United States
Environmental Protection
Agency

U.S. Environmental Protection Agency

Office of Research and Development

RESPONSE TO ERIS 2014

STATES' RESEARCH NEEDS SURVEY

AUGUST 2015

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ACRONYMS & KEY

ORD Laboratories and Centers

NCCT	National Center for Computational Toxicology
NCEA	National Center for Environmental Assessment
NCER	National Center for Environmental Research
NERL	National Exposure Research Laboratory
NHEERL	National Health and Environmental Effects Research Laboratory
NHSRC	National Homeland Security Research Center
NRMRL	National Risk Management Research Laboratory

ORD National Research Programs

ACE	Air, Climate and Energy
CSS	Chemical Safety for Sustainability
HS	Homeland Security
HHRA	Human Health Risk Assessment
SSWR	Safe and Sustainable Water Resources
SHC	Sustainable and Healthy Communities

Dashboard Key

Category:	Water Pollution	Water Protection Technologies	Drinking Water	Hazardous Waste	Air	Energy	Other/ Multimedia
Shorthand:	WP	WPT	DW	HW	A	E	O/M

INTRODUCTION

Over the past five years, EPA's Office of Research and Development (ORD) has partnered with the Environmental Council of States (ECOS, the national association of state environmental agency leaders) and its research arm, the Environmental Research Institute of the States (ERIS). ORD shares information on its scientific and technical capabilities with ECOS and ERIS, which, in turn, provide input to make EPA ORD's tools, methods, models, databases and research useful and practical for the states as they fulfill their environmental responsibilities.

To these ends, ORD has hosted ERIS Board members on five separate visits to EPA facilities in Research Triangle Park (summer 2011), Cincinnati (August 2012), Las Vegas (May 2013), Gulf Breeze (May 2014), and, most recently, our Pacific Coast Ecology Branch in Newport, OR (June 2015). The goal of these meetings has been to develop a better understanding of state environmental research needs, enhance our ability to provide useful tools, and transfer knowledge from ORD research to regions and states.

In September 2013, following up on the ECOS Fall Meeting, ERIS completed a survey of states that produced an initial set of state research needs. ERIS grouped these needs into broad topics, such as nutrients in water, cumulative risk and air quality modeling. ORD published its *Response to ERIS State Research Needs* in March 2014.

ERIS then conducted a two-phase follow-on survey on state-level research priorities and needs. Twenty-eight states responded to the first phase of the survey (spring 2014), while 32 states responded to the second phase (September/October 2014). The first phase provided an overview of how state agencies organize their research and profiled their interactions with ORD. States were also able to suggest areas of research that should be included in the second phase of the survey. In the second phase, each state ranked seven broad research categories by priority. Each of the seven categories comprised a range of research topics, and each state was asked to distribute 100 points per category among the research topics in each category, with the most important topics getting the most points. These data were compiled and the top priorities are included in this document, covering topic areas such as drinking water, water pollution, hazardous waste, air and energy.

This document is ORD's response to the states' needs and priorities, as identified in the 2014 survey. ORD identified existing methods, models, tools and databases on these topics, as well as near-term research and development efforts, that could assist states in their environmental work. A list of longer-term research and development efforts relevant to state needs is included as an appendix. Where appropriate, links to the tools and research have been provided. If a research report, device or tool is still in development, ORD will provide links when they are available.

DISCLAIMER: Some of the research discussed in this document is in progress and has not been peer reviewed or formally disseminated by EPA. Such research does not represent and should not be construed to represent any Agency determination or policy.

EXISTING METHODS, MODELS, TOOLS AND DATABASES

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Adverse Outcome Pathway (AOP) Wiki

The AOP Wiki presents existing knowledge concerning what happens on the molecular level when a chemical interacts with a biological process to cause an adverse human or environmental health risk. The goal of an AOP is to provide a framework that connects the events of the chemical interaction that starts a molecular initiating event and leads to an adverse health outcome. It is important to understand and map AOPs to be able to use high-throughput toxicological data, such as those available from the ToxCast program, for chemical risk assessments and regulatory decisions. Information used to help develop AOPs comes from in vitro data, animal toxicity studies, and computational systems. AOPs allow scientists to connect results from in vitro tools and rapid screening protocols to actual adverse outcomes.

http://aopwiki.org/

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Aggregated Computational Toxicology Resource (ACToR)

ACToR is an online warehouse of publicly available chemical toxicity data and can be used to find all publicly available data about potential chemical risks to human health and the environment. ACToR aggregates data from over 1,000 public sources on over 500,000 environmental chemicals. ACTor is searchable by chemical name, chemical structure and other identifiers.

http://actor.epa.gov/actor/faces/ACToRHome.jsp

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AQUATOX: Linking Water Quality and Aquatic Life

AQUATOX is a simulation model for aquatic systems. AQUATOX predicts the fate of various pollutants, such as nutrients and organic chemicals, and their effects on the ecosystem, including fish, invertebrates and aquatic plants. This model is a valuable tool for ecologists, biologists, water quality modelers and anyone involved in performing ecological risk assessments for aquatic ecosystems.

http://www2.epa.gov/exposure-assessment-models/aquatox

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Automated Geospatial Watershed Assessment (AGWA)

The AGWA tool is a geographic information systems (GIS) interface developed to automate the parameterization and execution of the Soil Water Assessment Tool (SWAT) and Kinematic Runoff and Erosion (KINEROS2) hydrologic models. AGWA applies these two models to perform watershed

assessments and model their hydrology at multiple temporal and spatial scales. For large river basins, SWAT is typically employed. AGWA's current outputs are runoff (volumes and peaks) and sediment yield, plus nitrogen and phosphorus with the SWAT model.
http://www.epa.gov/esd/land-sci/agwa/
http://ofmpub.epa.gov/sor_internet/registry/systmreg/resourcedetail/general/description/description.do?infoResourcePkId=11982

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Benchmark Dose Software (BMDS)

Most risk assessment relies on determining a benchmark dose (BMD) from human or animal data to serve as the point of departure for the derivation of health risk estimates that aid decision making about risk management, such as establishing cleanup levels. BMD methods involve fitting mathematical models to dose-response data and using the results to select a BMD associated with a predetermined benchmark response that is considered to be adverse. BMDS facilitates these operations by providing simple data management tools and an easy-to-use interface to run multiple models on the same dose-response dataset. A listserve provides users with updates and announcements about new features.
http://www.epa.gov/ncea/bmds/index.html

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Better Assessment Science Integrating Point and Non-point Sources (BASINS)

BASINS is a multipurpose environmental analysis system designed to help regional, state and local agencies perform watershed and water quality-based studies. BASINS assists in watershed management and total maximum daily load (TMDL) development by integrating environmental data, analysis tools, and watershed and water quality models. A geographic information system (GIS) organizes spatial information for display as maps, tables, or other graphics. With GIS, BASINS has the flexibility to display and integrate a wide range of information (e.g., land use, point source discharges, and water supply withdrawals) at scales chosen by the user.
http://water.epa.gov/scitech/datait/models/basins/index.cfm

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BASINS Climate Assessment Tool (CAT)

BASINS CAT – a module within BASINS – provides flexible capabilities for creating climate change scenarios allowing users quickly to assess a wide range of hypothetical questions about how weather and climate could affect their systems. More information on using the BASINS CAT module is in EPA's series of online lectures and exercises at:
http://water.epa.gov/scitech/datait/models/basins/userinfo.cfm.

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Biological Condition Gradient (BCG)

BCG is a conceptual framework allowing biological conditions to be interpreted independently of assessment methods. BCG evaluates biological conditions (relative to baseline) as they respond to different levels of a variety of stressors. This framework has been successfully applied nationally to management of freshwater streams. States can use BCG for more uniform and direct assessment of streams, and to communicate the status of aquatic resources and their potential for restoration to the public. Use of this framework is expanding to estuaries and other complex environments.
http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/biocriteria/databio.cfm#biologicalcg

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Best Management Practice (BMP) GeoPlatform

EPA's BMP GeoPlatform integrates geospatial technology and environmental data from the International Stormwater BMP Database so that users can conduct data searches pertinent to a specific region or site. Information for each site includes the type of BMP or low impact development (LID) approach utilized, the reduction of stormwater volume achieved, and select properties of soil, land cover, water table and climate. The BMP GeoPlatform provides states with a tool to help local communities to identify cost-effective green infrastructure technologies for controlling stormwater runoff and combined sewer overflows.
http://www2.epa.gov/water-research/geoplatform-stormwater-bmp-performance-database-0

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BMP Siting Tool (ArcGIS 10.1)

The BMP Siting Tool facilitates selection of suitable locations for different types of low impact development (LID) techniques or conventional best management practices (BMPs). Using GIS analysis and up to nine base data layers, the tool can help states identify suitable sites for placing structural BMPs according to suitability criteria, including slope, soil type, urban land use, land ownership, roads, water table depth, stream location and drainage area. To conceptualize the physical function of BMPs with regard to their associated landscape, four categories (or types) of BMPs are presented in the BMP Siting Tool: point LID, point BMP, linear BMP and area BMP.
http://www2.epa.gov/water-research/best-management-practices-bmps-siting-tool

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CANARY

CANARY software evaluates standard water quality data (e.g., free chlorine, pH, total organic carbon) over time and uses mathematical and statistical techniques to identify the onset of water quality

incidents. Before using CANARY for the first time, historical utility data must be interpreted to determine the natural variation of these water quality parameters. This allows CANARY to work accurately at multiple locations within the water distribution system and helps utility operators to better understand false alarms associated with CANARY and contamination incident detection.
http://cfpub.epa.gov/si/si_public_record_report.cfm?subject=Homeland%20Security%20Research&dirEntryId=253555

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Causal Analysis/Diagnosis Decision Information System (CADDIS)

CADDIS is a web-based technical support system for identifying the causes of biological effects. Biological indices are the principal monitoring tool for evaluating the biological condition of water bodies in many states, territories and tribal lands. Yet when a biological assessment indicates a problem, the cause of the problem may not be readily apparent. CADDIS provides a framework and tools to logically and quantitatively evaluate data and other information for causal assessment. Once the likely cause of an observed condition has been determined, appropriate remediation or restoration strategies can be implemented.
www.epa.gov/caddis

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Chemical and Product Categories (CPCat) Database

CPCat catalogs the use of over 40,000 chemicals, maps them into "use categories," and describes their function and how they are used. This chemical use information is compiled from numerous diverse sources of data on consumer- and industrial-process-based chemical uses from regulatory agencies, manufacturers, and retailers in various countries. EPA researchers are evaluating the possibility of expanding the database with additional product and use information. The database is publicly available as a free download.
http://www.sciencedirect.com/science/article/pii/S2214750014001632#
http://actor.epa.gov/cpcat/faces/home.xhtml

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Coastal Biodiversity Risk Analysis Tool (CBRAT)

One of the challenges in responding to the effects of climate change on near-coastal systems is their rich biodiversity. CBRAT is a web-based database that displays the taxonomy and ecology of select groups of near-shore marine invertebrates, including their distribution, life history and relative abundance. Using this generally available information, CBRAT can help states identify and predict the relative vulnerability of many near-coastal species to the impacts of a changing climate on the marine environment.
http://www.cbrat.org/

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Coastal Gulf Ecology Model (CGEM)

CGEM is a state-of-the-art complex model of nutrient dynamics and eutrophication processes and hypoxia. CGEM can help states assess how much nutrient reduction is needed to achieve Gulf Hypoxia Task Force water quality goals and to reduce the Gulf hypoxic zone. CGEM may be used to model harmful algal blooms (HABs), taking into consideration phytoplankton community dynamics. Technical expertise and high level computing resources are needed to run the three-dimensional (x, y, z) versions of the model; however, a one-dimensional version is available that can be run on a desktop computer. We are working on CGEM's website. For more information please contact John Lehrter at lehrter.john@epa.gov, or go to: http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=307055&fed_org_id=858&SIType=PR&TIMSType=&showCriteria=0&address=nheerl/pubs.html&view=citation&sortBy=pubDateYear&count=100&dateBeginPublishedPresented=01/01

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Community Multiscale Air Quality (CMAQ) Modeling System

CMAQ models the impacts of ozone, fine particulate matter, mercury, and other toxic air pollutants at spatial scales ranging from urban to hemispheric at a 1-hour resolution for time periods ranging from a few days to several decades. This modeling system provides air quality managers the tools to assess holistically the impacts of multiple air pollutants. Over 3,000 users from around the world are currently applying CMAQ, including many states and regional planning organizations. Public release of CMAQ version 5.1 is expected during the fall of 2015.
http://www.epa.gov/amad/Research/RIA/cmaq.html

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Compilation of Physicochemical and Toxicological Information about Hydraulic Fracturing-Related Chemicals (Draft Database)

This is a comprehensive database of information about the 1,173 hydraulic fracturing-related chemicals that were listed in the external review draft of the recently released Hydraulic Fracturing Drinking Water Assessment. The product consists of a series of spreadsheets with physicochemical and toxicological information pulled from several sources, including EPI Suite, LeadScope, QikiProp, Reaxys, IRIS, PPRTV, ATSDR and other sources. The spreadsheets also contain background information about how the list of chemicals was compiled, the different sources of chemical information, and definitions and descriptions of the values presented.
http://cfpub.epa.gov/ncea/hfstudy/recordisplay.cfm?deid=308341

- **Target Opportunity:** Public comments on this database and the associated draft of the Hydraulic Fracturing Drinking Water Assessment are currently being accepted through the Regulations.gov website, under Docket ID: EPA-HQ-OA-2015-0245.

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Consumer Product Chemical Profile Database (CPCPdb)

The reliability of models for chemical exposure prediction is highly dependent on the availability and applicability of underlying data regarding the chemicals in products, their prevalence, and their frequency of use. EPA curated consumer product Material Safety Data Sheet (MSDS) data from a large retailer. MSDS data include chemical information about products, as well as product use categories assigned to various product types. The MSDS database provides the means for states to link the presence and concentration of chemicals to a broad range of consumer products, including cleaning, pet care, automotive and personal care products. CPCPdb data are available in the CPCat database in AcTOR at:

http://actor.epa.gov/cpcat/faces/home.xhtml

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Design Manual: Removal of Fluoride from Drinking Water Supplies by Activated Alumina

This manual is an update to the 1984 version of the same title. It supports the fluoride maximum containment level (MCL) and provides an in-depth presentation of the steps required to design and operate a fluoride removal plant using activated alumina (a reliable and cost-effective process for eliminating excess fluoride from drinking water supplies). The design manual can be used for communicating novel and relevant fluoride treatment technologies, and fills the need for a comprehensive manual of available fluoride removal technologies.

http://nepis.epa.gov/Adobe/PDF/P100KFZQ.pdf

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Drinking Water Treatability Database (TDB)

The Drinking Water Treatability Database (TDB) presents referenced information on the control of contaminants in drinking water. It allows drinking water utilities, first responders to spills or emergencies, treatment process designers, research organizations, academicians, regulators and others to access referenced information gathered from thousands of literature sources and assembled on one site. Over time, the TDB will expand to include over 200 regulated and unregulated contaminants and their contaminant properties. It includes more than 25 treatment processes used by drinking water utilities. States and communities can use the database when considering how to deal with emerging contaminants of concern.

http://iaspub.epa.gov/tdb/pages/general/home.do

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Eco-Health Relationship Browser

The Eco-Health Relationship Browser provides information about major ecosystems, the services they provide, and how those services—or their degradation and loss—may impact over 30 specific health outcomes. The tool helps illustrate the linkages between human health and ecosystem services (i.e., the benefits supplied by nature). An extensive bibliography is included.
http://enviroatlas.epa.gov/enviroatlas/Tools/EcoHealth_RelationshipBrowser/introduction.html

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ECOTOX

ECOTOX is a comprehensive, web-based database that provides information on the effects of chemicals on ecologically relevant species. ECOTOX is the ecological counterpart to IRIS (Integrated Risk Information System), the human health effects database. Both ECOTOX and IRIS provide state risk assessors and researchers consistent information on the toxic effects of chemical substances. ECOTOX provides information on adverse effects of chemicals on aquatic and terrestrial plant and animal species. Pertinent data on species, chemicals, test methods and toxicity results are encoded into the database. The system currently includes over 789,000 test results on the effects of more than 8,600 chemicals on over 10,000 terrestrial and aquatic species. The database is updated quarterly with new test data.
http://cfpub.epa.gov/ecotox/index.html

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Endocrine Disruptor Screening Program 21 (EDSP21) Dashboard

The EDSP21 Dashboard is designed to help EPA's EDSP evaluate chemicals for endocrine-related activity and provides access to new chemical data on over 1,800 chemicals of interest.
http://actor.epa.gov/edsp21/

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Engineering Design and Operation: Biological Treatment Process for the Removal of Ammonia from a Small Drinking Water System from Pilot- to Full-Scale

This yearlong pilot study at a small system in Iowa evaluated the use of an EPA-patented biological treatment process to remove ammonia from their drinking water. A full-scale treatment system was then installed, based on the design and operating configurations identified during the pilot study. The treatment plant's engineering design criteria and operating conditions are presented, the project's transition from pilot- to full-scale is discussed, and lessons learned and future considerations are presented.
http://nepis.epa.gov/Adobe/PDF/P100KY74.pdf

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EnviroAtlas

EnviroAtlas is a publicly available, interactive web-based tool that states, communities and citizens can use to help inform policy and planning decisions. The tool allows users to view, analyze and download information related to ecosystem goods and services in the mainland United States. "Ecosystem goods and services" refers to the benefits derived by people from nature. They include direct benefits (e.g., catching fish from lakes), as well as indirect benefits (e.g., denitrification of runoff by stream buffer vegetation). Although EnviroAtlas is organized around an ecosystem services framework, many of the maps could be used by communities when making decisions that they regularly confront. Users can explore maps and other visual presentations of the benefits their communities gain from nature, and learn how they can conserve and enhance these benefits for a more sustainable future. A key benefit of the ecosystem services framework is the ability to view or "stack" multiple ecosystem services simultaneously, which will allow decision-makers to visualize the trade-offs associated with specific alternatives.

http://enviroatlas.epa.gov/enviroatlas

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EPA Estuary Data Mapper (EDM)

EDM is a downloadable application that can help states view and access data for estuary-scale geographical regions of interest. Data types include nitrogen sources and loads for coastal watersheds and estuaries, including atmospheric deposition, point source loads and nonpoint source loads, as well as response endpoints (such as seagrass and chlorophyll).

www.epa.gov/edm

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EPA Exposure Toolbox (Expo-Box)

EPA-Expo-Box is a web-based toolbox for exposure and risk assessors. EPA-Expo-Box is a compendium of exposure assessment tools that provides links to exposure assessment databases, models and reference materials in a logically organized, user-friendly format. Expo-Box provides one-stop shopping for the latest tools and techniques for exposure assessment. It is a flexible, dynamic source of exposure assessment information for EPA, other risk assessors, and the wider public, who require information to support scientifically defensible exposure and risk assessments.

http://www.epa.gov/risk/expobox

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EPA H2O

EPA H2O is a desktop GIS-based decision support tool for assessing the provision of ecosystem services under different land use scenarios. Users can explore the spatial arrangement of ecosystem goods and services at regional to local scales, complete spatial queries along hydrological networks, and generate customized reports for scenario comparisons, all to gain a better understanding of where ecosystem services are produced, and how land use change might affect future production. The tool is simple, yet powerful, with a graphical user interface designed for basic or advanced users. EPA H20 demonstrates a fully-populated case study database with the functionality to create new databases for other communities. Any community that can develop their local database can use this tool. States can generate pdf summary reports of what is in both an area of interest and areas upstream, or connected via transportation network; compare alternative future land use scenarios for an area, and generate custom designed scenarios, including changes in the placement and shape of land use parcels, as well as modifications to the monetary value benefit functions.

http://www.epa.gov/ged/tbes/H2O/index.html

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EPANET

EPANET allows users to simulate hydraulics and water quality in drinking water distribution networks. It is a freely distributed Windows program in the public domain. EPANET performs extended period simulation of pressures, flows, and disinfectant concentrations within pressurized pipe networks. Using EPANET, engineers can plan and design modifications to existing distribution systems. Using the model, they can gain insight into the operation of their system and can perform studies to diagnose and fix problems. EPANET is a general tool that allows utilities to manage the operations of their distribution networks.

http://www2.epa.gov/water-research/epanet

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EPANET – Multi-Species eXtension (MSX)

Homeland security researchers use EPANET to model contamination threats to water systems. Historically, EPANET has been limited to tracking the dynamics of a single chemical transported through a network of pipes and storage tanks, such as a fluoride used in a tracer study, or free chlorine used in a disinfection decay study. EPA released a new extension to EPANET called EPANET-MSX, which allows for consideration of multiple interacting species in the bulk flow and on the pipe walls. This capability has been incorporated into both a stand-alone executable program as well as a toolkit library of functions that programmers can use to build customized applications.

http://cfpub.epa.gov/si/si_public_record_report.cfm?subject=Homeland%20Security%20Research&dirEntryId=218488

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EPANET – Real-time eXtension (RTX)

EPANET-RTX is the first open-source set of libraries to extend EPANET's hydraulic and water quality simulation functionality to include data acquisition and predictive forecasting capabilities.
http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=286578&fed_org_id=1253&subject=Homeland%20Security%20Research&view=desc&sortBy=pubDateYear&showCriteria=1&count=25&searchall=%27EPANET%20extensions%27%20OR%20EPANET-RTX%20OR%20EPANET-BTX%20OR%20EPANET-MSX

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Fertilizer Emission Scenario Tool for CMAQ (FEST-C)

FEST-C simulates daily fertilizer application information and facilitates the creation of N and P loss maps over small regions or up to a national domain. These maps can use year-specific weather data and atmospheric deposition as inputs, or average files available with the download. FEST-C can be used by states to assess not only the impacts of agricultural fertilization and management practices on air quality (NH_3) and climate (N_2O), but also the impacts of weather, climate and air quality (N deposition) on crop yield, soil erosion, and the overall nitrogen, carbon, and phosphorus biogeochemical status of the agricultural ecosystem.
https://www.cmascenter.org/fest-c/

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Greenhouse Gases Mitigation Options Database (GMOD)

GMOD is a decision support database and tool intended to evaluate mitigation options to support state- and regional-level activities and independent research. GMOD's primary goal is to provide attainable options to state agencies and local governments reflecting realistic technology choices that are comparable to those obtained by engineering and economic analyses. GMOD allows evaluation of multiple mitigation options to achieve emissions reductions and co-benefits, and supports decision-making on state-level permitting activities, technology development, and technology investments. Additional sectors are planned for the next year. We are working to make the database publicly accessible on the EPA website.
To request access, please email Raj Bhander at bhander.gurbakhash@epa.gov.

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Ground Water and Vadose Zone Models

EPA's Center for Subsurface Modeling Support (CSMoS) provides public domain ground water and vadose zone modeling software to federal and state agencies and private companies throughout the United States and the world. The primary goal of CSMoS is to provide direct technical support to EPA

and state decision-makers via subsurface modeling applications. A major focus of CSMoS is to coordinate the use of models for risk assessment, site characterization, remedial activities and wellhead protection. In these ways, CSMoS has an active role in protecting, restoring, and preserving ground water resources in the U.S. CSMoS currently distributes and supports more than 20 different ground water and vadose zone models via EPA's website.
http://www2.epa.gov/water-research/methods-models-tools-and-databases-water-research

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Guidelines for Water Reuse

This manual provides comprehensive, up-to-date national guidance on water reuse regulations and program planning in support of regulations and guidelines developed by states, tribes and other authorities.
http://nepis.epa.gov/Adobe/PDF/P100FS7K.pdf

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Health and Environmental Research Online (HERO)

HERO contains the key studies used to develop health and environmental assessments, including references used for Integrated Scientific Assessments, Provisional Peer-Reviewed Toxicity Values and Integrated Risk Information System assessments. HERO facilitates public access to the scientific studies that underpin key regulatory decisions. The HERO database enhances the transparency of the science supporting agency decisions. Multiple methods are in development to improve data mining and extraction, and to reduce the resource needs for literature searching, identification, retrieval and curation within the database to support all levels (e.g., peer review) of assessment development.
http://hero.epa.gov/

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Health Impact Assessment (HIA)

HIA is a decision-making tool that informs users how proposed decisions may impact health and well-being. HIAs consider potential consequences of decisions; include input from the people impacted by those decisions; provide flexibility based on timelines and resources; consider different types of evidence; and present timely recommendations to decision-makers. EPA scientists collaborated with Georgia stakeholders to carry out a HIA at Proctor Creek's Boone Boulevard in Atlanta, GA. HIA evaluates the potential direct and indirect public health benefits of establishing green infrastructure projects. The City of Atlanta has used the HIA to make strategic decisions on public road infrastructure.
http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=266763&simpleSearch=1&searchAll=A+Review+of+Health+Impact+Assessments+in+the+U.S.%3A+Current+State-of-Science%2C+Best+Practices%2C+and+Areas+for+Improvement

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Human Well-Being Index (HWBI)

HWBI is a sustainability indicator for evaluating the provisioning of ecosystem, economic and social services in a predictive modeling framework, allowing decision-makers to use alternate scenarios to assess a range of potential impacts on communities.
http://www.epa.gov/ged/wellbeing.pdf

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Hydrological Simulation Program - FORTRAN (HSPF)

HSPF is a comprehensive package for simulation of watershed hydrology and water quality for both conventional and toxic organic pollutants. HSPF is a mixed land use model, applicable to urban and non-urban watersheds. The result of this simulation is a history of the runoff flow rate, sediment load, concentrations of pathogens, nutrients, and pesticides, and other stressors, along with a history of water quantity and quality at any point in a watershed. HSPF simulates three sediment types (sand, silt and clay) in addition to a single organic chemical and transformation products of that chemical. It allows states to develop total maximum daily loads (TMDLs) for water quality impaired streams and rivers, as required under the Clean Water Act (CWA). For any pollutant of interest to TMDL developers, HSPF allows states to calculate point and non-point pollutant loads (e.g., bacteria, total nitrogen, or dissolved oxygen). In addition, HSPF allows states to develop TMDL implementation plans using BMPs and to evaluate whether BMP placement in the watershed reduces pollutant loads to allowable levels.
http://www2.epa.gov/exposure-assessment-models/hspf

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Incident Waste Decision Support Tool (I-Waste)

I-WASTE provides information for planners on how to handle, transport, treat and dispose of contaminated waste and debris. The web-based platform condenses and presents large amounts of information in a user-friendly format. I-WASTE is easily updated as new information becomes available. I-WASTE includes the following data and information:

- Characteristics of waste, debris, potential contaminants and decontamination agents.
- Databases of treatment, disposal and recycling facilities.
- A waste quantity estimator for modeling waste and debris resulting from different events involving one or more buildings of different types.
- A water systems module for modeling impacts on piping (and other infrastructures) of different approaches to waste management and treatment in different geographical areas.
- Information and guidelines (including case studies and training modules) on agricultural biomass disposal, radiological waste management, worker protection and natural disaster debris disposal, transportation, packaging and staging.

http://www2.ergweb.com/bdrtool/login.asp

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Integrated Climate and Land Use Scenarios (ICLUS)

Climate change and land-use change are global drivers of environmental change. Impact assessments frequently show that interactions between climate and land-use changes can create serious challenges for aquatic ecosystems, water quality and air quality. Population projections to 2100 were used to model the distribution of new housing across the landscape. In addition, housing density was used to estimate changes in impervious surface cover. A final report, datasets, the ICLUS+ Web Viewer and ArcGIS tools are available at:
http://www.epa.gov/ncea/global/iclus/index.html.

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Landfill Gas Emissions Model (LandGEM)

LandGEM is an automated estimation tool with a Microsoft Excel interface with which users can estimate emission rates for total landfill gas, methane, carbon dioxide, nonmethane organic compounds, and individual air pollutants from municipal solid waste landfills. The LandGEM guide provides step-by-step guidance for using the software application, as well as an appendix containing background information on the technical basis of the model. LandGEM can use either site-specific data to estimate emissions or default parameters if no site-specific data are available.
http://www.epa.gov/ttn/catc/products.html#software

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Market Allocation Energy System Optimization (MARKAL) Model Database Development and User Support

Researchers have developed national databases for use with the MARKAL (one representative of the U.S. as a single continuous region), which MARKAL uses to characterize technology changes associated with alternative energy system scenarios. The model tracks fuel use, greenhouse gas and air pollutant emissions, and water use. EPA's databases and MARKAL provide the only comprehensive, environmentally detailed, peer-reviewed and publicly available energy modeling system in the U.S. These databases have found widespread use within and outside the Agency. There are numerous examples where this database has been used for state-level decisions. Northeast States for Coordinated Air Use Management (NESCAUM), for example, used EPA's MARKAL database to create their own New England MARKAL model, which was subsequently used to evaluate the Regional Greenhouse Gas Initiative, and in a pilot project to develop multipollutant control strategies. Researchers from Purdue are using EPA's MARKAL databases and expertise to develop a version of the MARKAL model for focused use by the state of Indiana. Users are also developing city- and community-level representations of the model for use in various efforts.
To access MARKAL, please contact Carol Lenox at lenox.carol@epa.gov.

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Mercury Geospatial Assessments for the New England Region (MERGANSER)

MERGANSER relates atmospheric mercury (Hg) and lake and watershed characteristics to Hg concentrations in fish and fish-eating wildlife (common loons). The web-based interactive tool provides predicted mercury levels in fish and loons for 4,404 lakes in New England. States can use MERGANSER to assess the risk of Hg contamination in fish and loons throughout New England and to help plan Hg-pollution reduction efforts.

http://gispub4.epa.gov/Merganser/

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Methods for measuring organic chemicals in drinking water

Three sensitive, rugged, and specific methods have been developed for measuring organic chemicals in drinking water: Methods 530, 543 and 544. These methods will provide accurate monitoring of chemicals on the Contaminant Candidate List (CCL), or chemicals of emerging concern in drinking water.

- **EPA Method 530** is a solid phase extraction SPE GC/MS method that can simultaneously monitor four CCL chemicals (o-toluidine, quinoline, butylated hydroxyanisole and dimethipin). Method 530 reports detection limits of <15 ng/L for all four CCL chemicals.
  http://www.epa.gov/nerlcwww/documents/method530_final.pdf

- **EPA Method 543** is an on-line SPE LC/MS/MS method that can simultaneously monitor for five CCL pesticides (3-hydroxycarbofuran, bensulide, fenamiphos, tebuconazole, tebufenozide) and two degradates of CCL chemicals (fenamiphos sulfoxide and fenamiphos sulfone). Method 543 uses innovative state-of-the-art on-line SPE LC/MS/MS technology, which enables automation of the extraction and analytical steps (a notable advantage over off-line SPE-LC/MS/MS). Other advantages are small sample volumes (1-20 mL), shorter sample processing and analysis times, and lower costs due to automation. The development of EPA Method 543 gives laboratories an alternative to Method 540 (the previously published off-line SPE LC/MS/MS method that addresses the same CCL chemicals as Method 543) to analyze for the CCL 3 chemicals under the UCMR with detection limits of ≤2.0 ng/L.-
  http://www.epa.gov/nerlcwww/documents/Method543_Final.pdf

- **EPA Method 544** is an SPE LC/MS/MS method for the determination of seven cyanotoxins, including six microcystin (MC) congeners and nodularin. This method includes MC-LR, which is listed on CCL 3. Method 544 reports a combined extracellular and intracellular measurement for each of the cyanotoxins, at detection limits of ≤22 ng/L.
  http://www.epa.gov/nerlcwww/documents/Method544_Final.pdf

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Municipal Solid Waste (MSW) Decision Support Tool

The MSW decision support tool allows communities and other stakeholders to evaluate the cost, life-cycle environmental tradeoffs, and societal aspects of current and future options that lead to more Sustainable Materials Management (SMM) of municipal solid "waste." With a new streamlined user interface, the tool provides the user the ability to tailor the software to local conditions and priorities, while reflecting current or forecasted changes in waste composition, management and transportation. The tool is being used to identify more sustainable solutions for MSW management. In addition, several universities are using it in classes to encourage more sustainable policies based on life-cycle environmental tradeoffs, energy flow analyses, full cost accounting, and impacts on societal issues, such as land use and infrastructure priorities.

https://mswdst.rti.org/

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National Database Structure for Life Cycle Performance Assessment of Water and Wastewater Rehabilitation Technologies (Retrospective Evaluation)

This database houses performance evaluation data for rehabilitation technologies used in the water and wastewater sectors on a national basis, including additional cured-in-place pipe liner testing. The database will improve the ability of utilities to sustain their aging and deteriorating water distribution and stormwater/wastewater collection systems, and will help increase acceptance of new and innovative technologies by decision-makers who adopt, regulate, and design infrastructure technologies. The databases can also assist utilities to implement comprehensive asset management, provide reliable service to their customers, and meet their Clean Water Act and Safe Drinking Water Act requirements. This will accelerate the development, evaluation and market acceptance of developed rehabilitation technologies.

http://138.47.78.37/Retrospective/Login.aspx?ReturnUrl=%2fRetrospective

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National Stormwater Calculator (SWC) with Climate Scenarios

SWC is a desktop application designed to support local, state and national stormwater management objectives using Green Infrastructure (GI) practices. The primary focus of the SWC is to inform site developers on how well they can meet a desired stormwater retention target, but it can also be used by landscapers and homeowners. In January 2014, updates to SWC included the ability to analyze the effects of different climate change scenarios. Users can apply these different scenarios to determine how well GI increases the resiliency of stormwater management approaches to a changing climate. The SWC is now a resource for LEED Project Credit 16 (Rainwater Management) certification by the U.S. Green Building Council for projects designed to reduce runoff and improve water quality of a site.

http://www2.epa.gov/water-research/national-stormwater-calculator

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Program to Assist in the Replacement of Industrial Solvents (PARIS III)

PARIS III is a publicly available solvent substitution software tool designed to enable the effective replacement of harmful solvents with more benign single solvent or solvent mixtures. The library database contains physical and chemical properties of each listed solvent, along with representative data for PARIS' environmental impact categories. This software can generate a list of solvents that may be effective replacements to the harmful solvent(s) under investigation. This tool, along with experimental validation, provides an effective approach for solvent substitution. States can provide useful input on the effectiveness of this software tool in finding benign replacements for harmful solvents. Comments on the usefulness of this software tool and possible enhancements can be provided through the technical contact tab on the bottom left corner of the PARIS III web page.
http://www2.epa.gov/chemical-research/program-assisting-replacement-industrial-solvents-paris-iii

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R-LINE model

The R-LINE model is a beta-release of a research dispersion model that is currently under development for near-roadway assessments. R-LINE is part of the ongoing evaluation of air quality impacts in the near-road environment. The research model simulates line type source emissions (e.g., mobile sources along roadways) by numerically integrating point source emissions. The model uses the surface meteorology provided by the AERMET meteorological data preprocessor and includes user-friendly input requirements such as simplified road-link specifications. Model simulation with integrated point sources has been formulated with careful attention to appropriately simulate line source emissions for receptors very near the source line. It should be clearly understood that the current version of the R-LINE model is not appropriate for regulatory applications (e.g., NAAQS compliance and enforcement, NSR/PSD permitting, PM Hot-spot Conformity Analyses, SIP analysis, etc.) because it has not undergone the extensive testing and comprehensive evaluation necessary for regulatory use.
www.cmascenter.org/r-line/

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Spsurvey

This software tool enables states and other organizations to construct survey designs for aquatic resources (lakes, streams, wetlands, coastal waters) based on their monitoring program requirements. It is used by EPA's Office of Water's National Aquatic Resource Surveys (NARS), as well as by several states that design their own state probability-based monitoring programs. Spsurvey also enables states to complete the statistical analyses necessary to report on the status of their waters.
http://www.epa.gov/nheerl/arm/analysispages/software.htm

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Standard Test Method and Practice Screen for Nonyphenol (NP), Octalphenol (OP), Nonylphenol Monoethoxylate (NP1EO) and Nonylphenol Diethoxylate (NP2EO) in environmental waters

NP and OP have been shown to have toxic effects on aquatic organisms. The primary source of NP and OP is the use of common commercial surfactants. The most widely used surfactant is nonylphenol ethoxylate (NPEO), which has an average ethoxylate chain length of nine. The ethoxylate chain is readily biodegraded to form NP1EO, NP2EO, and nonylphenol carboxylate (NPEC). Under anaerobic conditions, this standard test method detects these substances.

http://www.astm.org/Standards/D7485.htm

http://www.astm.org/Standards/D7742.htm

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Standard Test Method for Bisphenol A in Environmental Waters

The predominant environmental source of bisphenol A (BPA) is the decomposition of polycarbonate plastics and resins, which are used in a wide range of commercial products. BPA has been reported to have adverse effects on aquatic organisms and may be released into environmental waters directly at trace levels through landfill leachate and publicly owned treatment works (POTW) effluents. This method has been investigated only for use with surface water and secondary and tertiary POTW effluent samples, and therefore is applicable only to these matrices.

http://www.astm.org/Standards/D7574.htm

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Standard Test Methods for Perflourinated Compounds (PFC)

Standard test methods have been developed to detect PFC compounds in soils (ASTM D7968) and water, sludge, influent, effluent, and wastewater (ASTM D7979). PFCs are constituents of a wide variety of industrial and commercial products, and they are persistent, bioaccumulative, and ubiquitous in the environment. PFCs have been detected in soils, sludges, and surface and drinking waters, and have been reported to exhibit developmental toxicity, hepatotoxicity, immunotoxicity, and hormone disturbance. This standard test method provides a quick, easy and robust method to measure these compounds at trace levels in water matrices to improve understanding of the sources and pathways of exposure.

http://www.astm.org/Standards/D7968.htm, http://www.astm.org/Standards/D7979.htm

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Stochastic Human Exposure and Dose Simulation (SHEDS-HT)

ORD has developed a computationally lean version of the Stochastic Human Exposure and Dose Simulation model called SHEDS-HT. This lean version maintains SHEDS' advantages as a mechanistic stochastic model, while enabling estimates of total exposures to chemicals in consumer and food products. Like SHEDS, SHEDS-HT can be used to predict ranges of exposure in a population; identify critical pathways, factors, and uncertainties; and enhance dose model estimates. However, the HT version of SHEDS reduces model data needs and run times by retaining only the most highly influential parameters. SHEDS-HT has been modified to accommodate a down-the-drain scenario, which can be used by states to estimate chemical loadings to surface waters. The SHEDS-HT webpage is under development. For more information please visit the central SHEDS homepage: http://www.epa.gov/heasd/research/sheds.html

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Stormwater Management Model - Climate Adjustment Tool (SWMM CAT)

SWMM, first released in 1971, models hydrology and hydraulics to simulate the movement of water through the landscape and into and through sewer systems. The most recent version of this model includes a green infrastructure module to simulate the integration of green infrastructure practices (ranging from green roofs to permeable parking lots) into a community's stormwater management plan. SWMM is widely used throughout the world and considered the "gold standard" design of urban wet-weather flow pollution abatement approaches. SWMM CAT allows users to include any combination of low impact development/green infrastructure controls to determine their effectiveness in managing stormwater and sewer overflows. The new CAT update for SWMM is particularly useful to states, comprising a simple to use software that applies monthly climate adjustment factors onto historical precipitation and temperature data to consider potential impacts of future climate on stormwater. http://www2.epa.gov/water-research/storm-water-management-model-swmm

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Tampa Bay Ecosystem Services Demonstration Project Digital Atlas

This tool informs decisions regarding land use in the context of climate change by enabling communities to consider ecosystem goods and services in their decision making process. The Tampa Atlas provides mapped inventories of multiple ecosystem services in both physical and (when possible) monetary terms for multiple alternative future scenarios, out to 2100. This digital atlas is a product specifically for the Tampa Bay Ecosystem Services Demonstration project, but is transferable to other areas. http://www.epa.gov/ged/tbes/

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The Leaching Environmental Assessment Framework (LEAF)

LEAF is a collection of several elements, including four leaching methods; data management tools, geo-chemical speciation, and mass transfer modeling; quality assurance and control; and integrated leaching assessment approaches. LEAF provides data to predict more accurately the source term for environmental release of mercury and other constituents of potential concern to either groundwater or to surface water bodies. The integration of leaching results provides a site-specific or material-specific "source term" release for use in site or material management decisions for use or disposal scenarios.
http://www.vanderbilt.edu/leaching

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Threat Ensemble Vulnerability Assessment – Sensor Placement Optimization Tool (TEVASPOT)

TEVASPOT allows users to define a water network contamination scenario, simulate the spread of a contaminant or contaminants throughout the water network, analyze the consequences, and display the results in a variety of graphic and tabular formats. The ultimate aim of a simulation and subsequent analysis is to determine the vulnerability of the distribution system to contaminant releases, and to determine the optimal locations in the network to place a set of water quality sensors to mitigate the impacts of contamination.
http://cfpub.epa.gov/si/si_public_record_report.cfm?subject=Homeland%20Security%20Research&dirEntryId=257684

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Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)

TRACI is a software tool that can translate Life Cycle Assessment (LCA) inventories into quantitative environmental impacts. This process is called life cycle impact assessment. TRACI is designed to be used in conjunction with LCA methods or tools and requires life cycle inventory data to support characterization. The output characterizes results within respective impact categories. Users can then analyze these results further to determine which stressors provided the primary inputs within each impact category. TRACI has been incorporated into numerous software systems within the LCA research community and is used by academic, industrial, and government personnel to evaluate the sustainability of a process or product.

For more information and to obtain a copy of the software, please contact Jane Bare at bare.jane@epa.gov.

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Toxicity Estimation Software Tool (TEST)

TEST is a publicly available tool that estimates toxicity and levels of other physical properties of a chemical using quantitative structure activity relationship (QSAR) models. The models in TEST are built using toxicity/physical property data sets that require a molecular structure and toxicity/property values from other compounds for its library database. TEST estimates values for a variety of toxicity and physical property endpoints, and also provides detailed information allowing users to assess the reliability of predictions.

http://www.epa.gov/nrmrl/std/qsar/qsar.html

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Toxicity Forecaster (ToxCast™) and iCSS Dashboard

ToxCast uses high-throughput screening assays to screen cells or proteins for changes in response to chemical exposure. Changes in biological activity may suggest potential toxic effects and eventual adverse health effects from chemical exposure. The data from these assays is publicly available in the ToxCast database and can be explored using the Chemical Safety for Sustainability (iCSS) dashboard interactive tool.

http://epa.gov/ncct/toxcast/

http://actor.epa.gov/dashboard2/

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Virtual Beach

Virtual Beach is a software package designed to facilitate development of site-specific statistical models for the prediction of pathogen indicator levels at recreational beaches. $VB_{3.0.4}$ reads input data from a text or Excel file, assists the user in preparing the data for statistical analysis, and provides three analytical techniques for model development: multiple linear regression (MLR), partial least squares regression (PLS), and a gradient boosting machine (GBM). With an integrated mapping component to determine the geographic orientation of the beach, the software can automatically disaggregate wind/current speed and direction data into along-shore and onshore/offshore components. Virtual Beach is primarily designed for beach managers responsible for making decisions regarding beach closures due to pathogen contamination. However, Virtual Beach can be used by states to improve understanding of the relationships between water quality indicators and ambient environmental conditions.

http://www2.epa.gov/exposure-assessment-models/virtual-beach-vb

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Visualizing Ecosystems for Land Management Assessments (VELMA)

VELMA predicts the effectiveness of alternative green infrastructure scenarios for protecting water quality, and also estimates potential ecosystem service co-benefits and tradeoffs. VELMA is a spatially distributed, eco-hydrological model that links a land surface hydrology model with a terrestrial biogeochemistry model to simulate the integrated responses of vegetation, soil, and water resources to interacting stressors. For example, VELMA can be used by states to analyze the effects of climate and land use on the capacity of ecosystems to provide clean water, flood protection, food and fiber, greenhouse gas regulation, habitat for fish and wildlife, and other services. VELMA is being linked to a variety of other models – of fish and wildlife populations and air quality, among others – to support comprehensive environmental decision-making. Current applications include an assessment of forest management strategies for improving salmon habitat in the Pacific Northwest, and identification of rangeland prescribed burning strategies for balancing ecological, economic, and human health tradeoffs for rural and urban stakeholders in the central Great Plains. We are working to make VELMA's website available on our ORD Methods, Models, Tools and Databases web page.
Please contact Bob McKane at mckane.bob@epa.gov for additional information.

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Water Infrastructure Database (WATERiD)

This database can help utilities choose the best pipe rehabilitation, condition assessment, and pipe-location technologies for both wastewater conveyance systems and drinking water distribution systems. It includes primary information about the costs and performance of individual renewal technologies, case studies of real world applications, and lists of regional vendors, consultants, and contractors available for specific technologies. The database also allows utilities to input their experiences in these areas for the benefit of other utilities.
http://www.waterid.org/

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Water Quality Analysis Simulation Program (WASP)

WASP is a geographically and temporally dynamic, mechanistic modeling framework that can assist states by simulating solids, nutrients, dissolved oxygen, algae, and other environmental contaminants (e.g., organics and metals), with flexibility to handle the different complexities of ponds, lakes, streams, rivers, and estuaries. WASP has been widely applied in the development of Total Maximum Daily Loads (TMDLs). EPA's Office of Wastewater Management routinely uses this model to address nitrogen (N) and phosphorus (P) loadings. WASP also aids in understanding the governing processes of a system, and can be used to evaluate remediation strategies or management practices.
http://epa.gov/athens/wwqtsc/html/wasp.html

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Web-based Interspecies Correlation Estimation (Web-ICE)

WEB-ICE allows states to estimate the acute toxicity (LC50/LD50) of a chemical to a species, genus, or family. Web-ICE has modules to predict acute toxicity to fish, algae, aquatic invertebrates, birds, and mammals for use in ecological risk assessments. Other modules generate Species Sensitivity Distributions from Web-ICE-generated data. Used widely for toxicity extrapolation, Web-ICE is currently being tested for application to threatened and endangered species.
http://www.epa.gov/ceampubl/fchain/webice/

NEAR-TERM METHODS, MODELS, TOOLS AND DATABASES

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Advanced Streamline-Based Ground Water Transport Model (GW Transport)

GW Transport provides states with a quick way to assess subsurface contaminant transport from multiple sources under climate change scenarios, and the resulting potential impacts on community water supplies. It can also provide the basis for efficient simulation of multiple waste sites on the scale of a watershed. Trial version is planned for fall 2015.

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An Integrated Ecosystem Services and Ecological Integrity Assessment Framework for Strengthening Resiliency in Coastal Watersheds

The overarching goal of this effort is to promote the resiliency of coastal watersheds in the face of climate change and development, while considering ecological outcomes, as well as economic, social, and environmental justice issues. The research will provide an assessment framework with a decision support system that incorporates ecological integrity to identify threats to and impacts on the resilience of ecosystem services. This framework operates entirely within a geospatial platform, allowing for spatially explicit analysis of individual ecological units (and their associated ecosystem services) at multiple scales. This framework allows for the evaluation of both ecological integrity and ecosystem services of key functional processes, components, and elements of watershed integrity relative to the location within the watershed (e.g., headwater streams, flood plains, river banks, coastal wetlands, etc.). Decision support tools will integrate measures of ecosystem services and ecological integrity to provide scientific support in decision-making to enhance sustainability and resiliency. Product is expected by October 2016.

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Chemical Transformation Simulator (CTS)

The web-based beta version of the CTS will provide a unique capability for using multiple physiochemical calculators to provide the largest number of different physiochemical properties in one place, thus providing insight into the range and uncertainty of property estimations. CTS will enable the prediction of transformation products of organic chemicals under user-defined environmental conditions and estimate the physicochemical properties for both the parent and transformation products. This information will be used to parameterize environmental fate and transport, exposure potential, dose estimation, and effects-based models.

http://www.epa.gov/athens/research/efs_indepth.html

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C-LINE and C-PORT

The **C**ommunity LINE Source Model (C-LINE) is a web-based model that can inform states of local air quality impacts from mobile-sources using a simplified modeling approach. C-LINE is also being expanded to model emissions from port-related activities (e.g., ships, trucks, cranes, etc.). Currently in development, the Community modeling system for near-PORT (C-PORT) is expected to be available for beta testing in October 2015. Because these are reduced-form visualization tools, these models are not intended for regulatory use.

https://www.cmascenter.org/r-line/

- **Target Opportunity:** C-LINE is currently available as a beta-version and is expected to be publicly available beginning in October 2015. To access C-LINE online via the Community Modeling and Analysis System (CMAS), the user must create a CMAS account and log in before using the model.

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Community Cumulative Assessment Tool (CCAT)

CCAT is a computerized, guided process that informs users of the steps involved in a cumulative risk assessment. These steps include partnership development, comparing multiple issues and prioritizing solutions. CCAT supports informed decision making because it requires the users to seek out data, obtain expert and stakeholder input, and to consider available resources. It highlights health risks as well as community-based values in decision-making, and incorporates a method to rank and compare disparate environmental issues. A CCAT prototype is complete, and final testing and evaluation are ongoing. Public release is expected for FY16. CCAT is one of the major science and research activities listed in EPA Plan EJ 2014, listed on pages 11-12 of the Science Tools Development section.

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Community-Focused Exposure and Risk Screening Tool (C-FERST)

CFERST is an online information access and community mapping tool that communities can use to learn more about environmental, health and socioeconomic issues in their community. Designed to help assess risks in a community at a screening level, C-FERST users can view maps and community reports regarding a variety of environmental issues such as air toxics, diesel exhaust, lead, water pollution and beach advisories. C-FERST contains links to exposure and risk reduction options, and to projects other communities have conducted. Users can explore potential solutions to environmental issues and see what has worked in other communities. The tool will be continually refined and populated with more detailed and updated information.

http://www.epa.gov/heasd/c-ferst/index.html

- **Target Opportunity:** A draft final version of C-FERST is now available. This version contains National-scale Air Toxics Assessment (NATA) data from 2008 that will be replaced with the latest NATA data from 2011, as these become available. To access the draft version, email CFERSTMAIL@epa.gov for link, ID and password. Anticipated public release of final version by March 2016.

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Decision Analysis for a Sustainable Environment, Economy and Society (DASEES)

DASEES is a web-based interactive tool for structured decision-making. It provides an environment where communities can build common understanding of complex problems, then create and evaluate management alternatives through a multi-objective decision analysis. DASEES serves as an integrative framework for combined assessment of environmental, economic and social aspects of a decision problem involving uncertainty or risk. Applicable in many contexts and scales, DASEES is a tool that gives policy-makers the means to create, analyze, implement, and monitor action plans consistent with the intended objectives of specific policies.
http://nepis.epa.gov/Adobe/PDF/P100ECOI.pdf

- **Target Opportunity:** Currently in beta-testing, the final product is expected by 2017. To access a beta version, please contact Brian Dyson at dyson.brian@epa.gov.

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Drinking Water Inorganic Chloramine Chemistry Simulators

These two web-based applications relevant to drinking water systems are in the final stages of development. The applications will be used by drinking water treatment facilities to simulate inorganic chloramine formation and subsequent stability (including a simple inorganic chloramine demand reaction for organic matter) and to generate chlorine breakpoint curves. The applications will provide the user a free, easy access, interactive environment in which to explore and understand fundamental inorganic chloramine chemistry.

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EcoService Models Library (ESML) – Beta Release

Currently available as a beta version, ESML is an online database that provides descriptions of a wide variety of ecological models useful for quantifying ecosystem services. Models described in ESML range from well-known online tools to quantitative relationships usually found only in the scientific literature. Most entries describe published applications of models to specific settings. The database is searchable by type of environment modeled, by location, or by ecosystem service. ESML is intended to be used by scientists or other professionals who need to conduct ecosystem service assessments, by modelers who are assembling decision support systems, and by ecosystem services researchers.

- **Target Opportunity:** To register as a beta user, please go to https://esml.epa.gov/epf_l/public/signup.

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Effects Based Surveillance and Monitoring

Understanding the hazards and risks associated with chemical contaminants in the environment requires monitoring approaches that can (1) provide broad-based surveillance and early warning of potential biological impacts before they develop into ecosystem impairments, and (2) support detailed assessments of conditions as a function of space and time in order to aid source identification, evaluate trends, and evaluate the relative effectiveness of remedies at affected sites. 'Omic' tools (e.g., transcriptomics, metabolomics), in conjunction with adverse outcome pathway (AOP) frameworks, provide a mechanistic construct for linking contaminant-induced changes at the cellular or molecular-level with alterations of population-level responses. EPA scientists are developing and applying 'omics' technologies to analyze samples from fish gathered from over 30 sites within five Great Lakes area of concern (AOC). Additionally, ORD has developed non-lethal approaches for collecting fish biofluids for 'omics' analysis, and has developed novel approaches for screening environmental samples using in vitro metabolomics assays. The case studies associated with this work will inform recommendations regarding the use of these tools for both early warning and monitoring remediation of impairments in Great Lakes AOC. The principles and practices developed are expected to apply to regions, states, and other regulatory authorities protecting and managing the nation's waters.

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Final Ecosystem Goods and Services Classification System (FEGS-CS)

FEGS-CSS is a non-duplicative system that identifies and classifies ecosystem services (i.e., stocks) that specific, identified beneficiaries appreciate, need, and/or value. It is designed to define those ecosystem services that help to identify metrics that can be used in trade-off and sustainability decisions. http://gispub.epa.gov/FEGS/

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Gauging Reaction Effectiveness for the Environmental Sustainability of Chemistries with a Multi-Objective Process Evaluator (GREENSCOPE)

The GREENSCOPE tool quantifies process sustainability with 140 indicators in four main areas: material efficiency, energy, economics, and environment. This set of indicators can transmit and translate information about process performance, feedstocks, utilities, and equipment, and generate a sustainability measurement scale. GREENSCOPE can be applied to equipment or process units, as well as to the entire process or bench scale. It allows for a direct comparison between several processes manufacturing the same product, but employing different raw materials, reaction processes, and separation technologies, and producing different byproducts. In addition, the designer or the researcher

can implement this method to evaluate sustainability performance after modifying the process. This sustainability assessment describes how well the system under consideration makes use of mass and energy inputs to manufacture a valuable product, meets social and environmental needs, and maximizes its economic benefits.

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Green Infrastructure Wizard (GIWiZ)

GIWiz is an interactive web application that connects community users to EPA's Green Infrastructure tools and resources via reports tailored to fit their stated needs and interests. Designed to match the intuitive usability and sophistication of widely used web-based "wizards," GIWiz provides users with seamless access to 300 existing EPA Green Infrastructure resources and tools including models and calculators, case studies, design guidances, and financing options. GIWiz is intended to serve the needs of a broad range of users, including local communities, states, and the general public.

- **Target Opportunity:** Opportunity for states to participate in beta testing expected to begin October 2015.

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HYGEIA

The HYGEIA model predicts the effects of climate-change-induced heat stress on cardiovascular morbidity and mortality. Using census block data, the model assesses the vulnerability of various demographic groups over time and location, and predicts morbidity and mortality under future climate conditions and under conditions that mitigate climate extremes. The model is currently undergoing further development to address the effects of airborne particulate matter on cardio-pulmonary functions and adverse outcomes, including wildfire smoke effects.

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Integrating Modeling with Petroleum Vapor Site Assessment

This approach screens potential petroleum vapor sites that include three main factors: (1) the concentrations of hydrocarbons in soil gas at the source of the vapors, (2) the separation distance between the receptor and the source of the vapors, and (3) a presumption that aerobic biodegradation will reduce the concentrations of hydrocarbons in the unsaturated zone. Models are included in the approach as a means of adding to the weight of evidence for aerobic biodegradation. One model, PVIScreen, can be used to show how uncertainty estimates can be made and how the results can integrate with site assessment to increase confidence in decision-making.
http://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=305910

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Multimedia Models of the Linkage Between Discharge and Nutrients from the Mississippi River Basin (MARB) and the Resultant Gulf of Mexico (GOM) Hypoxia

The goal of this research is to predict how nutrient management decisions and future climate change will impact the size, frequency, and duration of the hypoxic area that forms every summer. This single and integrated modeling approach will be applied to Gulf of Mexico hypoxia, which is a critically important environmental issue affecting provision of ecosystem services in the northern Gulf. The integrated, multimedia modeling is being used to predict a broad set of consequences in the MARB and the GOM, consequences associated with nitrogen management decisions. Without such a multimedia framework, the interrelated actions of excess nitrogen can lead to unintended or unidentified consequences of particular decisions.

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Net Zero

Conserving water, reducing energy use, and eliminating solid waste can improve the environment, save money, and help communities become more sustainable and resilient. EPA researchers are helping by developing and implementing Net Zero strategies, approaches and technologies. Simply put, Net Zero means consuming only as much energy as produced, achieving a sustainable balance between water availability and demand, and eliminating solid waste sent to landfills. EPA's Net Zero research projects leverage federal, state, and local expertise and resources to make a positive impact on a grand scale, while fostering economic growth and promoting citizen health and well-being. Under this cross-agency, transdisciplinary partnership, EPA scientists and engineers are working with the U.S. Army, the U.S. Department of Energy, U.S. Army Corps of Engineers, U.S. Geological Survey, Kansas State University, and private industry to identify and demonstrate innovative technologies and approaches for achieving Net Zero goals. Results and lessons learned should be available in 2016 to assist states that have specific quantitative goals for reducing energy consumption, water use, and waste generation.
http://epa.gov/sustainability/netzero/

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Next Generation R&D for Air Quality Models

ORD has initiated research on the development of a "next gen" modeling system designed to extend the usefulness and applicability of current air quality models (such as CMAQ) to more difficult-to-model air quality problems, such as background ozone. ORD envisions that this system will include an integrated variable grid structure (to include spatial scales ranging from fine resolution at the urban level to relatively coarse scales, e.g., to represent hemispheric transport), coupled with meteorological-chemical processing, to account for the dynamic feedback that occurs in urban settings as well as with climate change/air quality changes; and, a computational core designed for code modularity and maintenance which takes advantage of evolving computer architectures. Initial design work has started on the

system; a concentrated effort will begin during fall 2015, after the release of CMAQv5.1.
http://www.epa.gov/cmaq

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N-Sink

N-Sink is a web-based tool that uses the best available biogeochemical data and nationally available land cover to estimate nitrogen retention along water flow paths within a hydrologic unit code (HUC-12) watershed. The approach can help states by generating heat maps of susceptibility and sensitivity to nitrogen deposition within a watershed that is highly valued by decision-makers. Two watershed case studies are available as examples, online and in an EPA report. EPA is working with the University of Connecticut and University of Rhode Island to apply the tool to multiple watersheds in EPA Region 1 (New England) to help support decision making.
http://www2.epa.gov/sites/production/files/2014-06/documents/tool-to-identify-nitrogen-sources.pdf

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Nutrient Sensor Challenge

The White House Office of Science and Technology Policy convened the U.S. Department of Agriculture (USDA), EPA, U.S. Geological Survey and National Oceanic and Atmospheric Administration (NOAA) to work together and collaborate with industry and other organizations to have lower-cost nutrient sensors (for water and soil) on the market in the next few years. The purpose of the work is to fill significant gaps in our understanding of nutrients in soil, nutrient loadings and nutrient transport that current methods and monitoring do not adequately resolve. Based on widely agreed upon specifications for usability, interoperability, sensitivity, accuracy and precision, a challenge was issued for the development of affordable sensors. Twenty-nine teams registered for the challenge and no-risk beta testing for a number of the sensors began on August 12, 2015. Full evaluation of the competing sensors will be conducted in August 2016. In addition to the sensor development, several other important activities are underway, including a nutrient sensor data visualization challenge, which was awarded on August 11, 2015. EPA and USGS are also working with the Water Environment Federation (WEF) to conduct discussions with states and other organizations to get their input on opportunities for market efficiencies for nutrient sensor acquisition, servicing and data sharing. A discussion was held at the ACWA meeting in August 2015. Results will be compiled into a report and shared in fall 2015.

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Pacific Coastal Waters Ocean Nutrient Input Tool (ONIT)

ONIT can help states distinguish naturally upwelled sources of nutrients from other causes of exceedances of water quality thresholds within estuaries. ONIT can predict the probability of exceedance of a water quality threshold, such as dissolved oxygen, based on water temperature and

salinity characteristics of the water mass. Trials correctly classified a natural cause of exceedances of dissolved oxygen about 80 percent of the time.

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Seagrass Habitat Model

A modelling approach for predicting seagrass habitat as a function of nutrients and other environmental variables has been developed and demonstrated for Narragansett Bay, RI. The approach is applicable to other estuarine systems as well. The EPA Report, expected to be released in September 2015, will include information on data sources for modelling other systems.

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Sequence Alignment to Predict Across-Species Susceptibility (SeqAPASS)

SeqAPASS is a web-based tool that allows the user to begin to understand how broadly High Throughput Screening (HTS) data or Adverse Outcome Pathways (AOP) constructs may plausibly be extrapolated across species, while describing the relative intrinsic susceptibility of different taxa to chemicals with known modes of action (e.g., pharmaceuticals and pesticides). The tool was designed to automate and streamline the relatively complex and time-consuming process of comparing protein sequences in a consistent, logical and criteria-driven manner intended for predicting across species susceptibility to a chemical perturbation. To define the domain of applicability and enhance the utility of the SeqAPASS tool, multiple case studies have been explored, including the derivation of predictions for across species susceptibility to chemicals that target the human estrogen receptor, bovine androgen receptor, mosquito voltage-gated sodium channel, fungus cytochrome P450 51, and honey bee nicotinic acetylcholine receptor. SeqAPASS will be released later in 2015 as an open-source program. http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=276372

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Simulation of Metacommunities of Riverine Fishes (SMURF)

SMURF can enable states to simulate the consequences to multiple populations of one or more fish species – a metacommunity – of multiple stressors across a river network. The model is spatially explicit and age-structured, with three components: habitat suitability, population dynamics (including species interactions) and movement across a spatial network. SMURF is designed to accept water quality time series from watershed models (e.g., VELMA, SWAT, HSPF), and translate these inputs into effects on habitats and populations.

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StreamCat and LakeCat

StreamCat is an extensive database of over 200 landscape metrics for approximately 2.65 million stream catchments within the conterminous United States. These data will greatly reduce the specialized geospatial expertise needed to acquire landscape information at specific streams for both researchers and managers. When combined with an existing geospatial framework of the nation's rivers and streams (National Hydrography Dataset Plus Version 2), the distribution of stream characteristics and conditions can be visualized for the conterminous United States. The StreamCat dataset provides states an important tool for stream researchers and managers to understand and characterize rivers and streams. LakeCat is a similar database for lake watersheds. StreamCat is expected to be available by October 2015 and LakeCat in FY 2016.

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Sustainable and Healthy Communities Indicators and Indices Web-based Communication Tool (SHC I&I)

EPA is developing a site that will offer web-based tools that could help states identify sustainability indicators relevant to community priorities. The tool will be a visual and interactive mode to help provide entry, navigation and cohesion to three sets of indicators and indices:

- **Database of Sustainability Indicators and Indices (DOSII)**
  DOSII comprises almost 1,800 indicators drawn from available sources at the international, national, and local levels, at various scales, on various topics. Communities interested in implementing sustainability programs can access the web utility to develop a customized list of suggested indicators and indices to support the community's identified activities.

- **Environmental Quality Index (EQI)**
  An environmental quality index was developed for all counties (n=3,141) in the U.S. for the period 2000-2005. The EQI uses indicators from the chemical, natural, built and social environments. The EQI comprises five environmental domains: air, water, land, built and sociodemographic. EQI is used to identify geographies characterized by differing environmental qualities, in order to identify clustering of adverse environmental exposures in potentially unhealthy places.
  http://epa.maps.arcgis.com/home/item.html?id=90ab3f8d668c4a4e88144d586ea34141

- **Human Well Being Index (HWBI)**
  The HWBI is a sustainability indicator for evaluating the provisioning of ecosystem, economic and social services in a predictive modeling framework, allowing decision-makers to use alternate scenarios to assess potential impacts on communities.
  http://www.epa.gov/ged/wellbeing.pdf

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The Nitrogen Footprint Tool (NFT)

NFT allows institutions to estimate and manage their nitrogen footprint. While carbon represents one facet of an institution's environmental impact, nitrogen is also important. A university's nitrogen loss to the environment contributes to smog, soil acidification, eutrophication, biodiversity loss, the enhanced greenhouse effect, stratospheric ozone depletion and more. To address this issue, the first nitrogen footprint tool (NFT) was created for the University of Virginia. Through support of the Nprint nitrogen footprint tool (Nprint.org), ORD is working with the University of Virginia and other collaborators to modify NFT so that universities, secondary schools, and residents of the Chesapeake Bay watershed and Baltimore can calculate their nitrogen footprint, identify actions to reduce their impact and monitor their progress. The data template and user's manual is expected to be available in 2015.

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übertool

übertool is a cloud-based web application platform that integrates 10 EPA regulatory models and supporting datasets into an automated system that improves the efficiency and transparency of modeled data informing ecological risk assessments. Models in the übertool web platform include a range of aquatic, terrestrial and atmospheric deposition fate and transport models used to estimate pesticide exposures and effects on ecological receptors. These models are used to determine if a pesticide can be approved, provide labeling information to determine safe levels of pesticide application and, in certain situations, assess impacts on endangered species. We are currently working to make the übertool website available. For further information, please contact Tom Purucker at purucker.tom@epa.gov.

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Waste Reduction Model (WARM) – openLCA Version

WARM was developed originally to enable solid waste planners and organizations to track and voluntarily report GHG emissions reductions and energy savings from different waste management practices for municipal solid waste and some construction and demolition materials. The current version of WARM uses CO_2 emission factors instead of full life cycle inventory data. A new version of WARM, built on the openLCA software tool, is being developed: it provides a more friendly user interface and additional life cycle analysis capabilities, including graphic display of life cycle impacts.
www.epa.gov/WARM

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Watershed Management Optimization Support Tool (WMOST)

WMOST is an application designed to support implementation of integrated watershed management (IWM) in the most cost-effective manner. IWM includes stormwater, drinking water, wastewater and land conservation management practices. WMOST Version 1 focuses on management of base flow. Version 2, expected to be released September 2015, will include a flooding module to assess costs associated with peak flows. Version 3, to be released in the winter of 2015, will include a nutrients module. http://www2.epa.gov/exposure-assessment-models/wmost

- **Target Opportunity:** States and local communities are invited to be beta-testers for version 3 of WMOST and to use and provide input on versions 1 and 2.

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Water Quality Analysis Tool (WQAT)

EPA and NASA developed WQAT jointly to overcome some of the barriers water quality analysts encounter when working with remote sensing satellite imagery. This tool simplifies access to and use of remote sensing. It allows an entry-level analyst with knowledge of GIS and Excel to work with satellite data. For example, user can develop a time-series or extract a statistical distribution for a water body to develop nutrient criteria. Since many states are moving forward with satellite data for establishing chlorophyll criteria, this tool could reproduce the satellite remote sensing work EPA did for the Florida nutrient criteria rulemaking. The tool currently requires pre-loading of data by a remote sensing expert and is being pilot tested in at least one state.

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Watershed Sustainability Project Tool

This tool will (1) support and further the broad-scale monitoring and assessments currently being produced under the National Aquatic Research Survey (NARS) and other programs; (2) expand NARS interpretation to the integrity of watersheds and watershed components; (3) define and demonstrate operational applications of the concepts of resilience and restoration potential at multiple spatial and temporal scales; (4) develop models and scenarios supporting policy and management alternatives to improve the integrity of the nation's watersheds and aquatic components; and (5) in concert across ORD national research programs, integrate environmental, social and economic science in a common model of watershed integrity and sustainability.

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WetQual

WetQual is a process-based wetland model that simulates nutrients and carbon in natural and treatment wetlands. The model accounts for physical transport and biogeochemical transformation of nitrogen, phosphorus and carbon in a typical wetland ecosystem: free water, wetland soil and rooted/floating plant biomass. The model can simulate nitrogen and gas emissions (ammonia and nitrogen gas). A software with a graphical user interface (GUI) is currently under development for use by researchers (ecologists, engineers, and hydrologists) and interested stakeholders. Modelers will be able to calibrate the model and conduct uncertainty analyses using wetland hydrologic and nutrient data from monitored sites. The model serves as a stand-alone tool for assessing the efficacy of restored and constructed wetlands for treating nutrients in urban stormwater and agricultural runoff. The hydrologic component will be improved for surface and subsurface flow routing. Stand-alone software with a GUI will be completed. The module will be further evaluated and applied to assess potential impacts of wetlands on nutrient retention and removal across a gradient of head watersheds in Alabama. For more information, please contact Mohamed Hantush at hantush.mohamed@epa.gov.

APPENDIX

What follows is a compilation of active, long-term research and development work in the areas relevant to the state needs identified in the 2014 ERIS survey. EPA ORD's Science to Achieve Results (STAR) program supports some of the work presented here. STAR funds research grants and graduate fellowships in numerous environmental science and engineering disciplines.

STAR funds research solicited through Requests for Applications (RFAs) that concentrate on areas of special significance to the EPA mission, such as health effects of particulate matter, drinking water, water quality, global change, ecosystem assessment and restoration, human health risk assessment, endocrine disrupting chemicals, pollution prevention and new technologies, children's health and socio-economic research.

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Approaches to Improving Air Pollution Emission Information

STAR awarded a series of 12 grants to universities to research the development and improvement of air pollution emission inventories. Work under these grants provide improvemed air pollution emissions information, which facilitate development of effective control strategies and reliable information about air quality trends (for accountability), and helps produce accurate air quality forecasts. All reports and publications from these grants are available through the Grantee Research Project Results search page. http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/search.welcome

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Clean Air Research Centers

ORD currently has four research centers, representing an investment of $32 million, investigating multipollutant air pollution and associated impacts upon health and the environment. Details of the centers and links to the publications can be found online. Four grants were awarded and all reports and publications from these grants can be found through the Grantee Research Project Results search page at:http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/search.welcome and selecting the RFA with the title given above. More information about the Research Centers can be found at: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/outlinks.centers/centerGroup/28

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Community-Based Participatory Children's Health Research

The STAR program, in partnership with the National Institute of Environmental Health Sciences (NIEHS), supports multiple Children's Environmental Health and Disease Prevention Research Centers. These Centers conduct multidisciplinary, community-based, participatory research to examine the effects of environmental threats on children's health and well-being. The research findings serve as a resource for

state and community health officials. EPA provides annual reports on the web at http://www.epa.gov/ncer/childrenscenters/ and published a synthesis of 10 years of research in 2007. This is available at http://www.epa.gov/ncer/publications/research_results_synthesis/ceh_report_508.pdf. Additional Centers will be funded under a new grant to be awarded in 2015.

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Cumulative Risks

To address the need to understand how chemical and nonchemical stressors affect health, the EPA STAR program awarded seven grants to fund cumulative human health risk assessment research on how combinations of harmful factors affect human health, including health in poor and underserved communities with extensive pollution problems. Over the study years, the researchers participated in webinars to report on key findings. The webinar summary reports can be found at: http://www.epa.gov/ncer/cra/webinars/cra-webinar-summary.pdf.

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Cyanobacteria Assessment Network (CyAN) Mobile App

Harmful algal blooms are a worldwide environmental problem causing human and animal health risks, fish kills, and taste and odor issues in drinking water. EPA ORD, along with other federal partners, is developing a scientific tool for local communities to stay informed about changes in water quality and to protect drinking water for their residents. The CyAN mobile app is an early warning indicator system using satellite data to detect cyanobacteria blooms, and informs water managers of changes in water quality. Final product expected by FY 2019.

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Drought Impact on Surface and Groundwater Quality and Availability

The STAR program will fund projects to investigate how drought (seasonal and prolonged), exacerbated by climate change, may impact surface water and groundwater quality and availability. The goal of this Request for Applications is to provide information on these complex interactions and devise innovative and sustainable management strategies for communities, municipalities, water managers, natural resource managers, and other stakeholders to protect our nation's ground and surface water resources from potential decrease in water quality and availability.
http://epa.gov/ncer/rfa/2014/2014-star-natl-priorities.html

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Ecological Assessment of Generalized Littoral Environments Decision-Support System (EAGLE/DS)

The STAR grantee will work closely with regional stakeholders and committed local partners, such as the Tampa Bay Estuary Program, to develop decision-support tools to understand past changes in climate, the occurrence of extreme events, and their impacts on water quality. The outcomes of this work will include predictions of water quality degradation, a decision-support system that integrates real-time environmental and satellite observations, and a strategy to educate the public and professionals engaged in coastal planning and development.
http://www.epa.gov/ncer/rfa/2011/2011_star_extremeevent.html
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/9721/report/0

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Ensuring Safe Drinking Water in Lake Erie: Quantifying Extreme Weather Impacts on Cyanobacteria and Disinfection Byproducts.

The EPA STAR grantee will use molecular tools and satellite remote sensing to quantify water quality and human health risks of harmful algal blooms (HABs) and disinfection byproducts associated with extreme weather in Lake Erie drinking water. Products of this work will include molecular tools for quantifying cyanotoxins; remote sensing indicators for modeling water quality and human health; and visualization products that will demonstrate future changes in drinking water quality (both long-term forecasting predictions, and short-term forecasts following an extreme event).
http://www.epa.gov/ncer/rfa/2011/2011_star_extremeevent.html
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/9720/report/0

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Environmental Health Disparities and Social Determinants of Health

This STAR grant will fund Centers of Excellence on Environmental Health Disparities Research that are expected to develop innovative approaches to understanding environmentally driven health disparities and improving access to healthy environments for vulnerable populations and communities. The proposed Centers are expected to support research efforts, mentoring, and research translation and information dissemination. EPA anticipates funding five centers for five years.
http://grants.nih.gov/grants/guide/rfa-files/RFA-ES-14-010.html.

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Estimating Tribal Fish Consumption Exposures to Methyl Mercury

ORD is conducting research to evaluate available data and methodologies for estimating tribal fish consumption exposures to methyl mercury (MeHg). These exposure assessment methods and tools can help inform decisions regarding meal sizes and frequency, types of fish and water bodies to avoid, and other factors to minimize exposures and potential health risks from contaminated fish on tribal lands. Research is continuing on the modeling and case study applications.

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Forecasting and Evaluating Vulnerability of Watersheds to Climate Change, Extreme Events, and Algal Blooms.

The STAR grantee will quantitatively establish the relationship between extreme events and harmful algal blooms (HABs), using this information to predict the effects of future climate change on HABs and the associated vulnerability of watersheds on a national scale. Outputs of this research will include decision support tools for informing water quality management strategies under different climate change scenarios.

http://www.epa.gov/ncer/rfa/2011/2011_star_extremeevent.html

http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/9723/report/0

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Healthy Schools Research

The STAR program has awarded grants to seven universities under the 2013 "Healthy Schools: Environmental Factors, Children's Health and Performance, and Sustainable Building Practices" Request for Applications. This research will improve understanding of the relationship between environmental factors in K-12 educational facilities and the safety, health, and academic performance of children, and the effectiveness of teachers and staff. Results will help inform states and community decisions regarding K-12 school building design, construction and operation practices in order to foster safe and healthy school environments, and maximize student achievement and teacher and staff effectiveness.

http://www.epa.gov/ncer/healthyschools/index.html

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Impacts of Treated Wastewater Applications and Water Conservation Practices

EPA's STAR program will fund research and demonstration projects regarding the human and ecological impacts of treated wastewater applications (reclaimed water and wastewater reuse), and water

conservation practices. The research will address the use of non-traditional water sources, as well as more comprehensive long-term management, availability of water resources, water reuse, and water conservation practices that protect public and aquatic ecosystem health. Methods to assess these effects over the long term will be evaluated to further holistic management of water resources availability.
http://epa.gov/ncer/rfa/2014/2014_star_water-reuse.html

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Nutrient Management Research Centers

The STAR program funded four research centers that will take a systems view of nutrient management approaches to study new, sustainable ways to improve U.S. water quality. The funded research centers address three urgent research needs:

- New science to achieve sustainable and cost effective public health and environmental solutions in water management.
- Demonstration projects to support water management strategies using current and new technologies, including information at appropriate scales.
- Community involvement in the design, acceptance and use of nutrient management systems.

The supporting projects engage diverse expertise, involving engineers, economists, soil scientists, ecologists, behavioral scientists and more.
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/outlinks.centers/centerGroup/30

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One Environment Multimedia Modeling System

This modeling system comprises a set of linked or coupled land, fresh water and atmospheric models that lead to a consistent set of human health endpoints and ecosystem service metrics or indicators. This is a large, complex system of models whose design facilitates the exploration of interconnected, multi-media problems, such as the response of the nitrogen cascade to external stressors, e.g., economic, land use and climate change. This system is currently being tested for the Mississippi Basin and is expected to be available for use by October 2016.

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Prediction of Effects of Changing Precipitation Extremes on Urban Water Quality.

This EPA STAR grantee is developing models to predict how the physical and chemical quality of urban streams will be affected by extreme climate. The project is nationally scalable and will investigate extremes in precipitation, temperature, sediment loading, waterborne pathogens and nutrients.
http://www.epa.gov/ncer/rfa/2011/2011_star_extremeevent.html
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/9722/report/0

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Prediction and Quantification of CSOS Under Extreme Storm Events: Flow Dynamics and Reduction of CSOS

The EPA STAR grantee will develop a model for prediction and quantification of Combined Sewer Overflows (CSOs) due to the highly dynamic flows of extreme weather conditions. An outcome of the research will be an open source model that can be used by federal agencies, states, municipalities and practitioners for predicting vulnerabilities to CSO events due to extreme events and various climate change scenarios. The model will assess the impacts of CSOs on the water quality of receiving water bodies, and will enable users to model, manipulate, and modify existing combined sewer system frameworks, enabling assessment of proposed modifications, and development of cost-effective retrofitting strategies.

http://www.epa.gov/ncer/rfa/2011/2011_star_extremeevent.html

http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/9683/report/0

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Role of Land Use and BMPS in Reducing the Effect of Extreme Magnitude Events on Sediment and Pollutant Transport in the SE US Coastal Plain and Mississippi Alluvial Valley

The STAR grantee will investigate the role of Best Management Practices (BMPs) and land use decisions on water quality in the face of climate change. The degree to which extreme storms will decrease the effectiveness of BMPs and change sediment and pollutant transport will be determined.

http://www.epa.gov/ncer/rfa/2011/2011_star_extremeevent.html

http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/9724/report/0

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Treatment Technologies and Approaches for Small Public Drinking Water Systems

The STAR program funded a portfolio of 10 individual grants and two research centers focused on the identification, development and demonstration of novel and innovative treatment technologies and approaches for small public drinking water systems. The research portfolio will produce robust and sustainable technologies able to treat or mitigate groups of contaminants or contaminant precursors in drinking water sources and systems. Technologies may include methods to retrofit or augment existing treatment trains; treatment practices or technologies aimed at contaminant or contaminant precursor reduction in source waters; and technologies used within the distribution system, including point-of-use devices.

http://epa.gov/ncer/rfa/2011/2011_star_drinkingwater.html

http://epa.gov/ncer/rfa/2013/2013_star_drinkingwater.html

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Tribal Health ORD – National Center for Environmental Assessment

EPA ORD's Tribal Environmental Health Research Program has supported studies of the health effects of environmental contaminants on tribal populations. The STAR program has awarded funding in various research areas that explore such environmental risks, particularly cumulative chemical exposure and global climate change affecting tribes. A decade of research is synthesized in a report that may serve as a resource on cultural practices, language, and traditional ecological knowledge; subsistence foods and water resources; and risk assessment and sensitive populations.
http://www.epa.gov/ncer/tribalresearch/news/results-impacts.pdf

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Water, Health, and Climate Change Impacts in Rural Communities

EPA and the U.S Department of Agriculture National Institute of Food and Agriculture are collaborating to better understand and communicate the human health impacts of nontraditional agricultural water resources in rural communities. The science and knowledge generated through the projects would be applicable to numerous states that face mounting pressures from drought, poor water quality, competing demands for limited water resources, and community/societal needs.
http://nifa.usda.gov/funding-opportunity/agriculture-and-food-research-initiative-water-agriculture-challenge-area.

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