

Developing a Prototype Marine Cadastre for Chedabucto Bay, Nova Scotia

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Keywords: Marine Cadastre; Marine Information System; Coastal Zone Management; Ocean Governance; Administration of Marine Spaces

ABSTRACT

The idea of a marine cadastre or marine information system has been an important focus of the geomatics community concerned with managing coastal and marine spaces, since at least 2001. The United States of America, Australia, South-East Asia and Canada are at least some of the entities that have seriously thought about implementing marine cadastres or marine information systems. The value of this tool to coastal zone management and the management of rights within marine spaces is well recognized.

The Coastal and Ocean Information Network for Atlantic Canada (COINAtlantic) is an “initiative of the Atlantic Coastal Zone Information Steering Committee (ACZISC) to develop, implement and sustain a network of data providers and users that will support secure access to data, information and applications, for decision-making by coastal and ocean managers and users of coastal and ocean space and resources” [COINAtlantic, 2009]. One component of this initiative is the development of a prototype marine cadastre for Chedabucto Bay, Nova Scotia, Canada. This component is being developed jointly by the University of New Brunswick, Canada and the University of the West Indies, Trinidad and Tobago. Work has been already begun on this component’s development and the application is available online in its current state, even as its development continues. This paper will outline the development to date of this application, its future development, and demonstrate the utility of this tool to serve the management of marine and coastal spaces.

Developing a Prototype Marine Cadastre for Chedabucto Bay, Nova Scotia

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1. INTRODUCTION

The Coastal and Ocean Information Network for Atlantic Canada (COINAtlantic) is an “initiative of the Atlantic Coastal Zone Information Steering Committee (ACZISC) to develop, implement and sustain a network of data providers and users that will support secure access to data, information and applications, for decision-making by coastal and ocean managers and users of coastal and ocean space and resources” [COINAtlantic, 2009]. COINAtlantic, supported by Geoconnections Canada, is developing a search utility that locates marine and coastal datasets and offers the user the option to add and display found datasets in a graphic map interface (Figure 1).

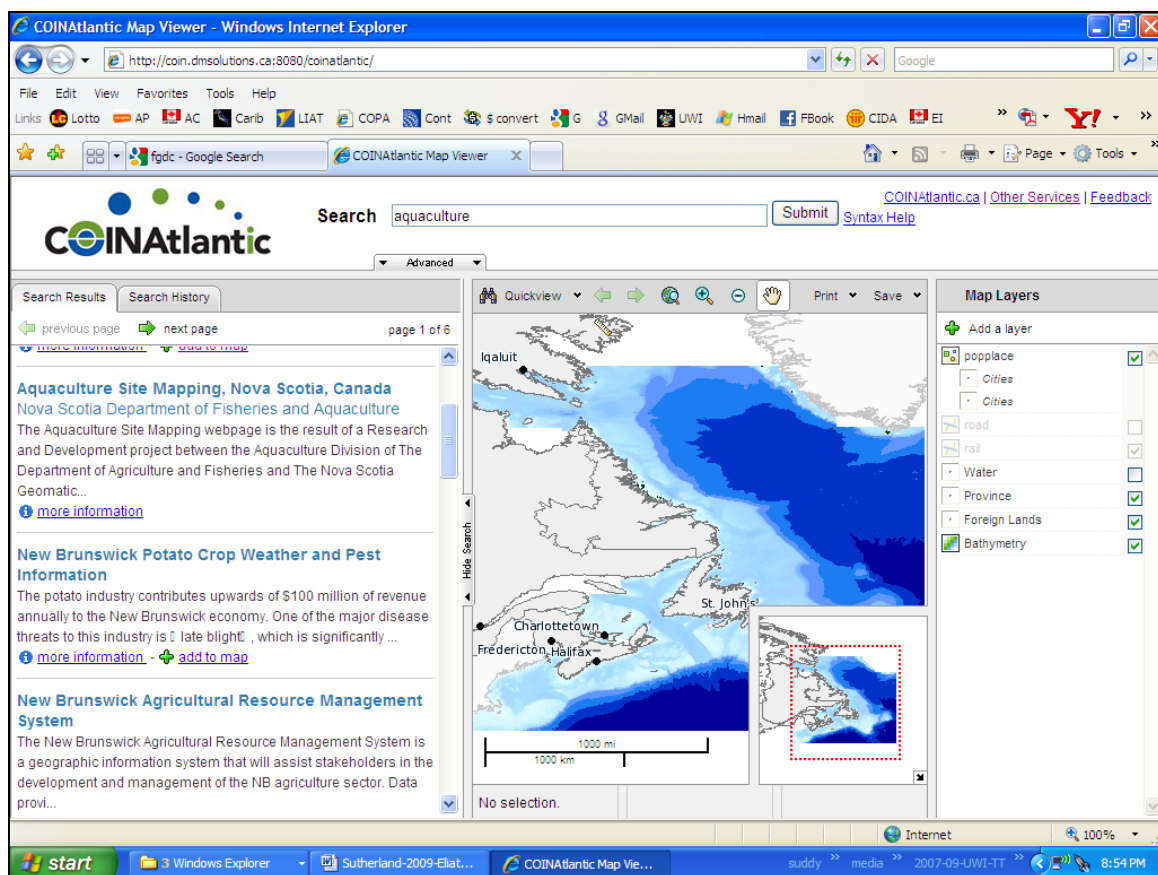


Figure 1 - COINAtlantic Search Utility

Another component of the COINAtlantic initiative is the development of a prototype marine cadastre for Chedabucto Bay, Nova Scotia, Canada. This component is accessed through the “Other Services” link at <http://www.marinebiodiversity.ca/COINAtlantic>. The prototype marine cadastre concept is being developed jointly by the University of New Brunswick,

Canada and the University of the West Indies, Trinidad and Tobago. Work has been already begun on this component's development and the application is available online in its current state, even as its development continues.

The idea of a marine cadastre or marine information system has been an important focus of the geomatics community concerned with managing coastal and marine spaces, since at least 2001. The United States of America, Australia, South-East Asia and Canada are at least some of the entities that have seriously thought about implementing marine cadastres or marine information systems [Collier, Leahy and Williamson, 2001; Ng'ang'a, Sutherland and Nichols, 2002; Sutherland, Wilkins, and Nichols, 2002; Barry, Elema and van der Molen, 2003; Binns et al., 2003; Ng'ang'a et al., 2004; Sutherland, 2004; Sutherland and Nichols, 2004; FGDC, 2008]. The value of this tool to coastal zone management and the management of rights within marine spaces is well recognized. This paper will outline the development to date of this application, its future development, and demonstrate the utility of this tool to serve the management of marine and coastal spaces.

2. DEVELOPING THE MARINE CADASTRE PROTOTYPE

The marine cadastre prototype is being developed on the concept that effective management of rights to marine and coastal spaces, as on land, will lead to efficient management of these spaces. This is because in the management of rights one is in effect managing people's relationships to one another, and to these spaces. All rights explicitly or implicitly relate to boundaries, whether these boundaries are clearly defined or fuzzy, and these boundaries have attached to them laws, rules, regulations, restrictions and responsibilities that define acceptable behaviour in these spaces. From this perspective, the management of boundary information directly supports good governance of these spaces [Sutherland, 2005].

The prototype is being developed as a Web Mapping tool using ESRI's ArcServer. ArcServer comes with certain functionalities that lend themselves well to the objectives of a marine cadastre. The data displayed can be queried by point-and-click methods and delivers text/attribute data results directly from linked spatial databases. The usual "zoom" and "pan" functions associated with most mapping utilities are also present. Additionally, certain query functionalities can be customized. Currently, the marine cadastre application is populated with Canadian national and provincial datasets, although the study area is Chedubucto Bay in Nova Scotia. The project is in the process of acquiring spatial datasets for the study area, but in the meanwhile the marine cadastre prototype retains some basic functionality and the datasets displayed can be queried. Figures 2 to 4 show various view samples, including queries from clicking on a point of interest on the map.

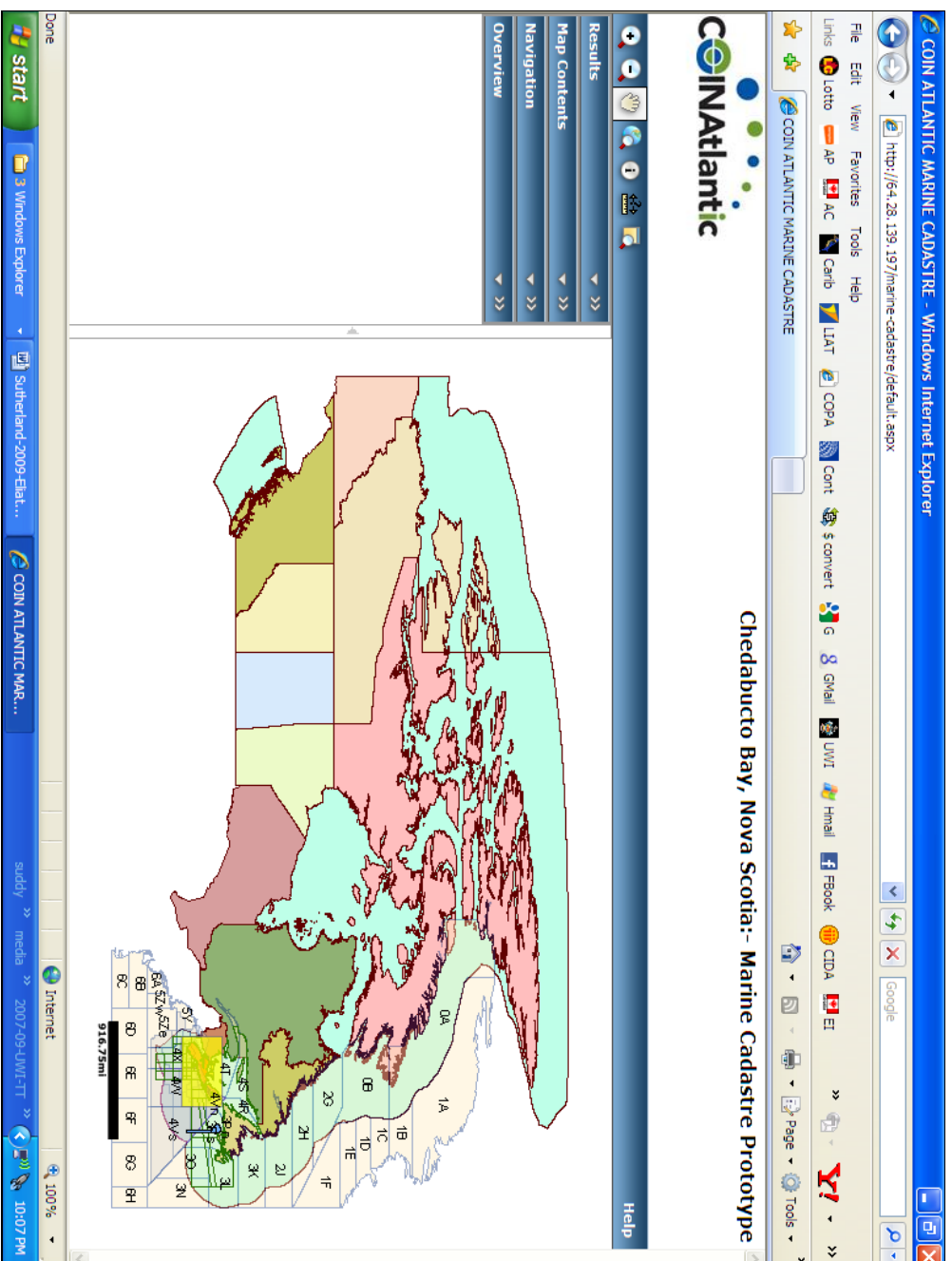


Figure 2 - COINAtlantic Marine Cadastre Prototype (Global View)

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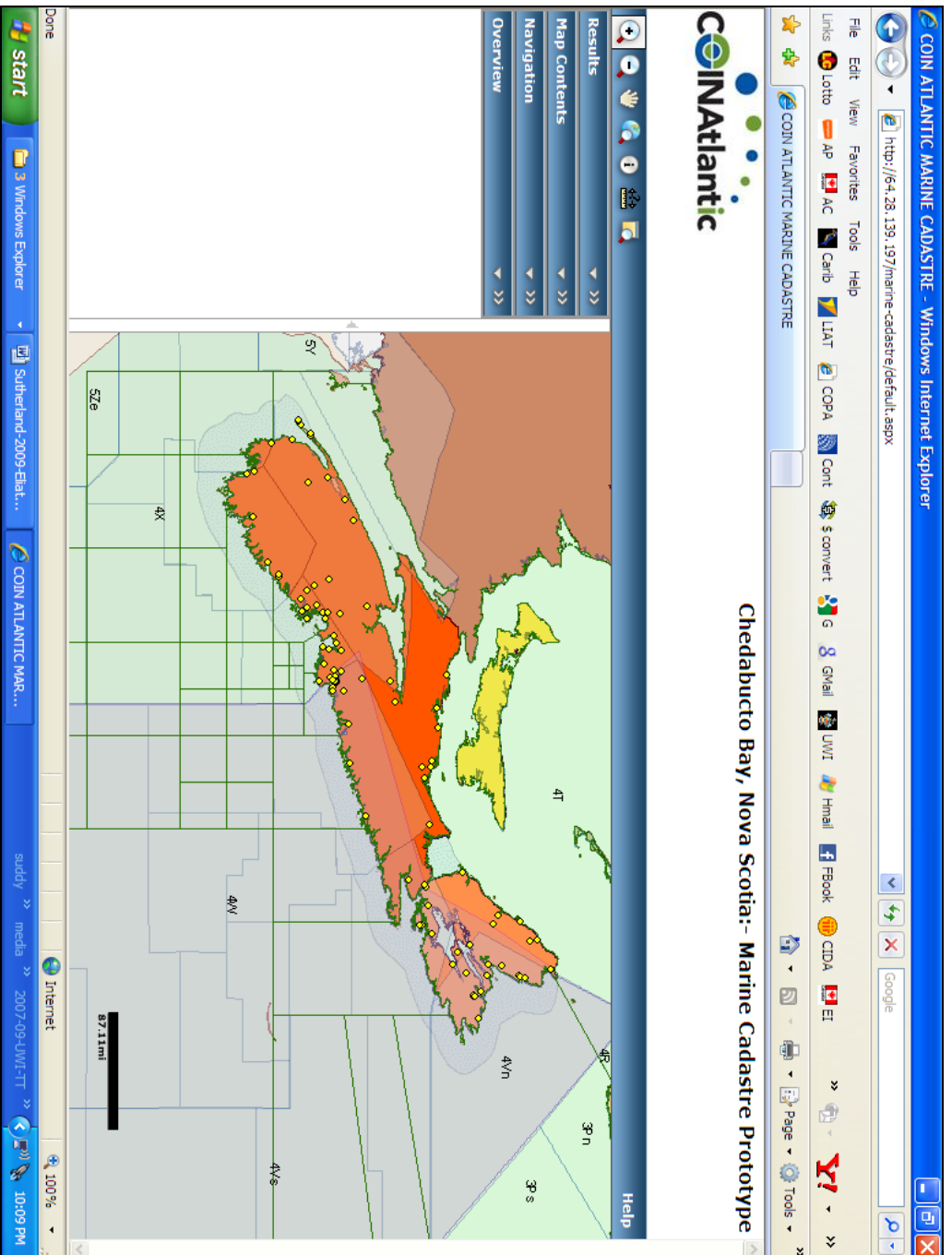


Figure 3 - COINAtlantic Marine Cadastre Prototype (Zoom View)

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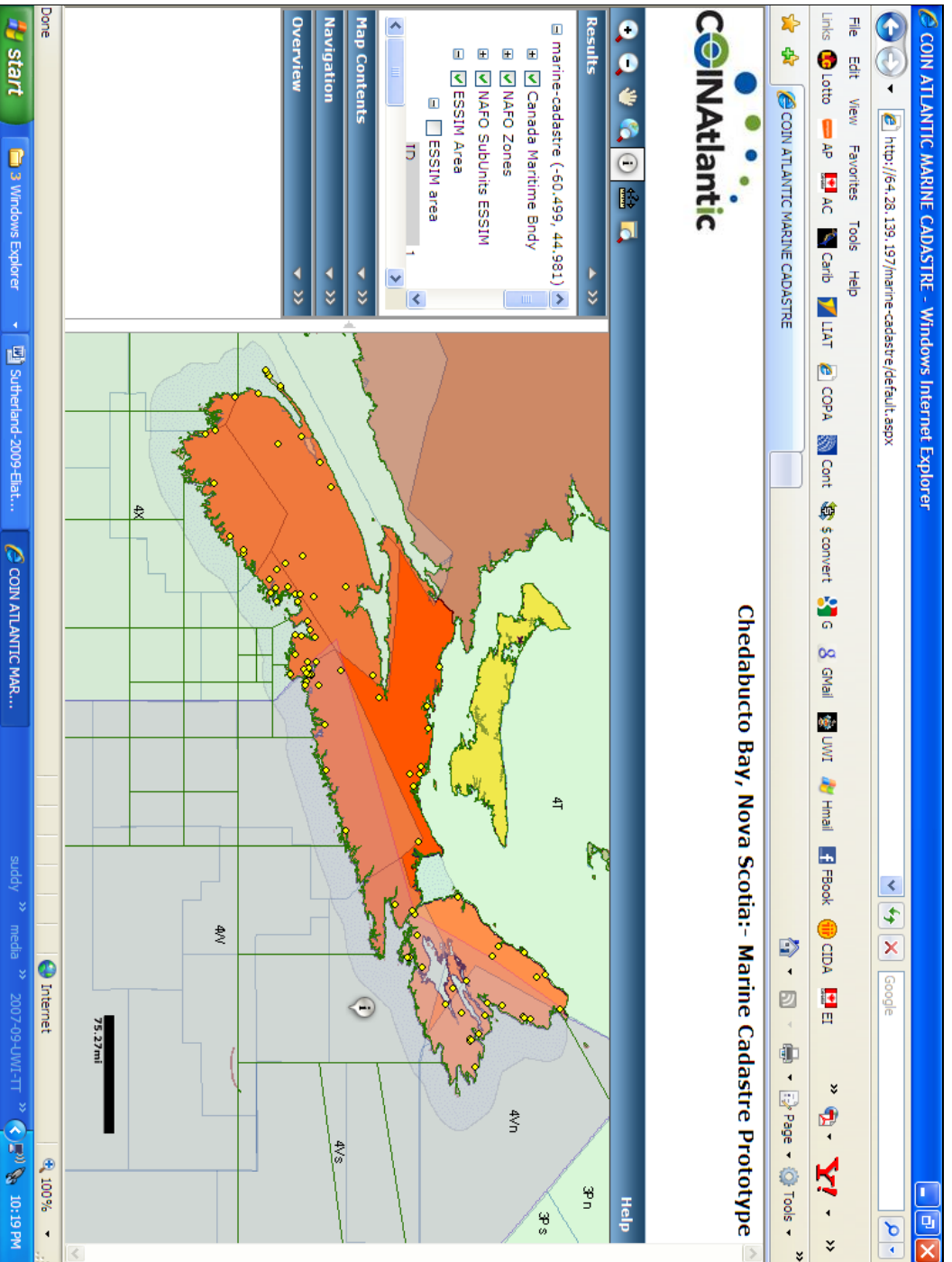


Figure 4 - COINAtlantic Marine Cadastre Prototype (Showing General Results)

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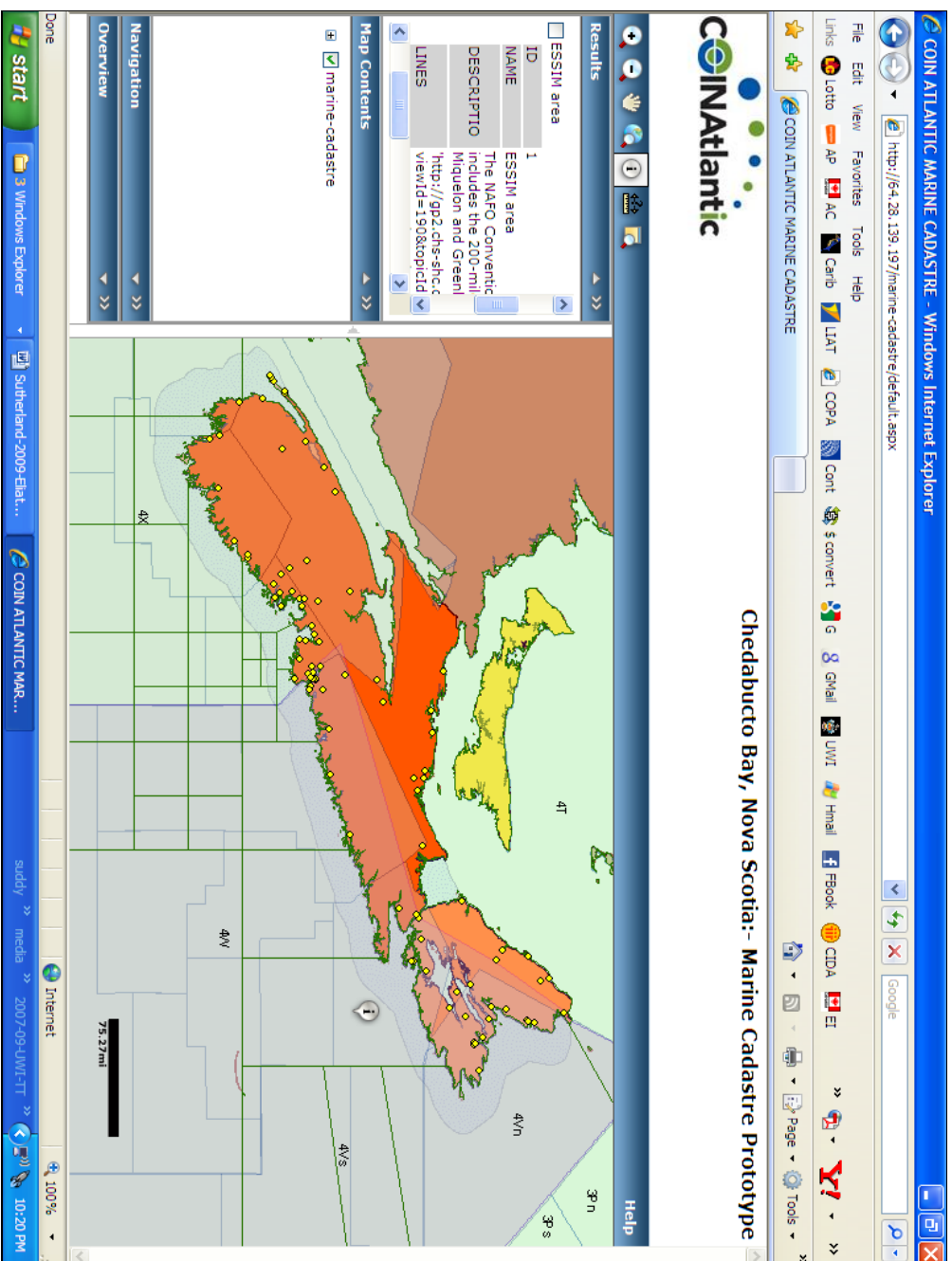


Figure 4 - COINAtlantic Marine Cadastre Prototype (Showing Detail Results)

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3. FUTURE DEVELOPMENT DIRECTIONS OF THE PROTOTYPE

Future directions for the prototype is best discussed within the context of what is missing from the current application development. To answer this question reference is made to Ng'ang'a, Sutherland, Cockburn and Nichols [2004] who presented an object-relationship design of logical components to be included in any well-thought-out marine cadastre design. Figure 5 shows this design.

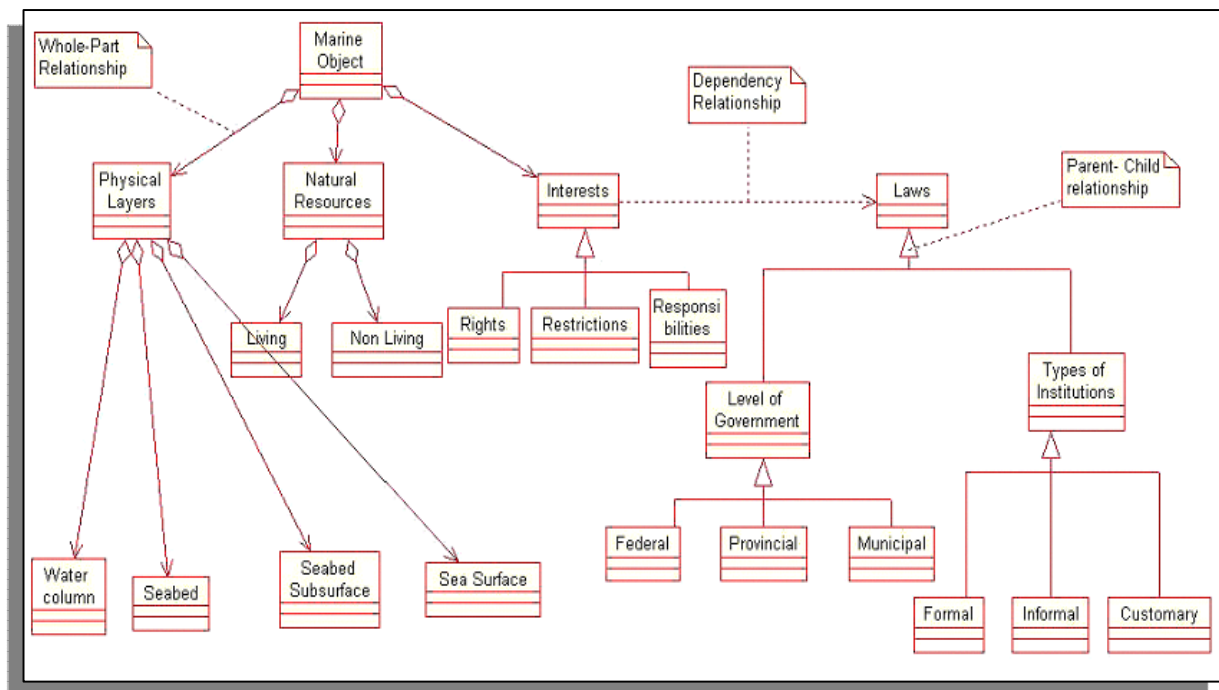


Figure 5 – Marine Cadastre Object-Relationship Design
(from Ng'ang'a et al., 2004)

A close perusal of Figure 5 will reveal that a consciousness of the obvious 3-dimensional nature of marine space affects the design. Rights to marine space can be to the water surface, water column, seabed, subsoil, or to any combination of the foregoing. Queries made about a particular space could make information requests about natural resources (living and non-living), the types of interests relevant to a point, the level of government administering rights at the point of interest, and whether the laws impacting upon the point of interest are formal, informal or customary. The design at Figure 5 also considers these perspectives.

The COINAtlantic marine cadastre prototype is a 2-dimensional interface. This means that a cursory view of displayed datasets will not immediately reveal the portion of 3-dimensional marine space to which the boundaries refer. The prototype will incorporate the 3-dimensional perspectives into its design by redesigning the spatial databases to include these types of information pointed to by Figure 5. Additionally, certain customized queries will be incorporated

into the design so that, for instance, one may ascertain a list of boundary-related information that pertains to the seabed or any other portion of the marine space.

Ideally, the map interface would allow participating stakeholders, who agree to supply spatial information for inclusion in the application, to maintain their own spatial data on their own site(s). ArcServer map interfaces allow this kind of distributed interaction. Currently the prototype, being developed as a proof of concept, stores all datasets on one web server. Future developments could include tests of the distributed model, but that depends upon some form of collaborative, integrative, or cooperative governance model being adopted by the stakeholders.

4. SUMMARY

The Coastal and Ocean Information Network for Atlantic Canada (COINAtlantic), with the support of Geoconnections, Canada is pursuing an initiative to provide interested parties with an interface that provides opportunity to search for coastal and marine spatial information, and to add the found datasets to a map interface. Attached to this project is another initiative to develop a marine cadastre prototype or proof of concept. The prototype currently displays various spatial datasets that may be queried for information. Future developments of the prototype will include redesigning the spatial databases to account for the 3-dimensional nature of marine spaces. Certain custom queries will also be added to enhance the information ascertained and thereby add value to the management of the coastal and marine spaces of interest.

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BIOGRAPHY

Michael Sutherland holds both a Master of Science in Engineering and a Ph.D. in land information management from the Department of Geodesy and Geomatics Engineering, University of New Brunswick, Canada. He has more than 18 year's international experience in land information management. He is currently a lecturer and Programme Coordinator of the Land Management B.Sc. degree Programme, University of the West Indies, St. Augustine, Trinidad and Tobago. Michael is a member of the Canadian Institute of Geomatics and the Institute of Surveyors of Trinidad and Tobago. He is a Vice-Chair and Chair-Elect of the International Federation of Surveyor's Commission 4 (i.e. hydrography, coastal zone management, ocean governance, and marine cadastre).

Dr. **Sue Nichols** is a Professor in Land Administration and Property Studies at the University of New Brunswick and has conducted research on tidal and marine boundaries for over 20 years. Sue is a Past-President of the Canadian Institute of Geomatics and has been on the Advisory Committee for the Canadian Minister of Natural Resources. She engaged in research as Project

Leader on a multi-year, interdisciplinary research project on "Good Governance of Canada's Oceans: The Use and Value of Marine Boundary Information".

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