

ESI ATLAS OF VIRGINIA

AN ATLAS ILLUSTRATING THE SENSITIVITY
OF THE COASTAL ENVIRONMENT TO SPILLED OIL



Prepared by:
College of William and Mary
VIRGINIA INSTITUTE OF MARINE SCIENCE
School of Marine Science
Gloucester Point, Virginia 23062



Ann Hayward Rooney-Chapman

Alyce Thomson Fritz
Marian L. Vance
Robert W. Middleton
Jean Baker

Mary Jo Shackelford, Illustrator
Elizabeth A. Clark, Illustrator

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GUIDE TO USING THE ENVIRONMENTAL SENSITIVITY MAP ATLAS

I. PREFACE

The ESI maps are designed to provide spill response teams with information on shoreline sensitivity and resources at risk in event of oil or hazardous materials spills. They address the sensitivity of the physical environment to spilled oil, plus the wildlife, socioeconomic, and archaeological resources found in those environments. The ESI maps will assist the federal On Scene Coordinator (OSC) and government agencies responsible for natural resources protection in developing strategies for protection and clean-up of the environment either prior to spills or when they occur.

This guide describes the categories used to classify the shoreline and resources likely to be affected by spills, as noted in the key at the bottom of each map. Reading this guide as part of pre-spill planning activities will significantly improve the user's ability and speed in understanding and interpreting the mapped information. Questions concerning these maps should be referred to the NOAA Hazardous Materials Response Project in Seattle, Washington or the NOAA Scientific Support Coordinator for the U.S. Coast Guard Fifth District.

The approach used in compiling these maps was developed by the Research Planning Institute (RPI) of Columbia, South Carolina. Their insight and assistance has been invaluable. VIMS gratefully acknowledges their generous cooperation throughout this project.

The mapped information was derived from the best available literature sources, supplemented by overflights of the entire shoreline. A list of references is available upon request. All the maps were subject to a thorough process of review by numerous state and federal agencies to ensure that the mapped information is complete, accurate and up-to-date. The contribution of this cooperative review effort to the overall quality of the maps is immeasurable, and could not have occurred without the continued interest and assistance of the various agency representatives on the Regional Response Team.

II. LOCATION KEY

The location key is the index map on the second page which illustrates the portion of the state mapped in this atlas, the ESI number assigned to each map, and latitude and longitude. The base maps used in compiling this ESI atlas are U.S. Geological Survey (USGS), 7.5 minute scale topographic quadrangles. The ESI number assigned to the quadrangles on the location key corresponds to the number found in the right corner of the key on the individual ESI maps. The numbers assigned to each ESI map and the names of the quadrangles are listed below.

The Virginia atlas contains 104 maps. Twenty-two of the Virginia maps depict the area along the Maryland-Virginia border, which includes the Potomac River, and Pocomoke Sound on the Eastern Shore. During spills affecting these areas, it is probable that the representatives from both the Marine Safety Office (MSO) Hampton Roads and Baltimore, and the states of Maryland and Virginia would respond. Consequently, these 22 maps are numbered identically in both the Virginia and Maryland atlases to facilitate communications during responses in these areas.

1	ALEXANDRIA	17	KINSALE
2	FORT BELVOIR	18	ST. GEORGE ISLAND
3	MOUNT VERNON	19	HEATHSVILLE
4	QUANTICO	20	BURGESS
5	INDIAN HEAD	21	EWELL
6	WIDEWATER	22	GREAT FOX ISLAND
7	NANJEMOY	23	CRISFIELD
8	MATHIAS POINT	24	SAXIS
9	PASSAPATANZY	25	FREDERICKSBURG
10	KING GEORGE	26	RAPPAHANNOCK ACADEMY
11	DAHLGREN	27	PORT ROYAL
12	COLONIAL BEACH NORTH	28	ROLLINS FORK
13	COLONIAL BEACH SOUTH	29	LORETO
14	STRATFORD HALL	30	CHAMPLAIN
15	ST. CLEMENTS ISLAND	31	MOUNT LANDING
16	PINEY POINT	32	TAPPAHANNOCK

33	DUNNSVILLE	69	NEWPORT NEWS NORTH
34	MORATTICO	70	HAMPTON
35	LIVELY	71	BENNS CHURCH
36	URBANNA	72	NEWPORT NEWS SOUTH
37	IRVINGTON	73	NORFOLK NORTH
38	REEDVILLE	74	LITTLE CREEK
39	FLEETS BAY	75	CAPE HENRY
40	SALUDA	76	VIRGINIA BEACH
41	WILTON	77	NORTH BAY
42	DELTAVILLE	78	KNOTTS ISLAND
43	NEW KENT	79	CHINCOTEAGUE WEST
44	WEST POINT	80	CHINCOTEAGUE EAST
45	TOANO	81	TANGIER ISLAND
46	GRESSIT	82	CHESCONESSEX
47	WARE NECK	83	PARKSLEY
48	MATHEWS	84	BLOXOM
49	WILLIAMSBURG	85	WALLOPS ISLAND
50	CLAY BANK	86	NANDUA CREEK
51	ACHILLES	87	PUNGOTEAGUE
52	NEW POINT COMFORT	88	ACCOMAC
53	YORKTOWN	89	METOMKIN INLET
54	POQUOSON WEST	90	JAMESVILLE
55	POQUOSON EAST	91	EXMORE
56	RICHMOND	92	WACHAPREAGUE
57	DREWRY'S BLUFF	93	FRANKTOWN
58	DUTCH GAP	94	NASSAWADOX
59	HOPEWELL	95	QUINBY INLET
60	WESTOVER	96	CAPE CHARLES
61	CHARLES CITY	97	CHERITON
62	BRANDON	98	COBB ISLAND
63	NORGE	99	GREAT MACHIPONGO INLET
64	CLAREMONT	100	ELLIOTTS CREEK
65	SURRY	101	TOWNSEND
66	HOG ISLAND	102	SHIP SHOAL INLET
67	BACONS CASTLE	103	CHESAPEAKE CHANNEL
68	MULBERRY ISLAND	104	FISHERMANS ISLAND

III. ENVIRONMENTAL SENSITIVITY INDEX (ESI)

The shoreline is categorized and ranked on a scale of one to eleven (least to most sensitive) to indicate the relative sensitivity to spilled oil and potential for biological damage associated with the various types of shorelines. A color-code system corresponding with the ESI numeric ranking is indicated on the ESI map base key (see figure below). The shorelines are outlined on U.S. Geological Survey (USGS) 7.5 minute scale topographic quadrangles with the appropriate ESI color, except the most sensitive environmental type, extensive intertidal marsh (ESI 11), which is completely colored with rhodamine red. Two or more colors may occur together on one shoreline when it is composed of two ESI types; e.g., a fringing marsh (ESI 10) may be fronted by a tidal flat (ESI 9).

	1 SEAWALLS, PIERS, CONSOLIDATED SHORE AND WAVECUT PLATFORMS
	2 EXPOSED FINE SAND BEACHES
	3 SHELTERED FINE SAND BEACHES
	4 COARSE SAND BEACHES
	5 EXPOSED TIDAL FLATS
	6 RIPRAP STRUCTURES
	7 SUPRATIDAL MARSHES PARTIALLY PROTECTED BY ELEVATION
	8 FRESH WATER MARSHES AND SWAMPS
	9 SHELTERED TIDAL FLATS
	10 FRINGING INTERTIDAL MARSHES
	11 EXTENSIVE INTERTIDAL MARSHES

The general order of ranking of the shoreline types in Maryland, Virginia, and North Carolina is similar to the system used for all ESI maps in the United States. However, the specific coastal environments found in this region differ somewhat from other regions. The mid-Atlantic states, Maryland, Virginia and North Carolina, contain thousands of

acres of marshes which differ in their vegetation and value for various purposes. Consequently the major types of marsh and their associated habitats are given five different ESI rankings (7, 8, 9, 10, 11). Supratidal marshes (ESI 7), by virtue of their elevation, are less susceptible to oil pollution. Intertidal marshes and sheltered tidal flats (ESI 8 through 11) are most sensitive to pollution because of high biological value, longer oil persistence and clean-up difficulty. Freshwater marshes (ESI 8) are usually located farthest from pollution impacts and are less tidally influenced than fringe (ESI 10) and extensive (ESI 11) marshes. In developing priorities for protection, the freshwater marsh should be given high priority when only small areas of a region are ESI 10 or 11 and large areas are ESI 8. This interpretation is important because freshwater marshes contain important vegetation (e.g. wild rice) for many migratory wildfowl and are also valuable as fish spawning and nursery areas. The substrate is very soft and unconsolidated and clean-up activities are extremely difficult.

Coastal environments with ESI rankings 1-6 are less sensitive to oil spills in part because: 1) they contain large percentages of physical structures from which oil can be easily removed; and 2) they are less biologically productive areas. Seawalls and similar environments (ESI 1) generally do not retain much oil because they are fairly self-cleaning, and mechanical cleaning can be carried out successfully if needed. Beaches (ESI 2-4) vary in their sensitivity to oil and degree of self-cleaning according to grain size and location (sheltered or exposed to wave action). The distinction between fine (ESI 2 and 3) and coarse (ESI 4) beaches was determined using a grain size of 0.18 mm (2.5 Ø) as a major criterion. However, where grain size was close to 0.18 mm or varied seasonally, beaches were assigned ESI 4. Sheltered fine sand (ESI 3) beaches which have a grain size < 0.18 mm are more sensitive to spills than exposed fine sand (ESI 2) beaches because oil may remain longer and thus require more clean-up activity. Coarse beaches are the most sensitive because the larger pore size allows extensive oil intrusion and clean-up may necessitate removal of large quantities of oiled sand.

Another factor needs to be considered in identifying shoreline priorities for protection. Although beaches are low on the ESI scale, these areas may be given high priority for protection because of socioeconomic factors e.g., recreational use, or biological resources at risk, e.g., nesting areas.

Exposed tidal flats (ESI 5) are fairly productive environments particularly when submerged aquatic vegetation (SAV) is present. They are less susceptible to oil pollution effects than the ESI 9 (sheltered tidal flats) because tidal action will remove spilled oil. Mechanical clean-up should not be attempted in either of the tidal flat (ESI 5 and 9) areas. ESI 6 (rip rap, stone revetments), although usually composed of man-made materials, is given a higher ESI ranking than some natural environments because large amounts of oil can be trapped in its physical structure. The trapped oil can be released later, creating a chronic pollution problem. Cleanup of ESI 6 is generally more difficult than for oiled beaches, although high pressure hoses can be used to remove oil in some ESI 6 areas.

In summary, environments ESI 1-6 are less sensitive than ESI 7-11, in part, because of the difference in the biological resources associated with them, in addition to being fairly self-cleaning. Mechanical cleaning methods also may be effective. The more sensitive environments ESI 7-11 will retain oil and cannot be cleaned easily. They should be given high protection priority because they are significant habitats for biological resources. Preventing oil from reaching ESI 11 is the key to protecting these environments. Shoreline protection strategies should be used to prevent oil from reaching these environments, whenever possible.

IV. OIL-SENSITIVE WILDLIFE

The maps also indicate the locations and time of year when oil-sensitive wildlife are present. This information, however, is not ranked as are the shoreline types in the ESI. There are several points to consider when interpreting wildlife information: the value of the species present, with particular attention to those species which are endangered, threatened, or of special concern; their abundance, in terms both of numbers present and distribution; the time of year and its relation to the organism's life cycle; the location of organisms in the physical environment (in marshes, on the beach, in the intertidal zone, or in deep water); and how the organisms may

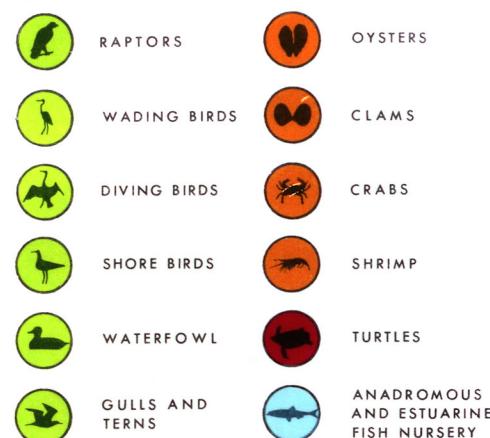
be affected by various types of pollutants. These considerations will be discussed briefly in the following sections.

Seasonal considerations are particularly important. Seasonal use of a shoreline by oil-sensitive organisms could change priorities for shoreline protection efforts and upgrade specific areas. For example, a beach (ESI 2-4) would require more protection during the spring when aggregations of nesting birds are present. Total impact to resources at risk should be evaluated by incorporating the biological resources information with the ESI shoreline ranking.

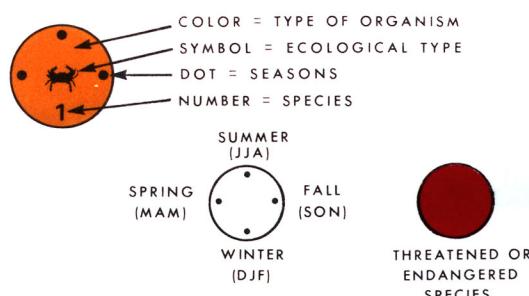
IV A. Wildlife Markers

Oil sensitive wildlife is denoted on ESI maps with species markers (colored circles) which are color coded for the following groups of organisms:

green = birds orange = shellfish (invertebrates)
blue = fish (finfish) red = turtles and alligators



These major groups are subdivided into more specific classifications indicated by a symbol (identified on key) found on the marker; e.g., raptors and waterfowl of birds. The various species are designated by a letter on the sticker representing a major group of species and/or by a number corresponding to an individual species on the Species List which follows this guide. The birds and finfish species lists, for example, contain groups A-K and A-D, respectively. Both the letter and a species number from that group may appear on the markers to identify a dominant individual species at risk within the group. Seasonal information is incorporated in a coded "dot" system around the perimeter of the circle indicating seasons when species may be present and/or more vulnerable. Additional species groups and seasonal considerations for oil sensitive wildlife are discussed in Sections IV C-F. An additional red border around the circle marker indicates that the species is endangered, threatened, or designated for special concern. Increased precautions should be taken to protect these areas or species (Section IV G).



IV B. Distribution of Oil-sensitive Wildlife

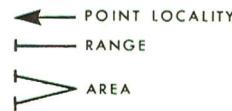
Species which are common to and found throughout a specific ESI map, are noted in a Common Local Species (CLS) box. The white CLS box is usually located in the lower right-hand corner of the map. The general format is: shellfish (if present), fish, birds, turtles and alligators, endangered and threatened species, submerged aquatic vegetation (SAV) symbols, and archaeological sites. The CLS box should be

examined during the initial evaluation of resources at risk. For example, shellfish, waterfowl, wading birds, nursery fish, and raptors like the osprey, all important oil-sensitive wildlife, may be distributed throughout and thus designated in the CLS box and not on the ESI map itself. The CLS box may contain several wildlife circles marked with letters. Each letter indicates that several species of that general group utilize the area. An individual species number from the letter group may be located on the map indicating an area of concentration and/or greater sensitivity.

COMMON LOCAL SPECIES



Populations of oil-sensitive wildlife may be concentrated in specific areas, or more broadly distributed. These different types of distribution are indicated on the maps using arrows for point localities and range lines extending from species markers for regions occupied. For example, an area enclosed by two or more range lines, such as a cove with a waterfowl marker, indicates a specific area of use.



If shellfish beds are present over most of the intertidal or subtidal area of an ESI map, they are denoted in the CLS box. Shellfish beds which cover only specific sections are denoted by a pattern of diagonal lines. Overlapping clam and oyster beds are denoted by a more closely spaced pattern of diagonal lines. Some of these areas are also marked with range lines and "Seed Bed" labels denoting areas of special concern during the summer and early fall larval setting periods.

Finally, submerged beds of aquatic vegetation, known as SAV, are also mapped. These areas provide an important food source for waterfowl and contain very productive fish and benthic communities. SAV's are particularly sensitive to pollution when located in or adjacent to ESI 9 (sheltered tidal flat) environments. The approximate perimeters and extent of SAV beds are indicated with an outline of large dots.



IV C. Birds

The Species List for birds (94 species) is divided into 11 major groups, denoted by letters A through K. Certain groups merit special consideration during spills because their behavior patterns and habits make them susceptible to being oiled.

The waterfowl group is divided into four subgroups:

A = dabbling ducks	C = sea ducks
B = diving ducks	D = geese and swans

Most dabbling ducks (A) are migratory and are present in this region during the fall and winter. They are usually found in protected nearshore areas. Some species, however, are nesting or resident species (all 4 season dots), such as the mallard or wood duck which nests in freshwater marshes. Diving ducks (B) are frequently found in estuaries during migrations and are very susceptible to oiling in the fall and winter. Sea ducks (C), open water species, and geese (D) would be impacted by spills in rivers, bays and the ocean during fall and winter migration and overwintering. Diving birds (E), like diving ducks, are particularly susceptible to oil spills and may be present through several seasons. Wading birds are divided into two subgroups: F = herons, egrets, and ibises; and H = rails. The other ecological types of birds are identified with one group letter. Letters and numbers from the same group are used

together when species are of special importance because of seasonal abundance.

IV D. Fish (finfish)

Finfish are extremely important commercial and recreational resources. They are divided into four groups which are designated by letters A-D:

A = anadromous	C = resident
B = nursery fish	D = resident estuarine

Anadromous fish (A) migrate into estuaries to spawn. The maps denote their spawning seasons and time during which larval and juvenile fish are present in the estuaries. The nursery fish (B) spawn offshore or in the deeper parts of the estuary. The larvae and juveniles remain in the nursery areas into the fall and occasionally remain in the estuary their first year. The resident (C and D) species are found in these areas year-round, but may be designated as being vulnerable to spills during particular parts of the year. The groups C and D also include the presence of other common resident species which, however, are not dominant and therefore not found on the species list.

Often several species within the different groups are abundant in coastal waters. This situation is described on the maps by the group letter in the CLS box or on range lines. Species numbers are included where specific information is available or to denote the most dominant species from each group. Lettered species markers found in open bay or ocean waters indicate commercially or recreationally important adult fish.

Spawning and nursery areas, in particular, are sensitive to pollution. The majority of organisms spawn during the spring. Spawning areas are delineated by range lines and markers with species numbers or letters and the spring season code, with the exception of winter flounder which has both spring and winter dots. The A group and striped bass are the most frequent examples of organisms having designated spawning and nursery areas. Certain estuaries, rivers, or streams are of prime importance for spawning and/or nursery areas. These are designated with range lines and one or both spawning and nursery species markers.

IV E. Shellfish (invertebrates)

Coastal areas of the Mid-Atlantic states contain important populations of commercially harvested shellfish, including bivalves, blue crabs, and shrimp. Oysters (*Crassostrea virginica*), hard clams (*Mercenaria mercenaria*), and soft clams (*Mya arenaria*), found along the shores of the Chesapeake Bay and its tributaries are commercially important. Prime growing areas for oysters and hard clams, for example the Rappahannock River in Virginia, are usually subtidal, except on the Eastern Shore where most oyster beds are in intertidal waters. Bivalves are most vulnerable to oil pollution during warmer months when they are more actively feeding (April-October) and spawning (June-September). Light fuel oil and aromatic fractions will seldom cause toxic effects in adult subtidal shellfish populations, but may adversely affect larvae, intertidal shellfish areas, and particularly soft clam beds. Heavier oils such as crude oil, which are more likely to settle onto shellfish seed and growing areas, may cause commercial losses of oysters and hard clams due to smothering or substrate contamination. Oil in bottom waters may result in tainted meat or render the bottom substrate unsuitable for larval recruitment. Oil dispersed in the water column during a heavy spawning or setting period, e.g., late August in the James River, may destroy larvae or disrupt the ability of the larvae to set on oyster rock. Oyster "seed beds," such as those of Virginia, including the James River-Wreck Shoals, Great Wicomico River, Eastern Shore bays and Maryland, e.g., Eastern Bay and the lower Eastern Shore, are important for oyster spat production and successful transfer of new populations. These areas are also particularly vulnerable to oil contamination during setting and growth of spat, or juvenile oysters, in summer and early fall.

The blue crab is widely distributed in the coastal waters of Maryland, Virginia, and North Carolina. Crab concentrations occur during spring and summer in the shallow waters of the Chesapeake Bay, its tributaries, and along the Eastern Shore. Adult and juvenile crabs may escape oil perturbation due to their high mobility, although ingestion of contaminated food items may be a problem. The designated "Critical Crab Habitat" of the lower Chesapeake Bay is extremely important for

reproduction, nursery, and commercial harvest of blue crabs. The overall success of the Chesapeake Bay blue crab population is heavily dependent upon the environmental conditions of this habitat. Oil spills and other acute types of pollution could cause severe damage during the spawning (larval release) season of summer and fall, when gravid (with sponge) females have migrated down the Bay to this area to release larvae.

IV F. Areas of Special Biological Significance

Areas of special biological significance and special concern are denoted by an outline of stars or labels, such as the "Nesting Area" and "Critical Crab Habitat" labels in the Chesapeake Bay, or by both stars and labels. Stars also may indicate boundaries of state or federal refuges, preserves, and wildlife management areas or areas of ecological and social or economic importance. The name of the designated area (white label) and important wildlife species are included within its boundaries. Areas of "ecological interest" contain species of special concern which may be particularly vulnerable to oil spills. These areas include nesting, roosting, and overwintering sites. The "Nesting Area" label designates particularly sensitive sites which include: rookeries; gull, tern, and/or shorebird colonies; and raptor (birds of prey) or turtle nesting sites. Species in these areas may be impacted severely by oil during the spring and summer breeding season. "Critical Crab Habitat" labels are found on six Virginia ESI maps and indicate the particularly sensitive summer habitat for blue crab larvae which is critical to the success of commercial populations.

IV G. Endangered or Threatened Species

There are six endangered or threatened species protected by the Endangered Species Act of 1973 which are included as oil-sensitive wildlife in the ESI atlas: bald eagle (G49), peregrine falcon (G51), shortnose sturgeon (A4), Atlantic loggerhead turtle (2), Atlantic green turtle (1), and Atlantic ridley turtle (3).

Bald eagles and peregrine falcons, although water oriented, usually will not dive through oil slicks nor directly contact an oil spill during normal fishing behavior. These raptors particularly the eagle which is a known scavenger, are more likely to ingest contaminated prey (fish, birds) or to be oiled indirectly while collecting nesting material. Bald eagles begin nesting in February somewhat earlier than ospreys, but like ospreys, their fledglings may be susceptible to oiling by transfer of oil from the adult through spring and summer. Many Virginia and Maryland nesting eagles are not migratory, but large numbers from further north overwinter in areas shown on the maps. Southern eagle populations concentrate in summer on upper James River or in Caledon State Park during both summer and winter. Peregrine falcons, a more sparsely distributed species, have been reintroduced at indicated sites which are regularly used between May and October. Some nesting birds use their man-made hacking towers as nests year-round. The Eastern Shore barrier islands, particularly Assateague Island, are used heavily in fall by migrating peregrine falcons and other protected raptors. Peak migration occurs between mid-September and mid-October.

Shortnose sturgeon are reported infrequently in tidal freshwater areas during the spring spawning season. Little is known of their specific spawning movements or distribution. The Atlantic loggerhead and Atlantic ridley turtles utilize the near-shore marine and estuarine waters as feeding habitat during summer months. Loggerhead subadults use the shallows of the entire Chesapeake Bay from May through October where they may be affected by oil pollution. Turtle nesting is limited to a few loggerhead sites in summer, usually July, on Eastern Shore barrier islands.

Five additional bird species (3 terns and 2 shorebirds) are regarded as either threatened or of special concern by resident experts due to declining populations and/or a particular susceptibility to oil pollution. The gull-billed tern (J81), least tern (J85), piping plover (I57) and Wilson's plover (I70) populations are declining. Their nesting areas and offspring would be extremely vulnerable in spring and summer to destruction by oil spills or physical disturbance of habitat from clean-up activities. Many of these marine birds are not present in great numbers during winter months, particularly the plovers which migrate in the fall and return in April, however, the breeding populations concentrate on Eastern Shore barrier islands. Because these species require undisturbed beaches for nesting areas and destruction of their

habitat may severely limit populations, nesting areas should be given year-round protection priority and special clean-up consideration.

Black skimmer (J80) populations are fairly stable but are of special concern because their feeding mode increases the likelihood of direct oiling in the event of a spill. Also, they frequently nest in gull-billed tern colonies and may transfer oil to the colony area.

V. SOCIOECONOMIC FEATURES

Areas of socioeconomic importance are marked by a black decal on a yellow background. Major state and local parks, beaches, boat ramps, and marinas may support high-density recreational use, and would require cleanup. Marina and boat ramp locations are indicated with arrows, or range lines if an area contains several facilities. The number on the marker corresponds to the total number of marinas and ramps within the area. Residential bulkheading markers are placed in areas requiring special clean-up considerations. In addition to parks and beaches, other shoreline areas have been specially designated for scenic, wildlife, or other ecological values. These areas are labelled and enclosed in stars as previously mentioned in the wildlife section.

Archaeological sites are marked with arrows or range lines indicating the general areas where historical evidence is found. Special consideration should be given to prevent disturbance of these areas. The stars indicate the number of sites recorded in the area:

- * = 1 site
- ** = 2-10 sites
- *** = more than 10 sites.

A coastal National Register site is indicated by the letters "NR" near the stars. The archaeological symbol indicates that the state contact should be notified for specific location information and methods of protection. The Virginia Archaeological Research Center is located in Williamsburg (804)253-4837.

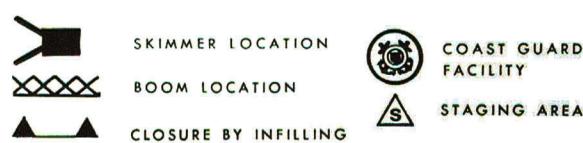


VI. PROTECTION METHODS

The sum of this information - shoreline ranking, biological resources, and socioeconomic features - forms the basis for decisions on protection priorities that constitute the strategy for responses to a spill.

Coast Guard facilities and possible staging areas are mapped, along with marinas and boat ramps available for deployment of open water protection and clean-up efforts.

Protection methods to mitigate the damage from spills and deployment locations found on the ESI maps were suggested by the Coast Guard Atlantic Strike Team (Elizabeth City). The symbols represent protection equipment, such as booms and inlet closures or oil removal equipment such as skimmers. They are located on the maps at the possible areas of deployment. During actual spills, the applicability of this information to the specific situation needs to be reassessed in consultation with the Atlantic Strike Team, the NOAA Scientific Support Team, and appropriate state and federal agencies.



SPECIES LIST

BIRDS

A. DABBING DUCKS

1. Mallard
2. Black duck
3. Pintail
4. Gadwall
5. Blue-winged teal
6. Green-winged teal
7. American widgeon
8. Wood duck
9. Shoveler

Anas platyrhynchos
Anas rubripes
Anas acuta
Anas strepera
Anas discors
Anas carolinensis
Anas americana
Aix sponsa
Spatula clypeata

B. DIVING DUCKS

10. Lesser scaup
11. Greater scaup
12. Canvasback
13. Ring-necked duck
14. Redhead
15. American Goldeneye
16. Bufflehead
17. Common merganser
18. Red-breasted merganser
19. Hooded merganser
20. Ruddy duck

Aythya affinis
Aythya marila
Aythya valisineria
Aythya collaris
Aythya americana
Bucephala clangula
Bucephala albeola
Mergus merganser
Mergus serrator
Lophodytes cucullatus
Oxyura jamaicensis

C. SEA DUCKS

21. Surf scoter
22. White-winged scoter
23. Common scoter
24. Common eider
25. Oldsquaw

Melanitta perspicillata
Melanitta deglandi
Oidemia nigra
Somateria mollissima
Clangula hyemalis

D. GEESE AND SWANS

26. Canada goose
27. Atlantic Brant
28. Greater snow goose
29. Lesser snow goose
30. Whistling swan
31. Mute swan

Branta canadensis
Branta bernicla
Anser caerulescens atlantica
Anser caerulescens caerulescens
Olor columbianus
Cygnus olor

E. DIVING BIRDS

- *32. Double-crested cormorant
33. Common loon
34. Red-throated loon
35. Horned grebe
- *36. Brown pelican
37. Pied-billed grebe

Phalacrocorax auritus
Gavia immer
Gavia stellata
Podiceps auritus
Pelecanus occidentalis (NC only)
Podilymbus podiceps

F. WADING BIRDS

38. Black-crowned night heron
39. Yellow-crowned night heron
40. Green heron
41. Louisiana heron
42. Little blue heron
43. Cattle egret
44. Great egret
45. Snowy egret
46. Great blue heron
47. Eastern glossy ibis
48. White ibis

Nycticorax nycticorax
Nycticorax violaceus
Butorides striatus
Hydranassa tricolor
Florida caerulea
Bubulcus ibis
Casmerodius albus
Egretta thula
Ardea herodias
Plegadis falcinellus
Eudocimus albus

G. RAPTORS

- +*49. Bald eagle
50. Osprey
- +*51. Peregrine falcon

Haliaeetus leucocephalus
Pandion haliaetus
Falco peregrinus

H. RAILS

52. Clapper rail
53. King rail
54. Virginia rail
55. Sora rail

Rallus longirostris longirostris
Rallus longirostris elegans
Rallus aquaticus limicola
Porzana carolina

I. SHORE BIRDS

56. Semipalmated plover
- +#57. Piping plover
58. Killdeer
59. Black-bellied plover
60. Spotted sandpiper
61. Dunlin
62. Least sandpiper
63. Purple sandpiper
64. Semipalmated sandpiper
65. Western sandpiper
66. Sanderling
67. Short-billed Dowitcher
68. Willet
69. Red knot
- +#70. Wilson's plover
71. Greater and Lesser yellowlegs
72. American oystercatcher
73. Marbled godwit
74. Ruddy turnstone

Charadrius hiaticula semipalmatus
Charadrius melanotos
Charadrius vociferus
Pluvialis squatarola
Actitis macularia
Erolia alpina
Erolia minutilla
Erolia maritima
Ereunetes pusilla
Ereunetes mauri
Crocethia alba
Limnodromus griseus
Catoptrophorus semipalmatus
Calidris canutus
Charadrius wilsonia
Totanus melanoleucus
Totanus flavipes
Haematopus palliatus
Limosa fedoa
Arenaria interpres

J. GULLS AND TERNS

75. Laughing gull
76. Bonaparte's gull
77. Ring-billed gull
78. Herring gull
79. Great black-backed gull
- +*80. Black skimmer
- +*81. Gull-billed tern
- *82. Royal tern
83. Common tern
84. Forster's tern
- +*85. Least tern
86. Caspian tern
87. Sandwich tern
88. Black-legged kittiwake

Larus atricilla
Larus philadelphicus
Larus delawarensis
Larus argentatus
Larus marinus
Rynchops niger
Gelochelidon nilotica
Sterna maxima
Sterna hirundo
Sterna forsteri
Sterna albifrons
Sterna caspia
Sterna sandvicensis
Rissa tridactyla

K. ANCILLARY

89. Northern Phalarope
90. Wilson's Phalarope
91. American coot
92. Boat-tailed grackle
93. Ipswich sparrow
- *94. Anhinga

Lobipes lobatus
Steganopus tricolor
Fulica americana
Cassidix mexicanus
Passerculus sandwichensis
Anhinga anhinga (NC only)

FISH

A. ANADROMOUS

1. American shad
2. Alewife
3. Blueback herring
- 4a. Atlantic sturgeon
- +#4b. Shortnose sturgeon

Alosa sapidissima
Alosa pseudoharengus
Alosa aestivalis
Acipenser oxyrinchus (NC only)
Acipenser brevirostrum (VA, MD only)

B. NURSERY

5. Mullet
6. Atlantic menhaden
7. Bluefish
8. Spot
9. Weakfish
10. Spotted sea trout
11. Black sea bass
12. Red drum
13. Black drum
14. Silver perch
15. Eel
- *16. Atlantic croaker
- *17. Striped bass
- *18a. Southern flounder
- *18b. Winter flounder
- *19. Summer flounder

Mugil cephalus
Brevoortia tyrannus
Pomatomus saltatrix
Leiostomus xanthurus
Cynoscion regalis
Cynoscion nebulosus
Centropristes striata
Sciaenops ocellatus
Pogonias cromis
Bairdiella chrysura
Anguilla rostrata
Micropogonias undulatus
Morone saxatilis
Paralichthys lethostigma (NC only)
Pseudopleuronectes americanus (VA, MD only)
Paralichthys dentatus

C. RESIDENT - FRESHWATER

- 20. White and channel catfish
- 21. White perch
- 22. Yellow perch
- 23. Banded killifish
- 24. Tidewater silverside

Ictalurus catus
Ictalurus punctatus
Morone americana
Perca flavescens
Fundulus diaphanus
Menidia beryllina

D. RESIDENT - ESTUARINE

- 25. Atlantic silverside
- 26. Mummichog
- 27. Striped killifish
- 28. Anchovy
- 29. Sheepshead minnow
- +30. Maryland darter

Menidia menidia
Fundulus heteroclitus
Fundulus majalis
Anchoa mitchilli
Cyprinodon variegatus
Etheostoma sellare (MD only)

INVERTEBRATES

- 1. Oyster
- 2. Hard clam
- 3. Soft clam
- 4. Bay scallop

- 1. Blue crab

Southern Shrimp

Crassostrea virginica
Mercenaria mercenaria
Mya arenaria
Argopecten irradians (NC only)

Callinectes sapidus

Penaeus spp.

TURTLES AND ALLIGATOR

- +#*1. Atlantic green
- +#*2. Atlantic loggerhead
- +#*3. Atlantic ridley

*American alligator

Chelonia mydas
Caretta caretta
Lepidochelys kempi

Alligator mississippiensis (NC only)

+ Endangered/Threatened in Virginia

Endangered/Threatened in Maryland

* Endangered/Threatened in North Carolina

° Species which are resident/nursery finfish