asa marine environmental newsletter

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INSIDE

ASA Integrates Models With ARCVIEW®

Since 1979 Applied Science Associates has been developing numerical models to study real-world problems in marine and freshwater environments. ASA's models have been used to investigate such issues as thermal discharge, oil and chemical spills, atmospheric releases, sewage outfall discharges, and dredge material and drill-cutting disposal. Common to all these models are the abilities to accept environmental input data and to present model results in an easily understandable geographic framework.

GIS is an ideal framework to use as an interface to numerical models. GIS provides powerful tools to handle large environmental datasets needed by models; GIS provides unique visualization and analysis of environmental data by allowing us to view model results in a geographic context. However, GIS has not always been an ideal platform because traditional GIS was not facile at handling time-varying (temporal) data. New generations of desktop GIS with programming languages and programmable mapping components now allow us to handle temporal data much more efficiently.

When ASA started the development of GIS-based model interfaces about 10 years ago, we researched all of the available commercial GIS applications, but none were able to handle the complex time-varying input data and model results, so we developed our own custom GIS. However, with the evolution of GIS, our interface tools are now in a transition to commercial GIS platforms. We have recently completed ArcView-based interfaces for a suite of dredging models, a hydrodynamics and thermal discharge model, a search & rescue model, and a re-engineered version of our existing OILMAPAV system which is now available as an Arview 3.1 extension.

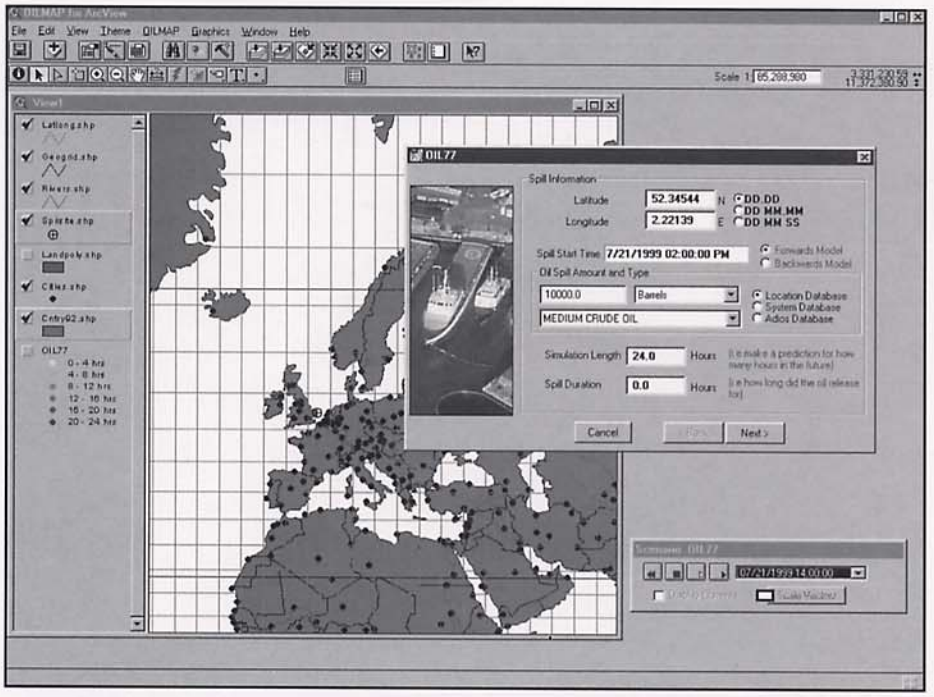
"It doesn't require any data conversion, management of multiple databases, or importing of data from an external model. It's completely integrated."

OILMAPAV is an interactive oil spill modeling extension that allows ArcView users to drop an oil spill model right on top of their existing marine, river, or freshwater projects. Eoin Howlett, ASA's OILMAP manager was enthusiastic, "we can really bring the power of our models to users that have a lot of data, but not always the tools to answer their questions. We just delivered OILMAPAV to a client that had many years worth of offshore data, including pipelines and drilling wells. Now they simply click on any site in their GIS and they can see where an oil spill may go. It doesn't require any data conversion, management of multiple databases, or importing of data from an external model. It's completely integrated".

The OILMAP extension provides complete tools for oil spill and current animation, linkage with real-time oil spill observations from GIS themes, and includes wizards for simplification of model setup. The OILMAP extension can be used in conjunction with the Spatial Analyst™, Tracking Analyst™, and 3D Analyst™.

OILMAPAV has the tools to:

- Predict the weathering and surface/subsurface transport of spilled oil
- Predict the probability of key areas being impacted from a given site
- Backtrack the oil to determine the likely spill site position
- Overflight (ground-truth) update facility
- Boom-Oil interaction
- Dispersant application
- Perform risk assessments for important resources.



A wizard interface in the OILMAP extension for Arcview provides a simplified model setup.

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Why collect field data?

Data Considerations for Water Quality Modeling and Management

Although environmental data collection can be expensive, it is crucially important in understanding natural systems, in support of numerical simulation modeling efforts and, ultimately, in designing management strategies

To determine how much data is necessary, we must first consider why we are collecting it. Three important reasons for data collection are: 1) to identify processes significant to the issue of interest; 2) to support numerical modeling; and, 3) to provide information on the effects of management decisions with on-going monitoring.

Understanding Natural Systems

First is to discover events and processes that are important to understanding how the system works. For example, an intensive data collection program undertaken in the lower Savannah River identified important relationships among salinity transport, stratification and tidal range. (see inset, below) ASA water quality modeler Dan Mendelsohn explains, "without this understanding of the river system, determining the potential impacts of dredging could not have been carried out correctly." When collecting data to identify important processes in a natural system, the amount of data required is usually dictated by the complexity of the system.

Support Simulation Modeling

Another reason to collect environmental data is in support of simulation modeling efforts. While data characterizes specific conditions for a given place and time, modeling provides predictions for other places and times. For example, a current meter can measure currents at one point in a shipping channel. A model can then be used to extrapolate measurements from that current meter to predict currents throughout the shipping channel. A model can also be used to estimate conditions at different times (i.e., between seasons) if data is collected during the different seasons.

The impact of a pollutant in a water body is determined by the physical characteristics of the system which control how the chemical is transported and dispersed, the chemical behavior of the pollutant itself, and the interaction between the chemical and the biota present in the area. So data must be collected in the right places at the right time. The type of data required depends on the type and extent of analysis being undertaken. At a minimum, both physical (i.e., currents) and chemical (i.e., concentrations) parameters must be measured. If a biological impact study is to be undertaken, biological (i.e., chlorophyll) measurements must be included as well. Geographically, measurements taken in support of modeling must extend beyond the local area of interest and include remote conditions. Remote measurements describe the boundaries of the system being studied and establish the context in which the system of interest is operating.

Ongoing Environmental Monitoring

The third reason to collect data is for monitoring of environmental conditions after a particular action, such as a management strategy, has been implemented. This type of data collection is to confirm that the natural system has responded as expected to the implemented action. Data collected for this activity can be significantly less involved than that collected initially to understand the system or support numerical modeling.

Two data collection issues pervade all of these data collecting needs: degree of accuracy required and the quality of the data. ASA field coordinator, Dr. Henry Rines, explains that "the world is an extremely variable place and the problem we face is quantifying the appropriate scales of that variability." He continues, "people are often surprised at how patchy and chaotic the data actually is and the difficulty in understanding what it all means." Data is often filtered in order to identify processes to better understand the system being observed. The level needed to understand the natural variability observed in the data define the degree of accuracy and the extent of the data collection effort.

ATM-ASA Launch Phase II of Savannah Field Study

Since 1997, ASA has been working with Applied Technology and Management to model the lower Savannah River in anticipation of dredging work to deepen the river. In 1997, an extensive monitoring program was established to measure temperature, salinity, dissolved oxygen, water levels, and currents in support of this modeling work. This July, Henry Rines of ASA visited Savannah for three weeks to assist ATM in the initiation of an expanded field effort to build on the earlier modeling work. More than 30 monitoring instruments have been deployed to continuously measure physical and chemical conditions in the river as well as meteorological conditions.

Henry Rines of ASA (lower) with Steve Davie of ATM (left) and Richard Humphreys of CC Lynch install a weather station.

OILMAP Delivered to OSRL

Oil Spill Response Limited (OSRL) recently took delivery of the latest version of OILMAP. OSRL owns and operates the world's largest oil spill response facility in Southampton, England, and currently is owned by a consortium of 27 major oil companies in support of their world-wide oil spill response needs.

Prior to acquiring OILMAP, OSRL's technical committee completed an in-depth review of oil spill models that would best suit their needs. OILMAP was chosen for its global capability, flexibility of use and ability to input a wide range of environmental and other related databases.

ASA's Eoin Howlett and Roddy Thomas completed a 2 day course for 8 of OSRL's staff in the use of OILMAP in support of their consultancy, training and emergency response services.

Eoin Howlett (left) answering some OILMAP questions with Kit Tennant and Tim Endean of OSRL.

personnel

Sasha Zigic of Asia-Pacific ASA presented a paper *Mixing in a River System Downstream of a Biodirectional Tidal Exchange System* at the 13th ASCE Engineering Mechanics Conference in June 1999.

As part of a series of training courses sponsored by Petrobras, ASA was invited to participate in a course specializing in modeling. Held in Rio de Janeiro during the week of 5 July 1999, **Craig Swanson** and **Roddy Thomas** introduced to technical staff from Petrobras and other Brazilian companies, state agencies and local universities a detailed overview of modeling applications for oil spills, spill impacts, hydrodynamics and various water quality problems. The presentation consisted of both lectures and hands-on model use for the 24 participants.

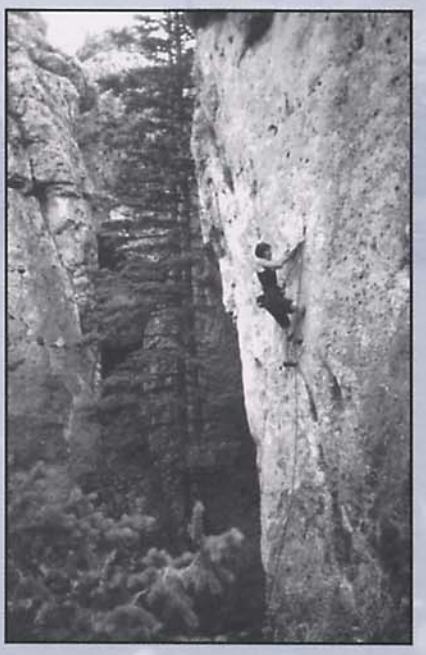
Eoin Howlett delivered the latest version of OILMAP and SARMAP to the Isle of Man Coast Guard. Working closely with the UK mainland, the Isle of Man Coast Guard is responsible for oil spills in their waters. Eoin provided training on the use of the latest versions and guidance on the conversion of paper contingency plans into electronic GIS layers with linkages to digital imagery.

Eoin Howlett and **Roddy Thomas** delivered the latest version of OILMAP97 to Mobil North Sea Ltd in Aberdeen. The delivery also included new hydrodynamic data originally commissioned by NWAG and subsequently taken up by the AFEN committee for the North West Shetlands region. Eoin and Roddy provided brief training and exercises to John Sinclair , Vicky Gooday, and Suzette Lang.

Heidi Schuttenberg presented a paper *The Manager and the Model: Use and Expectations of the Numerical Model* at the Coastal Zone 99 conference held in San Diego, CA on 27-29 July. The paper describes numerical modeling, reviews the current use of numerical models for coastal management and recommends ways in which models can be used for stakeholder processes.

Brian King and **Scott Langtry** of Asia-Pacific ASA presented a paper *Computer Simulations of Platform Discharges* at the Petroleum Industry Workshop on Naturally Occurring Radioactive Materials on 4 August. The workshop was sponsored by the Department of Minerals and Energy of Western Australia.

Daniel Mendelsohn and Steve Peene of Applied Technology and Management trained members of the South Carolina Department of Health and Environmental Conservation (SCDHEC) in the use of ASA's hydrodynamics and water quality model system, WQMAP. ASA's WQMAP model system is being used to evaluate water quality in Charleston Harbor as part of the Charleston Harbor TMDL program. The training took place at the SCDHEC offices in Columbia, SC on 4-6 August.



When competing as a rock climber, ASA's office manager, Leslie Smith, was ranked as the 53rd best woman climber in America. Leslie just returned from a climbing trip in Wild Iris, Wyoming (shown to the right).

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OILMAP Delivered to Malaysia

ASA recently delivered to Malaysia's national exploration and production company; Petronas Carigali (PC), the latest version of OILMAP together with a preliminary hydrodynamic data set covering their area of operations. Danny Mendelsohn and Roddy Thomas completed a 2 day training course for 10 PC staff including Mr. Sudirman Jais, Manager Health Safety and Environment (HSE), PC Kirteh, and his deputy Mr. Asul Kahar.

Initially the model will be used to support PC's operations offshore the Malaysian Peninsular (see diagram), and in particular will allow the HSE department to review and upgrade their oil spill contingency plans, assist in the preparation and support of spill drills, and provide an effective response tool in the event of a spill incident.

OILMAP's GIS interface will allow users to input a wide variety of PC's existing sensitivity and other environmental data. In addition PC has implemented an initiative to develop a series of comprehensive data gathering and associated modelling programmes. In due course these and other intitiatives will help to improve both the accuracy and utilisation of OILMAP.

Roddy Thomas (far right) and Dan Mendelsohn (center) with members of the Petronas Carigali oil spill response group.

"Given the renewed increase in exploration and production activities in the region, these tools are being welcomed by national oil companies to assist them in reviewing all of their existing and future environmental contingency arrangements" reports ASA Ltd. Director, Roddy Thomas.

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