

NORTHERN LAKE MICHIGAN  
ENVIRONMENTAL SENSITIVITY INDEX  
METADATA

*Prepared By:*

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FILE DESCRIBES: Digital data for 1994 Northern Lake Michigan Environmental Sensitivity Index. Data were compiled and digitized at Research Planning, Inc., Columbia, South Carolina.

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COMMENTS: Information was developed using the U.S. Federal Geographic Data Committee's Content Standards for Digital Geospatial Metadata, June 8, 1994. The numbering scheme matches the Meta Data Standard in order to facilitate referencing definitions of the elements. The items in **bold** are required elements and the others are optional elements. The Spatial Data Transfer Standard, ver. 03/92, was referenced to properly identify the geographic entities.

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## 1.0. IDENTIFICATION INFORMATION

### 1.1. CITATION

#### 1.1.1. ORIGINATOR:

National Oceanic and Atmospheric Administration (NOAA), Office of Ocean Resources Conservation and Assessment, Seattle, Washington 98115; and Research Planning, Inc. (RPI), 1121 Park Street, Post Office Box 328, Columbia, South Carolina 29202

#### 1.1.2. PUBLICATION DATE:

199409

#### 1.1.4. TITLE:

Sensitivity of Coastal Environments and Wildlife to Spilled Oil:  
Northern Lake Michigan

#### 1.1.5. EDITION:

First

#### 1.1.6. GEOSPATIAL DATA PRESENTATION FORM:

Atlas

#### 1.1.7. SERIES INFORMATION

##### 1.1.7.1. SERIES NAME:

None

##### 1.1.7.2. ISSUE IDENTIFICATION:

Northern Lake Michigan

#### 1.1.8. PUBLICATION INFORMATION

##### 1.1.8.1. PUBLICATION PLACE:

Seattle, Washington

##### 1.1.8.2. PUBLISHER:

NOAA, Office of Ocean Resources Conservation and  
Assessment

#### 1.1.9. OTHER CITATION DETAILS:

Prepared by Research Planning, Inc., Columbia, South Carolina for the Hazardous Materials Response and Assessment Division, National Oceanic and Atmospheric Administration, Seattle, Washington and the Ninth Coast Guard District, U.S. Coast Guard, Cleveland, Ohio

#### 1.1.10. ONLINE LINKAGE:

Not available

**1.1.11. LARGER WORK CITATION:**

None

**1.2. DESCRIPTION**

**1.2.1. ABSTRACT:**

This data set comprises the Environmental Sensitivity Index (ESI) maps for the shoreline of Northern Lake Michigan. ESI data characterize coastal environments and wildlife by their sensitivity to spilled oil. The ESI data include information for three main components: shoreline habitats; sensitive biological resources; and human-use resources

**1.2.2. PURPOSE:**

The ESI data were collected, mapped, and digitized to provide environmental data for oil spill planning and response. The Clean Water Act with amendments by the Oil Pollution Act of 1990 requires response plans for immediate and effective protection of sensitive resources

**1.3. TIME PERIOD OF CONTENT**

**1.3.1. TIME PERIOD INFORMATION**

**1.3.1.3. RANGE OF DATES/TIMES:**

The intertidal habitats were mapped during aerial and ground surveys conducted from 18-21 April 1994. The biological and human use resources data were compiled by regional biologists in 1994. The dates for these data vary and are documented in Section 2.5.1

**1.4. STATUS**

**1.4.1. PROGRESS:**

Complete

**1.4.2. MAINTENANCE AND UPDATE FREQUENCY:**

None planned

**1.5. SPATIAL DOMAIN**

**1.5.1. BOUNDING COORDINATES**

**1.5.1.1. WEST BOUNDING COORDINATE:**

-87.375

**1.5.1.2. EAST BOUNDING COORDINATE:**

-87.75

**1.5.1.3. NORTH BOUNDING COORDINATE:**

46.125

**1.5.1.4. SOUTH BOUNDING COORDINATE:**

44.75

**1.6 KEYWORDS**

**1.6.1. THEME**

**1.6.1.1. THEME KEYWORD THESAURUS:**

None

**1.6.1.2. THEME KEYWORD:**

Sensitivity maps; ESI; coastal resources; oil spill planning;  
and coastal zone management

**1.6.2. PLACE**

**1.6.2.1. THESAURUS:**

None

**1.6.2.2. PLACE KEYWORD:**

Northern shoreline of Lake Michigan, to encompass the coastal areas of Menominee, Delta, Schoolcraft, Mackinac, Emmet, Charlevoix, Antrim, Grand Traverse, and Leelanau counties

**1.7. ACCESS CONSTRAINTS:**

None

**1.8. USE CONSTRAINTS:**

DO NOT USE ESI MAPS FOR NAVIGATIONAL PURPOSES.

Besides the above warning, there are no use constraints on this data. Acknowledgment of NOAA and other contributing sources would be appreciated in products derived from these data

**1.11. DATA SET CREDIT:**

This project was supported jointly by NOAA's Hazardous Materials Response and Assessment Division, Robert Pavia, Project Manager, and the U.S. Coast Guard, LT Kenneth Barton, Project Manager. Air support was provided by the Air Station, Traverse City.

Many people from various State and Federal agencies provided information for these maps, as well as reviewed the maps. From the Michigan Department of Natural Resources, biological resource information and edits were provided by Ron Raisanen, Bob Odom, Glen Matthews, Ray Perez, Steve Scott, Dell Siler, Gary Schnicke, Craig Albright, James P. Baker, and Leo Mrozinski.

Additional information was provided by Judith Soule and Lynn Scrimger of the Michigan Natural Features Inventory; Carol Delahanty of the Great Lakes Commission; Al Hacker and Steve Yonch of the Sleeping Bear Dunes National Lakeshore; Mike Kovach of the Michigan Department of Public Health, Water Supply Division; Eric MacDonald of the Bureau of History, State Historic Preservation Office; and Tom Eitner, Kelly Millenbaugh, David Best, and Robert Kavetsky of the U.S. Fish and Wildlife Service.

Roger Gauthier and Gordon Thompson from the U.S. Army Corps of Engineers, Detroit District, provided the digital base maps. Information for tribal lands was provided by Julie Green and Betty Kienitz of the Michigan Commission on Indian Affairs.

At RPI, Jacqueline Michel was the project manager; she was responsible for the shoreline mapping. Debra K. Scholz was the project biologist and responsible for the data collection. Lee Diveley, III, Jeffrey Dahlin, James Olsen, Scott Johnson, William Holton, and Mark White worked diligently to complete the data entry and generate the final map product.

#### 1.13. NATIVE DATA SET ENVIRONMENT:

The software packages used to develop the atlas are Environmental Systems Research Institute's ARC/INFO® (version 7.0) and ORACLE RDBMS (version 6.0.36.1.1). The hardware configuration is Hewlett Packard workstations (models 715/50 and 712/80 with 4 X-terminals) with UNIX operating system (HP-UX Release A.09.01). The following files are included in the data set:

arc_lut.e00	birds.e00	biores.e00
breed.e00	esi.e00	fish.e00
habitats.e00	hydro.e00	index.e00
nests.e00	pnts_lut.e00	poly_lut.e00
seasonal.e00	soc_data.e00	soc_lut.e00
socecon.e00	species.e00	t_mammal.e00

The entire data set is approximately 27 megabytes.



## 2.0. DATA QUALITY INFORMATION

### 2.1. ATTRIBUTE ACCURACY

#### 2.1.1. ATTRIBUTE ACCURACY REPORT:

The attribute accuracy is estimated to be “good” given the years of ESI experience, the data input methodology, the quality control review sessions, and the digital logical consistency checks.

### 2.2. LOGICAL CONSISTENCY REPORT:

The digitization of shoreline types, biological resources, and human-use resources is a complex and highly quality-controlled process. In order to facilitate digitizing, the entire study area is split into individual quadrangles using the INDEX data layer. The first layer of information digitized is the ESI shoreline. Upon completion of digitization the data are checked for completeness and topological and logical consistency and then plotted and checked by the mapping geologists. Any errors in the shoreline classification are updated prior to digitization of the biological and socio-economic layers. All layers use the shoreline as the geographic reference so that there are no slivers in the geographic coordinates. The hardcopy biological information is compiled onto 1:24,000 USGS topographic quadrangles by a biological expert using data from regional specialists in the form of maps, tables, charts, and written descriptions of wildlife distributions. The data are digitized, checked using both digital and on-screen procedures, plotted, and sent out for review by the regional specialists. The edited maps are updated, checked once again, and the final product plotted (at approximately 1:50,000 scale). A team of specialists review the entire series of maps, check all data, and make final edits. The data are then merged to form the study-wide layers. The data merging includes a final quality control check where labels, chains, and polygons are checked for attribute accuracy.

To finalize the data checking process, each data layer is checked using a standardized form by two GIS personnel (a technician and the GIS manager), and each attribute database is checked using several programs which test the files for missing or duplicate data, rules for proper coding, GIS topological consistencies (such as dangles, unnecessary nodes, etc.), and ORACLE to ARC/INFO® consistencies. A final review is made by the GIS manager and programs are run to generate the unique IDs and associated lookup tables.

**2.3. COMPLETENESS REPORT:**

Shoreline Habitat Mapping:

The shoreline habitats of Northern Lake Michigan were mapped during overflights conducted from 18-21 April 1994. The surveys were conducted at elevations of 300-500 feet and slow air speed, using a H-65 helicopter provided by the U.S. Coast Guard. An experienced coastal geologist delineated the coastal types directly onto 1:24,000 scale USGS topographic maps, using a standardized classification scheme. Where appropriate, multiple habitats were delineated for each shoreline segment. For complicated areas or where the shoreline had changed significantly from that shown on the base maps, color infrared aerial photographs provided by the Michigan Department of Natural Resources were used to update the maps.

Prediction of the behavior and persistence of oil on intertidal habitats is based on an understanding of the dynamics of the coastal environments, not just the substrate type and grain size. The vulnerability of a particular intertidal habitat is an integration of the following factors:

- 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

All of these factors are used to determine the relative sensitivity of intertidal habitats. Key to the sensitivity ranking is an understanding of the relationships between: physical processes; substrate; shoreline type; product type; fate and effect; and sediment transport patterns. The intensity of energy expended upon a shoreline by wave action, tidal currents, and river currents directly affects 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.

These concepts have been used in the development of the ESI, which ranks shoreline environments as to their relative sensitivity to oil spills, potential biological injury, and ease of cleanup. Generally speaking, 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.

Sensitive Biological Resources:

Regional biologists compiled the biological data. These data denote the key biological resources that are most likely at risk in the event of an oil spill. Four major categories, or elements, of biological resources were considered during data compilation: birds, fish, habitats, and terrestrial mammals.

Each ELEMENT corresponds to a coverage or geographic theme. There are four attribute tables, BIORES, SEASONAL, SPECIES, and BREED, that are used to store the complex biological data (Fig. 1). Each biological coverage (BIRDS, FISH, HABITATS, NESTS, and T\_MAMMAL) is linked to the Biological Resources table (BIORES) using the item ID and the associated lookup tables. The lookup tables contain ID and RARNUM. RARNUM is the resources at risk number and is determined for each unique combination of SPECIES\_ID, SEASON\_ID, and CONC. The items in BIORES are: RARNUM, SPECIES\_ID, CONC, SEASON\_ID, G\_SOURCE, S\_SOURCE, and ELEMENT. SPECIES\_ID is the numeric identifier of each species and is unique within each ELEMENT. CONC is the concentration of the species and can be LOW, MEDIUM or HIGH or an actual count of the numbers of species present in the polygon. SEASON\_ID contains a numeric value according to the monthly presence of the species. Usually, there is one seasonality per species, but occasionally the same species has different monthly presence or breeding activity. When this occurs, a new record with a different seasonality is referenced.

The SEASONAL data table stores the monthly presence of each species and the characteristics of the presence (life history information). The BIORES data table is linked to the SEASONAL data table using the SPECIES\_ID, ELEMENT, and SEASON\_ID items. The categories of the variables BREED1 through BREED5 for each ELEMENT are:

ELEMENT	BREED 1	BREED 2	BREED 3	BREED 4	BREED 5
BIRD	nesting	laying	hatching	fledging	
FISH	spawning	outmigration	larvae	juvenile	adult

NOTE: There are no BREED variables for HABITATS and T\_MAMMALS.

The SPECIES data table contains the common name (NAME), scientific name (GEN\_SPEC), two-letter state abbreviation for listed species (STATE), state and federal status (S\_F), threatened and/or endangered status (T\_E), date of the

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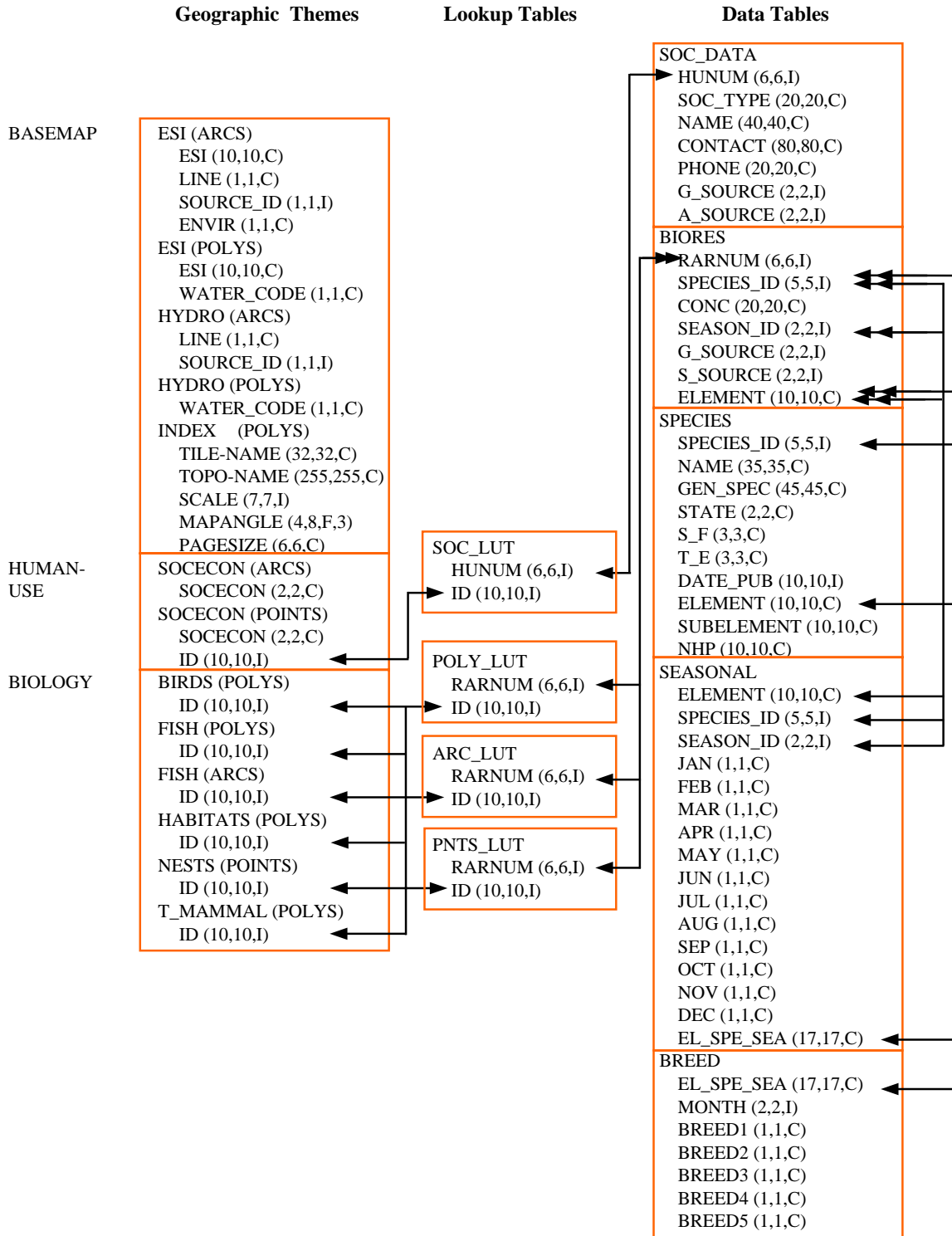


FIGURE 1. Relationships between data layers, lookup tables, and data tables.

list for threatened or endangered species (DATE\_PUB), species element (ELEMENT), species subelement (SUBELEMENT), and the global ranking from the Natural Heritage Program (NHP). The NHP item is included for data structure consistency. The item SUBELEMENT refers to the grouping of the species within each ELEMENT:

ELEMENT	SUBELEMENT
Bird	diving
	gull_tern
	raptor
	shorebird
	wading
	waterfowl
Fish	anadromous
	special
Habitat	shrub
Reptile	Alligator/Crocodile
	Sea Turtle
Terrestrial Mammal	mustelid
	rodent

Human Use Resources:

Several human use, or socio-economic, features are included in ESI atlases. Entity points and complete chains are digitized into the coverage SOCECON. The data set is linked to the data table SOC\_DATA using the item ID found in the SOC\_LUT. ID is a concatenation of atlas number (4), element number (10), and unique record number.

ENTITY POINTS (.PAT)		COMPLETE CHAINS (.AAT)	
Item	Type	Item	Type
SOCECON	C	SOCECON	C
ID	I		

The item SOCECON may contain the following values:

Entity Points		Polygons	
Feature	SOCECON	Feature	SOCECON
Access	A2	Beach	B
Airport	A	Indian Reservation	IR
Aquaculture	AQ	International Border	IB
Archaeological Site	AS	Marine Sanctuary	MS
Boat Ramp	BR	National Park	NP

Entity Points		Polygons	
Feature	SOCECON	Feature	SOCECON
Campground	CP	Regional or State Park	P
Coast Guard	CG	Wildlife Refuge	WR
Commercial Fishing	CF		
Diving	DV	Chains	
Ferry	F	Feature	SOCECON
Factory	F2	Beach	B
Hoist	H	Indian Reservation	IR
Helipad	HP	International Border	IB
Historical Site	HS	Marine Sanctuary	MS
Lock and Dam	LD	National Park	NP
Log Storage	LS	Pipeline	P
Marina	M	Regional or State Park	P
Mining	MZ	Wildlife Refuge	WR
Oil Facilities	OF		
Platform	PF		
Recreational Fishing	RF		
Subsistence	S		
Well	W		
Water Intake	WI		

The table SOC\_DATA contains the human-use number (HUNUM), feature type (SOC\_TYPE), name of the facility (NAME), contact person (CONTACT), telephone number (PHONE), geographic source (G\_SOURCE), and attribute source (A\_SOURCE).

## 2.4. POSITIONAL ACCURACY

### 2.4.1. HORIZONTAL POSITIONAL ACCURACY

#### 2.4.1.1. HORIZONTAL POSITIONAL ACCURACY REPORT:

The ESI data uses USGS 1:24,000 topographic quadrangles as the base map. It is estimated that the ESI has a minimum mapping unit of 50 feet. The biological data sets are developed primarily using regional experts who estimate concentration areas. Unlike shorelines, which maintain relative spatial stability through time, the biological data by nature migrate across the landscape. Therefore, the 1:24,000 USGS quadrangles are used as a base map in gathering the data but the data have “fuzzy” boundaries which must be understood when utilizing this information.

## 2.5. LINEAGE

### 2.5.1. SOURCE INFORMATION:

Data layer or theme name: BIRDS

#### 2.5.1.1. SOURCE CITATION

2.5.1.1.1 Originator	2.5.1.1.2 Publication Date	2.5.1.1.4 Title	2.5.1.1.6 Geospatial Data Presentation Form	2.5.1.1.8 Publication Information	2.5.1.2 Source Scale Denominator	2.5.1.4 Source Time Period
Brewer, R., G.A. McPeck, and R.J. Adams, Jr.	1991	The Atlas of Breeding Birds of Michigan	Book	Michigan State University Press, East Lansing Mich., 594 pp.	None	1989-1991
Evers, D.C.	1992	A Guide to Michigan's Endangered Wildlife	Book	University of Michigan Press, Ann Arbor, Mich., 103 pp.	None	Historical to date of pub.
Odom, Bob, Michigan Department of Natural Resources	None	Birds, Grand Traverse, Leelanau, and Benzie Cos.	Personal knowledge	None	None	1994
Matthews, Glen, Michigan Department of Natural Resources	None	Birds, Antrim, Charlevoix, and Emmet Cos.	Personal knowledge	None	None	1994
Eitnear, Tom, U.S. Fish and Wildlife Service, East Landing Field Office (ES)	None	Bald Eagle Nest Sites, Piping Plover Distribution and Nest Sites	Personal knowledge	None	None	1994
Kavetsky, B., K. Millenbaugh, D. Best, U.S. Fish and Wildlife Service, East Landing Field Office (ES)	None	Bald Eagle and Piping Plover Nest Sites	Personal knowledge	None	None	1994
Hacker, A. and S. Yonch, National Park Service, Sleeping Bear Dunes National Lakeshore	None	Birds along the National Lakeshore	Personal knowledge	None	None	1994

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2.5.1.1.1 <b>Originator</b>	2.5.1.1.2 <b>Publication Date</b>	2.5.1.1.4 <b>Title</b>	2.5.1.1.6 <b>Geospatial Data Presentation Form</b>	2.5.1.1.8 <b>Publication Information</b>	2.5.1.2 <b>Source Scale Denominator</b>	2.5.1.4 <b>Source Time Period</b>
Raisanen, Ron, Michigan Department of Natural Resources	None	Birds	Personal knowledge	None	None	1994
Albright, Craig, Michigan Department of Natural Resources	None	Birds, Delta and Schoolcraft Cos.	Personal knowledge	None	None	1994

**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: ESI

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1 <b>Originator</b>	2.5.1.1.2 <b>Publication Date</b>	2.5.1.1.4 <b>Title</b>	2.5.1.1.6 <b>Geospatial Data Presentation Form</b>	2.5.1.1.8 <b>Publication Information</b>	2.5.1.2 <b>Source Scale Denominator</b>	2.5.1.4 <b>Source Time Period</b>
State of Michigan	1989	Michigan Shorelines	Digital; line data	Provided by USACOE, digitized by State of Michigan, from 1982 aerial photos	24000	1982
Michel, Jacqueline, Research Planning, Inc.	None	Shoreline Type and Sensitivity Classifi- cation	Hardcopy maps	Notes made on USGS topos during overflights, digitized by RPI	24000	1993



**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: FISH

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1 <b>Originator</b>	2.5.1.1.2 <b>Publication Date</b>	2.5.1.1.4 <b>Title</b>	2.5.1.1.6 <b>Geospatial Data Presentation Form</b>	2.5.1.1.8 <b>Publication Information</b>	2.5.1.2 <b>Source Scale Denominator</b>	2.5.1.4 <b>Source Time Period</b>
U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers	1982	Atlas of Spawning and Nursery Areas of the Great Lakes: Volume III- Lake Michigan	Book	U.S. Fish and Wildlife Service, Biological Services Program, FWS/OBS-82/52	None	Historical to date of pub.
Evers, D.C.	1992	A Guide to Michigan's Endangered Wildlife	Book	University of Michigan Press, Ann Arbor, Mich., 103 pp.	None	Historical to date of pub.
Scott, Steve, Michigan Department of Natural Resources	None	Fish, Mackinac and Schoolcraft Cos.	Personal knowledge	None	None	1994
Siler, Dell, Michigan Department of Natural Resources	None	Fish, Delta and Schoolcraft Cos.	Personal knowledge	None	None	1994
Schnicke, Gary, Michigan Department of Natural Resources	None	Fish, Menominee Co.	Personal knowledge	None	None	1994
Albright, Craig, Michigan Department of Natural Resources	None	Fish, Delta and Schoolcraft Cos.	Personal knowledge	None	None	1994
Mrozinski, Leo, Michigan Department of Natural Resources	None	Fish, Grand Traverse and Leelanau Cos.	Personal knowledge	None	None	1994

**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: HABITATS

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1 Originator	2.5.1.1.2 Publication Date	2.5.1.1.4 Title	2.5.1.1.6 Geospatial Data Presentation Form	2.5.1.1.8 Publication Information	2.5.1.2 Source Scale Denominator	2.5.1.4 Source Time Period
Eitnear, Tom, U.S. Fish and Wildlife Service, East Landing Field Office (ES)	None	T/E Plants	Personal knowledge	None	None	1994
Soule, J. and L. Scrimger, Michigan Natural Features Inventory	None	T/E Plants	Personal knowledge	None	None	1994
Hacker, A. and S. Yonch, National Park Service, Sleeping Bear Dunes National Lakeshore	None	T/E Plants Within the National Lakeshore Boundaries	Personal knowledge	None	None	1994

**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: HYDRO

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1 Originator	2.5.1.1.2 Publication Date	2.5.1.1.4 Title	2.5.1.1.6 Geospatial Data Presentation Form	2.5.1.1.8 Publication Information	2.5.1.2 Source Scale Denominator	2.5.1.4 Source Time Period
State of Michigan	1989	Michigan Shorelines	Digital; line data	Provided by USACE, digitized by State of Michigan, from 1982 aerial photos	24000	1982
Michel, Jacqueline, Research Planning, Inc.	None	Shoreline Type and Sensitivity Classification	Hardcopy maps	Notes made on USGS topos during overflights, digitized by RPI	24000	1993

**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: INDEX

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1 <b>Originator</b>	2.5.1.1.2 <b>Publication Date</b>	2.5.1.1.4 <b>Title</b>	2.5.1.1.6 <b>Geospatial Data Presentation Form</b>	2.5.1.1.8 <b>Publication Information</b>	2.5.1.2 <b>Source Scale Denominator</b>	2.5.1.4 <b>Source Time Period</b>
Research Planning, Inc.	None	Map Index	Digital; complex polygon	Joanne Halls, GIS Manager	24000	1994

**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: NESTS

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1 <b>Originator</b>	2.5.1.1.2 <b>Publication Date</b>	2.5.1.1.4 <b>Title</b>	2.5.1.1.6 <b>Geospatial Data Presentation Form</b>	2.5.1.1.8 <b>Publication Information</b>	2.5.1.2 <b>Source Scale Denominator</b>	2.5.1.4 <b>Source Time Period</b>
Eitnear, Tom, U.S. Fish and Wildlife Service, East Landing Field Office (ES)	None	Bald Eagle Nest Sites, Piping Plover Distribution and Nest Sites	Personal knowledge	None	None	1994
Kavetsky, B., K. Millenbaugh, D. Best, U.S. Fish and Wildlife Service, East Landing Field Office (ES)	None	Bald Eagle and Piping Plover Nest Sites	Personal knowledge	None	None	1994

**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: SOCECON

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1  Originator	2.5.1.1.2  Publication Date	2.5.1.1.4  Title	2.5.1.1.6  Geospatial Data Presentation Form	2.5.1.1.8  Publication Information	2.5.1.2  Source Scale Denominator	2.5.1.4  Source Time Period
Michel, Jacqueline, Research Planning, Inc.	None	Boat Ramps, Marinas, Access	Hardcopy maps	Notes made on USGS topos during overflights, digitized by RPI	24000	1993
Fishing Hot Spots, Inc.	1992	Big Bay de Noc, Delta County, Marked Fishing Map (access)	Hardcopy map	Fishing Hot Spots, Inc., Map Number M305	1 in. = ~1.5 mi.	1991
Fishing Hot Spots, Inc.	1991	Little Bay de Noc, Marked Fishing Map (access)	Hardcopy map	Fishing Hot Spots, Inc., Map Number M227	None given	1990
Peebles, C.S. and D.B. Black, Division of the Great Lakes, Museum of Anthropology, University of Michigan	1976	The Distribution and Abundance of Archaeological Sites in the Coastal Zone of Michigan	Book	A report of the Michigan History Division, Michigan Department of State, 226 pp.	None	1825-1976
Bureau of Michigan History, State Historic Preservation Office, Michigan Department of State	1991	Michigan State Register of Historic Sites and National Register of Historic Places - Quick Reference	Book	Compiled by the State Historic Preservation Office	None	1991

2.5.1.1.1 Originator	2.5.1.1.2 Publication Date	2.5.1.1.4 Title	2.5.1.1.6 Geospatial Data Presentation Form	2.5.1.1.8 Publication Information	2.5.1.2 Source Scale Denominator	2.5.1.4 Source Time Period
MacDonald, Eric, Bureau Michigan History, State Historic Preservation Office, Michigan Department of State	None	Archaeologic and Historic Sites	Personal knowledge	None	None	1994
Kovach, Mike, Michigan Department of Public Health, Water Supply Division	None	Water Intakes	Personal knowledge	None	None	1994

**2.5.1. SOURCE INFORMATION:**

Data layer or theme name: T\_MAMMAL

**2.5.1.1. SOURCE CITATION**

2.5.1.1.1 Originator	2.5.1.1.2 Publication Date	2.5.1.1.4 Title	2.5.1.1.6 Geospatial Data Presentation Form	2.5.1.1.8 Publication Information	2.5.1.2 Source Scale Denominator	2.5.1.4 Source Time Period
Baker, R.H.	1983	Michigan Mammals	Book	Michigan State University Press, East Lansing Mich., 642 pp.	None	1700-1982
Albright, Craig, Michigan Department of Natural Resources	None	Mammals, Delta and Schoolcraft Cos.	Personal knowledge	None	None	1994

**2.5.2. PROCESS STEP**

**2.5.2.1. PROCESS DESCRIPTION:**

The digitization of ESI, biological resources, and human-use resources is a complex and highly quality controlled process. In order to facilitate digitizing, the entire study area was split

into individual quadrangles using a map index coverage. The first layer of information digitized is the ESI. Upon completion of digitization, the data is checked for completeness, topological and logical consistency and then plotted and checked by the overflight/field specialists. Any errors in the shoreline classification are updated prior to digitization of the biological and socio-economic layers. All data use the shoreline as the geographic reference so that there are no slivers in the geographic layers. The biological information is compiled onto 1:24,000 USGS topographic quadrangles by an in-house biological and GIS expert using the data from regional specialists in the form of maps, tables, charts, and written descriptions of wildlife distributions. The data are digitized, checked using both digital and on-screen procedures, plotted, and sent out for review by the regional specialists. The edited maps are updated on the computer, checked once again, and plotted at final map scale. A team of specialists review the entire series of maps, check all data, and make final edits. The data are merged to form the study-wide layers which are described in this document. The data merging includes a final quality control check where topological consistency, rules for geography, and database to geography are checked and reported to the GIS manager.

**2.5.2.3. PROCESS DATE:**

199409

**2.5.2.6. PROCESS CONTACT**

**2.5.2.6.1. CONTACT PERSON PRIMARY**

**2.5.2.6.1.1. CONTACT PERSON:**

Jill Petersen

**2.5.2.6.1.2. CONTACT ORGANIZATION:**

NOAA HMRAD

**2.5.2.6.3. CONTACT POSITION:**

GIS Manager

**2.5.2.6.4. CONTACT ADDRESS**

**2.5.2.6.4.1. ADDRESS TYPE:**

Physical Address

**2.5.2.6.4.2. ADDRESS:**

7600 Sand Point Way N.E., Bin C15700

**2.5.2.6.4.3. CITY:**

Seattle

**2.5.2.6.4.4. STATE OR PROVINCE:**

W A

**2.5.2.6.4.5. POSTAL CODE:**

98115

**2.5.2.6.5. CONTACT VOICE TELEPHONE:**

(206) 526-6944

**2.5.2.6.7. CONTACT FACSIMILE TELEPHONE:**

(206) 526-6329

**2.5.2.6.8. CONTACT ELECTRONIC MAIL ADDRESS:**

jill\_petersen@hazmat.noaa.gov.us

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**3.0. SPATIAL DATA ORGANIZATION INFORMATION**

**3.2. DIRECT SPATIAL REFERENCE METHOD:**

Vector

**3.3. POINT AND VECTOR OBJECT INFORMATION**

**3.3.1. SDTS TERMS DESCRIPTION:**

**3.3.1.1. SDTS POINT AND VECTOR OBJECT TYPE, and**

**3.3.1.2. POINT AND VECTOR OBJECT COUNT:**

Theme	Universe Polygon	GT-Polygons	Area Points	Complete Chains	Line Segments	Label Points	Entity Points	Nodes
BIRDS	1	295	295	1,057	259,118			841
ESI	1	154	154	4,182	126,270			4,187
FISH	1	344	344	1,025	230,437			897
HABITATS	1	16	16	33	3,752			25
HYDRO	1	671	671	1,215	171,815	643		1,161
INDEX	1	75	75	193	274			123
NESTS							3	
SOCECON				20	833		397	39
T_MAMMAL	1	83	83	374	131,095			348

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**4.0. SPATIAL REFERENCE INFORMATION**

**4.1. HORIZONTAL COORDINATE SYSTEM DEFINITION**

**4.1.2. PLANAR**

**4.1.2.1. MAP PROJECTION**

**4.1.2.1.1. MAP PROJECTION NAME:**  
TRANSVERSE MERCATOR

**4.1.2.1.2. MAP PROJECTION PARAMETERS :**  
TRANSVERSE MERCATOR

**4.1.2.1.2.2. LONGITUDE OF CENTRAL  
MERIDIAN:**  
-85.0

**4.1.2.1.2.3. LATITUDE OF PROJECTION ORIGIN:**  
0

**4.1.2.1.2.4. FALSE EASTING:**  
500,000

**4.1.2.1.2.5. FALSE NORTHING:**  
0

**4.1.2.1.2.6. SCALE FACTOR AT CENTRAL  
MERIDIAN:**  
0.99960

**4.1.2.4. PLANAR COORDINATE INFORMATION**

**4.1.2.4.1. PLANAR COORDINATE ENCODING METHOD:**  
Coordinate Pair

**4.1.2.4.2. COORDINATE REPRESENTATION:**

**4.1.2.4.2.1. ABSCISSA RESOLUTION:**  
50 feet

**4.1.2.4.2.2. ORDINATE RESOLUTION:**  
50 feet

**4.1.4. GEODETIC MODEL**

**4.1.4.1. HORIZONTAL DATUM NAME:**  
North American Datum of 1927

**4.1.4.2. ELLIPSOID NAME:**  
Clarke, 1866

**4.1.4.3. SEMI-MAJOR AXIS:**  
6,378,206.4

**4.1.4.4. DENOMINATOR OF FLATTENING RATIO:**  
294.98

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**5.0. ENTITY AND ATTRIBUTE INFORMATION**

**5.1. DETAILED DESCRIPTION: BIRDS**

The data layer BIRDS contains the polygons with bird species.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:
<u>GT-Polygons</u>	ID integer

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

ID

**5.1.2.2. ATTRIBUTE DEFINITION:**

A unique identifier which links to the POLY\_LUT table. The POLY\_LUT is a lookup table with two attributes: ID and RARNUM. ID is a concatenation of atlas number (4), element number (1), and record number. ID values of zero are holes in polygons and do not contain information. In the POLY\_LUT lookup table and the Biological Resources table (BIORES), the value of RARNUM is determined for each unique combination of ELEMENT, SPECIES\_ID, SEASON\_ID, and CONC. The items in BIORES are: RARNUM, SPECIES\_ID, CONC, SEASON\_ID, G\_SOURCE, S\_SOURCE, and ELEMENT. SPECIES\_ID is the numeric identifier of each species and is unique within each ELEMENT. CONC is the concentration of the species and can be LOW, MEDIUM, HIGH, or a numeric value representing the number of individuals. SEASON\_ID contains a numeric value according to the monthly presence of the species. Usually, there is one seasonality per species, but occasionally the same species has different monthly presence or breeding activity. When this occurs, a new record with a different seasonality is referenced. G\_SOURCE and S\_SOURCE are used for identifying sources which were unavailable during compilation of this atlas.

The following BIRDS species are found in the northern Lake Michigan ESI atlas:

SPECIES ID	NAME
1	Common loon
4	Red-necked grebe
5	Horned grebe
8	Double-crested cormorant
11	Whistling swan (tundra swan)
12	Canada goose
13	Brant
15	Snow goose
16	Mallard
17	Northern pintail
18	Green-winged teal
20	Northern shoveler
21	Canvasback
22	Greater scaup
23	Lesser scaup
24	Common goldeneye
26	Bufflehead
27	Oldsquaw
29	White-winged scoter
30	Surf scoter
32	Common merganser
33	Red-breasted merganser
34	American coot
38	Herring gull
40	Ring-billed gull
42	Bonaparte's gull
45	Common tern
54	Great blue heron
56	Spotted sandpiper
58	Greater yellowlegs
59	Lesser yellowlegs
60	Red knot
61	Pectoral sandpiper
62	Least sandpiper
63	Dunlin
66	Western sandpiper
67	Sanderling
69	Semipalmated plover
70	Killdeer
71	Black-bellied plover
73	Ruddy turnstone

SPECIES ID	NAME
76	Bald eagle
77	Osprey
89	Snowy egret
90	Black-crowned night heron
93	Cattle egret
97	Green-backed heron
107	Peregrine falcon
124	Redhead
136	Caspian tern
138	Forster's tern
148	Ruddy duck
153	Piping plover
156	Semipalmated sandpiper
162	Gadwall
164	Lesser golden plover
169	American wigeon
172	Sandhill crane
178	Least bittern
179	Pied-billed grebe
180	Ring-necked duck
181	Northern harrier
184	King rail
185	American bittern
186	Black duck
187	Virginia rail
188	Sora rail
189	Yellow rail
190	Blue-winged teal
191	Wood duck
192	Common moorhen
193	Black tern
195	American woodcock
196	Common snipe
198	Hooded merganser
214	Solitary sandpiper
216	Belted kingfisher
217	Mute swan
1,001	Gulls
1,002	Shorebirds

### 5.1.2.3. ATTRIBUTE DEFINITION SOURCE:

Research Planning, Inc.

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE**

**DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal



**5.1. DETAILED DESCRIPTION: ESI**

The data layer ESI contains polygonal (GT-Polygons) and arc (Complete Chains) features for the ESI shoreline classification. The classification of the features is based upon *Guidelines for Developing Digital Environmental Sensitivity Index Atlases and Data-bases* (Michel, J. and J. Dahlin, 1993, Hazardous Materials Response and Assessment Division, NOAA). The ESI classification was performed 18-21 April 1994.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:
<u>Complete Chain</u>	ESI character LINE character SOURCE_ID integer ENVIR character
<u>GT-Polygons</u>	ESI character WATER_CODE character

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

ESI

**5.1.2.2. ATTRIBUTE DEFINITION:**

The item ESI contains values according to the ESI ranking of the shorelines and polygons. The ESI rankings progress from low to high susceptibility to oil spills. In many cases, the shorelines are also ranked with multiple codes such as 10A/5. The first number is the most landward shoreline type, fringing wetlands, with mixed sand and gravel beaches being the shoreline type closest to the water. The northern Lake Michigan shoreline types are listed below.

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:	5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:
1A	Exposed Rocky Cliffs
1B	Exposed, Solid Man-made Structures
1B/4	Exposed, Solid Man-made Structures/Sand Beaches

<b>5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:</b>	<b>5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:</b>
1B/6A	Exposed, Solid Man-made Structures/Gravel Beaches
1B/6B	Exposed, Solid Man-made Structures/Riprap Revetments, Groins, and Jetties
1B/8B	Exposed, Solid Man-made Structures/Sheltered, Solid Man-made Structures
2	Shelving Bedrock Shores
2/5	Shelving Bedrock Shores/Mixed Sand and Gravel Beaches
3	Eroding Scarps in Unconsolidated Sediments
4	Sand Beaches
4/2	Sand Beaches/Shelving Bedrock Shores
4/9B	Sand Beaches/Sheltered Sand/Mud Flats
4/10A	Sand Beaches/Fringing Wetlands
5	Mixed Sand and Gravel Beaches
5/2	Mixed Sand and Gravel Beaches/Shelving Bedrock Shores
5/9B	Mixed Sand and Gravel Beaches/Sheltered Sand/Mud Flats
5/10A	Mixed Sand and Gravel Beaches/Fringing Wetlands
6A	Gravel Beaches
6A/2	Gravel Beaches/Shelving Bedrock Shores
6A/10A	Gravel Beaches/Fringing Wetlands
6B	Riprap Revetments, Groins, and Jetties
6B/4	Riprap Revetments, Groins, and Jetties/Sand Beaches
6B/5	Riprap Revetments, Groins, and Jetties/Mixed Sand and Gravel Beaches
6B/6A	Riprap Revetments, Groins, and Jetties/Gravel Beaches
6B/10A	Riprap Revetments, Groins, and Jetties/Fringing Wetlands
6B/10B	Riprap Revetments, Groins, and Jetties/Extensive Wetlands
8B	Sheltered, Solid Man-made Structures
8B/1B	Sheltered, Solid Man-made Structures/Exposed, Solid Man-made Structures
8B/4	Sheltered, Solid Man-made Structures/Sand Beaches
8B/6A	Sheltered, Solid Man-made Structures/Gravel Beaches
9A	Sheltered, Vegetated Low Banks
9B	Sheltered Sand/Mud Flats
9B/5	Sheltered Sand/Mud Flats/Mixed Sand and Gravel Beaches
10A	Fringing Wetlands
10A/2	Fringing Wetlands/Shelving Bedrock Shores
10A/4	Fringing Wetlands/Sand Beaches
10A/5	Fringing Wetlands/Mixed Sand and Gravel Beaches

<b>5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:</b>	<b>5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:</b>
10A/6A	Fringing Wetlands/Gravel Beaches
10A/6B	Fringing Wetlands/Riprap Revetments, Groins, and Jetties
10A/9B	Fringing Wetlands/Sheltered Sand/Mud Flats
10B	Extensive Wetlands
10B/2	Extensive Wetlands/Shelving Bedrock Shores
10B/4	Extensive Wetlands/Sand Beaches
10B/5	Extensive Wetlands/Mixed Sand and Gravel Beaches
10B/6A	Extensive Wetlands/Gravel Beaches
10B/9B U	Extensive Wetlands/Sheltered Sand/Mud Flats Unclassified

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**  
ordered

**5.1.2.1. ATTRIBUTE LABEL:**  
LINE

**5.1.2.2. ATTRIBUTE DEFINITION:**  
Type of geographic feature

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**  
Research Planning, Inc.

<b>5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:</b>	<b>5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:</b>
S	Shoreline

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**  
nominal

**5.1.2.1. ATTRIBUTE LABEL:**

SOURCE\_ID

**5.1.2.2. ATTRIBUTE DEFINITION:**

Data source for the ESI

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED  
DOMAIN VALUE:**

**5.1.2.4.1.2. ENUMERATED DOMAIN  
VALUE DEFINITION:**

0	Digital
1	Overflight
3	Digitized off topo

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

U.S. Army Corps of Engineers,  
digitized by State of Michigan from  
1982, 1:24,000 aerial photographs

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1.2.1. ATTRIBUTE LABEL:**

ENVIR

**5.1.2.2. ATTRIBUTE DEFINITION:**

Type of geographic feature

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED  
DOMAIN VALUE:**

**5.1.2.4.1.2. ENUMERATED DOMAIN  
VALUE DEFINITION:**

L	Lacustrine
---	------------

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1.2.1. ATTRIBUTE LABEL:**

WATER\_CODE

**5.1.2.2. ATTRIBUTE DEFINITION:**

Specifies a polygon as either water or land

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED  
DOMAIN VALUE:**

**5.1.2.4.1.2. ENUMERATED DOMAIN  
VALUE DEFINITION:**

---

L	Land
---	------

---

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

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**5.1. DETAILED DESCRIPTION: FISH**

The data layer FISH contains the polygons with fish species.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:	
<u>GT-Polygons</u>	ID	integer
<u>Complete Chains</u>	ID	integer

**5.1.2. ATTRIBUTES:****5.1.2.1. ATTRIBUTE LABEL:**

ID

**5.1.2.2. ATTRIBUTE DEFINITION:**

Both the GT-Polygons and the Complete Chains have a unique identifier which links to the POLY\_LUT and the ARC\_LUT, respectively. The POLY\_LUT and the ARC\_LUT are lookup tables with two attributes: ID and RARNUM. ID is a concatenation of atlas number (4), element number (2), and record number. ID values of zero are holes in polygons and do not contain information. In the POLY\_LUT lookup table, the ARC\_LUT lookup table, and the Biological Resources table (BIORES), the value of RARNUM is determined for each unique combination of ELEMENT, SPECIES\_ID, SEASON\_ID, and CONC. The items in BIORES are: RARNUM, SPECIES\_ID, CONC, SEASON\_ID, G\_SOURCE, S\_SOURCE, and ELEMENT. SPECIES\_ID is the numeric identifier of each species and is unique within each ELEMENT. CONC is the concentration of the species and can be LOW, MEDIUM, HIGH, or a numeric value representing the number of individuals. SEASON\_ID contains a numeric value according to the monthly presence of the species. Usually, there is one seasonality per species, but occasionally the same species has different monthly presence or breeding activity. When this occurs, a new record with a different seasonality is referenced. G\_SOURCE and S\_SOURCE are

used for identifying sources which were unavailable during compilation of this atlas.

The following FISH species are found in the northern Lake Michigan ESI atlas:

SPECIES ID	NAME
68	Chinook salmon (king) (a)
69	Coho salmon (silver) (a)
70	Pink salmon (humpy)
74	Rainbow trout (steelhead) (a)
84	Rainbow smelt (a)
85	Alewife (a)
100	Brown trout
144	Atlantic salmon (a)
152	Yellow perch
161	Lake sturgeon
162	Carp
165	Lake whitefish
166	Brook trout (a)
167	Lake trout
168	Spottail shiner
174	Longnose sucker (a)
175	White sucker (a)
178	Rock bass
179	Largemouth bass
180	Smallmouth bass
181	Black crappie
182	Bluegill
185	Northern pike (a)
188	Walleye
190	White bass
201	Channel catfish
212	Pumpkinseed
237	Burbot
238	Round whitefish (menomonee)
239	Splake
248	Common shiner

The species names with “(a)” are those associated with the arcs or complete chains. All of the species in this list are found in the GT-Polygon data.

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.



**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE**

**DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

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**5.1. DETAILED DESCRIPTION: HABITATS**

The data layer HABITATS contains the polygons with plant species.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:
<u>GT-Polygons</u>	ID integer

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

ID

**5.1.2.2. ATTRIBUTE DEFINITION:**

A unique identifier which links to the POLY\_LUT table. The POLY\_LUT is a lookup table with two attributes: ID and RARNUM. ID is a concatenation of atlas number (4), element number (3), and record number. ID values of zero are holes in polygons and do not contain information. In the POLY\_LUT lookup table and the Biological Resources table (BIORES), the value of RARNUM is determined for each unique combination of ELEMENT, SPECIES\_ID, SEASON\_ID, and CONC. The items in BIORES are: RARNUM, SPECIES\_ID, CONC, SEASON\_ID, G\_SOURCE, S\_SOURCE, and ELEMENT. SPECIES\_ID is the numeric identifier of each species and is unique within each ELEMENT. CONC is the concentration of the species and can be LOW, MEDIUM, HIGH, or a numeric value representing the number of individuals. SEASON\_ID contains a numeric value according to the monthly presence of the species. Usually, there is one seasonality per species, but occasionally the same species has different monthly presence or breeding activity. When this occurs, a new record with a different seasonality is referenced. G\_SOURCE and S\_SOURCE are used for identifying sources which were unavailable during compilation of this atlas.

The following HABITATS species are found in the northern Lake Michigan ESI atlas:

<b>SPECIES ID</b>	<b>NAME</b>
12	Pitcher's thistle (Dune thistle)

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1. DETAILED DESCRIPTION: HYDRO**

The data layer HYDRO contains polygonal water and land features as well as linear features for rivers and streams that are tidally influenced. This layer was created using the digital shoreline provided by the U.S. Army Corps of Engineers.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:
<u>Complete Chains</u>	LINE character SOURCE_ID integer
<u>GT-Polygons</u>	WATER_CODE character

The LINE, SOURCE\_ID, and WATER\_CODE attributes are the same as in the ESI coverage. This coverage contains all annotation used in producing the atlas.

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

LINE

**5.1.2.2. ATTRIBUTE DEFINITION:**

Type of geographic feature

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:**

**5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:**

B	Breakwater
H	Hydrography or stream features
I	Index for map/quad boundary
S	Shoreline

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1.2.1. ATTRIBUTE LABEL:**

SOURCE\_ID

**5.1.2.2. ATTRIBUTE DEFINITION:**

Data source for the ESI

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED  
DOMAIN VALUE:**

**5.1.2.4.1.2. ENUMERATED DOMAIN  
VALUE DEFINITION:**

---

0

Digital

---

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**  
nominal

**5.1.2.1. ATTRIBUTE LABEL:**

WATER\_CODE

**5.1.2.2. ATTRIBUTE DEFINITION:**

Specifies a polygon as either water or land

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED  
DOMAIN VALUE:**

**5.1.2.4.1.2. ENUMERATED DOMAIN  
VALUE DEFINITION:**

---

W  
L  
U

Water  
Land  
Unclassified

---

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**  
nominal

**5.1. DETAILED DESCRIPTION: INDEX**

The data layer INDEX contains the map boundaries for each quad/map in the atlas.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:
<u>GT-Polygons</u>	TILE-NAME      character
	TOPO-NAME      character
	SCALE            integer
	MAPANGLE       fraction
	PAGESIZE        character

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

TILE-NAME

**5.1.2.2. ATTRIBUTE DEFINITION:**

The TILE-NAME contains the map number according to the specified layout of the atlas. During the map production process the value of tile-name is plotted on the map product to order the maps in a coherent manner. The values for each polygon are unique and range from 1 through 70.

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

ordered

**5.1.2.1. ATTRIBUTE LABEL:**

TOPO-NAME

**5.1.2.2. ATTRIBUTE DEFINITION:**

USGS 1:24,000 topographic map name. Some polygons straddle two or more maps and all map names are included in this attribute. The date (latest/revised) of the USGS maps are also included in this field.

**5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:**

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE**

**DEFINITION SOURCE:**

Research Planning, Inc.

## NORTHERN LAKE MICHIGAN METADATA

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ATWOOD, MICH. (1983)  
BAY SHORE, MICH. (1983); FOREST BEACH, MICH. (1983)  
BEAVER ISLAND NORTH, MICH. (1986)  
BEAVER ISLAND NORTH, MICH. (1986); HIGH ISLAND, MICH. (1986)  
BEAVER ISLAND SOUTH, MICH. (1986)  
BIG STONE BAY, MICH. (1975); POINTE AUX CHENES, MICH. (1975)  
BLISS, MICH. (1982); BIG STONE BAY, MICH. (1975)  
BOYNE CITY, MICH. (1983); BAY SHORE, MICH. (1983)  
BREVORT, MICH. (1975)  
CEDAR RIVER, MICH. (1986)  
CENTRAL LAKE, MICH. (1983)  
CHARLEVOIX, MICH. (1983)  
CHIPPEWA POINT, MICH. (1985)  
CROSS VILLAGE, MICH. (1982)  
DEVILS CORNER, MICH. (1985)  
ELK RAPIDS, MICH. (1983)  
ELLSWORTH, MICH. (1983)  
EMPIRE, MICH. (1983)  
ENGADINE, MICH. (1973)  
EPOUFETTE, MICH. (1975)  
ESCANABA, MICH. (1985)  
FAIRPORT, MICH. (1985)  
FAYETTE, MICH. (1985)  
FORD RIVER, MICH. (1985)  
GARDEN, MICH. (1985)  
GARDEN CORNERS, MICH. (1985)  
GARDEN ISLAND WEST, MICH. (1980)  
GILLS PIER, MICH. (1983); LELAND, MICH. (1983)  
GLADSTONE, MICH. (1985)  
GLEN ARBOR, MICH. (1983)  
GLEN HAVEN, MICH. (1983)  
GOOD HARBOR, MICH. (1983)  
GOOD HART, MICH. (1982)  
GULL ISLAND, MICH. (1986)  
GULLIVER, MICH. (1972)  
HIRAM POINT, MICH. (1983)  
HOG ISLAND EAST, MICH. (1986)  
HOG ISLAND WEST, MICH. (1986)  
HOG ISLAND POINT, MICH. (1973)  
HUGHES POINT, MICH. (1972); MILAKOKIA LAKE, MICH. (1972)  
IRONTON, MICH. (1983); CHAREVOIX, MICH. (1983)  
KENNETH, MICH. (1964); POINTE AUX CHENES, MICH. (1975)  
LEVERING, MICH. (1982); McGULPIN POINT, MICH. (1976)  
MANISTIQUE EAST, MICH. (1972)  
MANISTIQUE WEST, MICH. (1983)  
MAPLETON, MICH. (1983)  
MAYFIELD, MICH. (1983); TRAVERSE CITY SE, MICH. (1983)  
MAYWOOD, MICH. (1985)  
McGULPIN POINT, MICH. (1976); MORAN, MICH. (1976)



NAHMA, MICH. (1985)  
 NAUBINWAY, MICH. (1973)  
 NORTH MANITOU ISLAND, MICH. (1983)  
 NORTHPORT, MICH. (1983)  
 NORTHPORT NW, MICH. (1983)  
 OGONTZ, MICH. (1985)  
 OMENA, MICH. (1983); GILLS PIER, MICH. (1983)  
 PENINSULA POINT, MICH. (1985)  
 PETOSKEY, MICH. (1983); HARBOR SPRINGS, MICH. (1983)  
 POINT AUX BARQUES, MICH. (1983)  
 POINT DETOUR, MICH. (1985)  
 POINT PATTERSON, MICH. (1973); GOULD CITY, MICH. (1973)  
 RAPID RIVER, MICH. (1985); PERKINS, MICH. (1985)  
 SEAGULL POINT, MICH. (1989); HENDERSON LAKES, MICH. (1985)  
 SEUL CHOIX POINT, MICH. (1972)  
 SOUTH FOX ISLAND, MICH. (1986)  
 SOUTH MANITOU ISLAND, MICH. (1983)  
 SUTTONS BAY, MICH. (1983)  
 TRAVERSE CITY SW, MICH. (1983)  
 WAUGOSHANCE ISLAND, MICH. (1982)  
 WASHINGTON ISLAND NE, WIS.-MICH. (1982)  
 WILLIAMSBURG, MICH. (1983)

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1.2.1. ATTRIBUTE LABEL:**

SCALE

**5.1.2.2. ATTRIBUTE DEFINITION:**

SCALE contains the value of the denominator of the scale at which the INDEX polygon is plotted in the final map product.

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:**

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41,000

42,000

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**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE**

**DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1.2.1. ATTRIBUTE LABEL:**

MAPANGLE

**5.1.2.2. ATTRIBUTE DEFINITION:**

MAPANGLE contains a value (usually negative) to rotate the final map product so that it is situated straight up and down.

**5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:**

---

-0.135  
-0.045  
0.00  
0.044  
0.045  
0.133  
0.222  
0.309  
0.310  
0.311  
0.314  
0.397  
0.398  
0.399  
0.402  
0.403  
0.404  
0.406  
0.45  
0.485  
0.486  
0.487  
0.488  
0.492  
0.495  
0.496  
0.575  
0.580  
0.582  
0.585  
0.663  
0.674  
0.724  
0.750  
0.764  
0.766  
0.797  
0.854

0.942  
0.944  
0.135  
0.224  
0.225  
0.315  
1.032  
1.117  
1.120  
1.122  
1.124  
1.207  
1.209  
1.212  
1.293  
1.299  
1.302  
1.389  
1.392  
1.395  
1.478  
1.481  
1.565  
1.568  
1.651

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**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1.2.1. ATTRIBUTE LABEL:**

PAGESIZE

**5.1.2.2. ATTRIBUTE DEFINITION:**

PAGESIZE contains the value of the width and height of the map in the final map product.

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:**

---

11,17

4,4

4.5,5

17,11

---

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1. DETAILED DESCRIPTION: NESTS**

The data layer NESTS contains entity points representing nesting sites.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:
<u>Entity Points</u>	ID integer

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

ID

**5.1.2.2. ATTRIBUTE DEFINITION:**

A unique identifier which links to the PNTS\_LUT table. The PNTS\_LUT is a lookup table with two attributes: ID and RARNUM. ID is a concatenation of atlas number (6), element number (5), and record number. In the PNTS\_LUT lookup table and the Biological Resources table (BIORES), the value of RARNUM is determined for each unique combination of ELEMENT, SPECIES\_ID, SEASON\_ID, and CONC. The items in BIORES are: RARNUM, SPECIES\_ID, CONC, SEASON\_ID, G\_SOURCE, S\_SOURCE, and ELEMENT. SPECIES\_ID is the numeric identifier of each species and is unique within each ELEMENT. CONC is the concentration of the species and can be LOW, MEDIUM, HIGH, or a numeric value representing the number of individuals. SEASON\_ID contains a numeric value according to the monthly presence of the species. Usually, there is one seasonality per species, but occasionally the same species has different monthly presence or breeding activity. When this occurs, a new record with a different seasonality is referenced. G\_SOURCE and S\_SOURCE are used for identifying sources which were unavailable during compilation of this atlas.

The following NESTS are found in the northern Lake Michigan ESI atlas:

<b>SPECIES ID</b>	<b>NAME</b>
38	Herring gull
40	Ring-billed gull
54	Great blue heron
77	Osprey

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

**5.1. DETAILED DESCRIPTION: SOCECON**

The data layer SOCECON contains the entity points and complete chains for the human use data.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:	
<u>Complete Chain</u>	SOCECON	character
<u>Entity Points</u>	SOCECON	character
	ID	integer

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

SOCECON

**5.1.2.2. ATTRIBUTE DEFINITION:**

Identifies a line or point with a socio-economic, or human use, feature. This attribute allows direct access to the type of feature instead of linking to the more detailed SOC\_DATA table.

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE DEFINITION SOURCE:**

Research Planning, Inc.

5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:	5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:
A	Airport (P)
A2	Access (P)
AQ	Aquaculture (P)
AS	Archaeological Site (P)
B	Recreational Beach (P)
BR	Boat Ramp (P)
CG	Coast Guard (P)
F	Ferry (P)
HS	Historical Site (P)
M	Marina (P)
NP	National Park (P & L)
P	Park (P & L)
SB	State Border (L)

5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:	5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:
W I	Water Intake (P)
W R	Wildlife Refuge (P & L)

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**  
nominal

**5.1.2.1. ATTRIBUTE LABEL:**  
ID

**5.1.2.2. ATTRIBUTE DEFINITION:**  
A unique identifier which links to the SOC\_LUT table. SOC\_LUT is a lookup table with two attributes: ID and HUNUM. ID is a concatenation of atlas number (4), element number (10), and record number. HUNUM is the link to the socio-economic data found in the SOC\_DATA table. The table SOC\_DATA contains the feature type (SOC\_TYPE), name of the feature (NAME), contact agency or person (CONTACT), telephone number (PHONE), geographic source number (G\_SOURCE), and attribute source number (A\_SOURCE).

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**  
Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**  
nominal



**5.1. DETAILED DESCRIPTION: T\_MAMMAL**

The data layer T\_MAMMAL contains the polygons with terrestrial mammal species.

**5.1.1. ENTITY TYPES:**

5.1.1.1. ENTITY TYPE LABEL:	5.1.1.2. ENTITY TYPE DEFINITION:
GT-Polygons	ID integer

**5.1.2. ATTRIBUTES:**

**5.1.2.1. ATTRIBUTE LABEL:**

ID

**5.1.2.2. ATTRIBUTE DEFINITION:**

A unique identifier which links to the POLY\_LUT table. The POLY\_LUT is a lookup table with two attributes: ID and RARNUM. ID is a concatenation of atlas number (4), element number (9), and record number. ID values of zero are holes in polygons and do not contain information. In the POLY\_LUT lookup table and the Biological Resources table (BIORES), the value of RARNUM is determined for each unique combination of ELEMENT, SPECIES\_ID, SEASON\_ID, and CONC. The items in BIORES are: RARNUM, SPECIES\_ID, CONC, SEASON\_ID, G\_SOURCE, S\_SOURCE, and ELEMENT. SPECIES\_ID is the numeric identifier of each species and is unique within each ELEMENT. CONC is the concentration of the species and can be LOW, MEDIUM, HIGH, or a numeric value representing the number of individuals. SEASON\_ID contains a numeric value according to the monthly presence of the species. Usually, there is one seasonality per species, but occasionally the same species has different monthly presence or breeding activity. When this occurs, a new record with a different seasonality is referenced. G\_SOURCE and S\_SOURCE are used for identifying sources which were unavailable during compilation of this atlas.

The following T\_MAMMAL species are found in the Northern Lake Michigan ESI atlas:

<b>SPECIES ID</b>	<b>NAME</b>
113	River otter
114	Beaver
37	Muskrat
38	Mink
44	Northern raccoon

**5.1.2.3. ATTRIBUTE DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.4.1.3. ENUMERATED DOMAIN VALUE  
DEFINITION SOURCE:**

Research Planning, Inc.

**5.1.2.5. ATTRIBUTE UNITS OF MEASUREMENT:**

nominal

## 6.0. DISTRIBUTION INFORMATION

### 6.1. DISTRIBUTOR

#### 6.1.1. CONTACT PERSON PRIMARY

##### 6.1.1.1. CONTACT PERSON:

Robert Pavia

##### 6.1.1.2. CONTACT ORGANIZATION:

NOAA

#### 6.1.4. CONTACT ADDRESS

##### 6.1.4.1. ADDRESS TYPE:

Physical Address

##### 6.1.4.2. ADDRESS:

7600 Sand Point Way N.E., Bin C15700

##### 6.1.4.3. CITY:

Seattle

##### 6.1.4.4. STATE OR PROVINCE:

W A

##### 6.1.4.5. POSTAL CODE:

98115

#### 6.1.5. CONTACT VOICE TELEPHONE:

(206) 526-6319

#### 6.1.7. CONTACT FACSIMILE TELEPHONE:

(206) 526-6329

### 6.2. RESOURCE DESCRIPTION:

ESI Atlas for Northern Lake Michigan

### 6.3. DISTRIBUTION LIABILITY:

Although this data has been processed successfully on a computer system at the National Oceanic and Atmospheric Administration, no warranty, expressed or implied, is made by NOAA regarding the utility of the data on any other system, nor shall the act of distribution constitute any such warranty. NOAA warrants the delivery of this product in computer-readable format, and will offer a replacement copy of the product when the product is determined unreadable by computer input peripherals, or when the physical medium is delivered in damaged condition.

### 6.5. CUSTOM ORDER PROCESS

Contact NOAA for distribution options (see 6.1.1.).

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**7.0. METADATA REFERENCE INFORMATION**

**7.1. METADATA DATE:**

19970228

**7.2. METADATA REVIEW DATE:**

19941115

**7.4. METADATA CONTACT**

**7.4.1. CONTACT PERSON PRIMARY**

**7.4.1.1. CONTACT PERSON:**

Joanne Halls

**7.4.1.2. CONTACT ORGANIZATION:**

Research Planning, Inc.

**7.4.3. CONTACT POSITION:**

Director, GIS Dept.

**7.4.4. CONTACT ADDRESS**

**7.4.4.1. ADDRESS TYPE:**

Physical Address

**7.4.4.2. ADDRESS:**

1121 Park Street

**7.4.4.3. CITY:**

Columbia

**7.4.4.4. STATE OR PROVINCE:**

South Carolina

**7.4.4.5. POSTAL CODE:**

29201

**7.4.5. CONTACT VOICE TELEPHONE:**

(803) 256-7322

**7.4.7. CONTACT FACSIMILE TELEPHONE:**

(803) 254-6445

**7.4.8. CONTACT ELECTRONIC MAIL ADDRESS:**

joanne@researchplanning.com

**7.5. METADATA STANDARD NAME:**

Content Standards for Digital Geospatial Metadata

**7.6. METADATA STANDARD VERSION:**

19940608

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