

* CALL MMS - OPEN WATER Pollution control measures

Bennie

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G. L. 854-5019

COASTAL SENSITIVITY INDEX

INTRODUCTION:

This Coastal Sensitivity Index is a set of descriptions of the shoreline types found along the Texas gulf coast and the effect that an oil spill and the related response effort might have on these areas. This was developed by the Texas Water Commission to be used in conjunction with coastal spill response maps for contingency planning and decision making. There are 13 different shoreline types identified. They are arranged in order starting with the most environmentally sensitive areas (Code 1) and on to the least sensitive area (code 13).

The following is a grouping of the shorelines according to the potential impact of oiling:

HIGH IMPACT AREAS (CODES 1-4)

NO TRUE BEACH FACE

POOR FLUSHING ACTION

SHELTERED FROM WIND & TIDAL WAVE ACTION

WELL DEVELOPED PLANT COMMUNITIES

PERSISTENCE OF OIL RESULT IN LARGE IMPACT ON BIOLOGICAL COMMUNITIES

CLEAN-UP DIFFICULT DUE TO LIMITED ACCESS

MEDIUM IMPACT AREAS (CODES 5-9)

POORLY DEFINED BEACHFACE

HYDROLOGIC ENERGY VARIABLE

MODERATE FLUSHING

WELL DEVELOPED BIOLOGICAL COMMUNITIES

LOW IMPACT AREAS (CODES 10-13)

WIDE BEACH FRONT (UNLESS MODIFIED BY MAN)

HIGH WAVE ENERGY

WELL FLUSHED

Each shoreline description includes the following sections:

DESCRIPTION OF THE ENVIRONMENT: Major distinguishing features

LOCAL SUBSTRATE: Types of soils; tidal effects; erosional or accretional trends

HYDROLOGICAL FORCES: Tidal and wind driven wave effects

BIOLOGICAL COMMUNITIES: Dominant communities present and the potential effect of oiling

ENVIRONMENTAL BEHAVIOR OF OIL: Impact of oiling on the overall environment

CLEAN-UP PROBLEMS: Problems typically associated with removal efforts

BIOLOGICAL COMMUNITIES:

BIOLOGICAL COMMUNITIES VARY CONSIDERABLY
ATTACHED ALGAE ARE THE PRIMARY PRODUCERS ON SOLID SUBSTRATES
INVERTEBRATES COMMUNITIES MAY BE DIVERSE AND DENSE

ENVIRONMENTAL BEHAVIOR OF OIL:

OIL ACCUMULATES ALONG SHORELINE DUE TO WIND AND WAVE ACTION THICK OIL COATINGS LIKELY ON ALL SOLID SURFACES
HEAVY ACCUMULATIONS AMONG THE ROCKS OF REVETMENT STRUCTURES.

CLEAN-UP PROBLEMS:

OIL CLEANUP MAY BE POSSIBLE BY LAND
BOOMS AND SKIMMERS USUALLY EFFECTIVE WHEN DEPTHS ALLOW

13 EROSIONAL SCARPS

DESCRIPTION OF SHORELINE:

STEEP SCARPS FORMED IN HEADLANDS DUE TO WAVE EROSION
OCCURS PRIMARILY IN VEGETATED CLAY SOIL HORIZONS IN PREVAILING DOWNWIND AREAS
WIND-INDUCED WAVE EROSIONAL EFFECTS MAY CHANGE SEASONALLY

BIOLOGICAL COMMUNITIES:

EMERGENT OR SUBMERSED VEGETATION ABSENT
BENTHIC INFAUNA OF MINOR IMPORTANCE
SLIGHT UTILIZATION OF HABITAT BY IMPORTANT ESTUARINE SPECIES

ENVIRONMENTAL BEHAVIOR OF OIL:

OIL ACCUMULATION ALONG SHORELINE ZONE
PENETRATION INTO CLAY SEDIMENTS SLIGHT

CLEAN-UP PROBLEMS:

SCARPS MAKE IT DIFFICULT TO REMOVE OIL VIA GROUND EQUIPMENT
SKIMMERS AND BOOMS CAN BE USED TO CONCENTRATE OIL WHEN ADJACENT WATER DEPTHS ALLOW

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OPEN WATER*

*DESCRIPTION OF SHORELINE
MAN-MADE STRUCTURES - PLATFORMS
SHORELINES - SANDY BEACHES - FLAT PROFILE
WIND & WAVE INDUCED FORCES ON EROSION*

*BIOLOGICAL COMMUNITIES
VARIED SPECIES OF LIFE - FISHES AND FEW CRUSTACEANS*

REFERENCE:

Texas Water Commission, "Coastal Region Spill Response Map Support Data," August 1989.

LOCAL SUBSTRATES:

GENERALLY FOUND IN ACCRETIONAL, RATHER THAN EROSIONAL, AREAS
MIXTURES OF FINE CLAYS AND ORGANIC MATTER
HIGHLY PRODUCTIVE FOR ROOTED PLANTS
SOILS ARE WATER-SATURATED MOST OF THE TIME AND MAY BE ALTERNATIVELY SUBMERGED OR DEWATERED

HYDROLOGIC FORCES:

HYDROLOGIC ENERGY MODERATELY LOW

BIOLOGICAL COMMUNITIES:

EMERGENT PLANT COMMUNITIES EXIST IN DENSE STANDS
NUMEROUS VARIETIES OF ATTACHED, FLOATING, AND PLANKTONIC ALGAE PRESENT WHICH SUSTAIN AN ABUNDANT AND
DIVERSE ASSEMBLAGE OF INVERTEBRATES AND FISHES
REFERRED TO AS NURSERY GROUNDS FOR ADJACENT ESTUARIES BECAUSE OF THIS HIGH PRODUCTIVITY

ENVIRONMENTAL BEHAVIOR OF OIL:

FLOATING OIL WILL ACCUMULATE ALONG OUTER FRINGE OF VEGETATION
TIDE AND WIND MAY DRIVE THE OIL INWARD INTO THE MARSH
PRESENCE OF BAYOUS AND TIDAL CHANNELS PROVIDES PATHWAYS FOR OIL MOVEMENT INTO MARSH INTERIOR
OIL COATINGS MAY ADVERSELY AFFECT THE VALUE OF THE MARSH HABITAT AS A NURSERY GROUND FOR ESTUARINE SPECIES

CLEAN-UP PROBLEMS:

BOOM PLACEMENT MAY LIMIT ADVANCEMENT OF SLICK INTO MARSH AREA
MANPOWER AND EQUIPMENT ACTIVITIES MAY DAMAGE MARSH VEGETATION AS SEVERELY AS THE OIL ITSELF
BOAT ACCESS TO THE FRONT EDGE OF THE MARSH MAY ALLOW FOR REMOVAL OF OILY ACCUMULATIONS AND OIL-SOAKED VEGETATION

4 SHELTERED TIDAL FLATS WITH VEGETATED MARGINS

DESCRIPTION OF ENVIRONMENT:

OCCUR ALONG INLAND SHORELINE OF BARRIER ISLANDS OR AS COMPONENTS OF SECONDARY AND TERTIARY BAY SYSTEMS
SHALLOW ESTUARINE WATERS WITH DIURNAL-WATER LEVEL CHANGES
FRINGE OF EMERGENT VEGETATION ALONG THE SHORELINE
MAY BE OPEN TO ADJACENT BAY WATERS OR SEMI-ENCLOSED WITH LIMITED CONTACT TO ADJACENT WATERS.

LOCAL SUBSTRATES:

MUD OR MIXED MUD-SAND SEDIMENTS TYPICAL

HYDROLOGIC FORCES:

DIURNAL TIDAL VARIATION PRINCIPAL MECHANISM OF WATER MOVEMENT

BIOLOGICAL COMMUNITIES:

FRINGES OF EMERGENT SALTWATER MARSH VEGETATION MAY OCCUR
PROTECTIVE HABITAT IN SUMMER MONTHS FOR JUVENILE ESTUARINE SPECIES, INCLUDING SHRIMPS, CRABS, AND FINFISH
ALGAL COMMUNITIES MAY BE LOCALLY IMPORTANT

ENVIRONMENTAL BEHAVIOR OF OIL:

OIL SPILL MOVEMENT CAN HAVE SUBSTANTIAL ADVERSE EFFECTS, ESPECIALLY IF EMERGENT VEGETATION IS OILED
REVEGETATION OF FRINGE MARSH AREAS MAY TAKE SEVERAL SEASONS
OIL INCORPORATION INTO SEDIMENTS DETRIMENTAL TO JUVENILES

CLEAN-UP PROBLEMS:

BOOMS AT MOUTHS OF SEMI-ENCLOSED FLAT AREAS NECESSARY TO PREVENT OIL MOVEMENT INTO THESE SENSITIVE AREAS
DESTRUCTION OF FRINGING VEGETATION SHOULD BE AVOIDED

5 RIPARIAN FRESHWATER SHORELINES

DESCRIPTION OF SHORELINE:

PLANT TYPES CHARACTERISTIC OF FLOODPLAIN FORESTS AND WETLANDS
SALTWATER WEDGE MAY BE PRESENT DURING LOW FLOW REGIME, BUT FRESHWATER USUALLY IN CONTACT WITH SHORELINE VEGETATION
DOWNSTREAM RIVER FLOW IS GENERALLY CONTINUOUS
WATER LEVELS MAY VARY IN RESPONSE TO DIURNAL TIDE VARIATION

LOCAL SUBSTRATES:

SEDIMENTS OF MUD AND SILT ARE TYPICAL
HIGH ORGANIC CONTENT

HYDROLOGIC FORCES:

ADVECTIVE FRESHWATER FLOW TOWARDS GULF PREDOMINATES
OBSERVABLE FLOW MAY BE DIMINISHED IN NAVIGATION CHANNELS WATER LEVEL VARIATION POSSIBLE DUE TO TIDAL ACTION

BIOLOGICAL COMMUNITIES:

NUMEROUS EMERGENT PLANTS AND TREES THAT TYPIFY COASTAL WATERCOURSES
TRANSITIONAL MIXTURES OF FRESHWATER AND ESTUARINE SPECIES

ENVIRONMENTAL BEHAVIOR OF OIL:

DOWNSTREAM FLOW IS THE PRIMARY MECHANISM FOR OIL MOVEMENT
ACCUMULATIONS AMONG RIPARIAN VEGETATION AND DEBRIS DEPOSITS
BACKWATER AREAS WITH POOR FLUSHING WILL ATTRACT FLOATING OIL.

CLEAN-UP PROBLEMS:

OIL MAY BECOME ASSOCIATED WITH FLOATING DEBRIS NECESSITATING REMOVAL OF LARGE QUANTITIES OF OILED MATERIAL
REMOVAL FROM RIPARIAN VEGETATION DIFFICULT FROM LAND OR WATER
SHORELINE BOOMS MAY BE USEFUL IN CAPTURING SOME OIL, BUT MID-CHANNEL VELOCITIES MAY EXCEED THE OPERATIONAL DESIGN CRITERIA AND OIL MAY BE CARRIED BEYOND THE BOOM

6 OYSTER REEFS

DESCRIPTION OF SHORELINE:

MOUNDS OF DEAD AND LIVING OYSTERS
LOW TO MODERATE SALINITY ESTUARIES
REEFS MAY BE SUBMERGED DEPENDING UPON THE AMBIENT TIDE HEIGHT
REEFS USUALLY LIE AWAY FROM PRIMARY SHORELINES
SHORELINE REPRESENTED BY REEFS IS POROUS TO FLOATING OIL (I.E. OIL MAY PASS THROUGH THE REEF ZONE TO OTHER SHORELINES)

LOCAL SUBSTRATES:

ACCUMULATIONS OF SHELL MAY BECOME LAYERED WITH MUDDS
PREDOMINANT SUBSTRATES ARE THE CALCIUM CARBONATE OYSTER SHELLS AND FINE-GRAINED MUDDS

HYDROLOGIC FORCES:

AMBIENT HYDROLOGIC ENERGY USUALLY LOW TO MODERATE
CURRENTS INDUCED BY FRESHWATER INFLOWS, WIND WAVES, AND TIDAL CIRCULATION ACT TO FLUSH THE REEF.

BIOLOGICAL COMMUNITIES:

FOOD CHAINS BASED ON DETRITUS AND ESTUARINE PLANKTON
REEF OFFERS PROTECTION TO MOLLUSKS, CRUSTACEANS, AND FISHES LIVE OYSTER REPRESENT A VALUABLE COMMERCIAL FISHERY RESOURCE

ENVIRONMENTAL BEHAVIOR OF OIL:

FLOATING OIL CAN BECOME ENTRAPPED IN UPPER STRATA OF REEFS ESPECIALLY IF EMERGENT DURING LOW TIDE
FLUSHING THROUGH REEF CAN LIMIT AMOUNT OF OIL DEPOSITED
OYSTERS CAN SURVIVE SHORT TERM EXPOSURE TO OILING DUE TO THEIR ABILITY TO REMAIN CLOSED FOR SEVERAL DAYS

CLEAN-UP PROBLEMS:

CLEAN-UP IS A WATER-ORIENTED ACTIVITY AND LARGELY INEFFECTIVE
USE OF BOOMS AND SKIMMERS TO PREVENT OIL FROM REACHING REEFS IS HIGHLY DESIRABLE

7 EXPOSED TIDAL FLATS

DESCRIPTION OF SHORELINE:

OFTEN OCCUR ADJACENT TO PRIMARY BAYS AND LAGOONS
ADJACENT TO OPEN WATER AREAS WITH UNRESTRICTED WATER EXCHANGE
FLATS VARY GREATLY IN AREAL EXTENT
ALTERNATELY FLOOD AND DEWATER ACCORDING TO TIDAL REGIME
OBSERVED LOCATION OF THE SHORELINE (HIGH WATER MARK) VARIES

LOCAL SUBSTRATES:

GENERALLY COMPOSED OF FINE-GRAINED SAND OR CLAYS
RELATIVELY UNSEGREGATED BY AMBIENT HYDROLOGIC ENERGY

HYDROLOGIC FORCES:

HYDROLOGIC ENERGY INPUT ACROSS TIDE FLATS IS LOW TO MODERATE
IMPORTANT CURRENTS GENERATED BY THE CHANGE IN WATER LEVELS

BIOLOGICAL COMMUNITIES:

BIOTA OFTEN BASED ON BLUE-GREEN ALGAL MATS GROWING ON MUDS
SPECIES DIVERSITY AND BIOMASS PER UNIT AREA ARE RELATIVELY LOW
COMPOSITION OF ALGAL MAT COMMUNITIES OFTEN DISTINCT FROM THOSE IN ADJACENT ESTUARINE WATERS.

ENVIRONMENTAL BEHAVIOR OF OIL:

OIL MAY BE DEPOSITED IN BANDS ACROSS THE FLATS DUE TO VARIATION IN HIGH WATER LINE

CLEAN-UP PROBLEMS:

REMOVAL OF OIL IS VIRTUALLY IMPOSSIBLE
MUD SUBSTRATE INHIBITS VEHICULAR ACCESS
SHALLOWNESS PREVENTS USE OF WATERCRAFT FOR REMOVAL PURPOSES

8 DREDGED SPOIL DEPOSITS

DESCRIPTION OF SHORELINE:

MAY OCCUR AS ISLANDS, SUBMERGED BANKS, OR MADE LAND
FORMED BY DEPOSITION OF DREDGE MATERIAL

LOCAL SUBSTRATES:

SAND, SHELL FRAGMENTS, CLAYS AND FINE-GRAINED SEDIMENTS
FINE MUDS DEVELOP IN ADJACENT SHALLOWS AS DEPOSIT AGES
RESISTANT SHELL AND HEAVIER SAND PROMINENT ALONG THE SHORELINE

HYDROLOGIC FORCES:

IMPACT OF HYDROLOGIC ENERGY VARIES
ORIENTATION PERPENDICULAR TO PREVAILING WINDS RESULTS IN STRONGER SHORELINE WAVE ACTION
TIDAL CURRENTS ARE ALSO A MAJOR HYDROLOGIC AND SEDIMENT TRANSPORT MECHANISM

BIOLOGICAL COMMUNITIES:

BIOTA ARE AFFECTED BY THE COMPOSITION OF THE SEDIMENT
COMMUNITY STRUCTURE IS OFTEN A FUNCTION OF AGE OF DEPOSIT
AQUATIC PLANTS AND ALGAE ARE LIMITED DURING EARLIER STAGES OF SPOIL AGING, BUT INVERTEBRATES MAY THRIVE

ENVIRONMENTAL BEHAVIOR OF OIL:

OIL MAY ACCUMULATE ALONG UPPER TIDELINE FROM WAVE ACTION OR MAY REMAIN IN ADJACENT SHALLOWS IF LITTLE
FLUSHING EXISTS
TURBID CONDITIONS FACILITATES OILING OF SHALLOW SEDIMENTS

CLEAN-UP PROBLEMS:

CLEAN-UP TECHNIQUES VARY WITH CONFIGURATION OF DEPOSIT

9 PARTIALLY-EXPOSED BAY MARGINS

DESCRIPTION OF SHORELINE:

SMALL TIDAL RANGES AND SHORT BEACHFACES
TYPICAL SURROUNDED BY SHALLOW BAY BOTTOMS

LOCAL SUBSTRATES:

SAND, SHELL, MUD, OR MIXTURES PREDOMINATE ALONG MARGINS
HEAVIER MATERIAL ACCUMULATING ON SHORELINE

HYDROLOGIC FORCES:

WAVE ACTION ON THESE ENVIRONMENTS IS VARIABLE
SOME SEDIMENT RESUSPENSION POSSIBLE WITH STRONG WAVE ACTION

BIOLOGICAL COMMUNITIES:

RESIDENT BIOTA ALONG THE BEACHFACE MAY BE VARIED IN DIVERSITY
CRUSTACEANS AND MOLLUSKS ARE THE PREDOMINANT INVERTEBRATES
EMERGENT OR SUBMERSED MACROPHYTE COMMUNITIES TYPICALLY ABSENT
BLUE-GREEN ALGAL MAT COMMUNITIES MAY COVER SEDIMENT SURFACE
POST-LARVAL AND JUVENILE FISHES FREQUENT NEARSHORE HABITATS

ENVIRONMENTAL BEHAVIOR OF OIL:

SOME OIL WILL ACCUMULATE ALONG THE SHORT BEACHFACE
MUCH CAN REMAIN AS A FLOATING MASS IN NEARSHORE WATER
MIXING OF OIL WITH SUSPENDED SEDIMENTS MAY ADVERSELY AFFECT THE INTERTIDAL BIOLOGICAL COMMUNITY