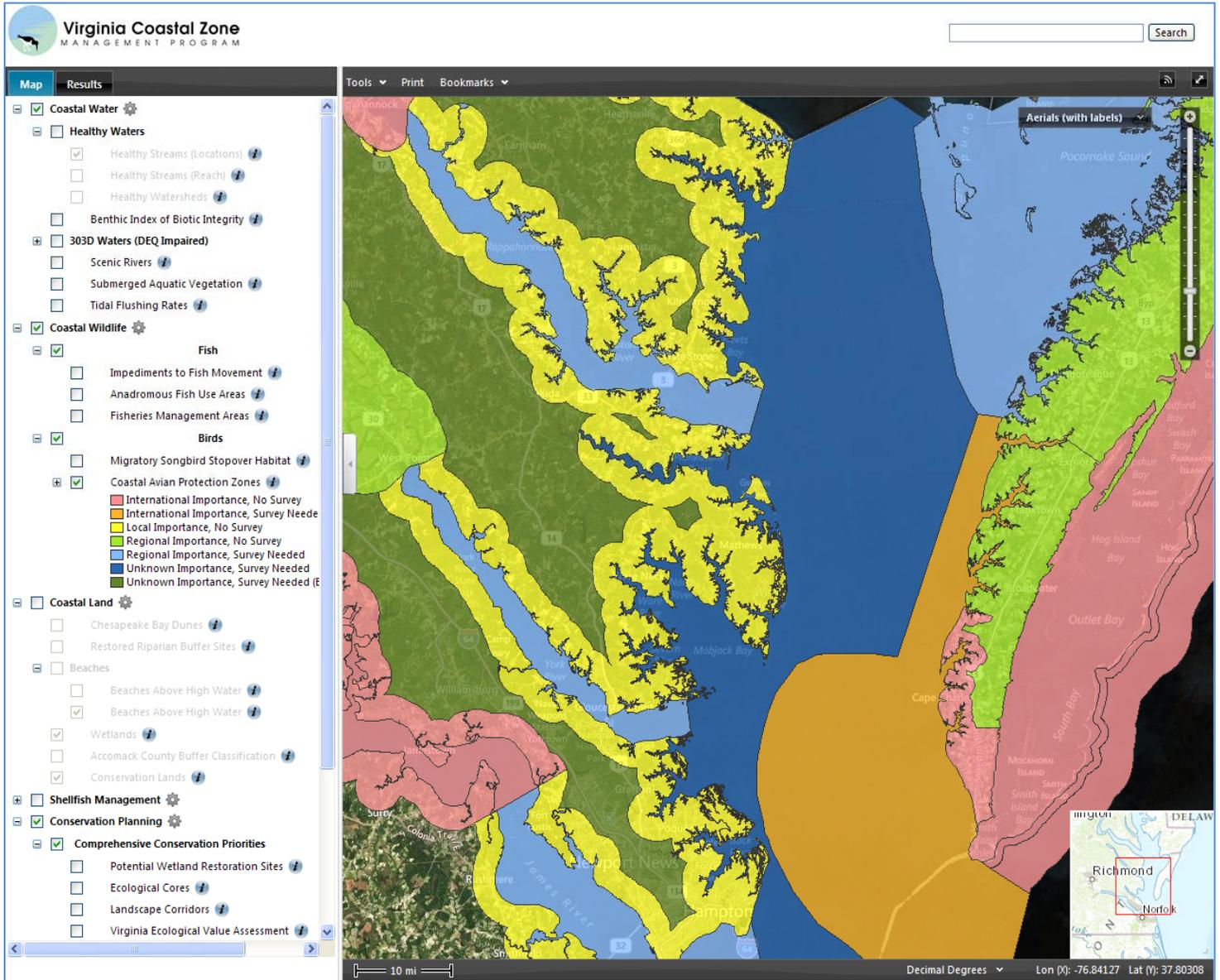


Virginia Commonwealth University, Center for Environmental Studies

# Coastal GEMS Version 3 Final Report

NOAA Grant # NA09NOS4190163, FY09 Task 93.02

NOAA Grant # NA10NOS4190205, FY10 Task 93.02



## **Acknowledgements**

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## **Introduction**

About six years ago, VA CZM teamed up with VCU's Center for Environmental Studies (CES) to create a comprehensive new coastal data resource for its partners and the public called Coastal GEMS. At that time online mapping applications were becoming popular but they typically only highlighted a specific dataset or two from one organization and some of the user interfaces could have been best described as clunky. Coastal GEMS stood ahead of the curve by leveraging some of the latest technologies from several software platforms and pulling together data from local, state, and federal agencies, non-profit organizations and academic institutions and fusing them all into one easy to use big picture data portal.

Over the past few years, resource managers have started to realize the effectiveness of online data portals like Coastal GEMS and new web mapping technologies have emerged that make it possible for these portals to be developed into robust decision support tools. Last fall VA CZM partnered again with VCU CES to utilize these new technologies in the development of Coastal GEMS Version 3.

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## **Version 3 Development**

The VA Coastal Zone Management Program's Coastal Geospatial and Educational Mapping System, or Coastal GEMS, was originally created through FY2003 Task 95.011 and FY2006 Task 93.04 by Virginia Commonwealth University's Center for Environmental Studies (VCU CES) in partnership with Worldview Solutions, Inc. Coastal GEMS maintenance is performed as part of a recurring grant to VCU CES, most recently FY2011 Task 1.02.

Coastal GEMS was designed to be a gateway for accessing a comprehensive collection of coastal resource information for educational purposes and for consideration in planning efforts and management decisions. It was populated with data and maps from local, state, and federal agencies, non-profit organizations and academic institutions highlighting the best remaining blue and green infrastructure in Virginia's coastal zone as well as information on the value and current management of those resources.

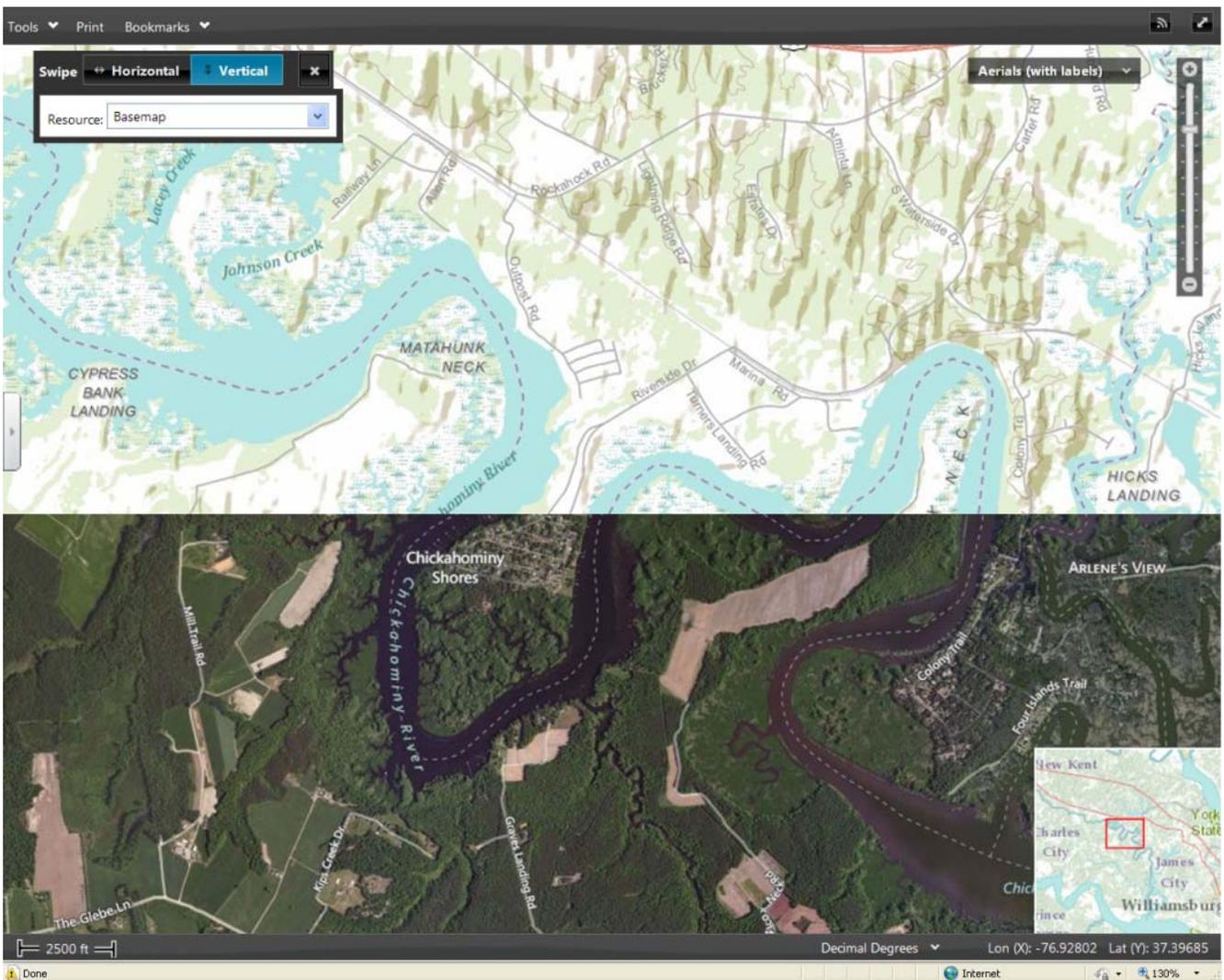
Coastal GEMS was originally developed using ArcIMS mapping software combined with a custom .NET/AJAX application which allowed it to quickly generate maps with large amounts of spatial data even for users on slower internet connections. At the time this technology was ahead of the web mapping curve and proved to be very successful with thousands of users and many success stories. Over the past few years, more and more resource managers began to realize the effectiveness of online data portals like Coastal GEMS and new web mapping technologies have emerged that make it possible for these portals to be developed into robust decision support tools. Last fall VA CZM partnered again with VCU CES to utilize these new technologies in the development of Coastal GEMS version 3.

Coastal GEMS Version 3 was built as an HTML 5 application using ESRI's ArcGIS Server 10.0. This combination means that version 3 is even faster than the previous version while adding many new features, tools, and access options outlined below.

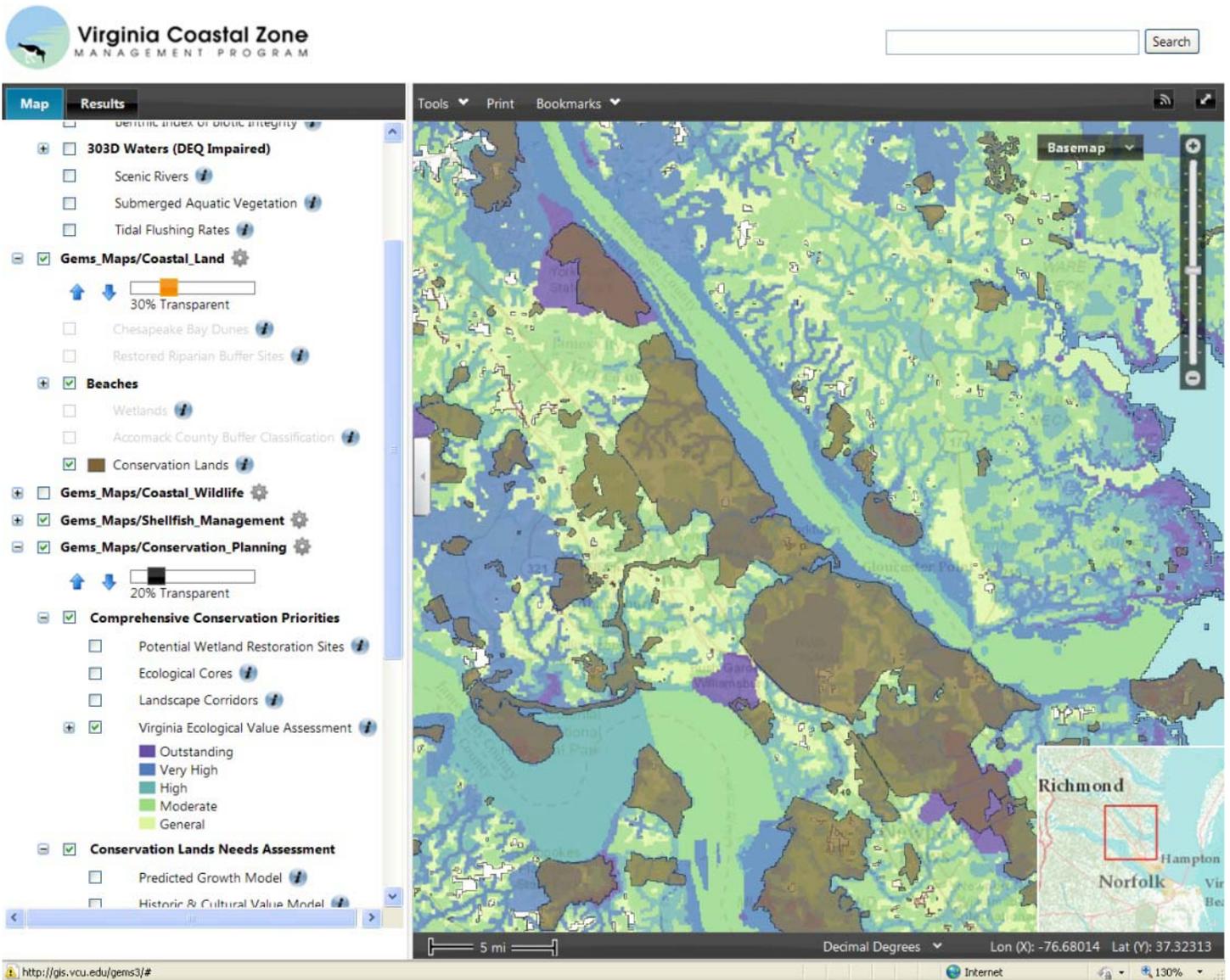
## Added Features

In the previous version of Coastal GEMS cartographic options were somewhat limited so as the application grew to include over sixty layers it got tougher and tougher to symbolize each dataset in a unique way. ESRI's ArcGIS Server 10.0 allows Coastal GEMS Version 3 access to a much richer array of cartographic options. This means that it will be easier to create distinctive symbology for each layer so that Coastal GEMS can continue to grow.

Utilizing ArcGIS Server 10.0 also gives Coastal GEMS Version 3 access to a wide range of basemaps from ArcGIS Online. To help put the data layers available on Coastal GEMS into context, users of the application can now quickly and easily select from a list of basemaps including road maps, aerial imagery, national geographic world map, ESRI's ocean basemap and more. Complementing those new basemaps Coastal GEMS Version 3 has a new swipe feature which allows GEMS users to more easily compare between them.

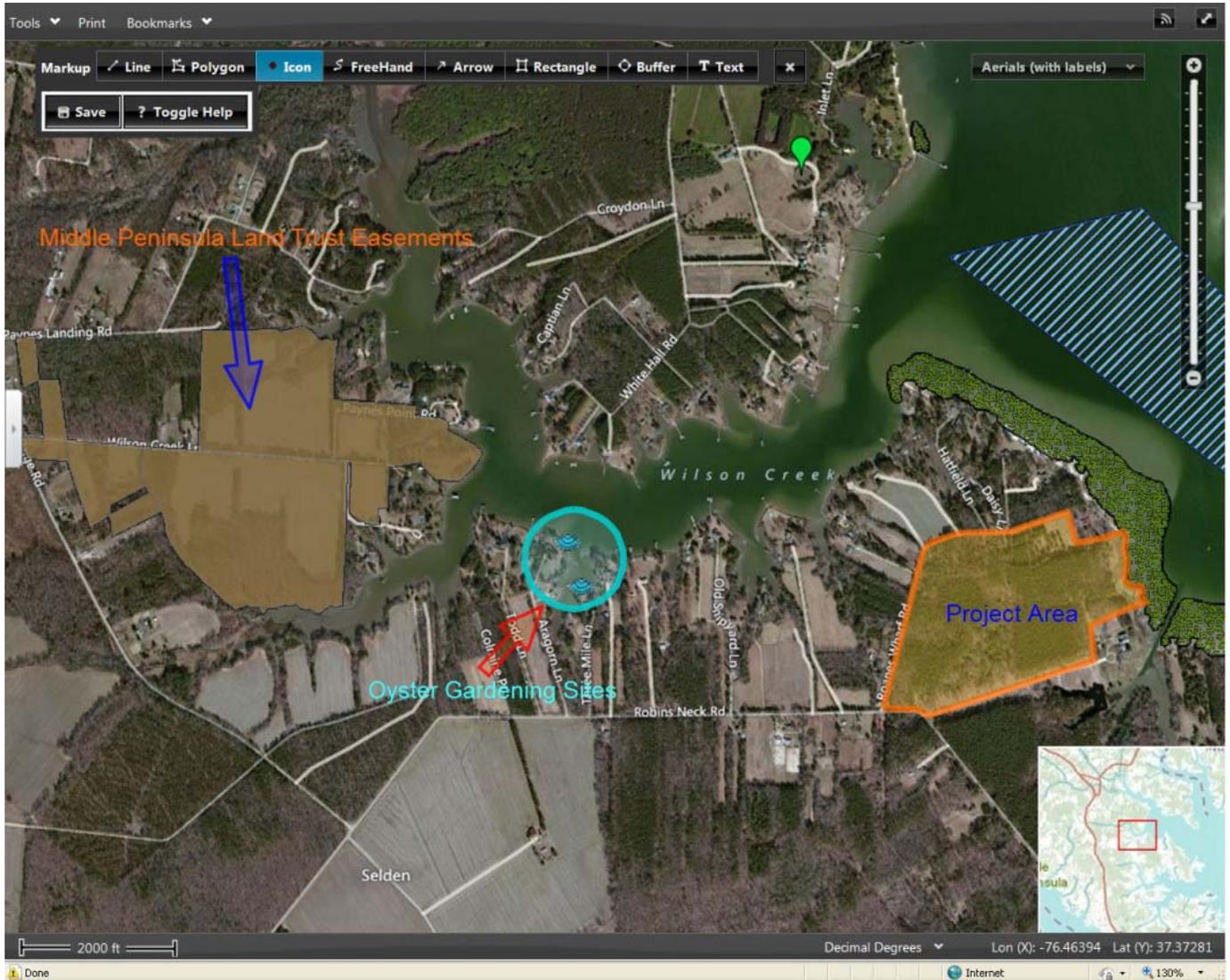


In the previous version of Coastal GEMS the order and transparency of the data layers was not changeable by GEMS users but Version 3 allows users to adjust data transparency and move data layers above or below each other to get a better view of the data and basemaps underneath.

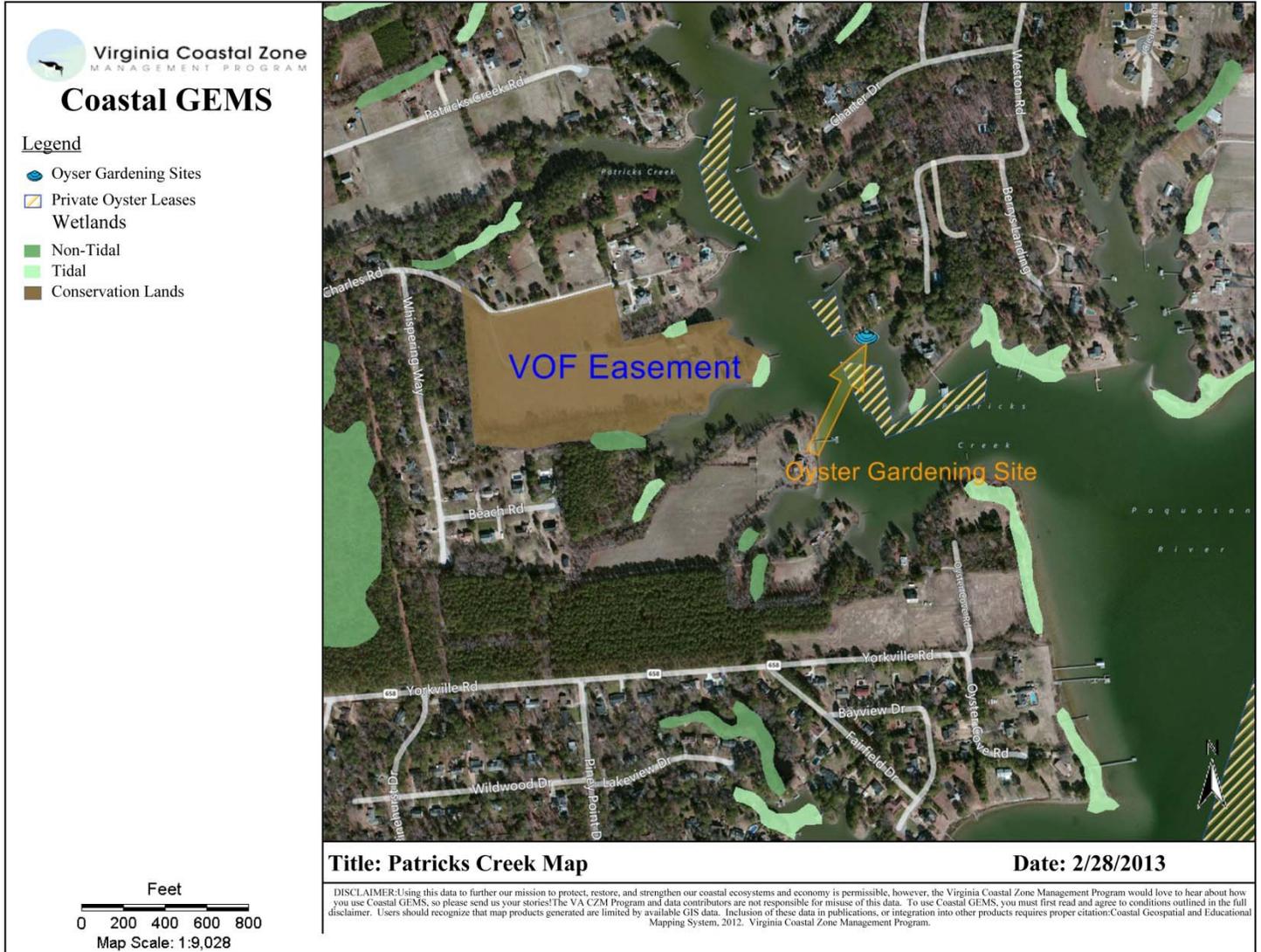


## Added Tools

The previous version of Coastal GEMS gave users the ability to export and print custom maps but Coastal GEMS Version 3 takes this ability a few levels further. One of the things we are most excited about in Coastal GEMS Version 3 are the new mark up tools. These tools allow users to add text to their maps, draw lines and shapes, add icons and symbols, and even buffer specific points.



Version 3 also allow users to set custom export areas, choose from various image file formats, add a title and map legend, and of course any mark up added will be included on the exported maps.



Like the previous version of Coastal GEMS , Version 3 has an Identify tool that allows users to view attribute information associated with features in the map. In addition to the Identify tool, Version 3 also includes a new Attribute Search tool. This tool allows users to search the attributes for any Coastal GEMS layer, scroll through a list of features that their search produces, and then zoom to the features of their choice.

The screenshot displays the Virginia Coastal Zone Management Program interface. At the top left, the logo for the Virginia Coastal Zone Management Program and Virginia Commonwealth University (VCU) is visible. The main interface is divided into several sections:

- Map:** Shows a map of the Richmond, Virginia area with the James River and surrounding parks highlighted in blue. A scale bar indicates 2 miles.
- Results Panel (Left):** Lists 8 Conservation Lands. The first entry is "James River" with details: Type: National Wildlife Refuge, Name: James River, Agency: US Fish and Wildlife Service, Owner: US Fish and Wildlife Service, Area (ac): 4199.58. Below it are several "James River Park Easement" entries, with the third one checked. The last entry is "James River SWCD Easement" with details: Name: SWCD Easement, Link: [Open Link](#), Type: Conservation Easement, Name: James River SWCD Easement, Agency: James River SWCD, Owner: Private, Area (ac): 0.
- Attribute Search Tool (Top Center):** A dialog box titled "Attribute Search" with the following settings:
  - Mode: Basic (selected)
  - Resource: Gems\_Maps/Coastal\_Land
  - Layers: Conservation Lands
  - Attribute: Name
  - Value: Contains james river
  - Search button
- Map Controls (Right):** Includes a "Base map" dropdown and a vertical zoom slider.
- Bottom Panel:** Shows navigation controls (back, forward, home), "Per Page: 10", "Decimal Degrees" setting, and coordinates: Lon (X): -77.59086, Lat (Y): 37.56132.

## Increased Accessibility

The Coastal GEMS project is all about making coastal data and information more accessible to decision makers and the public and Coastal GEMS Version 3 addresses some potential hurdles between the application and its users.

Version 3 was built using HTML 5 which means that its compatible with all popular web browsers (Internet Explorer, Mozilla Firefox, Google Chrome, Safari, and Opera) and also that it's not necessary to download and install any plugins which can be tough for anyone using a work computer without administrator privileges.



Over the past few years the use of mobile devices like smart phones and tablet computers has greatly increased and Coastal Gems Version 3 is compatible with these devices so you can explore the data from your iPad.



Coastal GEMS Version 3 is now available at [www.coastalgems.org](http://www.coastalgems.org)

## Appendix

NOAA Grant # NA09NOS4190163, FY09 Task 93.02 Final Project Summary

FY 09, Task 93.02 is the first of two consecutive grants to upgrade the VA CZM online mapping application, Coastal GEMS. This grant funds the creation of a draft version of the updated application and the second grant (FY10 Task 93.02) funds the completion of the upgraded Coastal GEMS mapping application.

The following tasks were completed during the grant period:

- Implementation of a Windows Server 2008 framework for development along with an installation of ESRI's ArcGIS Server 10.0.
- Installation of Microsoft SQL Server 2008 and ESRI ArcSDE 10.0.
- Migration of existing Coastal Gems layers from ESRI's ArcSDE version 9.2 to version 10.0. Addition of new layers included: Shellfish contamination areas.
- A prototype viewer was designed using HTML 5 instead of using the Microsoft Silverlight Application Program Interface (API) for ArcGIS Server. This option was chosen because HTML 5 allows programmers greater flexibility while interacting with objects like maps and data streams. Because mobile devices (Apple iPads, iPhones, and Android Devices) are becoming more prevalent in usage and faster, applications like Gems needs to perform as well on those devices as they do on a solid network land connection. A hybrid interface was chosen and built for this reason. Microsoft Silverlight is a resource intensive API and performance would have been significantly lower using that technology.
- Three map services were also built and deployed to use in the beta application.

The draft version of the upgraded mapping application was presented at the VA CZM Coastal Policy Team meeting on September 17th, 2012 and is available to view online at <http://gis.vcu.edu/gems3/>.

## NOAA Grant # NA10NOS4190205, FY10 Task 93.02 Final Project Summary

This is the second of two consecutive grants to upgrade the VA CZM online mapping application, Coastal GEMS. The first grant (FY09 Task 93.02) was to create a draft version of the upgraded Coastal GEMS and this grant was to complete the final version.

The following tasks were completed during the grant period:

- Incorporated ArcGIS online base maps into the application.
- Implemented facts sheets/non-spatial information for each layer in the application
  - An icon has been added to the end of each layer in the table of contents to denote the ability to click and obtain a fact sheet. As more users are coming to GEMS with tablet based hardware that are not mouse-aware, a “clickable” item needs to be present in order to obtain information.
- Added ability to add multiple map services into the viewer
  - We have developed the framework and code to support multiple map services. The concept was to have 3-4 services pre-loaded into the GEMS application and have one turned on. This would allow users to turn desired services on to display them. This will also allow users to set transparency to each service. The goal is to have mutually exclusive layers in each service therefore turning the map service to render non-redundant features.
- Added ability for users to customize maps by adding markup including text, shapes, polygons, lines, arrows, icons and more.
- Added ability to produce high resolution PDF's, and images (JPEG and PNG). PDF Maps also include custom legend and other information/disclaimers that are needed. The map legend will be generated for the services and layers the user is viewing at the exact time the map is generated.
- Improved tool allowing users to identify features in the maps.
- Ability to identify/select features from multiple services was finished.
- An enhancement to search by attributes was corrected so that a text/character search would not be case sensitive since some attribute values are capitalized and some are not.
- Ability to drag services up and down in the table of contents was added.
- PDF map had disclaimer added to the map print out.

The final version of the upgrading Coastal GEMS mapping application is currently available online at <http://gis.vcu.edu/gems3/> and will soon be put in production replacing version 2 of the Coastal GEMS application at [www.coastalgems.org](http://www.coastalgems.org).