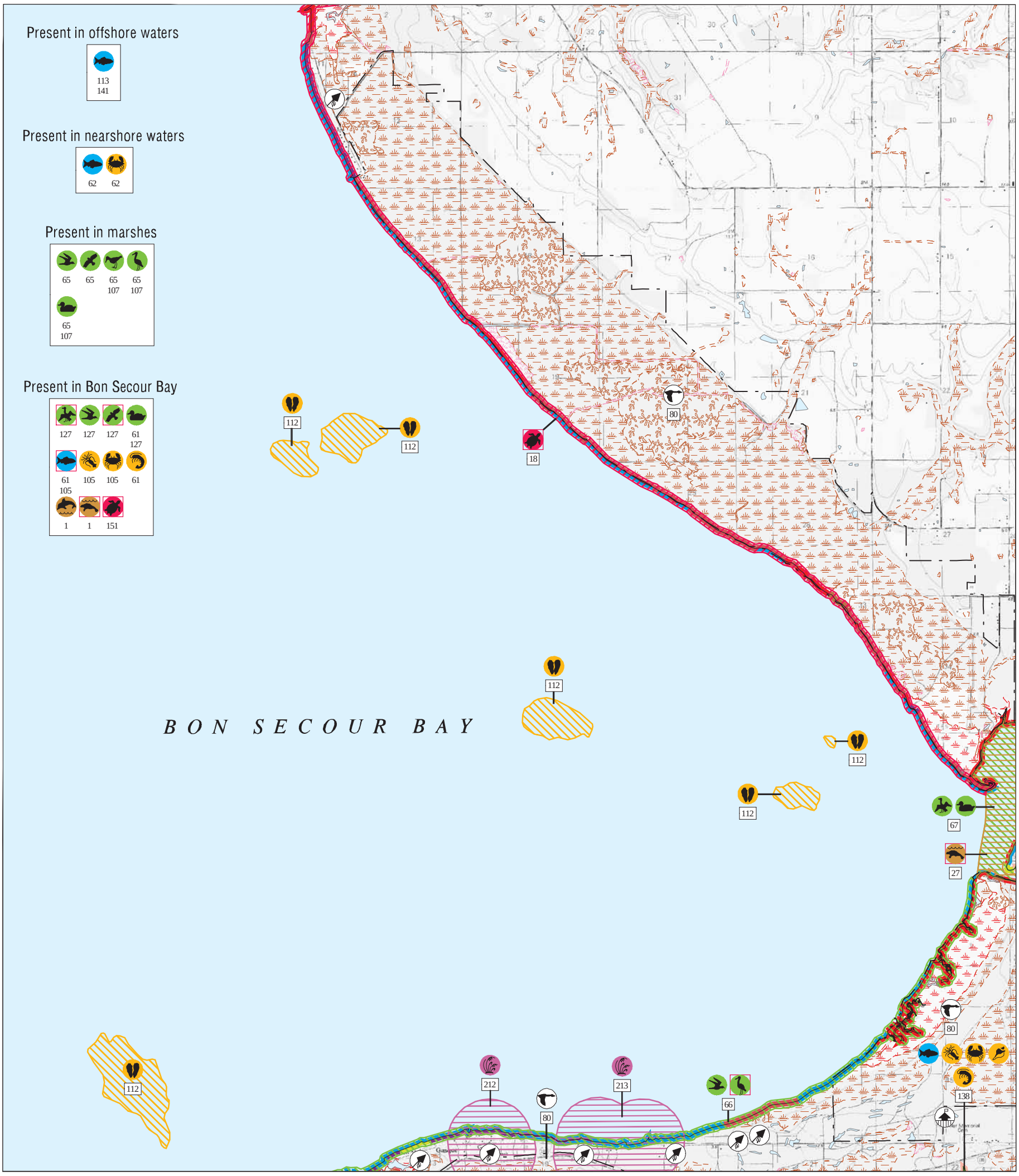
ENVIRONMENTAL SENSITIVITY INDEX MAP



SHORELINE HABITATS (ESI)

- 1B EXPOSED, SOLID MAN–MADE STRUCTURES
- 2A EXPOSED WAVE–CUT PLATFORMS IN MUD OR CLAY
  2B EXPOSED SCARPS AND STEEP SLOPES IN CLAY
- 3A FINE–TO MEDIUM–GRAINED SAND BEACHES
  3B SCARPS AND STEEP SLOPES IN SAND
- 4 COARSE–GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED SCARPS IN MUD OR CLAY
- 8B SHELTERED, SOLID MAN–MADE STRUCTURES
- 8C SHELTERED RIPRAP
- 9A SHELTERED TIDAL FLATS
  9B SHELTERED, VEGETATED LOW BANKS
- 10A SALT–AND BRACKISH–WATER MARSHES
- 10B FRESHWATER MARSHES
- 10C SWAMPS
- 10D SCRUB–SHRUB WETLANDS

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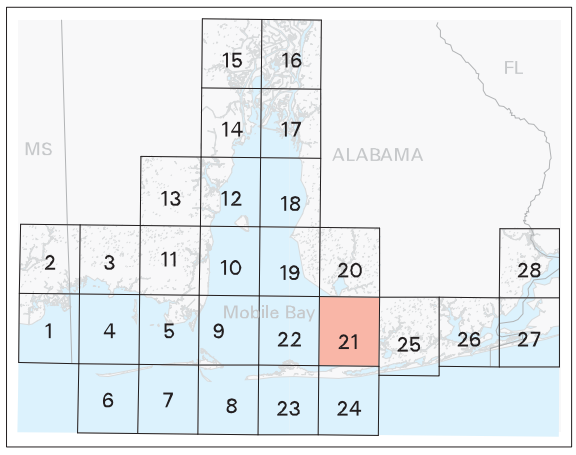
W E
S

SCALE 1:50000

1 .5 0 1 KILOMETER

1 .5 0 1 MILE



Not For Navigation

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National Ocean Service
Office of Response and Restoration
Emergency Response Division

BON SECOUR BAY, ALA. (1985) **ESI-21**

Alabama: ESIMAP 21

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Migrating	Molting
61	Black scoter				X	X									X	X	-	-	-
	White-winged scoter				X	X									X	X	-	-	-
65	American bittern				X	X	X									X	-	-	-
	American coot				X	X	X	X						X	X	X	-	-	-
	American wigeon				X	X									X	X	-	-	-
	Canada goose				X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-
	Caspian tern				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Common moorhen				X	X	X	X	X	X	X	X	X	X	X	X	MAY-JUL	-	-
	Gadwall				X	X	X	X						X	X	X	-	-	-
	Green-backed heron				X	X	X	X	X	X	X	X	X	X	X	X	MAY-JUL	-	-
	King rail				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Least bittern						X	X	X	X	X	X	X	X	X		-	-	-
	Mallard				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Mottled duck				X	X	X	X	X	X	X	X	X	X	X	X	APR-JUL	-	-
	Northern harrier				X	X	X	X	X				X	X	X	X	-	-	-
	Sora				X	X	X	X	X			X	X	X	X	X	-	-	-
	Spotted sandpiper				X	X	X	X				X	X	X	X	X	-	-	-
	Virginia rail				X	X	X								X	X	-	-	-
	White ibis				X	X	X	X	X	X	X	X	X	X	X	X	APR-JUN	-	-
	Wilson's snipe				X	X	X						X	X	X	X	-	-	-
	Wood duck				X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUL	-	-
66	Black skimmer				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Reddish egret	P					X	X	X	X	X	X					-	-	-
67	Anhinga				X	X	X	X						X	X	X	-	-	-
	Bufflehead				X	X	X								X	X	-	-	-
	Greater scaup				X	X	X								X	X	-	-	-
	Lesser scaup				X	X	X								X	X	-	-	-
	Pied-billed grebe				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Red-breasted merganser				X	X	X							X	X	X	-	-	-
107	Black-crowned night-heron						X	X	X	X	X	X	X	X	X		APR-JUN	-	-
	Blue-winged teal					X	X						X				-	-	-
	Cattle egret						X	X	X	X	X	X	X	X			MAY-JUN	-	-
	Clapper rail				X	X	X	X	X	X	X	X	X	X	X	X	MAY-AUG	-	-
	Great blue heron				X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUL	-	-
	Great egret				X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN	-	-
	Green-winged teal				X	X	X							X	X	X	-	-	-
	Killdeer				X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	-	-
	Little blue heron				X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUL	-	-
	Purple gallinule						X	X	X	X	X	X					MAY-JUL	-	-
	Snowy egret				X	X	X	X	X	X	X	X	X	X	X	X	APR-JUN	-	-
	Tricolored heron				X	X	X	X	X	X	X	X	X	X	X	X	MAY-JUN	-	-
	Willet				X	X	X	X	X	X	X	X	X	X	X	X	MAY-AUG	-	-
	Yellow-crowned night-heron				X	X	X	X	X	X	X	X	X	X	X	X	APR-JUL	-	-
127	American white pelican	P			X	X	X	X						X	X	X	-	-	-
	Bonaparte's gull				X	X	X	X	X						X	X	-	-	-
	Brown pelican				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Bufflehead				X	X	X								X	X	-	-	-
	Canvasback				X	X	X								X	X	-	-	-
	Common goldeneye				X	X	X								X	X	-	-	-
	Common loon				X	X	X	X	X				X	X	X	X	-	-	-
	Double-crested cormorant				X	X	X						X	X	X	X	-	-	-
	Forster's tern				X	X	X	X							X	X	-	-	-
	Greater scaup				X	X	X								X	X	-	-	-
	Herring gull				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Hooded merganser				X	X	X	X						X	X	X	-	-	-
	Horned grebe				X	X	X	X	X				X	X	X	X	-	-	-
	Laughing gull				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Lesser scaup				X	X	X								X	X	-	-	-
	Osprey	P			X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Red-breasted merganser				X	X	X							X	X	X	-	-	-
	Redhead				X	X	X								X	X	-	-	-
	Ring-billed gull				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Royal tern				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
	Ruddy duck				X	X	X								X	X	-	-	-

FISH:

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
61	Atlantic bumper								3	3	3	3	2	2	2		-	-	-	-	JUN-DEC
	Atlantic stingray				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Bighead searobin				2	2	2	2	2	1	1	1	1	1	1	2	-	-	-	-	-
	Florida pompano							2	2	2	2	2	2	2			APR-SEP	APR-SEP	APR-SEP	APR-OCT	APR-OCT
	Fringed flounder				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Gulf flounder					2	2	2	2	2	2	2	2	2			-	-	-	-	FEB-OCT
	Highfin goby				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Inshore lizardfish				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Lane snapper									1	2	2	2	1	1		-	-	-	-	JUL-DEC
	Lined seahorse				1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	JAN-DEC
	Longnose anchovy				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	-
	Pigfish				1			1	1	1	1	1	1	1	1	1	-	-	-	-	MAY-JAN
	Speckled worm eel				2	2	2	2	1	1			1	1	1	1	-	-	-	-	SEP-JUN
62	Inland silverside				3	3	3	3	3	3	3	3	3	3	3	3	MAR-AUG	MAR-AUG	MAR-SEP	JAN-DEC	JAN-DEC
	Longnose killifish				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Marsh killifish					1											-	-	-	-	MAR-MAR
	Rough silverside				1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	JAN-DEC
105	Atlantic croaker				4	4	4	4	4	4	4	4	4	4	3	3	-	-	AUG-APR	JAN-DEC	MAY-DEC
	Bay anchovy				4	4	4	4	4	4	4	4	4	4	4	4	FEB-SEP	FEB-NOV	FEB-DEC	JAN-DEC	JAN-DEC
	Bay whiff				2	2	2	3	3	3	3	3	3	3	3	2	-	-	DEC-APR	JAN-DEC	-
	Blue catfish				1	2	2	2	2	1	1			1	1		-	-	-	-	NOV-JUL
	Crevalle jack				2	2	2	2	2	2	2	2	2	2	2	2	JAN-DEC	MAY-SEP	MAY-SEP	JAN-DEC	MAY-SEP
	Darter goby				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Gafftopsail catfish							1	1	2	2	1	2	1	1		-	-	-	-	MAY-DEC
	Gray snapper							2	2	2	2	2	2	2	2		-	-	-	MAY-DEC	MAY-DEC
	Gulf killifish				3	3	3	3	3	3	3	3	3	3	3	3	MAR-SEP	MAR-SEP	MAR-OCT	JAN-DEC	JAN-DEC
	Gulf menhaden				2	4	4	4	4	3	3	3	3	4	3	4	-	SEP-FEB	OCT-MAY	FEB-DEC	FEB-OCT
	Gulf sturgeon	P	T		X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	JAN-DEC
	Hardhead catfish				2	2	2	3	3	3	3	3	3	3	3	2	APR-AUG	APR-AUG	APR-SEP	JAN-DEC	JAN-DEC
	Red drum				2	2	2	2	2	2	2	2	2	2	2	2	-	SEP-DEC	SEP-DEC	JAN-DEC	JUN-OCT
	Sand seatrout				2	2	4	4	4	4	4	3	3	3	2	2	FEB-SEP	FEB-SEP	FEB-SEP	JAN-DEC	JAN-DEC
	Silver perch				2	2	2	2	2	2	2	2	2	2	2	2	APR-AUG	APR-AUG	APR-AUG	JAN-DEC	JAN-DEC
	Southern flounder				2	2	2	2	2	2	2	2	2	2	2	2	-	-	NOV-MAR	JAN-DEC	JAN-DEC
	Southern hake				1	1	2	2	2				1		1		-	-	-	-	OCT-OCT DEC-MAY
	Spot				4	4	4	4	4	4	4	3	3	3	3	3	-	-	NOV-APR	JAN-DEC	JAN-DEC
	Spotted seatrout				3	3	3	3	3	3	3	3	3	3	3	3	APR-AUG	APR-AUG	APR-OCT	JAN-DEC	JAN-DEC
	Striped anchovy				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Striped mullet				3	3	3	3	3	3	3	3	3	3	3	3	-	-	DEC-APR	JAN-DEC	MAY-DEC
	Threadfin shad				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	White mullet				1			1	2	2	2	2	2	2	1		-	-	-	-	MAY-JAN

Biological information shown on the maps represents known concentration areas or occurrences, but does not necessarily represent the full distribution or range of each species. This is particularly important to recognize when considering potential impacts to protected species.

Alabama: ESIMAP 21 (cont.)

BIOLOGICAL RESOURCES: (cont.)

FISH: (cont.)

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
113	Least puffer				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Pinfish				3	3	3	3	3	3	3	3	3	3	3	3	-	-	DEC-APR	JAN-DEC	MAR-OCT
	Skipjack herring				1	1	1	1	1	1		1				1	-	-	-	-	AUG-AUG
																					DEC-JUN
	Southern kingfish				2	2	2	2	3	3	3	2	2	2	2	2	-	-	-	-	JAN-DEC
	Star drum				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
138	Atlantic croaker				4	4	4	4	4	4	3	3	3	3	3	3	SEP-APR	SEP-APR	OCT-APR	JAN-DEC	JAN-DEC
	Atlantic sharpnose shark					2	2	2	2	2	2	2	2				-	-	-	-	MAR-OCT
	Atlantic stingray				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Bay anchovy				4	4	4	4	4	4	4	4	4	4	4	4	FEB-SEP	FEB-NOV	FEB-DEC	JAN-DEC	JAN-DEC
	Bay whiff				3	3	3	3	3	3	3	3	3	3	3	3	-	-	-	JAN-DEC	-
	Bighead searobin					2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	FEB-DEC
	Blacktip shark					2	2	2	2	2	2	2	2				-	-	-	-	MAR-OCT
	Blue runner												2	2			-	-	-	-	SEP-OCT
	Bonnethead shark													1			-	-	-	-	OCT-OCT
	Broad flounder				1	1	1	1	1	1							-	-	-	-	JAN-JUN
	Bull shark					2	2	2	2	2	2	2	2				-	-	-	-	MAR-OCT
	Cobia										1	1	1				-	-	-	-	JUL-SEP
	Crested cusk-eel				1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	JAN-DEC
	Crevalle jack				2	2	2	2	2	2	2	2	2	2	2	2	JAN-DEC	MAY-SEP	MAY-SEP	JAN-DEC	MAY-SEP
	Darter goby				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Dolphin												2				-	-	-	-	SEP-SEP
	Florida pompano						2	2	2	2	2	2	2				APR-SEP	APR-SEP	APR-SEP	APR-OCT	APR-OCT
	Fringed flounder				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Gafftopsail catfish									1	2	2	2	2			-	-	-	-	JUN-OCT
	Gag								1								-	-	-	-	MAY-MAY
	Gray snapper								1	1	1	1	1	1	1	1	-	-	-	-	MAY-DEC
	Gulf flounder				2	2	2	2	2	2	2	2	2	2	2	2	NOV-FEB	NOV-FEB	NOV-FEB	JAN-DEC	JAN-DEC
	Gulf menhaden				4	4	4	4	4	4	4	4	4	4	4	4	OCT-MAR	OCT-MAR	OCT-MAY	JAN-DEC	JAN-DEC
	Hardhead catfish				2	2	2	4	4	4	4	4	4	4	4	2	APR-AUG	APR-AUG	APR-SEP	JAN-DEC	JAN-DEC
	Highfin goby				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Inshore lizardfish				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Lane snapper										1	2	2	2	1	1	-	-	-	JUL-DEC	-
	Least puffer				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Little tunny								1	1	1	1	1				-	-	-	-	MAY-SEP
	Longnose anchovy					2	2	2	2	2	2	2	2	2	2		-	-	-	-	FEB-NOV
	Pigfish				1			1	1	1	1	1	1	1	1	1	-	-	-	-	MAY-JAN
	Pinfish				3	3	3	3	3	4	4	4	4	4	3	3	NOV-MAR	NOV-MAR	NOV-APR	JAN-DEC	JAN-DEC
	Red snapper										1	1	1	1	1		-	-	-	JUL-NOV	-
	Rough scad								2	1			1	1			-	-	-	-	MAY-JUN
																					SEP-OCT
	Sand seatrout				4	4	4	4	4	4	4	4	4	4	4	4	MAR-OCT	MAY-OCT	FEB-OCT	JAN-DEC	JAN-DEC
	Silver perch				3	3	3	3	3	3	3	3	3	3	3	3	MAY-SEP	MAY-SEP	MAY-SEP	JAN-DEC	JAN-DEC
	Skipjack herring				1	1	1	1	1	1		1				1	-	-	-	-	AUG-AUG
																					DEC-JUN
	Southern flounder				3	3	3	3	3	3	3	3	2	3	3	3	SEP-JAN	SEP-JAN	SEP-APR	JAN-DEC	JAN-DEC
	Southern hake				1	1	1	1	1	1					1	1	-	-	-	-	NOV-JUN
	Southern kingfish				1	2	3	3	3	3	3	3	3	3	3	1	-	-	-	-	JAN-DEC
	Speckled worm eel				2	2	2	2	1	1			1	1	1	1	-	-	-	-	SEP-JUN
	Spinner shark					1	1	1	1	1	1	1	1				-	-	-	-	MAR-OCT
	Spot				4	4	4	4	4	4	4	4	4	4	4	4	NOV-MAR	NOV-APR	NOV-MAR	JAN-DEC	JAN-DEC
	Spotfin mojarra				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Spotted seatrout				3	3	3	3	3	3	3	3	3	3	3	3	MAR-SEP	MAR-SEP	MAR-OCT	JAN-DEC	JAN-DEC
	Striped anchovy				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Striped mullet				4	4	4	4	4	4	4	4	4	4	4	4	NOV-MAY	NOV-MAY	NOV-MAY	JAN-DEC	JAN-DEC
	Threadfin shad				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	White mullet				1	1	1	1	2	2	2	2	2	1	1	1	-	-	-	-	JAN-DEC
141	Atlantic spadefish				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Gulf butterfish				2	2	2	3	3	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Harvestfish				1	1	1	2	2	2	2	2	2	2	2	2	-	-	-	JAN-DEC	-
	Ladyfish					1	1	2	2	1	1	1	1	1			-	-	-	-	MAR-NOV
	Scaled sardine						2	2	2	2	2	2	2	2			-	-	-	-	APR-NOV
	Sheepshead				2	2	3	3	3	2	3	3	2	2	2	2	FEB-MAR	FEB-APR	MAR-AUG	JAN-DEC	JAN-DEC
	Silver seatrout				1	1		1	1	1	1	2	2	2	1		-	-	-	-	MAY-FEB
	Spanish mackerel						2	2	2	2	2	2	2				-	-	-	APR-OCT	AUG-OCT

HABITAT:

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D
212	Bandana-of-the-everglades				X	X	X	X	X	X	X	X	X	X	X	X
	Large-leaved jointweed				X	X	X	X	X	X	X	X	X	X	X	X
	Sand pine				X	X	X	X	X	X	X	X	X	X	X	X
213	Large-leaved jointweed				X	X	X	X	X	X	X	X	X	X	X	X
	Sand pine				X	X	X	X	X	X	X	X	X	X	X	X
	Slenderleaf clammy-weed				X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
61	Brown shrimp				2	4	4	4	4	4	4	4	4	4	4	2	-	-	FEB-NOV	MAR-NOV	JUN-AUG
	Pink shrimp				1	1	2	2	2	2	2	2	2	2	2	2	MAR-NOV	MAR-NOV	MAR-NOV	JAN-DEC	JAN-DEC
	White shrimp				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	JAN-DEC	JAN-JUN
62	Thinstripe hermit				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
105	Atlantic brief squid				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Blue crab				4	4	4	4	4	4	4	4	4	4	4	4	MAR-NOV	MAR-NOV	JAN-DEC	JAN-DEC	JAN-DEC
112	Eastern oyster				4	4	4	4	4	4	4	4	4	4	4	4	APR-NOV	-	APR-NOV	APR-NOV	JAN-DEC
138	Atlantic brief squid				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Blue crab				4	4	3	4	4	4	4	4	4	4	4	4	MAR-NOV	MAR-NOV	MAR-DEC	JAN-DEC	JAN-DEC
	Brown shrimp				4	4	4	4	4	4	4	4	4	4	4	4	NOV-APR	NOV-APR	FEB-NOV	JAN-DEC	JAN-DEC
	Mantis shrimp				2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	-	JAN-DEC
	Pink shrimp				1	1	2	2	2	2	2	2	2	2	2	2	MAR-NOV	MAR-NOV	MAR-NOV	JAN-DEC	JAN-DEC
	Shark eye				1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-
	White shrimp				4	4	3	3	3	4	4	4	4	4	4	4	MAR-OCT	MAR-NOV	JAN-DEC	JAN-DEC	JAN-DEC

MARINE MAMMAL:

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Mating	Calving	Pupping	Molting
1	Bottlenose dolphin				X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP	MAR-SEP	-	-
	West Indian manatee		E	VERY LOW				X	X	X	X	X	X	X	X		-	-	-	-
27	West Indian manatee		E					X	X	X	X	X	X	X	X		-	-	-	-

REPTILE:

RAR#	Species	S	F	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Hatching	Internesting	Juveniles	Adults
18	Alabama red-bellied turtle	P	E		X	X	X	X	X	X	X	X	X	X	X	X	APR-AUG	-	-	JAN-DEC	JAN-DEC
151	Green sea turtle	P	T				X	X	X	X	X	X	X	X	X		-	-	-	MAR-NOV	APR-SEP
	Kemp's ridley sea turtle	P	E				X	X	X	X	X	X	X	X	X		-	-	-	MAR-NOV	APR-SEP
	Leatherback sea turtle	P	E				X	X	X	X	X	X	X	X	X		-	-	-	MAR-NOV	-
	Loggerhead sea turtle	P	T				X	X	X	X	X	X	X	X	X		-	-	-	MAR-NOV	APR-SEP

Biological information shown on the maps represents known concentration areas or occurrences, but does not necessarily represent the full distribution or range of each species. This is particularly important to recognize when considering potential impacts to protected species.

Alabama: ESIMAP 21 (cont.)

HUMAN USE RESOURCES:

WILDLIFE REFUGE:

HUN#	Name	Contact	Phone
80	BON SECOUR NATIONAL WILDLIFE REFUGE	USFWS	251/540-7720

Biological information shown on the maps represents known concentration areas or occurrences, but does not necessarily represent the full distribution or range of each species. This is particularly important to recognize when considering potential impacts to protected species.

ENVIRONMENTAL SENSITIVITY INDEX: ALABAMA

INTRODUCTION

Environmental Sensitivity Index (ESI) maps have been developed for the marine and coastal areas of Alabama. The ESI maps are a compilation of information from three main categories: shoreline habitats, sensitive biological resources, and human-use resources.

The individual map pages in this atlas are divided according to the U.S. Geological Survey (USGS) topographic quadrangle index. Black and white scanned images of these maps are used as a backdrop for each map page in the atlas. The name on the bottom right of each map page refers to the corresponding USGS quadrangle.

SHORELINE HABITAT MAPPING

Original ESI maps, published in 1996, were re-examined and fully updated using the sources and methods described below. The intertidal shoreline habitats of Alabama were mapped via interpretation of a continuous, overlapping set of georeferenced oblique aerial photographs were acquired in October 2006 during overflights conducted at elevations of 400-600 feet and slow air speed. Where appropriate, revisions to the existing shoreline were made. Where necessary, multiple habitats were described for each shoreline segment.

To determine the sensitivity of a particular intertidal shoreline habitat, the following factors are integrated:

1) Shoreline type (substrate, grain size, tidal elevation, origin)
2) Exposure to wave and tidal energy
3) Biological productivity and sensitivity
4) Ease of cleanup

Prediction of the behavior and persistence of oil in intertidal habitats is based on an understanding of the dynamics of the coastal environments, not just the substrate type and grain size. The intensity of energy expended upon a shoreline by wave action, tidal currents, and river currents directly affect the persistence of stranded oil. The need for shoreline cleanup activities is determined, in part, by the slowness of natural processes in removal of oil stranded on the shoreline. The potential for biological injury and ease of cleanup of spilled oil are also important factors in the ESI ranking. In general, areas exposed to high levels of physical energy, such as wave action and tidal currents, and low biological activity rank low on the scale, whereas sheltered areas with associated high biological activity have the highest ranking. The list below includes the shoreline habitats delineated for Alabama, presented in order of increasing sensitivity to spilled oil.

1B) Exposed, Solid Man-made Structures
2A) Exposed Wave-cut Platforms in Mud or Clay
2B) Exposed Scarps and Steep Slopes in Clay
3A) Fine- to Medium-grained Sand Beaches
3B) Scarps and Steep Slopes in Sand
4) Coarse-grained Sand Beaches
5) Mixed Sand and Gravel Beaches
6B) Riprap
7) Exposed Tidal Flats
8A) Sheltered Scarps in Mud or Clay
8B) Sheltered, Solid Man-made Structures
8C) Sheltered Riprap
9A) Sheltered Tidal Flats
9B) Sheltered, Vegetated Low Banks
10A) Salt- and Brackish-water Marshes
10B) Freshwater Marshes
10C) Swamps
10D) Scrub-Shrub Wetlands

Each of the shoreline habitats are described on pages 8-14 in terms of their physical description, predicted oil behavior, and response considerations.

In addition to the shoreline habitats mapped from the oblique photographs, polygonal wetlands and tidal flats derived from the 2006 National Wetlands Inventory (NWI) Data and the 1996 Alabama ESI Data are included in this atlas. Polygonal wetlands and flats were modified based on the oblique photographs from the overflights, vertical aerial photographs, and DOQQs.

SENSITIVE BIOLOGICAL RESOURCES

Biological information presented in this atlas was collected, compiled, and reviewed with the assistance of biologists and resource managers from the following agencies:

- U.S. Fish and Wildlife Service (USFWS, Daphne Field Office)
- Alabama Division of Wildlife and Freshwater Fisheries (AL DWFF)
- Alabama Department of Environmental Management Coastal Zone Management Program (ADEM CZMP)
- Mobile Bay National Estuary Program (NEP)
- Alabama Department of Conservation and Natural Resources (ADCNR) Marine Resources Division (MRD) and State Lands Division (SLD)
- Alabama Natural Heritage Program (NHP)
- NOAA Fisheries Southeast Fisheries Science Center (SEFSC)
- University of Alabama

The above agencies provided the majority of information included in the atlas. Other participating agencies will be cited throughout the atlas and in the metadata accompanying the digital product.

KEY FEATURES ON ESI MAPS

1) Animal and plant species that are at risk during oil spills and/or spill response are represented on the maps by polygons.

2) Species have been divided into groups and subgroups based on their behavior, morphology, taxonomic classification, and spill vulnerability and sensitivity. The icons below reflect this grouping scheme.

3) Polygons are color-coded based on the species composition of each feature, as shown below:

ELEMENT	COLOR AND HATCH PATTERN
Birds	Green diagonal hatch
Fish	Blue diagonal hatch
Invertebrates	Orange diagonal hatch
Marine mammals	Brown horizontal hatch
Terrestrial mammals	Brown vertical hatch
Reptiles	Red diagonal hatch
Benthic habitats	“Simplified wetland” pattern
Plants	Purple horizontal hatch
Multi-element group	Black diagonal hatch

4) There is a Resources at Risk number (RAR#) located under each icon or group of icons. The RAR# references a table on the reverse side of the map with a complete list of species associated with the feature.

5) Also associated with each species in the table is the state and federal protected status as threatened (T), endangered (E), or protected species (P), as well as concentration, seasonality, and life-history information.

6) For species that are found throughout general geographical areas or habitat types on certain maps,

displaying the polygons for these species would cover large areas or would obscure the shoreline and biological features, making the maps very difficult to read. In these cases, a small box will be shown on the maps which states that they are "Present in ..." (e.g., "Present in Mobile Bay" or "Present in marshes").

MARINE MAMMALS

Marine mammals depicted in the Alabama atlas include bottlenose dolphin and West Indian manatee (federally endangered). Marine mammal concentration areas were mapped based on interviews with local resource experts from NOAA and USFWS. Areas where cetaceans are frequently sighted swimming in coastal waters are designated by large polygons.

Expert contacts for Alabama marine mammals are:

Name	Agency	City	Phone	Species
Keith Mullin	NOAA	Pascagoula, MS	228/ 762-4591	Marine mammals
Staff	USFWS Daphne Field Office	Daphne, AL	251/ 441-5857	West Indian manatee

BIRDS

Bird concentration areas depicted in this atlas include:

Waterbird and shorebird nesting and wintering sites – Locations where waterbirds (e.g., herons, egrets, skimmers, pelicans, terns, shorebirds, etc.) have been documented as nesting are mapped. Colony size (number of birds present) is included in tables on the reverse side of the maps and was provided by State biologists. Piping plovers (federally threatened) winter along the Gulf and Mississippi Sound. Designated critical habitat occurs in this area.

Waterfowl, diving bird, and pelagic bird migratory staging and wintering – Concentration areas are shown for migratory and wintering waterfowl, diving birds, pelagic birds, and gulls/ terns in Mississippi Sound, Mobile Bay, Perdido Bay, Gulf of Mexico, and associated smaller bays, rivers, and marshes. Alabama DWFF and DCNR provided distribution information based on many years of surveys and field expertise. Waterfowl nesting areas are mapped, most commonly for Canada goose, mottled duck, mallard, snow goose, and occasionally for other species in wetlands when information was available.

Migratory shorebird stopover areas – Sites where large concentrations of shorebirds occur annually, particularly during the spring and autumn months, are mapped along the Gulf Coast, the Delta, and other areas as appropriate.

Marsh birds, raptors, and passerine species – General locations of marsh birds (e.g., rails), raptors (e.g., eagles, osprey; nesting habitat/ sites are depicted), and passerine species of concern (e.g., some sparrow species), particularly threatened and endangered species, were mapped.

Expert contacts for Alabama birds are:

Name	Agency	City	Phone	Species
Patric Harper	USFWS	Daphne, AL	251/ 441 -5857	Federally listed birds
Dianne Ingram	USFWS	Daphne, AL	251/ 441 -5839	Federally listed birds
Roger Clay	ADWFF	Daphne, AL	251/ 626 -5474	Coastal birds
Carl Ferraro	ADCNR	Spanish Fort, AL	251/ 621 -1216	Coastal resources
Chuck Sharp	ADWFF	Daphne, AL	251/ 626 -5474	Waterfowl
James Masek	ADWFF	Daphne, AL	251/ 626 -5474	Waterfowl
Mark VanHoose	ADCNR MRD	Dauphin Island, AL	251/ 861 -2882	Coastal birds

Major Data Sources Used: Birds

Alabama Natural Heritage Program. 2006. Alabama Natural Heritage Program Element Occurrence Data for Rare and Endangered Species in Alabama, vector digital data.

Imhof, T.A. 1976. Alabama Birds. Second Edition. The University of Alabama Press, 445 pp.

Mirarchi, R.E., Bailey, M.A., Haggerty, T.M., and Best, T.L. 2004. Alabama Wildlife, Volume Three: Imperiled Amphibians, Reptiles, Birds, and Mammals. The University of Alabama Press, Tuscaloosa, AL, 225 pp.

USFWS. 2001. Piping plover critical habitat – wintering grounds, vector digital data.

REPTILES

Turtles depicted in this atlas include several listed/ protected species: Kemp's ridley sea turtle (*Lepidochelys kempi*, state protected/ federally endangered), loggerhead sea turtle (*Caretta caretta*, state protected/ federally threatened), leatherback sea turtle (*Dermochelys coriacea*, state protected/ federally endangered), green sea turtle (*Chelonia mydas*, state protected/ federally threatened), Alabama red-bellied turtle (*Pseudemys alabamensis*, state protected/ federally endangered), alligator snapping turtle (*Macrochelys temminckii*, state protected), delta map turtle (*Graptemys nigrinoda delticola*, state protected), gopher tortoise (*Gopherus polyphemus*, state protected/ federally threatened in Mobile County), and Mississippi diamondback terrapin (*Malaclemmys terrapin pileata*, state protected). Green water snake (*Nerodia cyclopion*) and gulf salt marsh snake (*Nerodia clarkii clarkii*, state protected) were also mapped. Information on distribution and seasonal presence of these species was provided by NOAA, USFWS, and the Natural Heritage Program.

Expert contacts for Alabama reptiles are:

Name	Agency	City	Phone	Species
Patric Harper	USFWS	Daphne, AL	251/ 441-5857	Federally listed turtles
Dianne Ingram	USFWS	Daphne, AL	251/ 441-5839	Federally listed turtles
Michael Barbour	AL NHP	Montgomery, AL	334/ 833-4062	T/ E species data provider
Wendy Teas	NOAA SEFSC	Miami, FL	305/ 361-4595 x595	Sea turtles

Major Data Sources Used: Reptiles

Alabama Natural Heritage Program. 2006. Alabama Natural Heritage Program Element Occurrence Data for Rare and Endangered Species in Alabama, vector digital data.

Mirarchi, R.E., Bailey, M.A., Haggerty, T.M., and Best, T.L. 2004. Alabama Wildlife, Volume Three: Imperiled Amphibians, Reptiles, Birds, and Mammals. The University of Alabama Press, Tuscaloosa, AL, 225 pp.

TERRESTRIAL MAMMALS

The terrestrial mammals depicted in this atlas are limited to the two listed species, Alabama beach mouse (*Peromyscus polionotus ammobates*, state protected/ federally endangered) and Perdido Key beach mouse (*Peromyscus polionotus trissyllepsis*, state protected/ federally endangered). Other mammals are potentially occurring in the study area, but are not mapped due to their relatively wide distribution, a lack of information regarding particular concentration areas, and/ or the unlikelihood of impact during coastal and marine oil spills due to their use of more upland and inland habitats.

Expert contacts for Alabama terrestrial mammals are:

Name	Agency	City	Phone	Species
Patric Harper	USFWS	Daphne, AL	251/ 441 -5857	Federally listed mammals

Major Data Sources Used: Terrestrial Mammals

Mirarchi, R.E., Bailey, M.A., Haggerty, T.M., and Best, T.L. 2004. Alabama Wildlife, Volume Three: Imperiled Amphibians, Reptiles, Birds, and Mammals. The University of Alabama Press, Tuscaloosa, AL, 225 pp.

FISH

Finfish depicted in this atlas include selected marine, estuarine, and freshwater species. Species of commercial, recreational, ecological, and/ or conservation interest are emphasized. Fish distributions are based largely on expert opinion and incorporate a combination of survey data, field experience, and habitat-based designations provided by resource experts at ADCNR and USFWS. Gulf sturgeon (*Acipenser oxyrinchus desotoi*,

state protected/ federally threatened) were mapped throughout the study area.

Seasonality was based mostly on survey data provided by ADCNR and data adapted from NOAA's Estuarine Living Marine Resources Program (ELMR) (Nelson, 1992). Under each month for most fish, a number code indicates the species abundance (1 = rare, 2 = common, 3 = abundant, 4 = highly abundant). The abundance usually refers to the adult life stage. Additional life-history information is provided in the adjacent columns. For species where monthly abundance detail was not known, seasonality is listed by month with an "X" indicating the species presence.

Expert contacts for Alabama fish are:

Name	Agency	City	Phone	Species
Leslie Hartman	ADCNR MRD	Dauphin Island, AL	251/ 861-2882	Fish
Mark VanHoose	ADCNR MRD	Dauphin Island, AL	251/ 861-2882	Fish
Jeff Powell	USFWS	Daphne, AL	251/ 441-5858	Gulf sturgeon

Major Data Sources Used: Fish

Nelson, D.M. (editor). 1992. Distribution and abundance of fishes and invertebrates in Gulf of Mexico, Volume I: data summaries. ELMR Rep. No. 10 NOAA/ NOS Strategic Environmental Assessments Division, Rockville, MD. 273 p.

INVERTEBRATES

Invertebrates depicted in this atlas include selected marine and estuarine species. Species of commercial, recreational, ecological, and/ or conservation interest are emphasized. Invertebrate distributions are based largely on expert opinion and incorporate a combination of survey data, field experience, and habitat-based designations provided by resource experts at ADCNR.

Seasonality was based mostly on survey data provided by ADCNR and data adapted from NOAA's Estuarine Living Marine Resources Program (ELMR) (Nelson, 1992). Under each month for most invertebrates, a number code indicates the species abundance (1 = rare, 2 = common, 3 = abundant, 4 = highly abundant). The abundance usually refers to the adult life stage. Additional life-history information is provided in the adjacent columns. For species where monthly abundance detail was not known, seasonality is listed by month with an "X" indicating the species presence.

Expert contacts for Alabama invertebrates are:

Name	Agency	City	Phone	Species
Leslie Hartman	ADCNR MRD	Dauphin Island, AL	251/ 861-2882	Marine/ estuarine invertebrates
Mark VanHoose	ADCNR MRD	Dauphin Island, AL	251/ 861-2882	Marine/ estuarine invertebrates

Major Data Sources Used: Invertebrates

Nelson, D.M. (editor). 1992. Distribution and abundance of fishes and invertebrates in Gulf of Mexico, Volume I: data summaries. ELMR Rep. No. 10 NOAA/ NOS Strategic Environmental Assessments Division, Rockville, MD. 273 p.

HABITATS

Benthic habitats (e.g., submerged aquatic vegetation) and rare/ sensitive coastal plants were mapped in this atlas.

Submerged aquatic vegetation (SAV) – SAV distribution shown in this atlas is based on 2003 digital data provided by the Mobile Bay Estuary Program. SAV are shown in the atlas as polygons. A purple "simplified wetland" pattern was used to display SAV. No icons or RAR#s are used.

Rare/sensitive coastal plants – Plants deemed as rare or sensitive to coastal oil spills by the Alabama Natural Heritage Program are included in this atlas. Refer to the species list (p. 6) for documentation of which species were mapped.

Expert contacts for Alabama habitats are:

Name	Agency	City	Phone	Species
David Yeager	Mobile Bay NEP	Mobile, AL	251/ 431-6409	SAV
Michael Barbour	AL NHP	Montgomery, AL	334/ 833-4062	T/ E species data provider

Major Data Sources Used: Habitats

Alabama Natural Heritage Program. 2006. Alabama Natural Heritage Program Element Occurrence Data for Rare and Endangered Species in Alabama, vector digital data

Barry A. Vittor & Associates, Inc. and Mobile Bay NEP. 2003. Submerged aquatic vegetation polygons, vector digital data.

HUMAN-USE RESOURCES

Management areas such as wildlife refuges, state parks, and designated critical habitats are mapped as polygons, with the boundaries indicated as a black dot-dash line with the corresponding icon placed near the center of the polygon. Where the feature is a known point location (e.g., archaeological site, marina), the exact location is shown as a small black dot and a leader line is drawn from it to the icon.

A human use number (HU#) can be found below the icon for some resources (such as management areas and marinas). The HU# references a table on the reverse side of the map and may provide more information (i.e., name, contact) for that particular resource. The types of human use resources mapped in this atlas are depicted below.

Airport: Locations of airports, airfields, landing strips, helipads, etc., whether they are manned or unmanned. Data were provided by USGS.

Archaeological and Historical Sites: Locations of archaeological and historic sites. An arrow symbol is used to designate prehistoric sites. A house symbol is used to designate historic sites. Data were provided by the University of Alabama.

Boat Ramp: Locations of boat ramps. This information was obtained from the Alabama Department of Environmental Management and earlier overflight observations.

Critical Habitat: USFWS Designated Critical Habitat for wintering piping plover and federally listed Alabama and Perdido Key beach mice. The data were provided by USFWS.

Management Area: Locations of conservation area lands such as reserves and wildlife management areas. Property names are provided in the data tables for each map. This information was provided by ADCNR.

Marina: Locations of marinas. This information was obtained from the Alabama Department of Environmental Management and earlier overflight observations.

Park: Location of State parks. Data were provided by ADCNR.

Recreational Beach: Locations of recreational beaches used for activities such as swimming, sun-bathing, boating, picnicking, etc. Water activities and use of recreational beaches may occur along all shoreline areas where access is possible. Data were gathered from the Alabama Atlas and Gazetteer.

Wildlife Refuge: Locations of National Wildlife Refuges. Data were provided by USFWS.

GEOGRAPHIC INFORMATION SYSTEM

The entire atlas product is stored in digital form in a Geographic Information System (GIS) as spatial data layers and associated databases. The format for the data varies depending on the type of information or features for which the data are being stored.

Under separate cover is a metadata document that details the data dictionary, processing techniques, data lineage, and other descriptive information for the digital data sets and maps that were used to create this atlas. Below is a brief synopsis of the information contained in the digital version. Refer to the metadata file for a full explanation of the data and its structure.

SHORELINE CLASSIFICATIONS

The ESI shoreline habitat classification is stored as lines and polygons with associated attributes. In many cases, a shoreline may have two or three different classifications or colored lines on the shoreline. These multiple classifications are represented on the maps by double and triple line patterns and in the database by ESI#1/ ESI#2, where ESI#1 is the landward-most classification and

ESI#2 is the seaward-most classification. In addition to the line features, tidal flats (ESI = 7, ESI = 9A), marshes (ESI=10A, ESI=10B), and scrub-shrub wetlands (ESI = 10D) are also stored as polygons. Therefore, the legend on each map may contain two patterns depicted on a map: a linear feature as well as a polygonal feature.

SENSITIVE BIOLOGICAL RESOURCES

Biological resources are stored as polygons. Associated with each feature is a unique identification number that is linked to a series of data tables that further identify the resources. The main biological resource table consists of a list of species identification numbers for each site, the concentration of each species at each site, and identification codes for seasonality and source information. This data table is linked to other tables that describe the seasonality and life-history time-periods for each species (at month resolution) for the specified map feature. Other data tables linked to the first table include: the species identification table, which includes common and scientific names; the species status table, which gives information for state and/ or federal threatened or endangered listings; and the source database, which provides source metadata at the feature-species level (specific sources are listed for each species occurring at each mapped feature in the biology coverages).

HUMAN-USE FEATURES

Human-use features are represented as points or polygons. The resource name, the owner/ manager, a contact person, and phone number are included in the database for management areas, when available. All metadata sources are documented at the feature level.

ACKNOWLEDGMENTS

This project was supported by the NOAA Office of Response and Restoration, Hazardous Materials Response Division. Access to aerial photography was provided by NOAA. Brad Benggio, NOAA Scientific Support Coordinator, assisted with the project.

The biological and human-use data included on the maps were provided by numerous individuals and agencies. Staff at the USFWS Daphne Field Office, Alabama Division of Wildlife and Freshwater Fisheries, Alabama Department of Environmental Management, Alabama Department of Conservation and Natural Resources, Alabama Natural Heritage Program, NOAA, and University of Alabama contributed a vast amount of information to this effort, including first-hand expertise, publications, maps, and digital data.

At Research Planning, Inc. (RPI) of Columbia, South Carolina, numerous scientific, GIS, and graphic staff were involved with different phases of the project. Mark White, GIS Director, was Project Manager. Shoreline habitat mapping was conducted by Zach Nixon. The biological and human-use data were collected and compiled onto base maps by Christine Boring. Katy Beckham, Lee Diveley, Chris Locke, Jeff Dahlin, and Bill Holton entered, processed, and produced the GIS data and hardcopy atlas. Graphic art production was conducted by Joe Holmes. Mark White, Christine Boring, Joe Holmes, Katy Beckham, and Chris Locke prepared the final text documents and metadata.

APPROPRIATE USE OF ATLAS AND DATA

This atlas and the associated database were developed to provide summary information on sensitive natural and human-use resources for the purposes of oil and chemical spill planning and response. Although the atlas and database should be very useful for other environmental and natural resource planning purposes, it should not be used in place of data held by State and Federal agencies. Likewise, information contained in the atlas and database cannot be used in place of consultations with natural and cultural resource agencies, or in place of field surveys. Also, this atlas should not be used for navigation.

SPECIES LIST

Common Name*	Species Name*
BIRDS	
DIVING BIRD	
American white pelican	*Pelecanus erythrorhynchos*
Anhinga	*Anhinga anhinga*
Brown pelican	*Pelecanus occidentalis*
Common loon	*Gavia immer*
Double-crested cormorant	*Phalacrocorax auritus*
Horned grebe	*Podiceps auritus*
Pied-billed grebe	*Podilymbus podiceps*
GULL/TERN	
Black skimmer	*Rynchops niger*
Black tern	*Chlidonias niger*
Bonaparte's gull	*Larus philadelphia*
Caspian tern	*Sterna caspia*
Common tern	*Sterna hirundo*
Forster's tern	*Sterna forsteri*
Gull-billed tern	*Sterna nilotica*
Herring gull	*Larus argentatus*
Laughing gull	*Larus atricilla*
Least tern	*Sterna antillarum*
Ring-billed gull	*Larus delawarensis*
Royal tern	*Sterna maxima*
Sandwich tern	*Sterna sandvicensis*
Terns	
PASSERINE BIRD	
Louisiana seaside sparrow	*Ammodramus maritimus fisheri*
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*
Red-cockaded woodpecker	*Picoides borealis*
PELAGIC BIRD	
Magnificent frigatebird	*Fregata magnificens*
Northern gannet	*Morus bassanus*
RAPTOR	
Bald eagle	*Haliaeetus leucocephalus*
Northern harrier	*Circus cyaneus*
Osprey	*Pandion haliaetus*
Swallow-tailed kite	*Elanoides forficatus*
SHOREBIRD	
American avocet	*Recurvirostra americana*
American oystercatcher	*Haematopus palliatus*
Black-bellied plover	*Pluvialis squatarola*
Black-necked stilt	*Himantopus mexicanus*
Dowitchers	*Limnodromus spp.*
Dunlin	*Calidris alpina*
Greater yellowlegs	*Tringa melanoleuca*
Killdeer	*Charadrius vociferus*
Least sandpiper	*Calidris minutilla*
Lesser yellowlegs	*Tringa flavipes*
Long-billed curlew	*Numenius americanus*
Marbled godwit	*Limosa fedoa*
Pectoral sandpiper	*Calidris melanotos*
Piping plover	*Charadrius melodus*
Red knot	*Calidris canutus*
Ruddy turnstone	*Arenaria interpres*
Sanderling	*Calidris alba*
Semipalmated plover	*Charadrius semipalmatus*
Semipalmated sandpiper	*Calidris pusilla*
Shorebirds	
Short-billed dowitcher	*Limnodromus griseus*
Snowy plover	*Charadrius alexandrinus*
Solitary sandpiper	*Tringa solitaria*
Spotted sandpiper	*Actitis macularia*
Stilt sandpiper	*Calidris himantopus*
Western sandpiper	*Calidris mauri*
Whimbrel	*Numenius phaeopus*
White-rumped sandpiper	*Calidris fuscicollis*
Willet	*Catoptrophorus semipalmatus*
Wilson's plover	*Charadrius wilsonia*
Wilson's snipe	*Gallinago delicata*
WADING BIRD	
American bittern	*Botaurus lentiginosus*
Black-crowned night-heron	*Nycticorax nycticorax*
Cattle egret	*Bubulcus ibis*
Clapper rail	*Rallus longirostris*
Glossy ibis	*Plegadis falcinellus*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Green heron	*Butorides virescens*
Green-backed heron	*Butorides striata*
King rail	*Rallus elegans*
Least bittern	*Ixobrychus exilis*
Little blue heron	*Egretta caerulea*
Mississippi sandhill crane	*Grus canadensis pulla*
Reddish egret	*Egretta rufescens*

Common Name*	Species Name*
BIRDS, cont.	
WADING BIRD, cont.	
Snowy egret	*Egretta thula*
Sora	*Porzana carolina*
Tricolored heron	*Egretta tricolor*
Virginia rail	*Rallus limicola*
Wading birds	
White ibis	*Eudocimus albus*
Whooping crane	*Grus americana*
Wood stork	*Mycteria americana*
Yellow-crowned night-heron	*Nyctanassa violacea*
WATERFOWL	
American black duck	*Anas rubripes*
American coot	*Fulica americana*
American wigeon	*Anas americana*
Black scoter	*Melanitta nigra*
Blue-winged teal	*Anas discors*
Bufflehead	*Bucephala albeola*
Canada goose	*Branta canadensis*
Canvasback	*Aythya valisineria*
Common goldeneye	*Bucephala clangula*
Common moorhen	*Gallinula chloropus*
Gadwall	*Anas strepera*
Greater scaup	*Aythya marila*
Green-winged teal	*Anas crecca*
Hooded merganser	*Lophodytes cucullatus*
Lesser scaup	*Aythya affinis*
Mallard	*Anas platyrhynchos*
Mottled duck	*Anas fulvigula*
Northern pintail	*Anas acuta*
Northern shoveler	*Anas clypeata*
Purple gallinule	*Porphyrula martinica*
Red-breasted merganser	*Mergus serrator*
Redhead	*Aythya americana*
Ring-necked duck	*Aythya collaris*
Ruddy duck	*Oxyura jamaicensis*
Snow goose	*Chen caerulescens*
Surf scoter	*Melanitta perspicillata*
Waterfowl	
White-winged scoter	*Melanitta fusca*
Wood duck	*Aix sponsa*
FISH	
FISH	
Alabama shad	*Alosa alabamae*
American eel	*Anguilla rostrata*
Atlantic bumper	*Chloroscombrus chrysurus*
Atlantic croaker	*Micropogonias undulatus*
Atlantic cutlassfish	*Trichiurus lepturus*
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*
Atlantic spadefish	*Chaetodipterus faber*
Atlantic stingray	*Dasyatis sabina*
Atlantic sturgeon	*Acipenser oxyrinchus*
Atlantic thread herring	*Opisthonema oglinum*
Banded drum	*Larimus fasciatus*
Bay anchovy	*Anchoa mitchilli*
Bay whiff	*Citharichthys spilopterus*
Bighead searobin	*Prionotus tribulus*
Black crappie	*Pomoxis nigromaculatus*
Black drum	*Pogonias cromis*
Blackcheek tonguefish	*Symphurus plagiusa*
Blacktip shark	*Carcharhinus limbatus*
Blue catfish	*Ictalurus furcatus*
Blue runner	*Caranx crysos*
Bluefish	*Pomatomus saltatrix*
Bluegill	*Lepomis macrochirus*
Bonnethead shark	*Sphyrna tiburo*
Broad flounder	*Paralichthys squamilentus*
Bull shark	*Carcharhinus leucas*
Chain pickerel	*Esox niger*
Cobia	*Rachycentron canadum*
Crested cusk-eel	*Ophidion josephi*
Crevalle jack	*Caranx hippos*
Darter goby	*Ctenogobius boleosoma*
Dolphin	*Coryphaena hippurus*
Dwarf sand perch	*Diplectrum bivittatum*
Finetooth shark	*Carcharhinus isodon*
Florida pompano	*Trachinotus carolinus*
Fringed flounder	*Etropus crossotus*
Gafftopsail catfish	*Bagre marinus*
Gag	*Mycteroperca microlepis*
Gizzard shad	*Dorosoma cepedianum*
Gray snapper	*Lutjanus griseus*
Great barracuda	*Sphyraena barracuda*
Gulf butterfish	*Peprilus burti*

Common Name*	Species Name*
FISH, cont.	
FISH, cont.	
Gulf flounder	*Paralichthys albigutta*
Gulf killifish	*Fundulus grandis*
Gulf kingfish	*Menticirrhus littoralis*
Gulf menhaden	*Brevoortia patronus*
Gulf sturgeon	*Acipenser oxyrinchus desotoi*
Gulf toadfish	*Opsanus beta*
Halfbeak	*Hyporhamphus unifasciatus*
Hardhead catfish	*Arius felis*
Harvestfish	*Peprilus alepidotus*
Highfin goby	*Gobionellus oceanicus*
Inland silverside	*Menidia beryllina*
Inshore lizardfish	*Synodus foetens*
King mackerel	*Scomberomorus cavalla*
Ladyfish	*Elops saurus*
Lane snapper	*Lutjanus synagris*
Largemouth bass	*Micropterus salmoides*
Least puffer	*Sphoeroides parvus*
Leopard searobin	*Prionotus scitulus*
Lined seahorse	*Hippocampus erectus*
Little tunny	*Euthynnus alletteratus*
Longear sunfish	*Lepomis megalotis*
Longnose anchovy	*Anchoa lyolepis*
Longnose gar	*Lepisosteus osseus*
Longnose killifish	*Fundulus similis*
Marsh killifish	*Fundulus confluentus*
Northern kingfish	*Menticirrhus saxatilis*
Ocellated flounder	*Ancylopsetta ommata*
Paddlefish	*Polyodon spathula*
Peamouth	*Mylocheilus caurinus*
Pigfish	*Orthopristis chrysoptera*
Pinfish	*Lagodon rhomboides*
Rainwater killifish	*Lucania parva*
Red drum	*Sciaenops ocellatus*
Red snapper	*Lutjanus campechanus*
Redear sunfish	*Lepomis microlophus*
Rock sea bass	*Centropristis philadelphica*
Rough scad	*Trachurus lathami*
Rough silverside	*Membras martinica*
Sailfin molly	*Poecilia latipinna*
Saltmarsh topminnow	*Fundulus jenkinsi*
Sand seatrout	*Cynoscion arenarius*
Scaled sardine	*Harengula jaguana*
Sheepshead	*Archosargus probatocephalus*
Sheepshead minnow	*Cyprinodon variegatus*
Shelf flounder	*Etropus cyclosquamus*
Shiners	*Notropis spp.*
Silver perch	*Bairdiella chrysoura*
Silver seatrout	*Cynoscion nothus*
Silverside shiner	*Notropis candidus*
Skilletfish	*Gobiesox strumosus*
Skipjack herring	*Alosa chrysochloris*
Southern flounder	*Paralichthys lethostigma*
Southern hake	*Urophycis floridana*
Southern kingfish	*Menticirrhus americanus*
Spanish mackerel	*Scomberomorus maculatus*
Spanish sardine	*Sardinella aurita*
Speckled worm eel	*Myrophis punctatus*
Spinner shark	*Carcharhinus brevipinna*
Spot	*Leiostomus xanthurus*
Spotfin mojarra	*Eucinostomus argenteus*
Spotted hake	*Urophycis regia*
Spotted seatrout	*Cynoscion nebulosus*
Spotted sunfish	*Lepomis punctatus*
Star drum	*Stellifer lanceolatus*
Striped anchovy	*Anchoa hepsetus*
Striped bass	*Morone saxatilis*
Striped burrfish	*Cyclichthys schoepfi*
Striped mullet	*Mugil cephalus*
Tarpon	*Megalops atlanticus*
Threadfin shad	*Dorosoma petenense*
White mullet	*Mugil curema*
Yellow bass	*Morone mississippiensis*

HABITATS

FAV	
Florida pondweed	*Potamogeton floridanus*
PLANT	
Atlantic St. John's-wort	*Hypericum reductum*
Bandana-of-the-everglades	*Canna flaccida*
Beaked spikerush	*Eleocharis rostellata*
Bearded grass-pink	*Calopogon barbatus*
Beardgrass	*Andropogon capillipes*
Bluethreads	*Burmannia capitata*

Common Name*	Species Name*
HABITAT, cont.	
PLANT, cont.	
Bog spicebush	*Lindera subcoriacea*
Bottomland-post oak	*Quercus similis*
Brilliant hibiscus	*Hibiscus coccineus*
Broad-leaf signalgrass	*Urochloa platyphylla*
Brown beakrush	*Rhynchospora pleiantha*
Carolina lilaeopsis	*Lilaeopsis carolinensis*
Chaffseed	*Schwalbea americana*
Chapman aster	*Eurybia chapmanii*
Chapman's butterwort	*Pinguicula planifolia*
Christmas berry	*Lycium carolinianum*
Climbing fetter-bush	*Pieris phillyreifolia*
Coastal-sand frostweed	*Helianthemum arenicola*
Crenate milkwort	*Polygala crenata*
Crestless eulophia	*Pteroglossaspis ecristata*
Eastern bishop-weed	*Ptilimnium costatum*
Flame flower	*Macranthera flammea*
Flax	*Linum macrocarpum*
Flax-leaf false-foxglove	*Agalinis linifolia*
Georgia tickseed	*Coreopsis nudata*
Giant spiral ladies'-tresses	*Spiranthes longilabris*
Godfrey's golden-aster	*Chrysopsis godfreyi*
Green-fly orchid	*Epidendrum conopseum*
Gulf spike-moss	*Selaginella ludoviciana*
Hairy-peduncled beakrush	*Rhynchospora crinipes*
Harper's yellow-eyed grass	*Xyris scabrifolia*
Incised groovebur	*Agrimonia incisa*
Large white fringed orchid	*Platanthera blephariglottis var. conspicua*
Large-leaved jointweed	*Polygonella macrophylla*
Lattice jointgrass	*Coelorachis tessellata*
Leafless false-foxglove	*Agalinis aphylla*
Loblolly bay	*Gordonia lasianthus*
Many-flowered grass-pink	*Calopogon multiflorus*
Michaux orchid	*Habenaria quinqueseta*
Naked-stemmed panic grass	*Dichanthelium dichotomum*
Night-flowering wild-petunia	*Ruellia noctiflora*
Nodding clubmoss	*Lycopodiella cernua var. cernua*
Nodding nixie	*Apteria aphylla*
Panhandle lily	*Lilium iridollae*
Pineland bogbutton	*Lachnocaulon digynum*
Powdery thalia	*Thalia dealbata*
Rush false-asphodel	*Pleea tenuifolia*
Sand pine	*Pinus clausa*
Serviceberry holly	*Ilex amelanchier*
Shadow-witch orchid	*Ponthieva racemosa*
Shiny spikegrass	*Chasmanthium nitidum*
Slenderleaf clammy-weed	*Polanisia tenuifolia*
Snowy orchis	*Platanthera nivea*
Southeastern tickseed	*Coreopsis gladiata*
Southern rein orchid	*Platanthera flava var. flava*
Southern three-awned grass	*Aristida simpliciflora*
Southern white beak rush	*Rhynchospora macra*
Spoon-flower	*Peltandra sagittifolia*
Spring sneezeweed	*Helenium vernale*
Swamp buckthorn	*Sideroxylon thornei*
Swamp cottonwood	*Populus heterophylla*
Sweetflag	*Acorus calamus*
Swollen bladderwort	*Utricularia inflata*
Texas pipewort	*Eriocaulon texense*
Thin-stemmed false-foxglove	*Agalinis filicaulis*
Tiny-leaved buckthorn	*Sageretia minutiflora*
Tracy's beak rush	*Rhynchospora tracyi*
Twig rush	*Cladium mariscoides*
Walter's sedge	*Carex striata*
Yellow fringeless orchid	*Platanthera integra*
SAV	
Submerged aquatic vegetation	

INVERTEBRATES

BIVALVE	
Eastern oyster	*Crassostrea virginica*
Hooked mussel	*Ischadium recurvum*
CEPHALOPOD	
Atlantic brief squid	*Lolliguncula brevis*
CRAB	
Blue crab	*Callinectes sapidus*
Flatclaw hermit	*Pagurus pollicaris*
Thinstripe hermit	*Clibanarius vittatus*
ECHINODERM	
Five-slotted sand dollar	*Mellita quinquiesperforata*
Lined sea star	*Luidia clathrata*

Common Name*	Species Name*
INVERTEBRATES, cont.	
GASTROPOD	
Shark eye	*Neverita duplicata*
SHRIMP	
Atlantic seabob shrimp	*Xiphopenaeus kroyeri*
Brown shrimp	*Penaeus aztecus*
Grass shrimp	*Palaemonetes spp.*
Mantis shrimp	*Gonadactylus falcatus*
Pink shrimp	*Penaeus brevirostris*
Roughback shrimp	*Rimapenaeus similis*
White shrimp	*Penaeus vannamei*
MARINE MAMMALS	
DOLPHIN	
Bottlenose dolphin	*Tursiops truncatus*
MANATEE	
West Indian manatee	*Trichechus manatus*
REPTILE	
SNAKE	
Green water snake	*Nerodia cyclopion*
Gulf salt marsh snake	*Nerodia clarkii clarkii*
TURTLE	
Alabama red-bellied turtle	*Pseudemys alabamensis*
Alligator snapping turtle	*Macrochelys temminckii*
Delta map turtle	*Graptemys nigrinoda delticola*
Gopher tortoise	*Gopherus polyphemus*
Green sea turtle	*Chelonia mydas*
Kemp's ridley sea turtle	*Lepidochelys kempii*
Leatherback sea turtle	*Dermochelys coriacea*
Loggerhead sea turtle	*Caretta caretta*
Mississippi diamondback terrapin	*Malaclemys terrapin pileata*
TERRESTRIAL MAMMALS	
SMALL MAMMAL	
Alabama beach mouse	*Peromyscus polionotus ammobates*
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*

* Threatened and endangered species and species of special concern are designated by underlining

SHORELINE DESCRIPTIONS

EXPOSED, SOLID MAN-MADE STRUCTURES ESI = 1B

DESCRIPTION

- These structures are solid, man-made structures such as seawalls, groins, revetments, piers, and port facilities
- Many structures are constructed of concrete, wood, or metal
- Often there is no exposed substrate at low tide, but multiple habitats are indicated if present
- They are built to protect the shore from erosion by waves, boat wakes, and currents, and thus are exposed to relatively high-energy processes
- Attached animals and plants are sparse to moderate
- Present in highly developed industrial and port areas and scattered along residential waterfronts

PREDICTED OIL BEHAVIOR

- Oil is held offshore by waves reflecting off the steep, hard surface in exposed settings
- Oil readily adheres to the dry, rough surfaces, but it does not adhere to wet substrates
- The most resistant oil would remain as a patchy band at or above the high-tide line

RESPONSE CONSIDERATIONS

- Cleanup is usually not required
- High-pressure water spraying may be conducted to:
  - remove persistent oil in crevices;
  - improve aesthetics; or
  - prevent leaching of oil

EXPOSED WAVE-CUT PLATFORMS IN MUD OR CLAY ESI = 2A

DESCRIPTION

- This habitat occurs where the shoreline is eroding across a wetland, leaving behind a wave-cut platform on the old marsh soils; there is often a thin sand/ shell washover beach on top of the marsh
- The platform is usually composed of a hard, compact peat-rich clay with numerous holes from old root cavities
- The platform width can vary from a few feet to tens of feet
- Species density and diversity are low because they are highly eroding
- Uncommon, occurring near erosional areas along barrier islands and the outer coast

PREDICTED OIL BEHAVIOR

- Oil will not adhere to the wet muddy surface, but could penetrate root cavities if present
- Persistence of any stranded oil is usually short-term, except where trapped in slump blocks eroded from the marsh scarp

RESPONSE CONSIDERATIONS

- Cleanup is usually not required except for areas of high biological use and under heavy oil accumulations
- Where the high-tide area is accessible, it may be feasible to manually remove heavy oil accumulations and oiled debris

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EXPOSED SCARPS AND STEEP SLOPES IN CLAY ESI = 2B

DESCRIPTION

- These habitats generally occur along tidal channels and major river tributaries in the marsh where currents and boat wakes cut a steep bank into the marsh soils
- Scarp heights vary from about 1 to 3 feet and usually consist of a heavily rooted, peaty soil
- May be fronted by a narrow beach of fine to medium-grained sand and/ or shell fragments
- Low biological utilization because of strong currents
- Typically backed by wetland vegetation
- Uncommon, occurring along the outer exposed margins of marsh areas

PREDICTED OIL BEHAVIOR

- Oil is not expected to adhere to the wet, impermeable, and vertical clay surface
- There may be a thin band of oil left at or above the high water line

RESPONSE CONSIDERATIONS

- Cleanup is usually not required, because any stranded oil is quickly removed by wave action
- Access may be difficult

FINE- TO MEDIUM-GRAINED SAND BEACHES ESI = 3A

DESCRIPTION

- These beaches are flat to moderately sloping and relatively hard packed
- They are composed of predominantly quartz sand
- There can be heavy accumulations of wrack present
- They are utilized by birds and turtles
- Upper beach fauna include ghost crabs and amphipods; lower beach fauna can be moderate, but highly variable
- They are generally areas of heavy recreational use
- Common along the barrier islands

PREDICTED OIL BEHAVIOR

- Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone
- Heavy oil accumulations will cover the entire beach surface; oil will be lifted off the lower beach with the rising tide
- Maximum penetration of oil into fine- to medium-grained sand is about 10-15 cm
- Burial of oiled layers by clean sand within the first week after a spill typically will be less than 30 cm along the upper beach face
- Organisms living in the beach sediment may be killed by smothering or lethal oil concentrations in the interstitial water
- Biological impacts include temporary declines in infauna, which can affect important shorebird foraging areas

RESPONSE CONSIDERATIONS

- These beaches are among the easiest shoreline types to clean
- Cleanup should concentrate on removing oil and oily debris from the upper swash zone once oil has come ashore
- Traffic through both oiled and dune areas should be severely limited, to prevent contamination of clean areas
- Manual cleanup, rather than road graders and front-end loaders, is advised to minimize the volume of sand removed from the shore and requiring disposal
- All efforts should focus on preventing the mixing of oil deeper into the sediments by vehicular and foot traffic
- Mechanical reworking of lightly oiled sediments from the high-tide line to the upper intertidal zone can be effective along outer beaches

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SCARPS AND STEEP SLOPES IN SAND ESI = 3B

DESCRIPTION

- This shoreline type occurs where sandy bluffs are undercut by waves or currents and slump
- Some scarps are fronted by narrow beaches, if the erosion rates are moderate and episodic
- Trees growing at the top of these slopes are eventually undercut and the logs can accumulate at the base of the scarp
- Biological utilization by birds and infauna is low
- Present near topographic highs along canals and tributaries in the bay and behind barrier islands

PREDICTED OIL BEHAVIOR

- Any stranded oil will concentrate at the high-water line and may penetrate sandy sediments
- Oil will also adhere to the dry surfaces of any logs that have accumulated at the base of the scarp
- There is little potential for burial except when major slumping of the bluff occurs
- Active erosion of the scarp will remove the oil

RESPONSE CONSIDERATIONS

- In most cases, cleanup is not necessary because of the short residence time of the oil

- The need for removal of oiled sediments and debris should be carefully evaluated because of the potential for increased erosion
- Closely supervised manual labor should be used so that the minimal amount of material is removed during cleanup

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COARSE-GRAINED SAND BEACHES ESI = 4

DESCRIPTION

- These beaches are moderate sloping, of variable width, and have soft sediments. These characteristics combine to lower their trafficability
- Generally species density and diversity is lower than on fine-grained sand beaches
- Uncommon, occurs along tributaries in the bay

PREDICTED OIL BEHAVIOR

- During small spills, oil will be deposited primarily as a band along the high-tide line
- Under very heavy accumulations, oil may spread across the entire beach face, though the oil will be lifted off the lower part of the beach with the rising tide
- Penetration of oil into coarse-grained sand can reach 25 cm
- Burial of oiled layers by clean sand can be as rapid as one tidal cycle and to depths of 60 cm or more
- Burial to depths over one meter is possible if the oil comes ashore at the start of a depositional period

- Biological impacts include temporary declines in infaunal populations, which can also affect important shorebird foraging areas

RESPONSE CONSIDERATIONS

- Remove oil primarily from the upper swash lines
- Removal of sediment should be limited to avoid erosion problems
- Mechanical reworking of lightly oiled sediment into the surf zone may be used to release the oil without sediment removal
- Activity in the oiled sand should be limited to prevent mixing oil deeper into the beach
- Use of heavy equipment for oil/ sand removal may result in the removal of excessive amounts of sand; manual cleanup may be more effective

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MIXED SAND AND GRAVEL BEACHES **ESI = 5**

DESCRIPTION

- Moderately sloping beach composed of a mixture of sand and shell (shell component comprises between 20 to 80 percent of total sediments)
- Because of the mixed sediment sizes and shapes, there may be zones of pure sand or shell
- Uncommon, present in erosional areas behind barrier islands

PREDICTED OIL BEHAVIOR

- During small spills, oil will be deposited along and above the high-tide swash
- Large spills will spread across the entire intertidal area
- Oil penetration into the beach sediments may be up to 50 cm; however, the sand fraction can be quite mobile, and oil behavior is much like on a sand beach if the sand fraction exceeds about 40 percent
- Burial of oil may be deep at and above the high-tide line, where oil tends to persist, particularly where beaches are only intermittently exposed to waves

- In sheltered pockets on the beach, pavements of asphalted sediments can form if there is no removal of heavy oil accumulations because most of the oil remains on the surface
- Once formed, these asphalt pavements can persist for years

RIPRAP **ESI = 6B**

DESCRIPTION

- Riprap structures are composed of cobble- to boulder-sized blocks of bedrock or concrete
- Riprap structures are used for shoreline protection and tidal-inlet stabilization
- Attached biota are sparse on exposed riprap
- Common along highly developed commercial waterfronts and residential areas

PREDICTED OIL BEHAVIOR

- Deep penetration of oil between the blocks is likely
- Oil adheres readily to the rough surfaces of the blocks
- Uncleaned oil can cause chronic leaching until the oil hardens

RESPONSE CONSIDERATIONS

- When the oil is fresh and liquid, high-pressure spraying and/ or water flooding may be effective, making sure to recover all mobilized oil

- Heavy and weathered oils are more difficult to remove, requiring scraping and/ or hot-water spraying
- It may be necessary to remove heavily oiled blocks and replace them

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EXPOSED TIDAL FLATS **ESI = 7**

DESCRIPTION

- Exposed tidal flats are broad, flat intertidal areas composed primarily of sand and minor amounts of shell
- The presence of sand indicates that tidal currents and waves are strong enough to mobilize the sediments
- They are usually associated with another shoreline type on the landward side of the flat, though they can occur as separate shoals; they are commonly associated with tidal inlets
- Biological utilization can be very high, with large numbers of infauna, heavy use by birds for roosting and foraging, and use by foraging fish
- Present at tidal inlets between barrier islands along the outer coast, and exposed areas of the bay

PREDICTED OIL BEHAVIOR

- Oil does not usually adhere to the surface of exposed tidal flats, but rather moves across the flat and accumulates at the high-tide line
- Deposition of oil on the flat may occur on a falling tide if concentrations are heavy
- Oil does not penetrate water-saturated sediments
- Biological damage may be severe, primarily to infauna, thereby reducing food sources for birds and other predators

RESPONSE CONSIDERATIONS

- Currents and waves can be very effective in natural removal of the oil
- Cleanup is very difficult (and possible only during low tides)
- The use of machinery should be restricted to prevent mixing of oil into the sediments

SHELTERED SCARPS IN MUD OR CLAY — ESI = 8A

DESCRIPTION

- This shoreline type is sheltered from wave activity and strong currents
- Sediments (rock debris, etc.) may accumulate at the base of this shoreline type
- The slope of the intertidal zone is generally moderate to steep (greater than 15°) with little width
- Present along canals and tributaries in the delta and bay

PREDICTED OIL BEHAVIOR

- Stranded oil will persist because of low energy setting

RESPONSE CONSIDERATIONS

- Low-pressure flushing at ambient temperatures is most effective when the oil is fresh and still liquid
- Where the high-tide area is accessible, it may be feasible to remove heavy oil accumulations and oiled debris

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SHELTERED, SOLID MAN-MADE STRUCTURES — ESI = 8B

DESCRIPTION

- These structures are solid man-made structures such as seawalls, groins, revetments, piers, and port facilities
- Most of the structures are designed to protect a single lot, thus their composition, design, and condition are highly variable
- Most structures are constructed of concrete, wood, or metal
- Often there is no exposed beach at low tide, but multiple habitats are indicated if present
- Attached animal and plant life can be high
- Common in highly developed commercial areas and along residential waterfront areas

PREDICTED OIL BEHAVIOR

- Oil will adhere readily to rough surfaces, particularly along the high-tide line, forming a distinct oil band
- The lower intertidal zone usually stays wet (particularly if algae covered), preventing oil from adhering to the surface

RESPONSE CONSIDERATIONS

- Cleanup of seawalls is usually conducted for aesthetic reasons or to prevent leaching of oil
- Low- to high-pressure spraying at ambient water temperatures is most effective when the oil is fresh

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SHELTERED RIPRAP — ESI = 8C

DESCRIPTION

- Riprap structures are composed of cobble- to boulder-sized blocks of bedrock or concrete
- These structures are found inside harbors and bays in developed areas, sheltered from direct exposure to waves
- Attached animal and plant life can be present
- Common in highly developed commercial and residential waterfront areas

PREDICTED OIL BEHAVIOR

- Deep penetration of oil between the blocks is likely
- Oil adheres readily to the rough surfaces
- If oil is left uncleaned, it may cause chronic leaching until the oil hardens

RESPONSE CONSIDERATIONS

- High-pressure spraying may be required to remove oil for aesthetic reasons and to prevent leaching of oil from the structure
- Cleanup crews should make sure to recover all released oil

SHELTERED TIDAL FLATS — ESI = 9A

DESCRIPTION

- Sheltered tidal flats are composed primarily of mud with minor amounts of sand and shell
- They are present in calm-water habitats, sheltered from major wave activity, and are usually backed by marshes
- The sediments are very soft and cannot support even light foot traffic in many areas
- Sheltered tidal flats can be sparsely to heavily covered with algae and/ or seagrasses
- They can have heavy wrack deposits along the upper fringe
- Large concentrations of shellfish, worms, and snails can be found on and in the sediments
- They are heavily utilized by birds for feeding
- Common along marsh channels and sheltered areas of the delta and bay

PREDICTED OIL BEHAVIOR

- Oil does not usually adhere to the surface of sheltered tidal flats, but rather moves across the flat and accumulates at the high-tide line
- Deposition of oil on the flat may occur on a falling tide if concentrations are heavy
- Oil will not penetrate the water-saturated sediments, but could penetrate burrows or other crevices in muddy sediments
- In areas of high suspended sediments, sorption of oil can result in deposition of contaminated sediments on the flats
- Biological damage may be severe

RESPONSE CONSIDERATIONS

- These are high-priority areas necessitating the use of spill protection devices to limit oil-spill impact; deflection or sorbent booms and open water skimmers should be used
- Cleanup of the flat surface is very difficult because of the soft substrate; many methods may be restricted
- Low-pressure flushing and deployment of sorbents from shallow-draft boats may be helpful

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SHELTERED, VEGETATED LOW BANKS **ESI = 9B**

DESCRIPTION

- These habitats are either low banks with grasses or trees and tree roots exposed to the water
- They are flooded occasionally by high water
- Present along upper reaches of tributaries in the delta and bay

PREDICTED OIL BEHAVIOR

- During low water stages there is little impact, with the oil coating a narrow band of sediment at the water level
- During high water, the oil will cover and coat the grasses and base of trees
- May cause loss of the grasses, but the trees should survive unless oil penetrates and persists in the substrate

RESPONSE CONSIDERATIONS

- Low-pressure flushing of oiled areas is effective in removing moderate to heavy accumulations of oil from along the banks
- Sorbent and containment boom should be placed on the water side of the cleanup operations to contain and collect oil outflow

- Low- to high-pressure flushing can be used to remove oil from tree roots and trunks, if deemed necessary in high-use areas

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SALT- AND BRACKISH-WATER MARSHES **ESI = 10A**

DESCRIPTION

- Intertidal wetlands containing emergent, herbaceous vegetation
- Width of the marsh can vary widely, from a narrow fringe to extensive areas
- Sediments are composed of organic muds except on the margins of islands where sand is abundant
- Exposed areas are located along bays with wide fetches and along heavily trafficked waterways
- Sheltered areas are not exposed to significant wave or boat wake activity
- Resident flora and fauna are abundant with numerous species with high utilization by birds, fish, and shellfish
- Very common behind barrier islands and along the outer coast

PREDICTED OIL BEHAVIOR

- Oil adheres readily to intertidal vegetation
- The band of coating will vary widely, depending upon the water level at the time oil slicks are in the vegetation; there may be multiple bands
- Large slicks will persist through multiple tidal cycles and coat the entire stem from the high-tide line to the base
- If the vegetation is thick, heavy oil coating will be restricted to the outer fringe, although lighter oils can penetrate deeper, to the limit of tidal influence
- Medium to heavy oils do not readily adhere to or penetrate the fine sediments, but can pool on the surface or in burrows
- Light oils can penetrate the top few centimeters of sediment and deeply into burrows and cracks (up to one meter)

RESPONSE CONSIDERATIONS

- Under light oiling, the best practice is natural recovery; natural removal processes and rates should be evaluated prior to conducting cleanup
- Heavy accumulations of pooled oil can be removed by vacuum, sorbents, or low-pressure flushing
- Cleanup activities should be carefully supervised to avoid vegetation damage
- Any cleanup activity must not mix the oil deeper into the sediments; trampling of the roots must be minimized
- Cutting of oiled vegetation should only be considered when other resources present are at great risk from leaving the oiled vegetation in place

FRESHWATER MARSHES ESI = 10B

DESCRIPTION

- These are grassy wetlands composed of emergent herbaceous vegetation
- They occur upstream of brackish vegetation in the upper estuary and along creeks and rivers
- Those along major channels are exposed to strong currents and boat wakes; smaller channels tend to be sheltered
- Resident flora and fauna are abundant
- Present along tidal freshwater sections of rivers in the delta

PREDICTED OIL BEHAVIOR

- Oil adheres readily to the vegetation
- The band of coating will vary widely, depending upon the water level at the time oil slicks are in the vegetation; there may be multiple bands
- Most of the time, there will be a narrow band because of the small tidal range; the band can be very large during high-water events
- If the vegetation is thick, heavy oil coating will be restricted to the outer fringe, although lighter oils can penetrate deeper

RESPONSE CONSIDERATIONS

- Under light oiling, the best practice is natural recovery; natural removal processes and rates should be evaluated prior to conducting cleanup

- Heavy accumulations of pooled oil can be removed by vacuum, sorbents, or low-pressure flushing
- Cleanup activities should be carefully supervised to avoid vegetation damage
- Any cleanup activity must not mix the oil deeper into the sediments. Trampling of the roots must be minimized
- Cutting of oiled vegetation should only be considered when other resources present are at great risk from leaving the oiled vegetation in place

SWAMPS ESI = 10C

DESCRIPTION

- Swamps consist of shrubs and hardwood forested wetlands, essentially flooded forests. Vegetation is taller, on average, than 6 meters
- The sediment tends to be silty clay with large amounts of organic debris
- They are seasonally flooded, though there are many low, permanently flooded areas
- Resident flora and fauna are abundant with numerous species
- Common adjacent to the rivers in the delta

PREDICTED OIL BEHAVIOR

- Oil behavior depends on whether the swamp is flooded or not
- During floods, most of the oil passes through the forest, coating the vegetation at the waterline, which changes levels throughout the flood event
- Oiled woody vegetation is less sensitive than grasses to oil coating
- Some oil can be trapped and pooled on the swamp flood plain as water levels drop
- Penetration into the floodplain soils is usually limited because of high water levels, saturated soils, muddy composition, surface organic debris, and vegetation cover
- Large amounts of oily debris can remain
- During dry periods, terrestrial spills flow downhill and accumulate in depressions or reach waterbodies

RESPONSE CONSIDERATIONS

- Under light oiling, the best practice is to let the area recover naturally
- Heavy accumulations of pooled oil can be removed by vacuum, sorbents, or low-pressure flushing. During flushing, care must be taken to prevent transporting oil to sensitive areas down slope or along shore
- Under stagnant water conditions, herding of oil with water spray may be needed to push oil to collection areas
- Oily debris can be removed where there is access
- Any cleanup activity must not mix the oil deeper into the sediments

SCRUB-SHRUB WETLANDS ESI = 10D

DESCRIPTION

- Scrub-shrub wetlands consist of woody vegetation less than 6 meters tall including true shrubs, small trees, and trees and shrubs that are stunted due to environmental conditions
- The sediments are silty clay mixed with organic debris
- They are seasonally flooded, though there are many low, permanently flooded areas
- Resident flora and fauna are abundant
- Uncommon, occurring in low areas adjacent to rivers in the delta

PREDICTED OIL BEHAVIOR

- Oil behavior depends on water level
- During high water, most of the oil passes through the forest, coating the vegetation above the waterline
- Woody vegetation is less sensitive than grasses to oil
- Some oil can be trapped and pooled on the swamp flood plain as water levels drop

- Penetration into the floodplain soils is usually limited because of high water levels, muddy composition, surface organic debris, and vegetation cover
- Large amounts of oily debris can remain in the wetland
- During dry periods, terrestrial spills flow downhill and accumulate in depressions or reach waterbodies

RESPONSE CONSIDERATIONS

- Under light oiling, the best practice is natural recovery
- Heavy accumulations of pooled oil can be removed by vacuum, sorbents, or low-pressure flushing
- Under stagnant water conditions, herding of oil with water spray may be needed to push oil to collection areas
- Oily debris can be removed where there is access
- Any cleanup activity must not mix the oil deeper into the sediments. Trampling of the roots must be minimized
- Woody vegetation should not be cut

ALABAMA

SHORELINE HABITAT RANKINGS

1B) EXPOSED, SOLID MAN-MADE STRUCTURES

2A) EXPOSED WAVE-CUT PLATFORMS IN MUD OR CLAY
2B) EXPOSED SCARPS AND STEEP SLOPES IN CLAY

3A) FINE- TO MEDIUM-GRAINED SAND BEACHES
3B) SCARPS AND STEEP SLOPES IN SAND

4) COARSE-GRAINED SAND BEACHES

5) MIXED SAND AND GRAVEL BEACHES

6B) RIPRAP

7) EXPOSED TIDAL FLATS

8A) SHELTERED SCARPS IN MUD OR CLAY

8B) SHELTERED, SOLID MAN-MADE STRUCTURES

8C) SHELTERED RIPRAP

9A) SHELTERED TIDAL FLATS
9B) SHELTERED, VEGETATED LOW BANKS

10A) SALT- AND BRACKISH-WATER MARSHES

10B) FRESHWATER MARSHES

10C) SWAMPS

10D) SCRUB-SHRUB WETLANDS

HUMAN-USE FEATURES

AIRPORT

ARCHAEOLOGICAL SITE

BOAT RAMP

CRITICAL HABITAT

HISTORICAL SITE

MANAGEMENT AREA

MARINA

PARK

RECREATIONAL BEACH

WILDLIFE REFUGE

123 HUMAN-USE NUMBER

BRIDGE

MANAGEMENT AREA BOUNDARY

STATE BOUNDARY

SENSITIVE BIOLOGICAL RESOURCES

BIRD

DIVING BIRD

GULL / TERN

PASSERINE BIRD

PELAGIC BIRD

RAPTOR

SHOREBIRD

WADING BIRD

WATERFOWL

NESTING SITE

FISH

FISH

MARINE MAMMAL

DOLPHIN

MANATEE

TERRESTRIAL MAMMAL

SMALL MAMMAL

REPTILE

TURTLE

OTHER REPTILE

INVERTEBRATE

BIVALVE

CEPHALOPOD

CRAB

INVERTEBRATE (cont)

ECHINODERM

GASTROPOD

SHRIMP

HABITAT

FLOATING AQUATIC VEGETATION

PLANT

SUBMERGED AQUATIC VEGETATION

MULTI-GROUP

123 RAR NUMBER

THREATENED / ENDANGERED / SPECIES OF SPECIAL CONCERN

Guidelines for Interpreting ESI Maps

To help users interpret the ESI maps and tabular data, we offer the following guidelines for use in addition to the map legend:

• Shoreline Habitats. The "shoreline," representing the boundary between land and water, is color-coded with the ESI classification. Most shoreline habitats are shown as a line, with no areal dimension. Where there is more than one shoreline type (e.g., a beach in front of a seawall), the colors for each habitat are shown, with the color for the landward habitat on the land side of the shoreline and the color for the seaward habitat on the water side. In areas where the intertidal zone is wide (e.g., wide tidal flats, wave-cut rocky platforms), the habitat from high to low water is filled with the ESI classification color. When data are available, the entire extent of wetlands are filled with colored patterns. The seaward edge of the wetland is color-coded with the ESI classification; the landward extent of the wetland is indicated by a dashed, colored line.

• Biological Resources. The distribution of biological resources is shown using many different conventions. The major convention is an icon associated with a point, line, or polygon that shows the species' areal distribution. The icon's reference number corresponds to a data table with details on species and life history. Biological resource data are organized into six major groups, each with a reference color: birds (green), mammals (brown), fish (blue), shellfish (orange), reptiles (red), and rare/endangered plants and special habitats (purple). These colors are used to fill hatched polygons and the icons. Each major group has subgroups with unique icons to visually indicate the type of organism or feature present. The icon or group of icons is usually located inside the polygon it represents; however, sometimes a line is connected between the icon and the polygon or point to make it easier to relate the two. Note that icons are used to indicate the types of resources present, but the actual data are the points and polygons. A red box around an icon indicates the presence of a species on the state or Federal list of threatened or endangered species.

The number listed below each icon refers to the first column of a data table for each map. The data tables, organized by group (birds, fish, etc.), include the following information: species name, status as threatened or endangered on state and Federal lists, concentration (specifically for each point or polygon), presence by month, and special life-history time periods. When a polygon contains multiple groups, the one number under the group of icons is listed under each group heading in the data tables. Where possible, the same number is used on multiple maps. For example, all bald eagle nests with the same seasonality could have the same number throughout the atlas, or the same assemblage of fish would have the same number wherever it occurred.

A data table has a separate listing for every unique combination of species, concentration, seasonality, life-history stage, and source. By looking at the monthly seasonality data in the table for each map, the species present at the time of concern can be easily identified. An 'X' or number is placed under each month in which any life stage of the species is present in the area represented by the point or polygon. Numbers are used typically for fish and shellfish where data on relative abundance are available. The final columns in the data tables include the months when reproductive activities occur or early life stages are present. Users should pay close attention to the data tables because they contain much of the information needed to identify the most sensitive resources at different times of the year.

Points, lines, and polygons on a map represent the distribution of the resources. Green points show bird nesting sites, including bald eagle nests and dense colonial nesters (e.g., heron rookeries and seabird nesting colonies). Animals and habitats are also represented as: 1) hatched polygons in the color for the animal group (e.g., green for birds); 2) black hatched polygons which contain multiple groups of resources (birds and fish in the same tidal channels); 3) solid lines (usually used for fish in small streams); or 4) in "common in ..." boxes. When showing the biological resource polygons would make the maps too difficult to read (usually when multiple polygons cover a large area), the polygons are not plotted and the presence of the resource is indicated by placing the icon in a box labeled "common in ..." The box contains an appropriate geographic reference. Different boxes can be used on the same map when, for example: "common in Winyah Bay" or "common in tidal creeks." The data for these resources are still fully present in the database but are not shown to make the maps more readable.

• Human-use Resources. Most of the human-use resources are point features indicated by a black-and-white icon. Managed lands, such as refuges and sanctuaries, have their boundaries shown as a dot-dash line with an icon and name placed inside. Where the feature is a known point location (e.g., a drinking water intake, boat ramp, marina), the exact location is shown as a small black dot and a line is drawn from it to the icon. Activities such as commercial and recreational fishing and areas such as recreational beaches are also indicated by an icon placed in the general area without any lines to points or polygons since the boundaries are not readily defined.

Some features, like historic and archaeological sites, are location-sensitive: the agency managing the resource believes the exact location should not be shown in order to protect the site. In these cases, the icon is placed in the general area of the resource, but the exact location is not shown.