than NPA 4 and 6 (50.3% versus 43.2%), because additional labor costs are incurred to remove the heart and pound in addition to the leader. For details, see Sections 5.1.2 (PA), 5.3.2 (NPA 1), 5.4.2 (NPA 2), 5.5.2 (NPA 3), 5.6.2 (NPA 4), 5.7.2 (NPA 5), and 5.8.2 (NPA 6).

Table 8.2.1.1. Ratio of the number of harvesters affected to total active harvesters and the reduction in annual revenues per affected harvester by alternative and region.

Alternatives	Upper Bay		Lower Bay	
	No. Harvesters	Revenue Reductions	No. Harvesters	Revenue Reductions
PA	0/21	0%	10/10	14.7% to 29.4%
NPA 1	4/21	8.4%	10/10	34.5%
NPA 2	4/21	8.4%	10/10	8.6% to 12.1%
NPA 3	4/21	8.4%	10/10	50.3%
NPA 4	21/21	33.5%	10/10	43.2%
NPA 5	4/21	8.4%	10/10	12.1%
NPA 6	4/21	8.4%	10/10	43.2%

8.2.2 Industry Impacts

Industry revenues are $2.6M for the pound net fishery. Under the PA, 10 harvesters out of 31 are affected (Table 8.2.2.1). Industry revenues are reduced by 7.3% (=$0.19M/$2.6M) under the PA, which requires all *offshore* leaders removed in the lower bay. Under the NPA 1, NPA 2, NPA 3, NPA 5 and NPA 6, 14 harvesters out of 31 are affected, and industry revenues are reduced by 14.8% (=$0.385M/$2.6M), 4.9% (=$0.127M/$2.6M), 21.2% (=$0.551M/$2.6M), 5.8% (=[$0.150M]/[$2.6M]) and 18.3% (=$0.476M/$2.6M), respectively. Under NPA 4, all harvesters (=31/31) are affected and forgone industry revenues are reduced by 34.9% (=$0.908/$2.6M).

Alternatives can now be ranked by forgone industry revenues and turtle protection. Ranking does not inform us about the marginal change in protection between alternatives. That is, how much more protection do we gain when we move between alternatives. In the lower bay, the PA requires offshore leaders, and NPA 1, NPA 3, NPA 4 and NPA 6 require all leaders, to be removed in an area in which turtles were observed entangled or impinged during 2002 and 2003. Protection is reduced in the lower bay under NPA 2, since leaders are allowed with modifications. In summary, non-preferred alternatives 3 and 4 (NPA 3 and NPA 4) provide the most protection in the lower bay, followed by non-preferred alternative 6 (NPA 6) then by the equivalent preferred and non-preferred alternative 1 (PA and NPA 1), with the least sea turtle protection under non-preferred alternative 2 (NPA 2) (Table 8.2.2.1).

For this analysis, the ranking results of the lower bay were used to represent the overall protection level of the Chesapeake Bay for the following reasons. First, observer coverage is low in the upper bay compared to the lower bay. Each pound site was visited 3 times on average in the upper bay, compared to 17 times in the lower bay. There have also been no documented turtle takes in the upper bay in the NEFSC 2002 and 2003 surveys. Second, the upper and lower bay have very different management restrictions within an alternative. If we combine the sea turtle protection rankings of the two areas, a un-interpretable result occurs. Third, under the PA, there are no economic impacts in the upper bay and the remaining alternatives are similar except for a complete closure. Therefore, we will use the lower bay ranking of alternatives in terms of sea turtle protection to represent the entire Chesapeake Bay for this portion of the analysis (i.e., protection versus industry cost).

Ideally, we want to choose the alternative that provides the most protection for the least cost to the pound net fishery. Since we cannot estimate marginal increases in protection, we then choose the alternative that minimizes industry costs and provides sufficient protection. The NPA 2 provides the least protection for the least revenue loss to the industry (Table 8.2.2.1). The following alternatives were grouped in relation to industry cost and sea turtle protection levels: Group 1) NPA 2 ; Group 2) PA & NPA 1; Group 3) NPA 6; and Group 4) NPA 3 & NPA 4. It is fairly clear that Group (4) provides the most protection at the highest industry cost and Group (1) provides the least protection at the least industry cost. Within a group it is possible to choose among alternatives. For example, in Group (4) the NPA3 would be preferred over NPA 4. NPA 3 provides similar levels of protection at a lower industry cost.

Group (4) alternatives not only provide the most protection at the highest industry cost, but also at the highest cost per individual harvester (43.2% to 50.3% reduction in revenues in the lower bay; see Table 8.2.1.1). Group (3) alternatives provide the next lower level of protection at the next lower cost to the industry and individual (43.2%). The PA is within Group (2) and provides the next lower level of protection and cost to the industry and individual harvester. Within Group (2) we would choose the PA over the NPA 1 since it has a lower cost to the industry and individual.

Groups (4) and (3) provide the most protection, however the marginal increase in protection compared to Group (2) may be very low. All documented turtle takes by NOAA Fisheries have been in the lower bay. These 3 groups prohibit offshore leaders where 22 of the 23 observed turtle takes in 2002 and 2003 have occurred. Group (4) and (3) provide more protection because they also prohibit nearshore leaders in the lower bay where only 1 of the 23 observed turtle takes in 2002 and 2003 have occurred. So according to this data, a small risk of a turtle becoming entangled in a nearshore leader still exists under the PA. The marginal increase in protection between these groups may be very small, but the marginal increase in cost is not small. Group (3) and (4) have industry costs of 18% to 34.9%, and the PA under Group (2) has an industry cost of 7.3%. Individual harvesters in Group (3) and (4) have revenue reductions of 43.2% to 50.3% (Table 8.2.1.1), and the PA under Group (2) has revenue reductions of 14.7% (for 8 harvesters) to 29.4% (for 2 harvesters). The PA does satisfy the objective of minimizing cost for a sufficient level of protection at the harvester and industry level.

Table 8.2.2.1. Management actions in the lower bay, ratio of the number of harvesters affected to the total number of active harvesters, and industry revenue losses (%), with the ranking of industry revenue losses and sea turtle protection and grouping assignment (in parentheses) by alternative.

Alt	Management actions and the ending date in the *Lower Bay*	Total Industry *Upper and Lower Bay*		Ranking (Low [1] to High [6])	
		No. Harvesters	Revenue Reductions (%)	Reduction in Industry Revenues	Sea Turtle Protection in the Lower Bay
PA	Offshore leaders prohibited to 7/15	10/31	7.3%	2 (2)	2 (2)
NPA 1	All leaders prohibited to 6/30	14/31	14.8%	3 (2)	2 (2)
NPA 2	All leader mesh < 8" to 7/15	14/31	4.9%	1 (1)	1 (1)
NPA 3	All gear prohibited to 7/15	14/31	21.2%	5 (4)	4 (4)
NPA 4	All leaders prohibited with extended boundary to mouth of bay to 7/15	31/31	34.9%	6 (4)	4 (4)
NPA 5	Experiment to 7/15	14/31	5.8%	NR[17]	NR
NPA 6	All leaders prohibited to 7/15	14/31	18.3%	4 (3)	3 (3)

[17] No turtle interactions data are available on the effect of dropping the leader mesh to one third of the water depth. Therefore, this alternative is "Not Ranked" (NR) since the level of protection is unknown and can not be compared to other alternatives.

8.3 Final 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 final regulatory flexibility analysis provides: 1) a succinct statement of the need for, and objectives of, the rule; 2) a summary of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a summary of the agency's assessment of such issues, and a statement of any changes made as a result of such comments; 3) a description and, where feasible, an estimate of the number of small entities to which the final rule applies; 4) a description of the projected reporting, record-keeping, and other compliance requirements of the final rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and 5) a description of the steps taken to minimize the significant economic impact on small entities, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule, and why the other alternatives were rejected.

This rule prohibits all offshore pound net leaders in a portion of the southern Virginia Chesapeake Bay and retains the leader mesh size restriction on stretched mesh 12 inches or greater and leaders with stringers, the year-round reporting and monitoring requirements, and the framework mechanism for extending the restrictions and/or modifying the restrictions, as included in the 2002 interim final rule. The leader restrictions would be in effect from May 6 to July 15. The purpose is to reduce the entanglement and impingement of threatened and endangered sea turtles in pound net leaders. This action is necessary to conserve listed sea turtles, help promote their recovery, and aid in the enforcement of the ESA.

The fishery affected by this final rule is the Virginia pound net fishery in the Chesapeake Bay. According to the 2002 VMRC data, there are 31 harvesters actively fishing pound nets from May 6 to July 15, with 10 harvesters located in the lower portion of the Virginia Chesapeake Bay and 21 harvesters located in the upper portion of the Virginia Chesapeake Bay. These 31 harvesters fish approximately 40 pound nets in the upper portion of the Virginia Chesapeake Bay (=21 harvesters x 1.9 pound nets/harvester) and 30 pound nets in the lower portion of the Virginia Chesapeake Bay (=10 harvesters x 3.0 pound nets/harvester). Of the 31 harvesters, 33 percent of the harvesters (=[0 located in the upper region +10 located in the lower region]/31 total harvesters) fishing from May 6 to July 15 would be affected by this action. Approximately 12 pound nets in total would be affected by this action, all of which occur in the lower portion of the Virginia Chesapeake Bay.

This rule employs the best available information on sea turtle and pound net leader interactions to reduce sea turtle entanglement and strandings, while minimizing the impacts to the pound net industry. Seven alternatives to the final rule have been considered, in addition to status quo.

Given the inability to provide a quantitative analysis of these regulatory alternatives, the alternatives were considered with respect to mitigating the known costs on small entities while providing sea turtle protection. One alternative, the status quo, would not provide any additional protection to sea turtles, but would not have any economic consequences at least in the short term. No action now may lead to more severe and costly action to protect sea turtles in the future. The non-preferred alternative 1 (NPA 1) would have prohibited all pound net leaders in the lower bay and leaders with 8 inches and greater stretched mesh in the remainder of the Virginia Chesapeake Bay from May 6 to June 30. The non-preferred alternative 2 (NPA 2) would have prohibited all pound net leaders with 8 inches and greater stretched mesh from May 6 to July 15. The non-preferred alternative 3 (NPA 3) would have prohibited all pound net gear in the lower bay and leaders with 8 inches and greater stretched mesh in the remainder of the Virginia Chesapeake Bay from May 6 to July 15. The non-preferred alternative 4 (NPA 4) would have prohibited all pound net leaders in the Virginia Chesapeake Bay from May 6 to July 15. The non-preferred alternative 5 (NPA 5) would have restricted the mesh height to one third the depth of the water, and required the mesh to be less than 8 inches and held with ropes 3/8 inches in diameter strung a minimum of every 2 feet in the lower bay, as well as restricted leaders with 8 inches and greater stretched mesh in the remainder of the Virginia Chesapeake Bay from May 6 to July 15. The non-preferred alternative 6 (NPA 6) would have prohibited all pound net leaders in the lower bay and leaders with 8 inches and greater stretched mesh in the remainder of the Virginia Chesapeake Bay from May 6 to July 15.

The alternatives can be ranked by forgone industry revenues and turtle protection. Ranking does not inform us about the marginal change in protection between alternatives. That is, how much more protection do we gain when we move between alternatives. In the lower bay, the PA requires offshore leaders, and NPA 1, NPA 3, NPA 4 and NPA 6 require all leaders, to be removed in an area in which turtles were observed entangled or impinged during 2002 and 2003. Protection is reduced in the lower bay under NPA 2, since leaders are allowed with modifications. In summary, NPA 3 and NPA 4 provide the most protection in the lower bay, followed by NPA 6 then by the equivalent PA and NPA 1, with the least sea turtle protection under NPA 2. For this analysis, the ranking results of the lower bay were used to represent the overall protection level of the Chesapeake Bay.

Ideally, the alternative that provides the most protection for the least cost to the pound net fishery would be chosen. Since marginal increases in protection cannot be estimated, the alternative that minimizes industry costs and provides sufficient protection is chosen. The NPA 2 provides the least protection for the least revenue loss to the industry. The following alternatives were grouped in relation to industry cost and sea turtle protection levels: Group 1) NPA 2; Group 2) PA & NPA 1; Group 3) NPA 6; and Group 4) NPA 3 & NPA 4. It is fairly clear that Group (4) provides the most protection at the highest industry cost and Group (1) provides the least protection at the least industry cost. Within a group it is possible to choose among alternatives. For example, in Group (4), the NPA3 would be preferred over NPA 4. NPA 3 provides similar levels of protection at a lower industry cost.

Group (4) alternatives not only provide the most protection at the highest industry cost, but also at the highest cost per individual harvester (43.2% to 50.3% reduction in revenues in the lower bay). Group (3) alternatives provide the next lower level of protection at the next lower cost to the industry and individual (43.2%). The PA is within Group (2) and provides the next lower level of protection and cost to the industry and individual harvester. Within Group (2), the PA would be chosen over the NPA 1 since it has a lower cost to the industry and individual.

Groups (4) and (3) provide the most protection, however the marginal increase in protection compared to Group (2) may be very low. All documented turtle takes have been in the lower bay. These 3 groups prohibit offshore leaders where 22 of the 23 observed turtle takes in 2002 and 2003 have occurred. Group (4) and (3) provide more protection because they also prohibit nearshore leaders in the lower bay, where 1 of the 23 observed turtle takes in 2002 and 2003 have occurred. So according to this data, a small risk of a turtle becoming entangled in a nearshore leader still exists under the PA. The marginal increase in protection between these groups may be very small, but the marginal increase in cost is not small. Group (3) and (4) have industry costs of 18% to 34.9%, and the PA under Group (2) has an industry cost of 7.3%. Individual harvesters in Group (3) and (4) have revenue reductions of 43.2% to 50.3%, and the PA under Group (2) has revenue reductions of 14.7% (for 8 harvesters) to 29.4% (for 2 harvesters). The PA does satisfy the objective of minimizing cost for a sufficient level of protection at the harvester and industry level.

No comments were received on the initial regulatory flexibility analysis. No additional recordkeeping or reporting requirements are included in this final rule.

9.0 APPLICABLE LAW

9.1 National Environmental Policy Act

NOAA Fisheries prepared this Environmental Assessment in accordance with the National Environmental Policy Act.

9.2 Endangered Species Act

A formal section 7 consultation has been completed on NOAA Fisheries' implementation of the final rule that prohibits all offshore pound net leaders in a southern portion of the Virginia Chesapeake Bay and retains the restriction of pound net leaders with stretched mesh 12 inches or greater and leaders with stringers in the remainder of the Virginia Chesapeake Bay between May 6 and July 15. The final rule also retains year round monitoring and reporting and a framework mechanism to protect sea turtles by responding to new information. The section 7 consultation on the measures included in the 2002 interim final rule has also been reinitiated, due to the exceedence of the Incidental Take Statement during the spring of 2003. The PA would change the previously implemented leader restrictions on the Virginia pound net fishery. As such, the proposed action considered in the section 7 consultation included the continuation of the measures included in the 2002 interim final rule, except as modified by the new proposed leader prohibition. The biological opinion concluded that NOAA Fisheries' implementation of the final rule may adversely affect but is not likely to jeopardize the continued existence of the loggerhead, leatherback, Kemp's ridley, green, or hawksbill sea turtle, or shortnose sturgeon. An accompanying Incidental Take Statement has been prepared.

9.3 Marine Mammal Protection Act

The action to prohibit certain pound net leaders will not adversely affect marine mammals because the final rule will provide additional risk reduction in the effort to reduce serious injury and mortality due to entanglement in pound net leaders.

9.4 Paperwork Reduction Act

The final rule does not contain a collection of information requirement for the purposes of the Paperwork Reduction Act.

9.5 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. On December 10, 2003, NOAA Fisheries conducted an analysis of the impacts on EFH pursuant to 50 CFR 600.920(h), and determined that this action will not have any adverse impact to EFH.

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Figure 1. Locations of documented pound net stands in the spring of 2003, depicting the active, inactive and unknown status pound net sites in the Virginia Chesapeake Bay. The locations of documented sea turtle entanglements and/or impingements are also noted. Data collected by the NOAA Fisheries Northeast Fisheries Science Center.

INSERT FIGURE

Figure 2. Locations of documented pound net stands and associated sampling effort in the Virginia Chesapeake Bay during the spring of 2003. Data collected by the NOAA Fisheries Northeast Fisheries Science Center.

INSERT FIGURE

Figure 3. Geographical locations of proposed management measures for the pound net fishery in the Virginia Chesapeake Bay. The striped area depicts where status quo would be retained (prohibition of leaders with greater than or equal to 12 inches stretched mesh and leaders with stringers), and the crosshatched area shows where all offshore leaders would be prohibited. Nearshore leaders found in the crosshatched area would not be prohibited, instead they would be subject to the status quo leader mesh size restrictions.

INSERT FIGURE

Figure 4 - INSERT FIGURE

Figure 5 - INSERT FIGURE

Figure 6. The Virginia Chesapeake Bay as subdivided into VMRC fishing zones, overlaid with the proposed pound net leader management measures. As noted, the upper bay includes areas 308, 309, 317, 345, 346, 353, 358, and 374. The lower bay includes areas 306, 307, 347, and 371.

INSERT FIGURE

Appendix A.

Virginia Landings Bulletin
COMMERCIAL FISHERIES STATISTICS
2nd QUARTER (April-June) 2003
(Preliminary Report)

Click here to view index of previous commercial landings bulletins

SPECIES FINFISH	APRIL POUNDS	APRIL VALUE($)	MAY POUNDS	MAY VALUE($)	JUNE POUNDS	JUNE VALUE($)
ALEWIFE	124165	13597	8163	852	634	70
AMBERJACK	4	2	0	0	103	44
ANGLER	6835	6822	405	380	2	2
BLUEFISH	9348	3156	57430	20018	40657	10187
BULLHEADS	6230	1185	12160	2313	3935	750
BUTTERFISH	445	212	1622	764	2444	1149
COBIA	0	0	0	0	3431	8583
CARP	374	40	328	39	140	23
CATFISH	151113	84396	161236	93055	183985	107000
CROAKER, ATLANTIC	1461097	453303	1195362	386421	1112693	355339
RIBBON FISH	3	2	0	0	0	0
DOLPHIN FISH	0	0	0	0	621	932
DRUM, BLACK	8436	1687	51732	10349	18168	3633
DRUM, RED	111	168	1208	1794	145	217
HERRING, BLUEBACK	366	36	0	0	0	0
EEL, AMERICAN	26643	25761	15663	17443	1918	1798
FLOUNDER, SUMMER	19388	30612	20909	30644	13539	18713
GARFISH	0	0	0	0	691	78
SHAD, GIZZARD	119325	8964	29423	2264	40647	3515
HARVESTFISH	0	0	319	360	8872	10026
HERRING, ATLANTIC	2823	570	4264	854	0	0
SHAD, HICKORY	1476	378	146	38	0	0
MACKEREL, KING	0	0	22	41	167	314
WHITING, KING	1338	678	4477	2258	1298	674
MACKEREL, ATLANTIC	111	39	42	15	0	0
MENHADEN	434298	70378	566800	72922	644578	75816
MULLET	955	384	539	217	1285	515
POLLOCK	37	21	0	0	0	0
POMPANO, COMMON	0	0	3	5	410	686
SCUP	4	3	8	6	0	0
BASS, BLACK SEA	2	5	0	0	151	347
SEATROUT, GREY	37797	23132	78913	39474	34549	18932
SEATROUT, SPOTTED	28	50	15	26	127	224
SHAD, AMERICAN	10373	5801	2938	3733	693	942
DOGFISH, UNCLASSIFIED	6846	2397	184206	55971	1041	365
DOGFISH, SMOOTH	16072	5304	88875	29329	8453	2711
SHARK, THRESHER	107	54	3881	1944	134	68
SHEEPSHEAD	26	13	124	66	192	98
SHARK, UNCLASSIFIED	608	1271	11384	24292	51287	20035
SKATE, WINGS	650	77	0	0	0	0
SPADEFISH	0	0	2033	1206	2700	1597
MACKEREL, SPANISH	2	1	818	534	23351	15184
SPOT	87862	26453	78999	24851	70913	22396
BASS, STRIPED	48278	98005	30955	62839	21206	38533
PUFFER, NORTHERN	1745	2790	11188	20444	4242	10594
TAUTOG	1030	1030	290	290	3	3

TOADFISH, OYSTER	0	0	717	1617	0	0
TRIGGERFISHES	0	0	0	0	21	6
TUNA, FALSE ALBACORE	0	0	236	60	308	77
SHARK, SANDBAR	0	0	456	251	1411	965
SHARK, BLACKTIP	0	0	0	0	24	5
SHARK, LEMON	0	0	0	0	85	0
PERCH, WHITE	4716	2914	2878	1843	3096	2179
PERCH, YELLOW	141	94	70	89	7	6
OTHER FISH (FOOD)	138	79	1	1	0	0
FISH, OTHER(INDUSTRY)	661568	47342	733683	53060	516558	38513
TOTAL FINFISH	3257191	919206	3369811	964972	2824545	773844

SPECIES	APRIL		MAY		JUNE	
SHELLFISH	POUNDS	VALUE($)	POUNDS	VALUE($)	POUNDS	VALUE($)
BLOOD ARK, CLAM	45	29	2	2	29	17
CRAB, BLUE	978944	366841	2090688	1395532	1714973	971660
CRAB, RED	22	0	0	0	0	0
HORSESHOE CRABS	164	64	1882	718	3094	1271
QUAHOG, PUBLIC	24051	158324	34919	194170	38628	220670
WHELK (UNCLASSIFIED)	8191	3693	58089	81183	38324	43559
TOTAL SHELLFISH	1011417	528951	2185580	1671605	1795048	1237177
FINFISH & SHELLFISH	4268608	1448157	5555391	2636577	4619593	2011021

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In cooperation with the National Marine Fisheries Service and the Potomac River Fisheries Commission

Appendix B.

Virginia Landings Bulletin

COMMERCIAL FISHERIES STATISTICS

3rd QUARTER (July - September) 2002

(Preliminary Report)

Click here to view index of previous commercial landings bulletins

SPECIES	JULY		AUGUST		SEPTEMBER	
FINFISH	POUNDS	VALUE ($)	POUNDS	VALUE ($)	POUNDS	VALUE ($)
ALEWIFE	225	24	170	19	98	12
AMBERJACK	134	56	0	0	0	0
ANGLER	80	76	64	50	15	23
BASS, BLACK SEA	42731	92339	12123	40510	3977	14102
BASS, STRIPED	7094	11584	5523	8948	16818	26796
BLUEFISH	54466	14360	82961	20585	71314	17588
BONITO	0	0	16	12	55	16
BUTTERFISH	5774	3468	21089	12634	5931	3659
CARP	6	1	0	0	52	5
CATFISH	219652	33065	182394	27367	201486	30233
COBIA	1938	2925	3065	4608	1580	2382
CREVALLE	1117	1117	0	0	0	0
CROAKER, ATLANTIC	1784224	604729	1791683	607984	835507	280723
DOGFISH, SMOOTH	802	199	0	0	703	232
DOGFISH, SPINY	11	2	0	0	0	0
DOGFISH, UNCLASSIFIED	3412	1193	2761	966	998	349
DOLPHIN FISH	298	532	311	474	122	147
DRUM, BLACK	1282	257	46	10	147	29
DRUM, RED	938	1323	646	911	958	1383
EEL, AMERICAN	238	233	779	684	4084	3466
EEL, CONGER	755	378	349	256	10	6
FLOUNDER, SUMMER	22928	27613	14952	17932	17066	20773
GARFISH	262	29	0	0	0	0
HAKE, RED	112	59	0	0	11	4
HARVESTFISH	19629	22181	13576	15346	1201	1358
JOHN DORY	3864	1724	1286	579	383	172
MACKEREL, ATLANTIC	223	96	2	1	39	17
MACKEREL, KING	60	113	12	25	116	213
MACKEREL, SPANISH	37680	24451	15322	10334	8540	5715
MENHADEN	402652	24406	772712	48348	457168	28081
MULLET	138	29	940	192	3109	638
PERCH, WHITE	469	339	538	403	481	354
PERCH, YELLOW	94	188	16	32	16	32
PIGFISH	0	0	3	3	2	2
POMPANO, COMMON	30	50	102	173	671	1121
PUFFER, NORTHERN	3993	8653	3661	8403	4593	9198
RIBBON FISH	36	18	948	474	498	252
SCUP	3	2	20	12	0	0
SEATROUT, GREY	51624	31097	102738	62702	135858	83678
SEATROUT, SPOTTED	80	138	25	33	927	1574
SHAD, GIZZARD	2183	185	20332	1109	16423	1093
SHAD, HICKORY	0	0	15	15	0	0
SHARK, BLACKTIP	1234	631	700	155	50	11
SHARK, DUSKY	194	86	0	0	0	0
SHARK, LARGE COASTAL	7612	3775	23453	28201	0	0
SHARK, LEMON	73	0	0	0	0	0

SHARK, SANDBAR	581	319	370	205	468	303
SHARK, UNCLASSIFIED	36738	14805	23958	10316	1477	659
SHARKS, MAKO	0	0	0	0	160	360
SHEEPSHEAD	142	28	52	11	21	4
SKATE, UNCLASSIFIED	0	0	320	16	0	0
SPADEFISH	1876	1110	1343	796	1617	954
SPOT	107306	35546	222833	68256	1403531	430406
TARPON	194	98	0	0	0	0
TAUTOG	92	119	55	91	355	496
TILEFISH	62	44	0	0	0	0
TILEFISH, GOLDEN	0	0	0	0	21	37
TRIGGERFISHES	369	231	36	25	51	26
TRIPLETAIL	0	0	26	13	16	8
TUNA, ALBACORE	14	14	0	0	90	69
TUNA, BIGEYE	0	0	58	174	0	0
TUNA, FALSE ALBACORE	0	0	1185	1185	21	7
TUNA, YELLOWFIN	7239	13157	5166	10976	1185	1534
WAHOO	0	0	116	309	43	71
WHITING, KING	28	26	1591	1290	1505	1223
FISH, OTHER (FOOD)	218	120	6803	3417	44	24
FISH, OTHER(INDUSTRY)	43673	35981	348137	27506	159612	12957
TOTAL FINFISH	3278800	1015296	3687382	1045076	3361224	984575

SPECIES	JULY		AUGUST		SEPTEMBER	
SHELLFISH	POUNDS	VALUE($)	POUNDS	VALUE($)	POUNDS	VALUE($)
BLOOD ARK, CLAM	106	63	149	111	39	34
CRAB, BLUE	4107389	5265570	3673609	4126710	2890144	2850312
HORSESHOE CRABS	2338	672	4496	1653	3388	1158
LOBSTER	0	0	0	0	859	4250
OCTOPUS	16	17	0	0	195	176
OYSTERS	0	0	0	0	58	160
QUAHOG, PUBLIC	49497	276634	44794	224986	20020	88322
SCALLOPS, SEA	2024690	6524026	1778446	6202904	1604911	6451927
SQUID (ILLEX)	94875	14232	84033	12605	18850	2828
SQUID (LOLIGO)	6425	1285	11479	2439	4055	2180
WHELK, CHANNEL	268	797	46	137	0	0
WHELK, KNOBBED	2103	2101	570	693	0	0
WHELK, UNCLASSIFIED	560	150	1956	534	1288	348
TOTAL SHELLFISH	6288267	12085547	5599578	10572772	4543807	9401695
FINFISH & SHELLFISH	9567067	13100843	9286960	11617848	7905031	10386270

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Appendix C. 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 D. 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.