

WESTERN LAKE MICHIGAN ENVIRONMENTAL SENSITIVITY INDEX METADATA

April 1997

Prepared By:

National Oceanic and Atmospheric Administration
Hazardous Materials Response and Assessment Division
7600 Sand Point Way, Northeast
Seattle, Washington 98115

FILE DESCRIBES: Digital data for 1993 Western Lake Michigan Environmental Sensitivity Index.

FILE CREATED BY: NOAA Hazardous Materials Response & Assessment Division
N/ORCA3
7600 Sand Point Way
Seattle, WA 98115
Phone: 206-526-6317
Fax: 206-526-6329
email: library@hazmat.noaa.gov

FILE CREATED ON: 19970328

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 Metadata 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 (SDTS), 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., 1200 Park Street, Post Office Box 328, Columbia, South Carolina 29202

1.1.2. PUBLICATION DATE:

199304

1.1.4. TITLE:

Sensitivity of Coastal Environments and Wildlife to Spilled Oil: Western 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:

Western 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 U.S. Coast Guard, Ninth Coast Guard District

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 Western 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 16-19 September 1991. The biological and human-use resources data were compiled by regional biologists in 1992. 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:

-88.125

1.5.1.2. EAST BOUNDING COORDINATE:

-86.750

1.5.1.3. NORTH BOUNDING COORDINATE:

45.500

1.5.1.4. SOUTH BOUNDING COORDINATE:

42.491

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:

Shoreline of Western Lake Michigan, to encompass the lakeshore for the states of Wisconsin and Michigan

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 Jay Rodstein, Project Facilitator. The U.S. Coast Guard provided the funding for the project and the efforts of LCDR Michael Tobbe towards securing the funds are greatly appreciated. Air support was provided by the Ninth District Air Station,

Chicago. MST 1 Craig Wellman of the Marine Safety Office in Milwaukee provided much of the human-use data.

Joel Trick of the U.S. Fish and Wildlife Service in Green Bay, Wisconsin collected all of the biological data for the maps, as well as coordinated the review of the biological data. Many local, state, and federal resource agency personnel contributed to the biological information shown on the maps. They include: Wisconsin Department of Natural Resources - Fish Managers: Mike Coshun, Paul Peeters, Mark Holey, Terry Lychwick, and Brian Belonger; Wildlife Managers: Thomas Becker, Mark Anderson, Dale Katsma, Tim Grunewald, Tom Bahti, and Roger Amundson; Former Wildlife Managers: Leroy Lintereur and Dan Olson; Bureau of Endangered Resources: Diane Hills-Mochon and June Dobberpuhl; Michigan Department of Natural Resources - Gary Schnicke, Jim Hamill.

Roger Gauthier and Gordon Thompson from the U.S. Army Corps of Engineers, Detroit District provided the digital base maps as well as color infrared aerial photographs that were used to confirm overflight observations.

Also contributing information on biological and human-use resources were Thomas Erdman (Richter Museum of Natural History); H.J. Harris, Gary Fewless, and Jim Lubner (University of Wisconsin); Mark Walter (Bay-Lakes Regional Planning Commission); Don Reed (Southeast Wisconsin Regional Planning Commission); Ken Stromberg (U.S. Fish and Wildlife Service); Greg Septon (Milwaukee Public Museum); and Richard Dexter (Historic Preservation Division, State Historical Preservation Society of Wisconsin).

At Research Planning, Inc., Jacqueline Michel was the project manager and geologist. Jeffrey Dahlin was the project biologist and responsible for the data structure and automation. James Olsen, Scott Johnson, William Holton, and Nilesh Shiroff worked diligently to complete the data entry and generate the final map product. Graphics support was provided by Joseph Holmes, Rebecca Cox, and Mark White. Dot Zaino prepared the text. Jack Moore was the project coordinator.

1.13. NATIVE DATA SET ENVIRONMENT:

The software packages used to develop the atlas are Environmental Systems Research Institute's ARC/INFO® (version 7.0.3) 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	poly_lut.e00
seasonal.e00	soc_data.e00	soc_lut.e00
socecon.e00	species.e00	

The entire data set is approximately 20 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. 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 socioeconomic layers. All layers use the shoreline as the geographic reference. The biological and human-use 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.

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 that 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 Western Lake Michigan were mapped during overflights conducted from 16-19 September 1991. 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 (August 1988) provided by the U.S. Army Corps of Engineers 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, mammals, and habitats.

Each ELEMENT corresponds to a coverage or geographic theme. There are three attribute tables, BIORES, SEASONAL, and SPECIES, that are used to store the complex biological data (Fig. 1). Each biological data layer (BIRDS, FISH, and HABITATS) 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 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.

The SPECIES data table contains the species identification number (SPECIES_ID), 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 list for threatened or endangered species (DATE_PUB), biology element (ELEMENT), and the biology subelement (SUBELEMENT). The item SUBELEMENT refers to the grouping of the species within each ELEMENT:

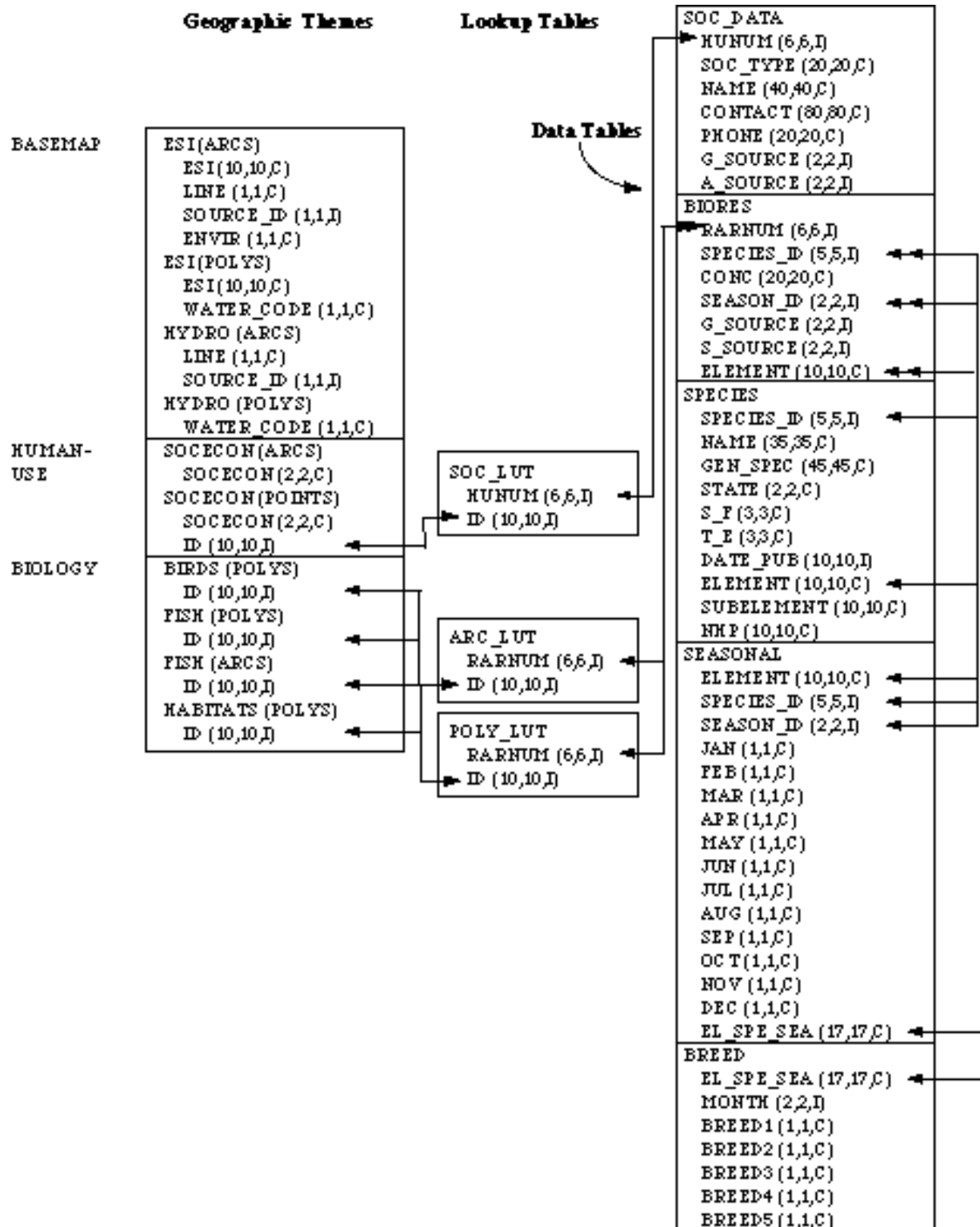


FIGURE 1. Relationships between data layers, lookup tables, and data tables.

ELEMENT	SUBELEMENT
Bird	diving
	gull_tern
	passerine
	raptor
	shorebird
	wading
	waterfowl
Fish	anadromous
	special
Habitat	shrub

Human-use Resources:

Several human-use, or socioeconomic, 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 (5), 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
Campground	CP	Regional or State Park	P
Coast Guard	CG	Wildlife Refuge	WR
Commercial Fishing	CF		
Diving	DV		
Ferry	F		
Factory	F2		
Hoist	H		
Helipad	HP		
Historical Site	HS		
Lock and Dam	LD		
Log Storage	LS		

Entity Points		Chains	
Feature	SOCECON	Feature	SOCECON
Marina	M	Beach	B
Mining	MZ	Indian Reservation	IR
Oil Facilities	OF	International Border	IB
Platform	PF	Marine Sanctuary	MS
Recreational Fishing	RF	National Park	NP
Subsistence	S	Pipeline	P
Well	W	Regional or State Park	P
Water Intake	WI	Wildlife Refuge	WR

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 that 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
U.S. Fish and Wildlife Service	1992	Sensitive Biological Resources	Hardcopy	Green Bay, WI	N/A	1992
Robbins, S.D.	1991	Wisconsin Bird Life, Population and Distribution, Past and Present	Text	The University of Wisconsin Press, Madison, WI	N/A	Unknown
Erdman, Thomas, Richter Museum of Natural History	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
University of Wisconsin	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Bay-Lakes Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Southeast Wisconsin Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Milwaukee Public Museum	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992

2.5.1. SOURCE INFORMATION:

Data layer or theme name: ESI

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
Research Planning, Inc.	1991	Shoreline Habitat Classification	Hard copy map	N/A	24000	1991
U.S. Army Corps of Engineers	Unknown	Digital Shorelines	Digital complete chains	N/A	24000	Unknown
U.S. Army Corps of Engineers	Unknown	Color infrared aerial photographs	Photos	N/A	24000	Unknown

2.5.1. SOURCE INFORMATION:

Data layer or theme name: FISH

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
U.S. Fish and Wildlife Service	1992	Sensitive Biological Resources	Hardcopy	Green Bay, WI	N/A	1992
Erdman, Thomas, Richter Museum of Natural History	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
University of Wisconsin	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Bay-Lakes Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992

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2.5.1.1.1	2.5.1.1.2	2.5.1.1.4	2.5.1.1.6	2.5.1.1.8	2.5.1.2	2.5.1.4
Originator	Publication Date	Title	Geospatial Data Presentation Form	Publication Information	Source Scale Denominator	Source Time Period
Southeast Wisconsin Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Milwaukee Public Museum	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Becker, G.C.	1983	Fishes of Wisconsin	Text	The University of Wisconsin Press, Madison, WI	N/A	Unknown
Coberly, C.	1980	Fish Spawning Grounds in Wisconsin Waters of the Great Lakes	Text	University of Wisconsin Sea Grant Institute, Madison, WI	N/A	Unknown

2.5.1. SOURCE INFORMATION:

Data layer or theme name: HABITATS

2.5.1.1. SOURCE CITATION

2.5.1.1.1	2.5.1.1.2	2.5.1.1.4	2.5.1.1.6	2.5.1.1.8	2.5.1.2	2.5.1.4
Originator	Publication Date	Title	Geospatial Data Presentation Form	Publication Information	Source Scale Denominator	Source Time Period
Wisconsin Department of Natural Resources, Bureau of Endangered Resources	1992	State or Federal List of Threatened or Endangered Plants	Hardcopy	N/A	N/A	1992
Erdman, Thomas, Richter Museum of Natural History	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992

2.5.1.1.1	2.5.1.1.2	2.5.1.1.4	2.5.1.1.6	2.5.1.1.8	2.5.1.2	2.5.1.4
Originator	Publication Date	Title	Geospatial Data Presentation Form	Publication Information	Source Scale Denominator	Source Time Period
University of Wisconsin	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Bay-Lakes Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Southeast Wisconsin Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Milwaukee Public Museum	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992

2.5.1. SOURCE INFORMATION:

Data layer or theme name: HYDRO

2.5.1.1. SOURCE CITATION

2.5.1.1.1	2.5.1.1.2	2.5.1.1.4	2.5.1.1.6	2.5.1.1.8	2.5.1.2	2.5.1.4
Originator	Publication Date	Title	Geospatial Data Presentation Form	Publication Information	Source Scale Denominator	Source Time Period
Research Planning, Inc.	1991	Shoreline Habitat Classification	Hard copy map	N/A	24000	1991
U.S. Army Corps of Engineers	Unknown	Digital Shorelines	Digital complete chains	N/A	24000	Unknown
U.S. Army Corps of Engineers	Unknown	Color infrared aerial photographs	Photos	N/A	24000	Unknown

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
U.S. Coast Guard	1992	Access Sites, Airports, Boat Ramps, Coast Guard Stations, Hoists, Marinas, and Water Intakes	Hardcopy	N/A	N/A	1992
Research Planning, Inc.	1991	Airports, Marinas	Hardcopy	N/A	N/A	1991
U.S. Geological Survey	Varies	7.5 minute Topographic Human-use Features, Airports, and Parks	Hardcopy	U.S. Geological Survey, Reston, VA	24000	Varies
State Historic Preservation Society of Wisconsin	1992	Archaeological Sites and Historical Sites	Hardcopy	N/A	Unknown	1992
U.S. Coast Guard	Unknown	MSO Area Plan	Text	Marine Safety Office, Milwaukee, WI	N/A	Unknown
Erdman, Thomas, Richter Museum of Natural History	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
University of Wisconsin	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Bay-Lakes Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992

2.5.1.1.1	2.5.1.1.2	2.5.1.1.4	2.5.1.1.6	2.5.1.1.8	2.5.1.2	2.5.1.4
Originator	Publication Date	Title	Geospatial Data Presentation Form	Publication Information	Source Scale Denominator	Source Time Period
Southeast Wisconsin Regional Planning Commission	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992
Milwaukee Public Museum	1992	Biology and Human-use Information	Hardcopy	N/A	N/A	1992

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. 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 socioeconomic 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 that 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:

199304

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:

WA

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

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	188	188	393	15,769			247
ESI	1	365	365	4,155	44,230			4,012
FISH	1	269	269	560	39,881			454
HABITATS	1	36	36	36	2,020			35
HYDRO	1	202	202	402	66,130	1,276		361
SOCECON				4,888	28,226		495	5,838

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4.0. SPATIAL REFERENCE INFORMATION

4.1. HORIZONTAL COORDINATE SYSTEM DEFINITION

4.1.1. GEOGRAPHIC

4.1.1.1. LATITUDE RESOLUTION:

0.00005

4.1.1.2. LONGITUDE RESOLUTION:

0.00005

4.1.1.3. GEOGRAPHIC COORDINATE UNITS:

Decimal Degrees

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

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 that 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 (2), element number (1), and record number. ID values of zero are holes in polygons and do not contain information. In the lookup table (POLY_LUT) and biological resources table (BIORES), the value of RARNUM is determined for each unique combination of ELEMENT, SPECIES_ID, SEASON_ID, and CONC and links to the biology table, BIORES. 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 is unknown in this atlas. 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 that were unavailable during compilation of this atlas.

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

SPECIES ID	NAME
1	Common loon
5	Horned grebe
8	Double-crested cormorant
11	Whistling swan (tundra swan)
12	Canada goose
16	Mallard
18	Green-winged teal
20	Northern shoveler
21	Canvasback
22	Greater scaup
23	Lesser scaup
24	Common goldeneye
26	Bufflehead
27	Oldsquaw
32	Common merganser
33	Red-breasted merganser
34	American coot
38	Herring gull
40	Ring-billed gull
45	Common tern
54	Great blue heron
56	Spotted sandpiper
61	Pectoral sandpiper
62	Least sandpiper
63	Dunlin
67	Sanderling
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
172	Sandhill crane
178	Least bittern

SPECIES ID	NAME
179	Pied-billed grebe
180	Ring-necked duck
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
216	Belted kingfisher
218	Red-shouldered hawk
220	Merlin
224	Sedge wren
225	Marsh wren
226	Red-winged blackbird
228	Brewer's blackbird
229	Swamp sparrow
233	Northern goshawk
274	Yellow-headed blackbird

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: ESI

The data layer ESI contains 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 16-19 September 1991.

5.1.1. ENTITY TYPES:

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

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 Western 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, Hard Man-made Structures
1B/5	Exposed, Hard Man-made Structures/Mixed Sand and Gravel Beaches

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

5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:	5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:
8A/5	Sheltered Scarps in Bedrock/Mixed Sand and Gravel Beaches
8B	Sheltered Man-made Structures
8B/9A	Sheltered Man-made Structures/Sheltered Vegetated Low Banks
9A	Sheltered Vegetated Low Banks (P)
9B	Sheltered Sand/Mud Flats
10A	Fringing Wetlands
10A/2A	Fringing Wetlands/Shelving Bedrock Shores
10A/4	Fringing Wetlands/Sand Beaches
10A/5	Fringing Wetlands/Mixed Sand and Gravel Beaches
10A/6A	Fringing Wetlands/Gravel Beaches
10A/6B	Fringing Wetlands/Riprap Revetments, Groins, and Jetties
10A/8A	Fringing Wetlands/Sheltered Scarps in Bedrock
10A/9B	Fringing Wetlands/Sheltered Sand/Mud Flats
10B	Extensive Wetlands (P)
10B/4	Extensive Wetlands/Sand Beaches
10B/6B	Extensive Wetlands/Riprap Revetments, Groins, and Jetties
10B/9B	Extensive Wetlands/Sheltered Sand/Mud Flats
U	Unranked

NOTE: Domain values with “P” are included as complex polygons and all values are found as complete chains.

**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.

**5.1.2.4.1.1. ENUMERATED
DOMAIN VALUE:**

**5.1.2.4.1.2. ENUMERATED DOMAIN
VALUE DEFINITION:**

M
S

Marsh
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 (Corps of Engineers)

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

U.S. Army Corps of Engineers

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
U

Lacustrine
Unranked

**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 and arcs 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:

A unique identifier that 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 (2), element number (2), and record number. The value of RARNUM 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 is unknown in this atlas. 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 variables that hold metadata information. The information for these variables was unavailable during compilation of this atlas.

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

SPECIES ID	NAME
68	Chinook salmon (king) (A) (P)
69	Coho salmon (silver) (A) (P)
70	Pink salmon (humpy) (P)
74	Rainbow trout (steelhead) (A) (P)
84	Rainbow smelt (A) (P)
85	Alewife (A) (P)
100	Brown trout (A) (P)
144	Atlantic salmon (P)
145	White perch (P)
152	Yellow perch (A) (P)
161	Lake sturgeon (P)
162	Carp (A) (P)
163	Gizzard shad (A) (P)
165	Lake whitefish (P)
166	Brook trout (A) (P)
167	Lake trout (A) (P)
168	Spottail shiner (A) (P)
174	Longnose sucker (A) (P)
175	White sucker (A) (P)
176	Yellow bullhead (A) (P)
178	Rock bass (A) (P)
179	Largemouth bass (P)
180	Smallmouth bass (A) (P)
181	Black crappie (P)
182	Bluegill (A) (P)
185	Northern pike (A) (P)
186	Muskellunge (P)
187	Sauger (P)
188	Walleye (A) (P)
190	White bass (P)
191	Shorthead redhorse (P)
201	Channel catfish (A) (P)
211	Brown bullhead (A) (P)
212	Pumpkinseed (P)
237	Burbot (P)
239	Splake (P)
240	Greater redhorse (P)
241	Striped shiner (P)
242	Redfin shiner (A)
243	Longear sunfish (P)
244	Golden redhorse (P)
245	Silver redhorse (P)
246	Black bullhead (A) (P)

SPECIES ID	NAME
247	Emerald shiner (A) (P)
248	Common shiner (A) (P)
249	Logperch (P)

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 that 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 (2), element number (3), and record number. The value of RARNUM 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 are polygons and are unknown. 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 variables that hold metadata information. The information for these variables was unavailable during compilation of this atlas.

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

SPECIES ID	NAME
12	Pitcher's thistle (Dune thistle)
13	Clustered broomrape

SPECIES ID	NAME
24	Thickspike wheatgrass
25	Moonwort
26	Sand reed
27	Garber's sedge (Elk sedge)
28	Chestnut sedge
29	Northern comandra
30	Pale false foxglove
31	Dwarf lake iris
32	Smooth phlox
34	Sand dune willow
35	Lake Huron tansy
36	False asphodel
65	Grass-of-parnassus
220	Prairie white-fringed orchid

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 coverage 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:**

GT-Polygons
Complete Chains

5.1.1.2. ENTITY TYPE DEFINITION:

WATER_CODE character
LINE character
SOURCE_ID integer

The WATER_CODE, LINE, and SOURCE_ID attributes are the same as in the ESI coverage. This data layer contains all annotation used in producing the atlas.

5.1.2. ATTRIBUTES:**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:

W
L
U

5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:

Water
Land
Unmapped

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:

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:**

H	Hydrography or stream features
I	Map Index
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. 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:**

Complete Chain
Entity Points

5.1.1.2. ENTITY TYPE DEFINITION:

SOCECON character
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 socioeconomic, 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)
AS	Archaeological Site (P)
BR	Boat Ramp (P)
CB	City Border (L)
CF	Commercial Fishing (P & L)
F	Ferry (P)
HS	Historical Site (P)
M	Marina (P)
P	Park (P & L)
R	Road (L)
RR	Railroad (L)

5.1.2.4.1.1. ENUMERATED DOMAIN VALUE:	5.1.2.4.1.2. ENUMERATED DOMAIN VALUE DEFINITION:
SB	State Border (L)
WI	Water Intake (P)
WR	Wildlife Refuge (P)

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 that 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 (2), element number (10), and record number. HUNUM is the link to the socioeconomic 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

6.0. DISTRIBUTION INFORMATION

6.1. DISTRIBUTOR

6.1.1. CONTACT PERSON PRIMARY

6.1.1.1. CONTACT PERSON:

John Kaperick

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:

WA

6.1.4.5. POSTAL CODE:

98115

6.1.5. CONTACT VOICE TELEPHONE:

(206) 526-6400

6.1.7. CONTACT FACSIMILE TELEPHONE:

(206) 526-6329

6.2. RESOURCE DESCRIPTION:

ESI Atlas for Western 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:

19970328

7.2. METADATA REVIEW DATE:

19941115

7.4. METADATA CONTACT

7.4.1. CONTACT PERSON PRIMARY

7.4.1.1. CONTACT PERSON:

Jill Petersen

7.4.1.2. CONTACT ORGANIZATION:

NOAA HMRAD

7.4.3. CONTACT POSITION:

GIS Manager

7.4.4. CONTACT ADDRESS

7.4.4.1. ADDRESS TYPE:

Physical Address

7.4.4.2. ADDRESS:

7600 Sand Point Way N.E., Bin C15700

7.4.4.3. CITY:

Seattle

7.4.4.4. STATE OR PROVINCE:

Washington

7.4.4.5. POSTAL CODE:

98115

7.4.5. CONTACT VOICE TELEPHONE:

(206) 526-6944

7.4.7. CONTACT FACSIMILE TELEPHONE:

(206) 526-6329

7.4.8. CONTACT ELECTRONIC MAIL ADDRESS:

Jill_Petersen@hazmat.noaa.gov.us

7.5. METADATA STANDARD NAME:

Content Standards for Digital Geospatial Metadata

7.6. METADATA STANDARD VERSION:

19940608

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