

Integrated Coastal Data Model

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What is a Data Model

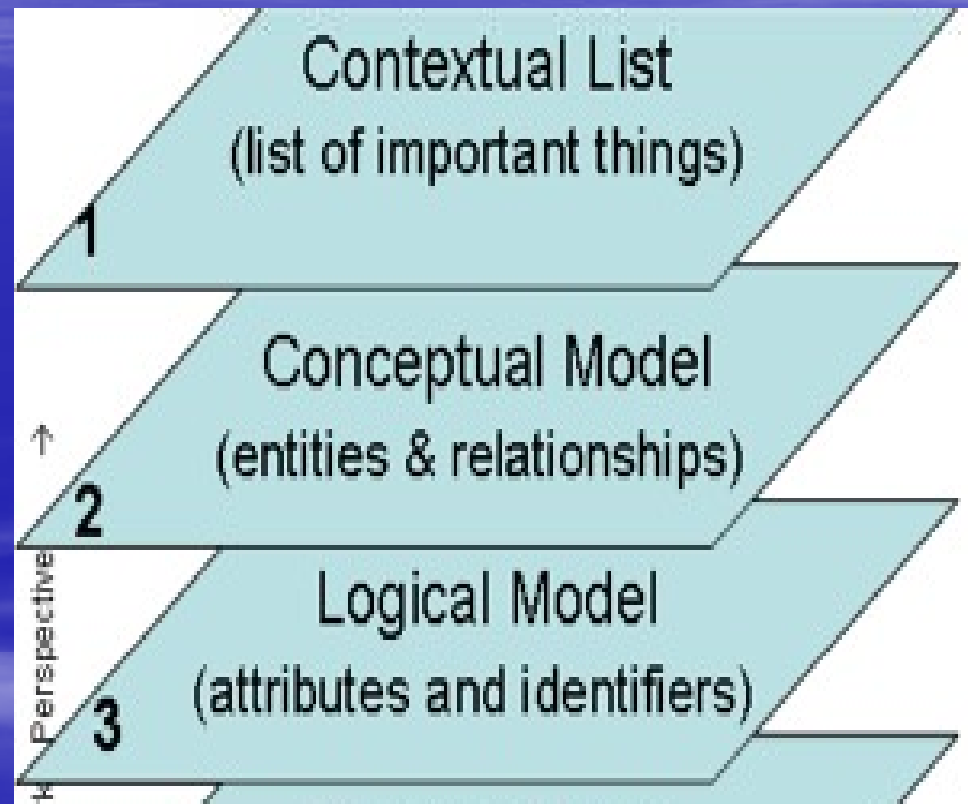
- Definition on Wiki:
 - A data model is an abstract model that describes how data is represented and accessed
 - Has two generally accepted meanings:
 1. A data model theory
 2. A data model instance

Data Model Theory

- Data Model Theory has three components:
 1. The structural part
 2. The integrity part
 3. The manipulation part

Data Model Instance

- Data modeling is the process of creating a data model instance by applying a data model theory



GIS Data Model

- The aim of a GIS data model is to provide a practical **template** for implementing GIS projects
- Constructing data models for GIS applications is the crucial first step of GIS projects.
- Data Model developed by ESRI:
ArcHydro, ArcMarine, Atmospheric

Why Do We Need Coastal GIS Data Model

- 50% to 80% of the costs for Coastal Zone Data Management are directly related to gathering and organizing the relevant data and information for the area in question.
- Lack of dissemination of knowledge is one of the major factors limiting the protection and restoration of coastal zones.

What do we care about in the Great Lakes area?

- Water Level Change
- Lake Stratification and Turnover
- Shore Erosion/Recession
- Wetlands
- Pollution and Toxic Contaminants
- Climate Change
- Land Use Patterns
- Transportation/Dredging
- Public Access

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What Have We Identified

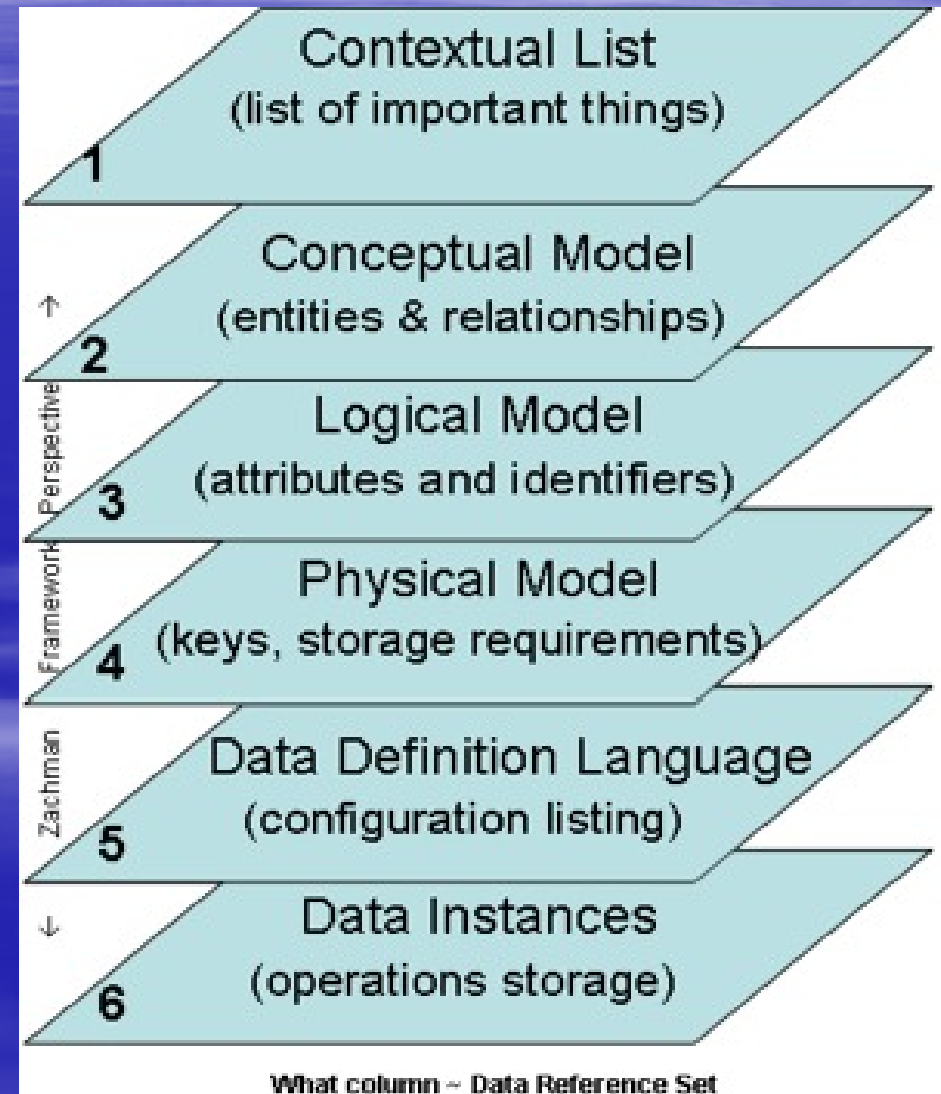
- No Regional Data Model Available for CZM in GL

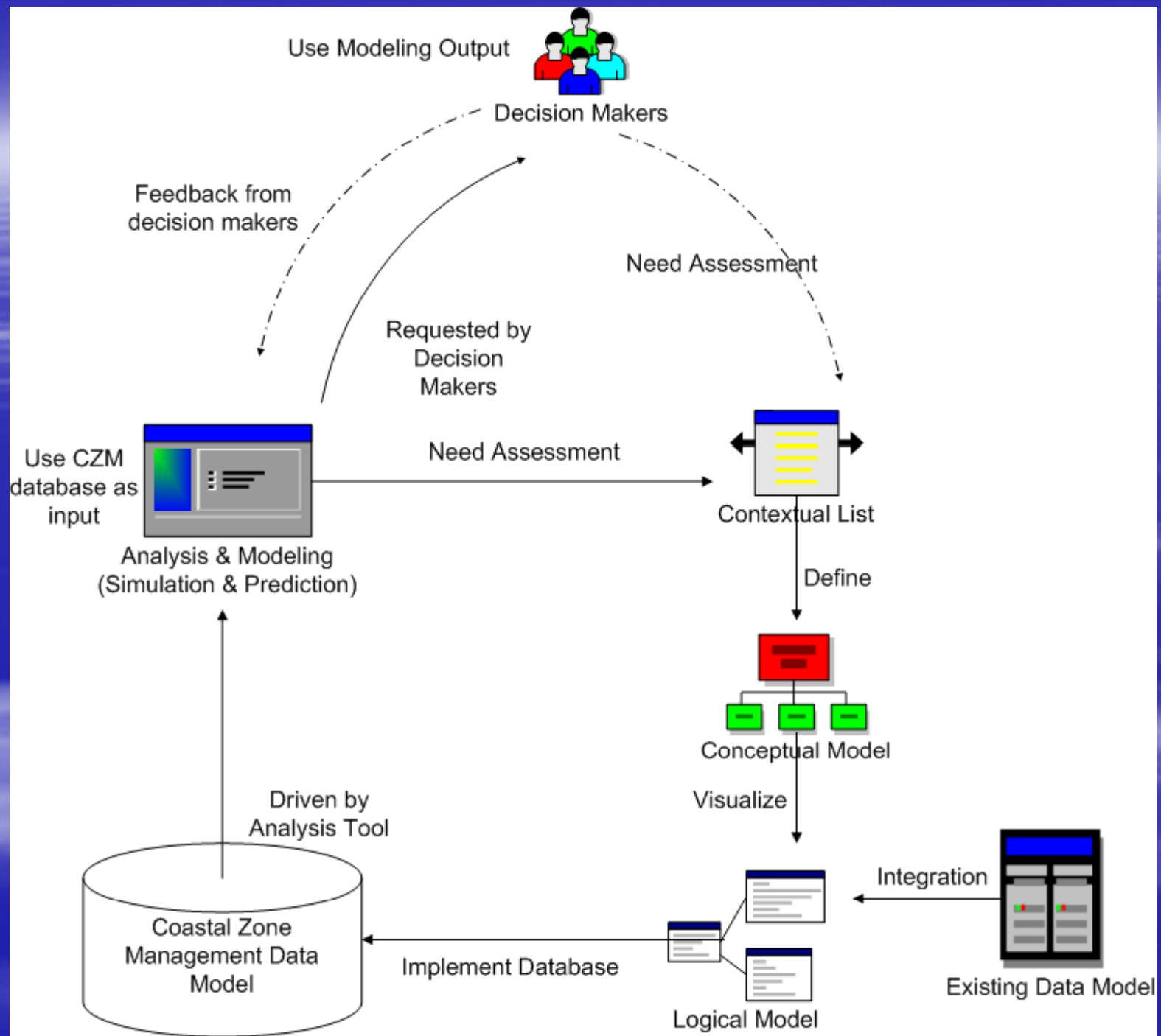
Well, no such a thing nationally either...

- Lots of Legacy Apps are running on various databases with different schemas.
- Data are not stored in identical formats.

The Procedure to Create a Coastal Data Model

- 1-3 Design Phase
- 4-6 Implementation Phase





The Characters of Coastal Data

- Terrestrial & Marine Components
- Spatial & Temporal Variability
- Environmental & Economical Concerns
- Information needed to support decision-making doesn't begin or end at the shoreline

Coastal Data Model Contextual List

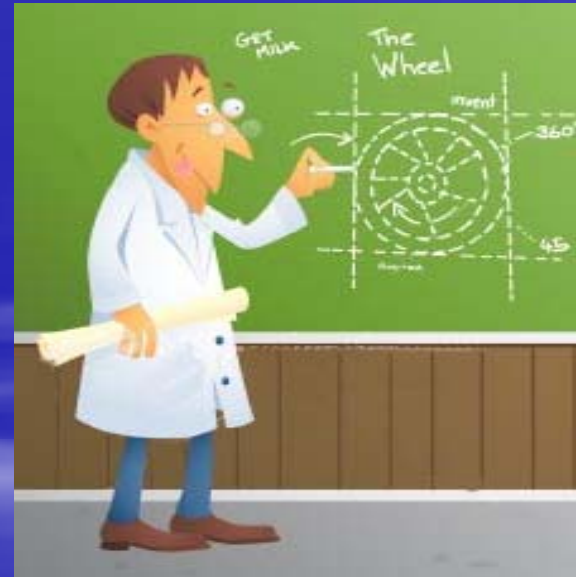
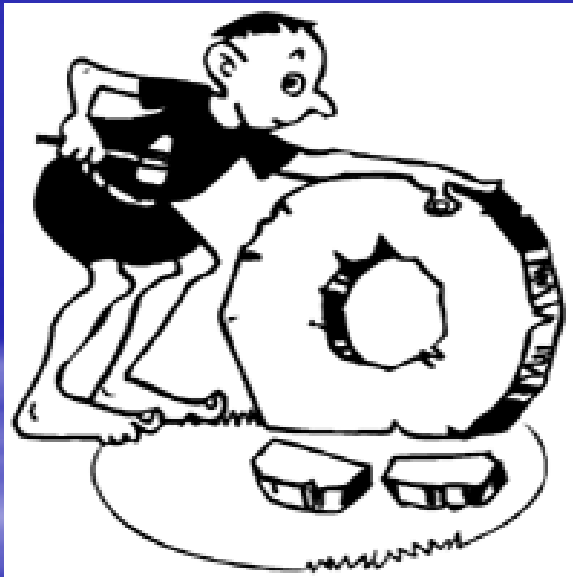
- Data Inventory
 - Shoreline
 - Water Resources
 - Other Natural Resources
 - Human Infrastructure/Impact
 - Soil
 - Real-time

Coastal Data Model Conceptual Model

- Describe the semantics of the organization
- Define the primary entities and relationships
- Visualized by Logical Model, such as ER Diagram or Object-Oriented Classes

Data Model Integration

- Build from Scratch



Data Model Integration

- Extract the concepts and features from existing data models
- Add new “coastal features” to the existing data models
- Not a really GENERIC model, not in a specific vendor’s format, but the backbone of an practical data model for CZM decision making.

Integrate ESRI Data Models

- AAA Method (NOT Auto Insurance)
Integrate ArcHydro, ArcMarine and possibly Atmospheric
 - Recognized that even the idea of “shoreline” is not common between ArcHydro and ArcMarine
 - Not a holy war, but they are only in ESRI format

Integrate Existing Dataset: NHD to Create the Logical Model

- Positional and descriptive data in the NHD provide the starting point for linking or geocoding various information
- Be updated periodically, including coastal line reaches
- Has been used already by CZM managers

What NHD doesn't include

- Shoreline classification
- Underground Water
- Real-time hydrological data

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Core Dataset of Coastal Data Model

- Core dataset is derived from NHD
- The initial coastline information comes from the content of USGS National Hydrography Dataset
- Refine the NHD coastline reach with shoreline classification
- Allows temporal datasets

Shoreline Classification Scheme

- Geomorphic Nature Classification
- Shoreline Protection Classification
- Nearshore Subaqueous Geomorphic nature Classification

Geomorphic Nature Classification

- 1 High (>15m) Bluff
- 2 High (>15m) Bluff with Beach
- 3 Low (<15m) Bluff
- 4 Low (<15m) Bluff with Beach
- 5 Sandy/Silty Banks
- 6 Clay Banks
- 7 Sandy Beach/Dunes
- 8 Coarse Beaches
- 9 Baymouth-Barrier Beaches
- 10 Bedrock (Resistant)
- 11 Bedrock (Non-resistant)
- 12 Low Riverine/Coastal Plain
- 13 Open Shoreline Wetlands
- 14 Semi-Protected Wetlands
- 15 Composite
- 16 U.S. Shore: Unclassified
- 16 Canadian Shore: Artificial
- 17 U.S. Shore: Artificial
- 17 Canadian Shore: Unclassified
- 99 Unclassified (coded by the compiler)

Shoreline Protection Classification

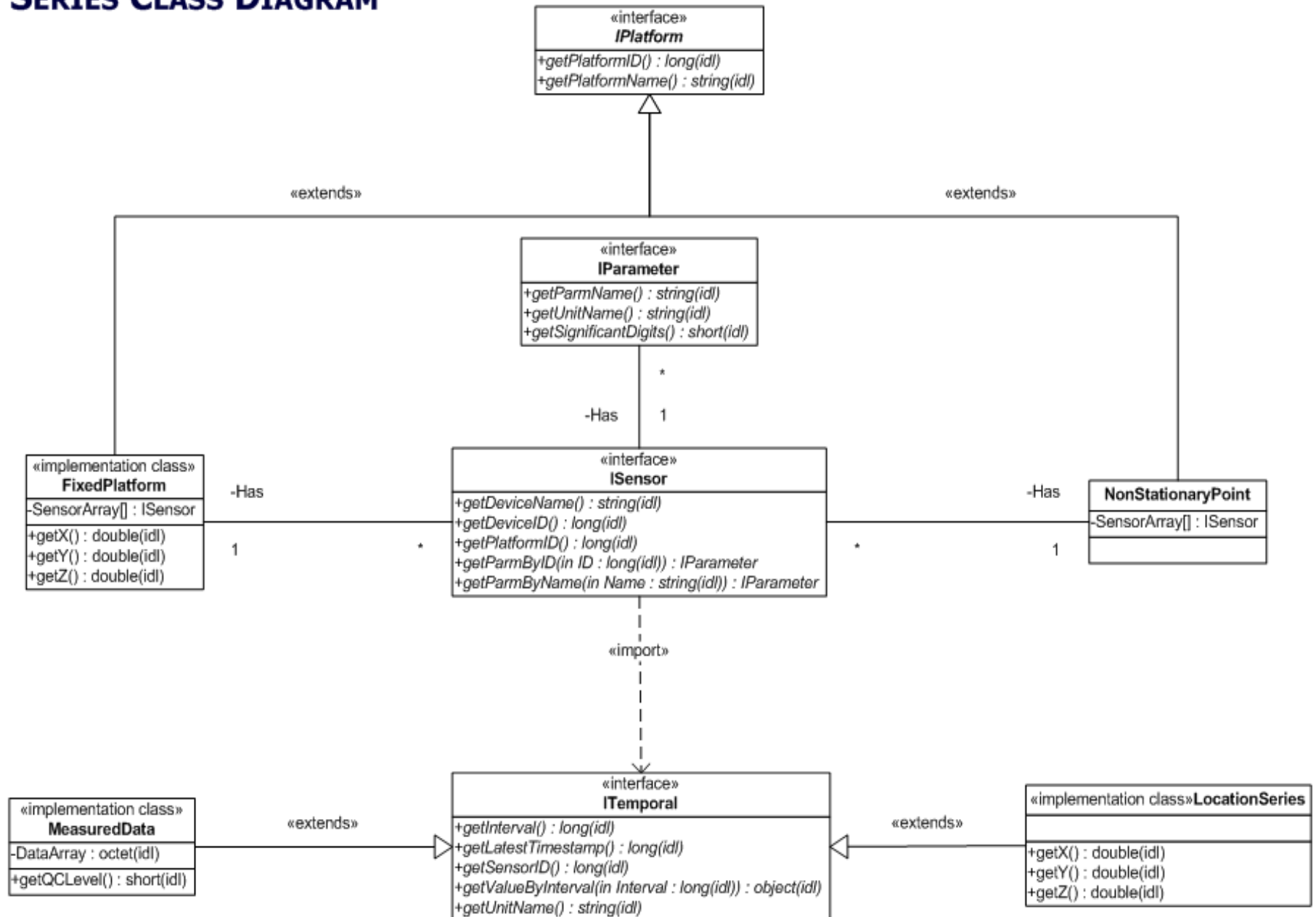
- 1 Highly Protected: 70-100 percent of reach/segment protected
- 2 Moderately Protected: 40-70 percent of reach/segment protected
- 3 Minor Protection: 15-40 percent of reach/segment protected
- 4 No Protection: <15 percent of reach/segment is protected
- 5 No Protection: <15 percent of reach/segment is protected
- 6 Unclassified
- 9 Unclassified (coded by the compiler)

Nearshore Subaqueous Nature Classification

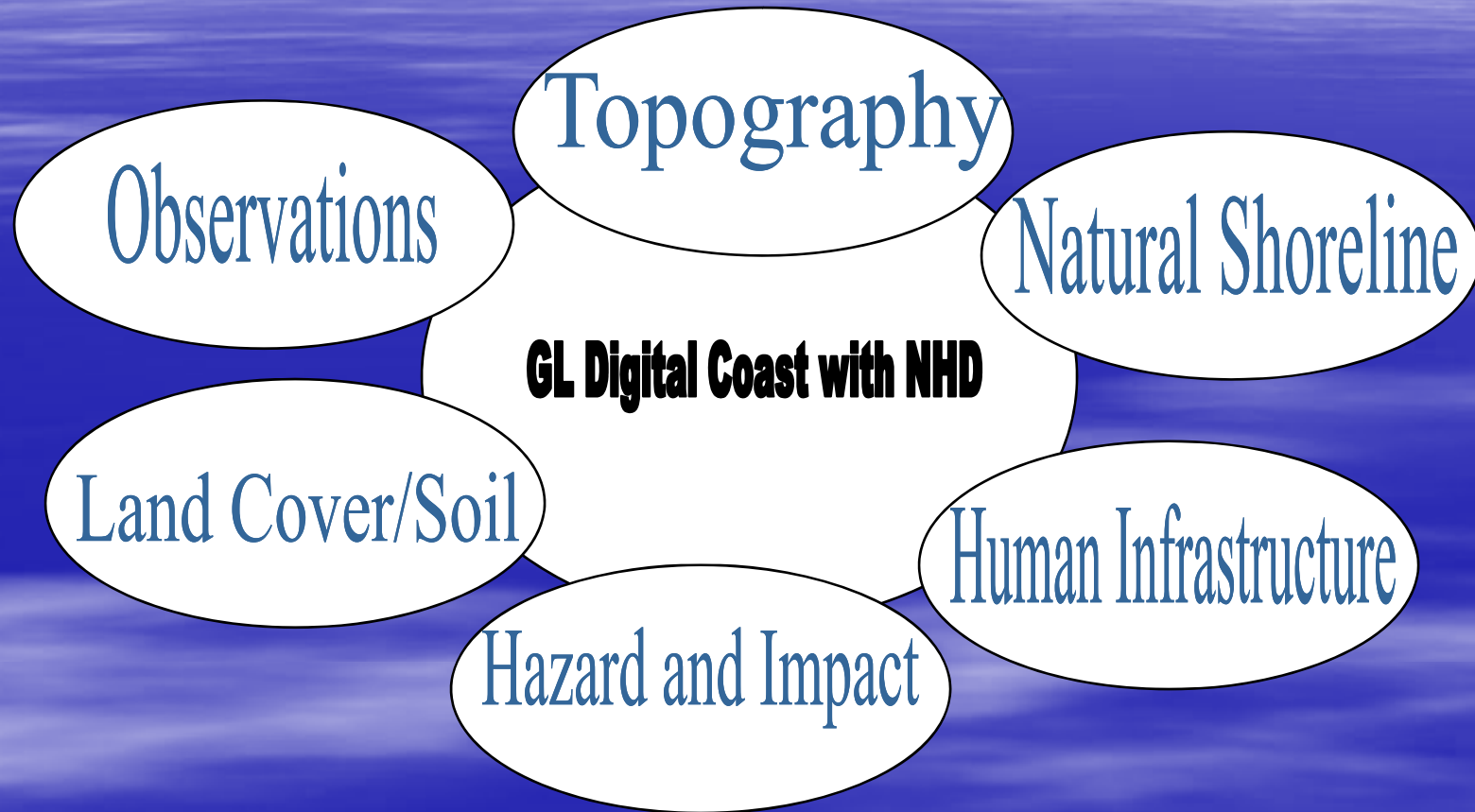
- 1 Clay
- 2 Sand
- 3 Sand/Gravel Lag Over Clay
- 4 Bedrock (Resistant)
- 5 Bedrock (Non-Resistant)
- 6 Unclassified
- 9 Unclassified (coded by the compiler)

GREAT LAKES COMMISSION COASTAL DATA MODEL

TIME SERIES CLASS DIAGRAM



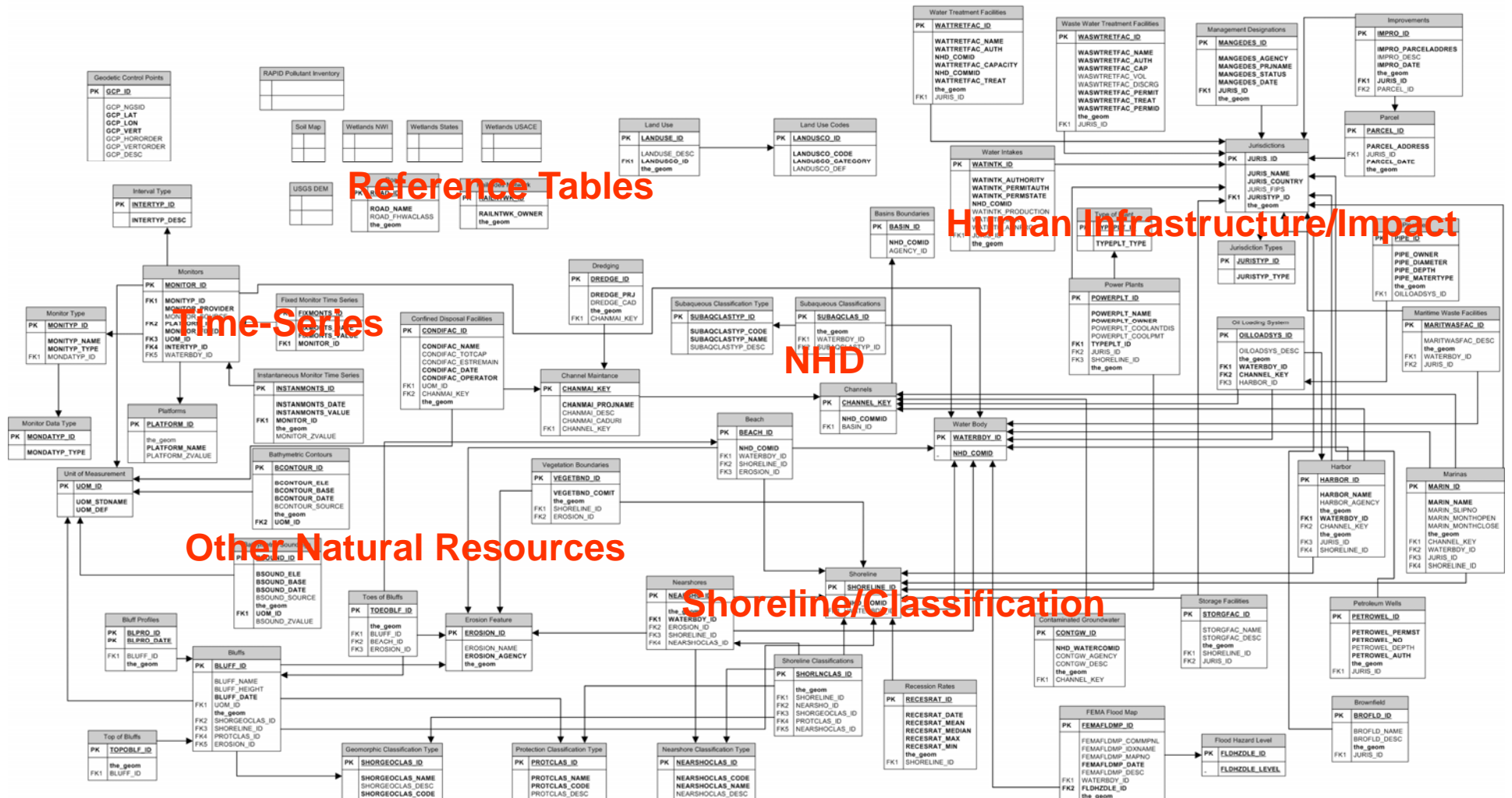
Great Lakes Digital Coast



Logical Data Model-ER Diagram

GREAT LAKES DIGITAL COAST CONCEPT

ER DIAGRAM(DRAFT) MAY 1, 2008



Data Model for Coastal Zone Management

- The overall aim of Coastal Data Model is to create a comprehensive, integrated and accessible dataset for **Decision-Making**.
- Access to the information in a timely fashion.
- Facilitate the modeling tools to assess shoreline variation.

Throw a brick and get the jade

- A hope that my crude remarks may draw forth valuable input from abler people.

It is Time to Discuss