

**MAKING COASTAL SCIENCE AND ENGINEERING DATA EASILY ACCESSIBLE
TO COASTAL MANAGEMENT DECISION MAKERS – THE DEVELOPMENT OF A
COASTAL DATA PORTAL FOR THE SOUTHWEST WASHINGTON COAST**

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ABSTRACT

Coastal erosion hazards and long-term shoreline change are serious coastal management issues along the southwest coast of Washington state and have been under intense study for many years. Informed decision-making concerning risks associated with coastal erosion issues and coastal projects must rely on analysis of the available scientific and engineering data. Timely and efficient access to the best available data is often a decisive factor influencing the cost of coastal projects and improving the end-products of analysis. As a result of a number of large scale regional coastal investigations over the past ten years, a large amount of scientific and engineering data is now available for this section of coastline. The Coastal Communities of Southwest Washington - a group of coastal jurisdictions located between the Mouth of the Columbia River and Point Grenville at the north boundary of Grays Harbor County, and sponsors of many of these projects - wished to make this data available and readily accessible to other users, in particular those involved in making management decisions in the local communities, and as such, initiated the development of a "Coastal Data Portal" to provide efficient access to this data through the Internet. The internet portal provides an archive and management system for the available coastal data. The site provides access to raw data files, processed data and analyses, reports and articles. The data include aerial photography, on-land topographic and over-water bathymetric surveys, wave, tide, current and other oceanographic measurements, sample analyses of surficial sediments, boring and sub-surface data, river hydrology, and a variety of other data types. Users of the site can search and download data by specific region and data type through a hierarchical data query system. Geospatial data can be viewed directly in a browser using an ArcIMS web mapping interface. An FGDC compliant metadata catalogue has also been prepared for all data sets and users may search this catalogue to view related metadata prior to downloading the actual data.

Keywords: *coastal data portal, Southwest Washington, coastal erosion hazards*

INTRODUCTION

Coastal erosion hazards and long-term shoreline change are serious coastal management issues along the southwest coast of Washington state and have been under intense study for many years. Informed decision-making concerning risks associated with coastal erosion issues and coastal projects must rely on analysis of the available scientific and engineering data. Timely and efficient access to the best available data is often a decisive factor influencing the cost of coastal projects and improving the end-products of analysis.

The Coastal Communities of Southwest Washington consist of a group of coastal jurisdictions located between the Mouth of the Columbia River and Point Grenville at the north boundary of Grays Harbor County, a distance of approximately 120 km (Figure 1). The group was formed by an inter-local agreement among the jurisdictions to participate in, coordinate, and perform studies and projects related to coastal erosion in the region. These include studies by the U.S. Army Corps of Engineers, other federal and state-funded agencies, coastal engineering consultants, and Universities - an example of which is the recently completed Southwest Washington Coastal Erosion Study, a 5-year joint project carried out by the Washington State Department of Ecology and the U.S. Geological Survey (Gelfenbaum and Kaminsky, 2002).

As a result of these investigations, a large amount of scientific and engineering data is now available for this section of coastline. The Coastal Communities wished to make this data available and readily accessible to other users, in particular those involved in making management decisions in the local communities, and as such, coordinated the development of a “Coastal Data Portal” to provide efficient access to this data through the Internet.

SYSTEM ARCHITECTURE, DESIGN AND FUNCTIONALITY

A schematic of the general system design for the Coastal Data Portal is presented in Figure 2. Components are described briefly below, along with screen captures of the final web pages.



Figure 1 – Southwest Washington Coastal Areas (United States Geological Survey, 2003)

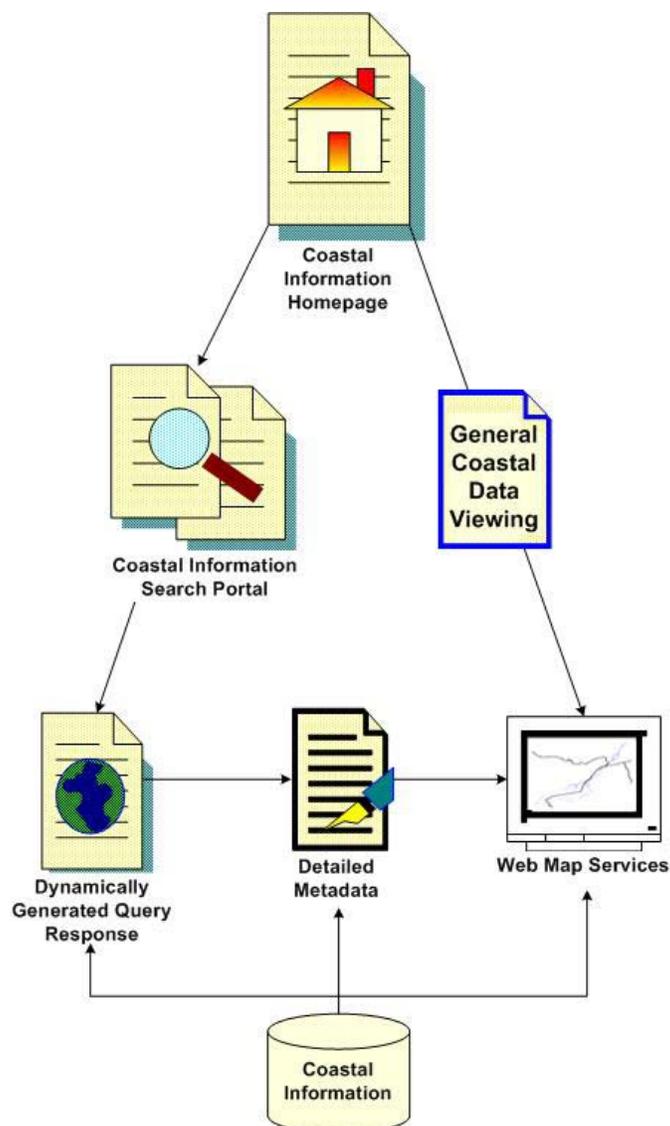


Figure 2 - Coastal Data Portal System Design Schematic

Coastal Information Database

The Coastal Data Portal is in fact anchored by the “Coastal Information” database, which is the ultimate repository of coastal data that is available for search, discovery and viewing. Ultimately, the site will provide access to raw data files, processed data and analyses, reports and articles. The data will include aerial photography, on-land topographic and over-water bathymetric surveys, wave, tide, current and other oceanographic measurements, sample analyses of surficial sediments, boring and sub-surface data, river hydrology, and a variety of other data types¹.

¹ As of September 2003 only a limited amount of data was available through the portal interface. Additional coordination with State and other data providers is continuing and more data is continually being added.

Coastal Information Homepage

Access to all levels of information in the Coastal Data Portal, including the data repository, is through an overall Project web page – the “**Coastal Communities of Southwest Washington Coastal Data Portal**” (Figure 3). This page is designed to provide users with a wealth of general level information about the various coastal data sets, agencies and related projects, but also to provide linkages that will allow them to seek out more detailed information through a “**Coastal Information Search Portal**” and the ability to view various data sets through a “**General Coastal Data Viewing Portal**” that allows users to view interactive web-mapping services (e.g., a standard browser via ArcIMS services). The “Search” and “Viewing” portals will be described in more detail below. Other linkages however include:

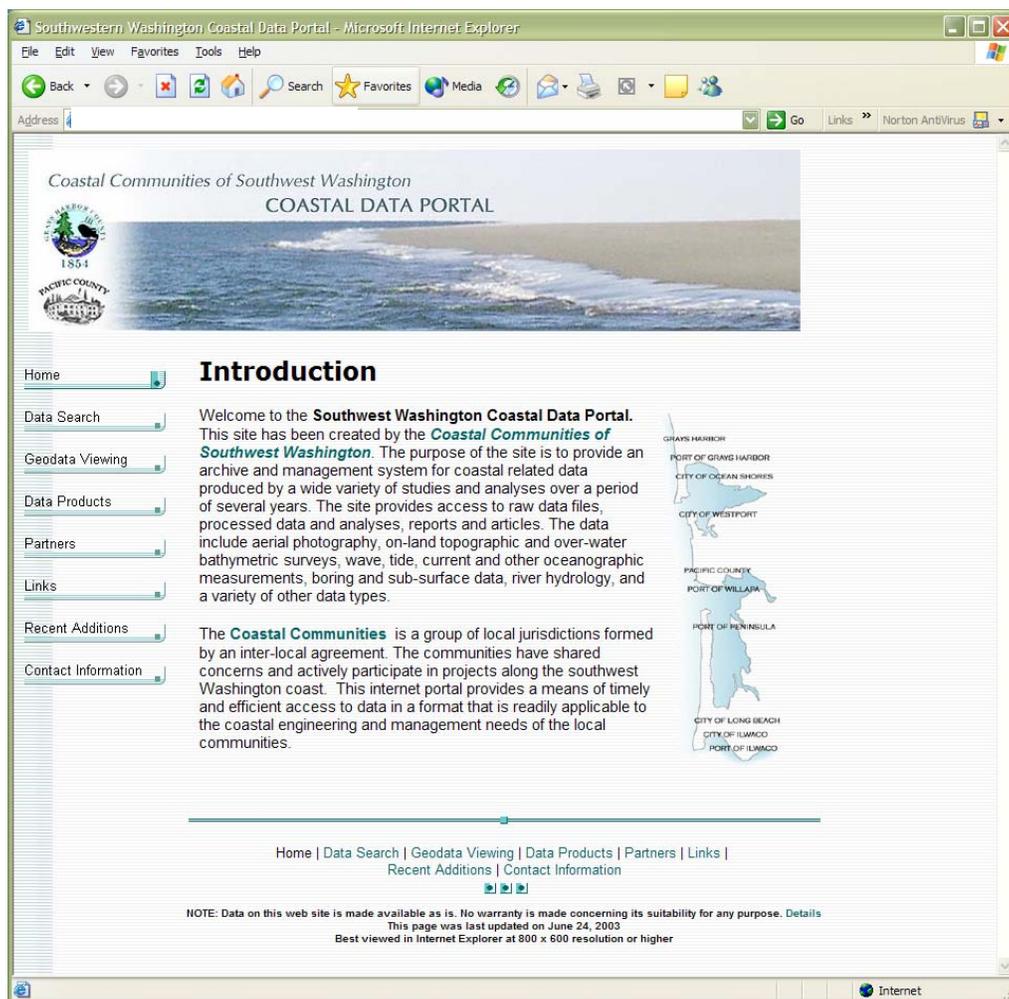


Figure 3 - Coastal Data Portal Home Page²

² As of September 2003, the Coastal Data Portal has not yet been officially launched by the Coastal Communities and as such a URL is not yet available.

Data Products - In addition to the data that are available through the Data Search web pages, a number of additional reports and products are available and will be made available here for download.

Partners - A list of project partners and participants, including links to their web sites. This includes the various counties and towns within the Coastal Communities, the State and Federal agencies providing the data, and the consultants involved in the Portal design.

Links - Web linkages to alternative data sites and other agency or project sites related to Southwest Washington, coastal erosion, etc.

Recent Additions - A summary of recent additions to the Data Portal

Contact - Contact information for the prime consultant on the project.

Coastal Information Search Portal

The Data Search Portal functionality provides users with the ability to seek more detailed coastal data by performing a number of different hierarchical searches, including those by region, city/place, or coastal feature (Figure 4) and then by time interval, data type, data theme, collection type, collection agency and by keyword (Figure 5). Keywords are tied to a number of things such as data type, document type, date, and/or keywords relating geography, subject area, etc. This required that brief metadata (e.g., Dublin Core) was available for every information element in the Coastal Information Database. This abbreviated set of metadata (including pointers to geospatial data, geospatial metadata, and non-spatial document types) was organized in a simple database using Microsoft Access. Keyword searches for information are then performed against this database.

The “**Dynamically Generated Query Response**” consists of a table that is returned to the user that provides brief descriptions of the “hits” from the data search (Figure 6), and hypertext links to either the metadata, or in some cases directly to the data itself (Figure 6 Inset A). Results from queries allow users to access the full metadata records (Figure 6 Inset B), from which the download option would also be available via standard file transfer protocols (http or ftp). By making this type of simple, easy to maintain web-based application for document search and query available, users are able to quickly locate and obtain access to any information desired for distribution.

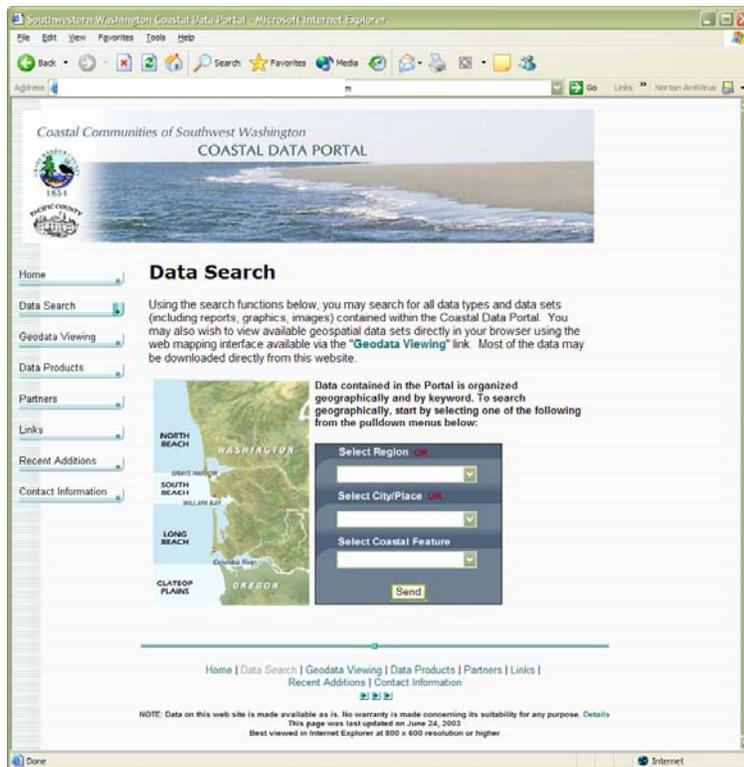


Figure 4 - Data Search Page. Users Initially Search by Region, City/Place or Coastal Feature.

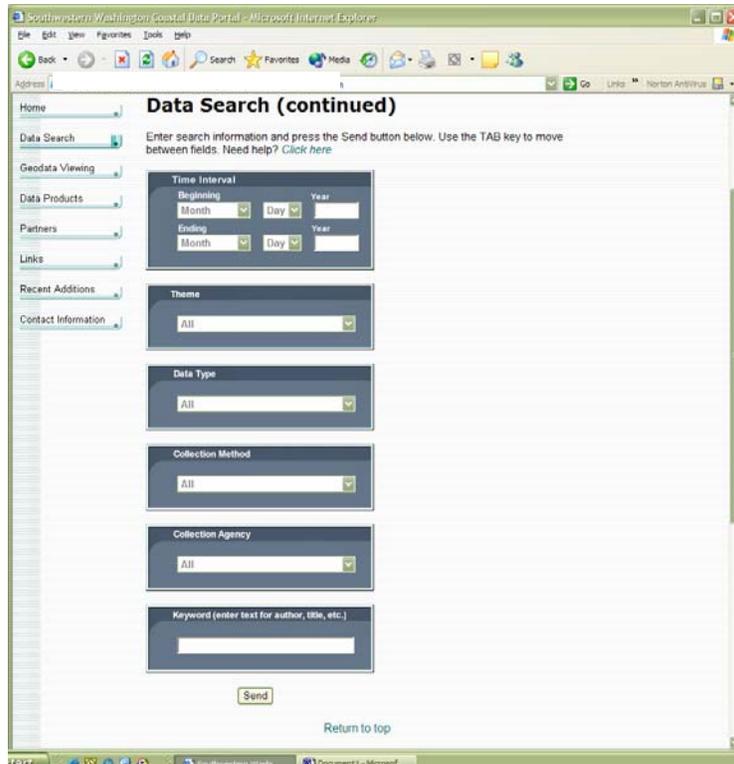


Figure 5 - Secondary Data Search Page. Users may query by Time Interval, Data Type, Data Theme, Collection Method, Collection Agency or by Keyword.

Southwestern Washington Coastal Data Portal - Microsoft Internet Explorer

Coastal Communities of Southwest Washington
COASTAL DATA PORTAL

Home
Data Search
Geodata Viewing
Data Products
Partners
Links
Recent Additions
Contact Information

... searching for records where Region contains "Long Beach" and City / Place contains "" and Coastal Feature contains "" with a Beginning Date of "" and an Ending Date of "" and Theme contains "" and Data Type contains "Beach Profile" and Collection Method contains "" and Collection Agency contains "" and Keyword contains ""

(Please note that when downloading data in shapefile format, you must collect all related files, i.e. .shx, .shp, .dbf, etc. in order to view with GIS software)

Title	Metadata	Size (bytes)	Data Type	Region	City / Place	Coastal Feature	Start Date
metadata; ColumbiaRiverlittoralcellbeachprofiles, fall1998.ht	Metadata	43847	Beach Profile	Long Beach			12/4/1998
metadata; ColumbiaRiverlittoralcellbeachprofiles, fall1999.ht	Metadata	44139	Beach Profile	Long Beach			12/18/1999
metadata; ColumbiaRiverlittoralcellbeachprofiles, fall2000.ht	Metadata	44760	Beach Profile	Long Beach			12/10/2000
metadata; ColumbiaRiverlittoralcellbeachprofiles, fall2001.ht	Metadata	44150	Beach Profile	Long Beach			11/28/2001
metadata; ColumbiaRiverlittoralcellbeachprofiles, spring199	Metadata	44140	Beach Profile	Long Beach			6/15/1999
metadata; ColumbiaRiverlittoralcellbeachprofiles, spring199	Metadata	44438	Beach Profile	Long Beach			6/12/2000
metadata; ColumbiaRiverlittoralcellbeachprofiles, spring199	Metadata	44154	Beach Profile	Long Beach			6/27/2001
metadata; ColumbiaRiverlittoralcellbeachprofiles, spring199	Metadata	44154	Beach Profile	Long Beach			6/18/2002

Inset A

Profile	Name	Northing 1	Easting 1	Northing 2	Easting 2
1	E2	225794.36	214700.11	225734.16	214801.01
2	South	224784.28	216647.64	224952.33	216898.35
3	L443	222775.12	217379.61	222873.62	217739.28
4	B1	221821.27	217568.46	221946.19	217978.11
5	A1.5	220351.73	217949.63	220446.9	218272.15
6	Pier RM1	218426.05	218214.73	218500.53	218652.01
7	Gcam	214935.43	219043.27	214973.51	219436.26
8	Bhux	211223.23	219636.35	211270.35	219975.43
9	GP-14109	204544.51	220355.02	204515.41	220786.75
10	Dana	199493.91	220670.82	199539.7	220967.07
11	Damaon	193770.05	220647.67	193748.67	220993.84
12	ET	191097.81	220436.54	191031.88	220838.53
13	Butter	187681.8	220256.29	187628.41	220570.37
14	XI north	184272.54	220168.19	184243.89	220375.48
15	XI south	183978.55	220137.48	183954.17	220363.43
16	HD-1	180591.97	223133.14	180644.69	223459.37
17	WORM	179022.99	223529.84	179076.78	223817.57
18	SPICE	177785.08	223798.72	177783.81	224065.67
19	RDAN	174825.48	224415.63	174837.17	224708.98
20	PRUG	171925.7	224794.66	171897.18	225140.21
21	PC068	168644.85	225072.47	168607.78	225460.14
22	PC064	165807.43	224645.36	165748.83	225201.5
23	GELF	163407.5	224819.88	163317.12	225399.85
24	CSW	161117.44	228466.28	161117.44	228466.28
25	LB1	152826.59	226927.59	152511.56	227435.75
26	PC055	151125.25	226216.35	150936.59	226851.71
27	PC051	148673.63	226307.28	148627.79	226882.66
28	PC044	144566	226544.1	144587.97	226960.05
29	PC057	142558.87	226592.94	142637.8	227064.88
30	OYSTER3	141082.47	226656.67	141024.08	227100.06
31	PC037	138882.05	226811.82	138872.38	227028.63
32	PC035	137709	226743.17	137673.09	227018.17
33	PC052	135799.28	226713.18	135788.76	226967.19
34	KLIPIAN2	131914.81	226566.37	131890.83	226916.94
35	PC021	129081.57	226384.48	129004.65	226658.39
36	RICH	126273.37	226114.67	126276.59	226424.39
37	PC014	123174.7	225883.58	123155.23	226195.58
38	PC008	118704.24	225457.33	118610.52	225779.31

Inset B

Columbia River littoral cell beach profiles, fall 1999

Identification Information
Data Quality Information
Spatial Reference Information
Entity and Attribute Information
Distribution Information
Metadata Reference Information

Section Index

Citation:
Citation Information:
 Originator: Washington Department of Ecology, Coastal Monitoring & Analysis Program
 Publication Date: Unpublished Material
 Publication Time: Unknown
 Title: Columbia River littoral cell beach profiles, fall 1999
 Online Linkage: <http://www.ecy.wa.gov/programs/sea/swces/index.htm>

Description:
Abstract:
 Cross-shore beach profiles are collected at approximately 47 locations along the Columbia River littoral cell on a bi-annual to quarterly basis. Beach profiles are collected using Real Time Kinematic Differential Global Positioning Techniques (RTK DGPS). The data collected through this effort represents the first regional scale beach morphology monitoring program for the Columbia River littoral cell in the Pacific Northwest USA.

Purpose:
 Beach profile data is being collected as a component of the beach morphology monitoring program of the Southwest

General Coastal Data Viewing Portal / Web Map Services

The Coastal Data Search Portal will allow users to download many types of data and metadata to their local computers. However, in many cases, it is useful for users to be able to interactively view and query spatial data sets within a web mapping application. For viewing, evaluation and exploration of geospatial information products, the Coastal Data Portal includes a second major linkage off the general study page site that utilizes ESRI's ArcIMS program, a web mapping application. In this mode, users may view a selection of available geospatial data interactively through their web browser in presentation quality maps. Data can be previewed, additional data layers can be turned on or off, and attributes can be examined. Future functionality will allow users to proceed to a data download page and download the data for use in their own GIS systems.

Figure 7 and 8 provide examples of this functionality. In the main ArcIMS view page (Figure 7) (accessed via the "Geodata Viewing" link on the main portal page), the user is presented with an overview map in the centre portion of the browser, standard GIS zoom, pan, query and measurement "tools" in the left hand frame, and a list of data folders (organized initially by region) in the right hand frame.

Users can click on the folders to open them and see what data is available. Data is then "activated" by clicking the small check box and then clicking the "Map Refresh" button near the bottom of the right hand frame. This then redraws the map with the data selected now visible. Users can then use the zoom tool to focus in on a particular area. Figure 8 shows an example of this, where the user has zoomed in to a specific area and where the visible data includes the digital orthophotography, as well as historic shoreline position data.

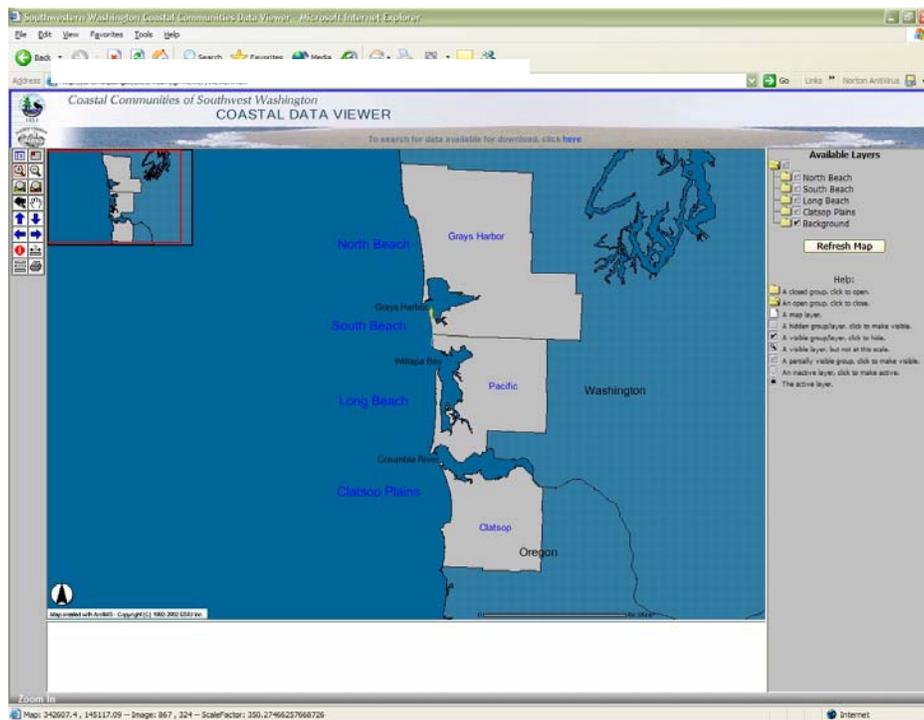


Figure 7 - ArcIMS Viewer Screen. Provides overview map of Study Area and Available Data Sets

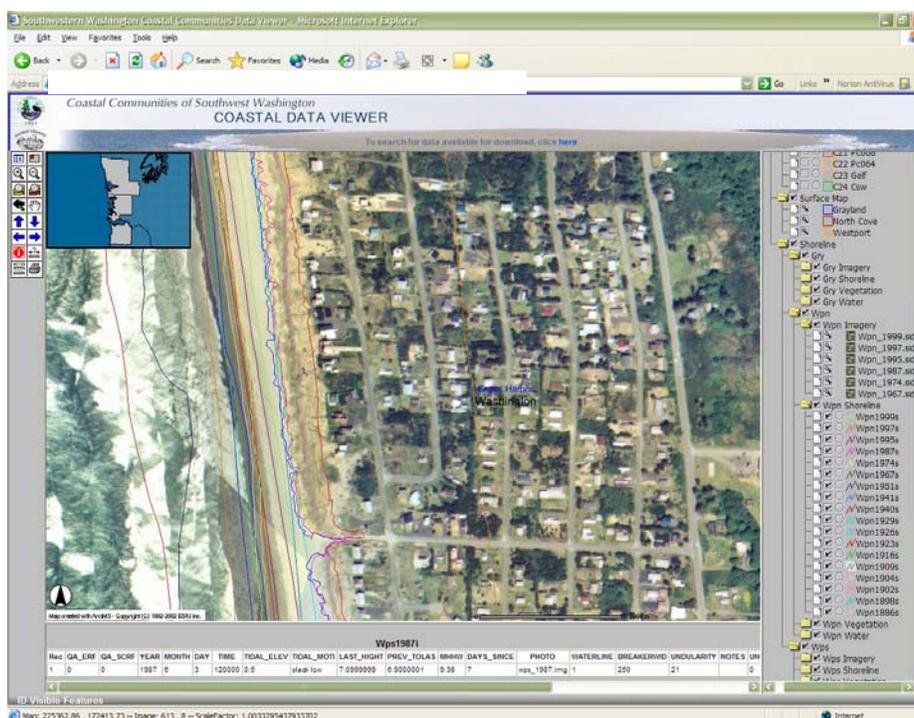


Figure 8 - ArcIMS Viewer with various data sets selected and zoomed in to a specific location.

SUMMARY

The Coastal Data Portal provides an easy and effective, modern state-of-the-art approach to the search and discovery of scientific and engineering data required by local agencies for making sound coastal management decisions. In addition to this, there are a number of additional benefits to a data sharing approach of this nature:

It Can be Targeted to a Wider Audience

In addition to coastal managers and planners, there may be a number of other interest groups who will need and want access to this type of data. In addition, different groups may require different levels of information. A tool such as this offers considerable flexibility in this regard. For example, non-technical users who simply wish to learn more about coastal issues in Southwest Washington can visit the general web page and associated links and very quickly acquire the information that they need. More advanced users, or perhaps stakeholders who have a keen interest in the coast, can delve more deeply into the site via data searches, download reports or view maps and available data of their area. Finally, those who need to access detailed geospatial or imagery data (perhaps other State or Federal agencies) can examine these data or its metadata online and then download the data for use in their own GIS systems.

It is Easily Updated

As new information is added to the Coastal Information Database, it will be made immediately “discoverable” to users via the Data Search Portal application. Only a minimal effort will be

required from an administration standpoint (copying data into a set directory on the project web server, and ensuring that any necessary metadata updates to the indexing database have been completed where required) to keep the server completely up to date at all times. Web mapping services created for the Study will require only a minimal effort to update. Each time a new data layer is staged for inclusion in the web mapping service(s) developed for the Study, a system administrator must simply add a few lines of ArcXML code to the service configuration file to reflect the new addition's data location, style and symbology.

It Will Serve As a Model for Future Data Dissemination

Our proposed system represents a state-of-the-art approach for the sharing and dissemination of data of this type to a wide range of interest groups and users. We are confident that this approach can serve as a model for other projects of this nature.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the considerable efforts of Jerry Johnston and Bryce Stath of Pangaea Information Technologies who conducted the bulk of the coding required for the Data Search and ArcIMS functionality, as well as Nels Sultan of Pacific International Engineering, who assembled the majority of data and related metadata that has been incorporated in the Portal to date.

REFERENCES

Gelfenbaum, G., and Kaminsky, G.M. (eds.), 2002. Southwest Washington Coastal Erosion Workshop Report 2000. United States Geological Survey Open File Report 02-229, June 2002, 308pp.

United States Geological Survey, 2003. Southwest Washington Coastal Erosion Study Web Site. <http://www.ecy.wa.gov/programs/sea/swces/index.htm>. Accessed August 30, 2003.