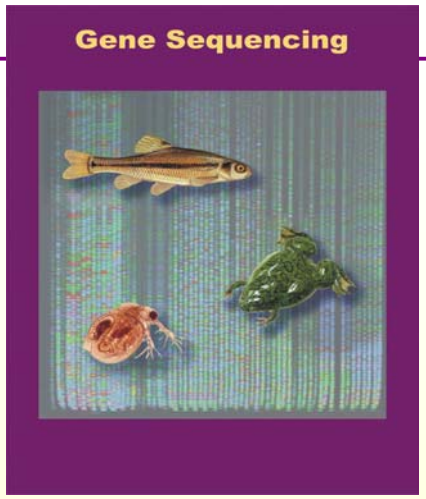
EPA-DOE Partnerships

Collaboration • Technology • Results

EPA Science Forum 2004
Healthy Communities and Ecosystems

Valerie Garcia, Dr. Gregory Toth, Kenneth Schere, Dr. Elizabeth Smith
U.S. EPA, Office of Research and Development, National Exposure Research Laboratory
Research Triangle Park, NC



Gene Sequencing

Environmental Issue

- Using approaches derived from modern computational methods, medicinal chemistry, molecular biology and systems biology, computational biology allows us to address the questions of "when and how" to test specific chemicals for hazards and for improving quantitative risk assessments of chemicals and microbial human pathogens. Gene sequencing holds the potential to reveal molecular pieces of the toxicity pathway which is critical to these questions.

Scientific Approach

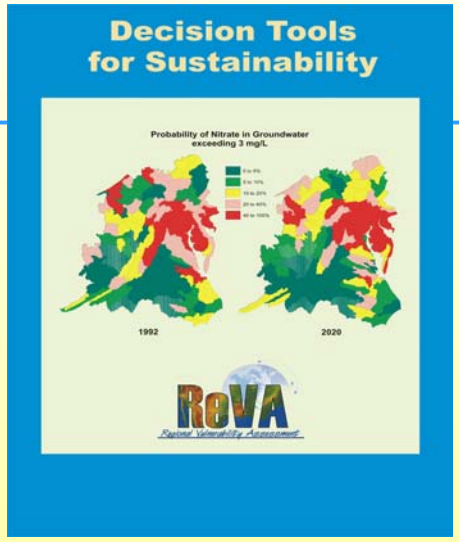
- EPA will collaborate with DOE on the development and sequencing of complementary DNA libraries of the fathead minnow (Pimephales promelas) that will aid in constructing the first large scale cDNA microarrays for research use by environmental scientists.
- EPA will join DOE and others with the whole genome sequencing of Xenopus tropicalis, an organism closely related to Xenopus laevis.
- DOE's plans to sequence the genome for Daphnia pulex, an invertebrate organism, will contribute unique data for EPA's ecological risk assessments and historical use of invertebrate toxicity tests.

Partnerships

- The collaboration between EPA and DOE will produce DNA sequence data on organisms of special importance to EPA's effort to apply molecular data to the prediction of toxicity, characterization of exposure, and, ultimately, integration in ecological risk assessments. These organisms include the fathead minnow (Pimephales promelas), the African clawed frog (Xenopus tropicalis) and the freshwater crustacean Daphnia pulex.

Impact

- Computational biology is a multi-disciplinary science that takes advantage of new technologies to better understand the molecular mechanisms and processes underlying the environmental transformation and organismal metabolism of chemicals within a biological system, and then use this information to predict the potential toxicity and adverse outcomes that may result from real-world environmental exposures to existing and emerging chemicals.



Decision Tools for Sustainability

Environmental Issue

- Collaboration on the underlying scientific methodologies led to the development of the Regional Vulnerability Assessment (ReVA) Environmental Decision Toolkit (EDT) - a basic integration and visualization toolkit used by EPA and partners in state and local government to address a suite of assessment questions crucial to reducing ecological risk.
- An important element of the planned DOE-EPA collaboration is to focus on issues relevant to decision-makers at all levels of government.

Scientific approach

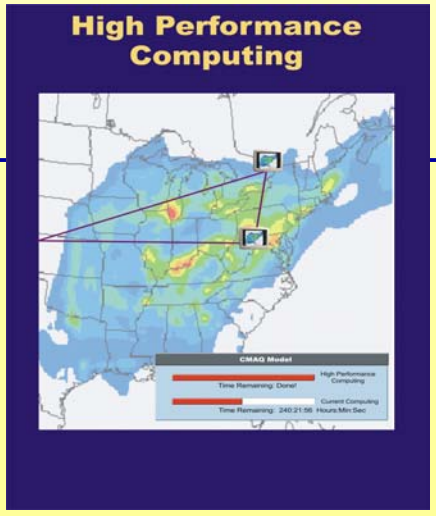
- EPA and DOE activities will focus on the development and implementation of sensing, data collection, and information synthesis for measuring and tracking the state of the environment, and on the development of data, tools, and analyses relating to how decisions we make today will effect environmental conditions in the future.

Partnerships

- DOE and EPA's collaborative efforts will focus on a variety of research tools and modeling activities that contribute to informed decisions and policies in environmental protection, development of new environment and energy technology, sustainable energy use, ecological monitoring, analysis of material flows, and environmental and facilities clean-up.

Impact

- Achieving sustainable economic growth requires a strong research foundation in developing clean and efficient energy systems, improved understanding of the impact of cumulative stresses on ecological systems, and informed decision-making that considers all facets of the economy, social well-being, and the ecological system.



High Performance Computing

Environmental Issue

- High performance computing allows optimization (better, faster, cheaper runs) of environmental models like EPA's Community Multi-Scale Air Quality (CMAQ) model, enhances data storage and transfer of large data sets, and reduces data duplication.
- Optimization is targeted to systems used by state and regional agencies who must meet upcoming deadlines on air quality implementation plans in the 2007-2008 timeframe.

Scientific Approach

- As EPA and DOE's scientists explore new research areas, networking enhancements will enable more thorough and rapid analysis of large datasets.

Partnerships

- A pilot project planned between EPA's National Exposure Research Laboratory and DOE's Sandia National Laboratory involves the evaluation of remote sensing techniques for monitoring water quality.
- DOE and EPA's collaboration will also promote a "Collaboratory" or virtual science laboratory/office without walls, in which researchers and their partners can conduct their science regardless of geographical location.
- EPA and DOE plan to work with NARSTO, to potentially expand NARSTO's mission to address the important and poorly understood air pollution-climate relationship that effects both the ability to achieve healthy air and address climate change.

Impact

- This forward-looking EPA/DOE high performance computing relationship will facilitate innovative scientific breakthroughs. Direct connectivity to joint Agency resources will help facilitate: joint model development and evaluation; linkages of disparate, remote databases; assess the results from these tools using statistical and data mining applications from multiple sources; and seamless access to computing power. Leveraging DOE's expertise in computational approaches is already making existing tools more efficient and timely. The gained efficiencies through this partnership will allow Agency scientists new opportunities to design next generation modeling systems to explore complex environmental issues that can't be addressed with current modeling tools.

225nerl-io04.db

Science and Innovation to Protect Health and the Environment