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GeoHealth Newsletter

The U.S. Geological Survey's Environmental Health Newsletter

What's In This Issue

USGS Activities Related to Environmental Health Science

Emerging Avian Influenza Viruses Highlight the Importance of Wild Bird Surveillance

On March 31, 2013, China announced that a novel strain of avian influenza virus [A(H7N9)] was causing severe illness and death in humans, but was not causing illness in the few birds found to be infected by the virus. Because some birds migrate between continents, a concern was raised that wild birds infected with this virus in China might migrate to the United States and bring this virus with them. This influenza virus is new and very unusual because it does not cause disease in chickens (low pathogenic avian influenza virus - LPAIV) but the respiratory disease it causes in humans can be severe, often fatal. Not enough is known about the virus to answer all of the questions, but U.S. Geological Survey (USGS) science was used to build a model showing that the risk of this virus moving to the United States by migratory birds was low at this time.

Low Pathogenic and Highly Pathogenic Avian Influenza Viruses—What's the difference?

Tests for pathogenicity are done in chickens and are not necessarily relevant to other birds or people.

- Low pathogenicity (LPAI) means that infected chickens, do not get sick from the virus.

- High pathogenicity (HPAI) means chickens die from being infected with the virus.

USGS scientist takes a blood sample from a blue-winged teal (*Anas discors*) on the Anahuac National Wildlife Refuge in Texas as part of a study on migratory birds and the pathogens they may carry between continents. The USGS is conducting studies to determine the types of pathogens potentially being introduced by migratory birds into North America from Asia, South America, and Europe. Photo credit: U.S. Fish and Wildlife Service.

Recent studies by USGS scientists are helping provide some understanding of the movement and genetic mixing of avian influenza (AI) viruses in birds in Asia and North America. The studies listed here conclude that AI viruses from Asia likely change their genetic makeup either as they move in their avian hosts from Asia to North

America or upon arrival in North America. No completely Asian-origin AI viruses have been detected in North American birds, but numerous viruses of mixed genetic backgrounds, both Asian and North American, have been identified. These studies illustrate the significant role that migratory bird breeding grounds in Russia and Alaska play in this important family of viruses. The breeding grounds are mixing areas not only for bird populations but also for the AI viruses they may carry.

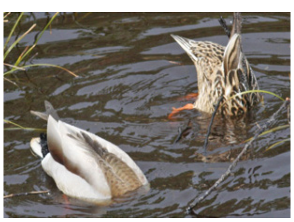
- **Antibodies to Avian Influenza Viruses among Wild Waterfowl in Alaska** — Scientists from the USGS and the U.S. Fish and Wildlife Service showed that 60 percent of the 4,485 wild waterfowl from 11 species they studied over 14 years in Alaska had antibodies from infection with an AI virus. Once infected, a bird usually sheds AI virus for only a few days, making it difficult to isolate the virus. However antibodies developed in response to viral infection can be found in the blood from months to years after infection providing a history of exposure. Not all waterfowl species are equally susceptible to AI viruses so species with high levels of AI virus antibodies and those with high AI viral infection rates are likely species to target for LPAIV and HPAIV surveillance programs.

  This study was funded by the USGS Wildlife: Terrestrial and Endangered Resources Program, the U.S. Fish and Wildlife Service, and the National Institutes of Health.

- **Annual Patterns of Movement Influence Exposure of Wild Birds to Influenza Viruses** — USGS scientists reported 47 to 96 percent of geese in late summer on the Yukon-Kuskokwim Delta of western Alaska had detectible antibodies to AI viruses, indicating previous infection with the virus. Over 95 percent of emperor geese (*Chen canagica*) sampled had detectible AI virus antibodies, compared to 40 to 60 percent in other species of geese in the study. Emperor geese spend winters in the Aleutian Islands of Alaska, moving to western Alaska for breeding and Russia for molting in late summer. Why emperor geese exhibit higher exposure to AI viruses is unknown. However, the restricted distribution of emperor geese when compared to other species in the Bering Sea region may contribute to their higher exposure to AI.

  This study was funded by the USGS Wildlife: Terrestrial and Endangered Resources Program, the U.S. Fish and Wildlife Service, and the National Institutes of Health.

- **Transmission of Avian Influenza Viruses Among Alaskan Dabbling Ducks** — Scientists from the USGS and the Institute of Arctic Biology at the University of Alaska Fairbanks used the genetics of LPAIV in dabbling ducks to examine how frequently genetically similar AI viruses are found across different timeframes and geographical distances in Alaska. Many AI virus genes can be identified as either Asian or North American because of their unique characteristics. The results suggest that highly similar AI viruses are more often found in birds that are in the same place at the same time; within days of each other and across short geographic distances (kilometers). Highly similar AI viruses were less frequently observed across larger distances (hundreds of kilometers) and longer time periods (years).

  Dabbling ducks, such as pintails (*Anas acuta*) and mallards (*Anas platyrhynchos*), feed mainly from the surface rather than diving for aquatic plants. Photo credit: U.S. Fish and Wildlife Service.

  These results provide an initial perspective into how frequently avian influenza viruses change over time and space and support the observation that no completely Eurasian viruses have ever been detected in Alaska. Such information is useful in forecasting the movement of avian influenza viruses from Asia and other continents into North America.

  This study was funded by the USGS Wildlife: Terrestrial and Endangered Resources Program and the U.S. Fish and Wildlife Service.

- **Avian Influenza Viruses Differ among Migrating and Resident Mallards (*Anas platyrhynchos*) in Northern California Wetlands** — Mallards contribute differently to avian influenza virus gene pools depending on their migration strategy according to USGS scientists and their collaborators from Massachusetts Institute of Technology, University of California, Davis, Environment Canada, and University of Minnesota. Looking at stable isotopes in the flight feathers of wintering populations of mallards in northern California wetlands, scientists identified those birds that had migrated and those that hadn't (residents). They then looked closely at the AI viruses isolated from these two groups. Migrants introduced viruses with genes from northern breeding grounds (Alaska and the northwest Pacific rim) into the wintering population, facilitating gene flow of viruses at continental scales. However, circulation of imported viruses in the wintering population of mallards appeared to be limited. Mallards that stayed in the wetlands year-round facilitated persistent circulation of a limited number of AI virus subtypes. Characterizing the more genetically stable AI viruses in the resident mallards and the contribution of novel viruses from afar, offers scientists an AI model of "virus exchange in temperate regions driven by the convergence of wild populations with separate geographic origins and exposure histories."

  A mallard in flight. Mallards are a principal host of avian influenza viruses in nature. Photo credit: U.S. Fish and Wildlife Service.

  > "We're trying to determine the factors that affect wildlife disease transmission," says USGS ecologist John Takekawa. "There is more to learn about how waterfowl migration relates to disease spread and about the environmental or human factors that shape these migration strategies."

  This study was funded by the USGS Wildlife: Terrestrial and Endangered Resources Program, the National Institutes of Health's National Institute of Allergy and Infectious Diseases (NIAID), and the U.S. Fish and Wildlife Service.

USGS Response to Hurricane Sandy

In late October 2012, Hurricane Sandy came ashore during a spring high tide on the New Jersey coastline, delivering hurricane-force winds, storm tides exceeding 19 feet, driving rain, and plummeting temperatures. Hurricane Sandy resulted in 72 direct fatalities in the mid-Atlantic and northeastern United States, and widespread and substantial physical, environmental, ecological, social, and economic impacts estimated at near $50 billion. Before the landfall of Hurricane Sandy, the USGS provided forecasts of potential coastal change; collected oblique aerial photography of pre-storm coastal morphology; deployed storm-surge sensors, rapid-deployment streamgages, wave sensors, and barometric pressure sensors; conducted Light Detection and Ranging (LIDAR) aerial topographic surveys of coastal areas; and issued a landslide alert for landslide prone areas. During the storm, Tidal Telemetry Networks provided real-time water-level information along the coast. Long-term network and rapid-deployment real-time streamgages and water-quality monitors reported on river levels and changes in water quality. Immediately after the storm, the USGS serviced real-time instrumentation, retrieved data from over 140 storm-surge sensors, and collected other essential environmental data, including more than 830 high-water marks mapping the extent and elevation of the storm surge. Post-storm lidar surveys documented storm impacts to coastal barriers, informing response and recovery and providing a new baseline to assess vulnerability of the reconfigured coast. The USGS Hazard Data Distribution System served storm-related information from many agencies on the Internet on a daily basis.

Oblique aerial photographs of Seaside Heights, New Jersey, before and after landfall by Hurricane Sandy show the impact to the developed coastline. Photo credit: USGS

Immediately following Hurricane Sandy, the USGS developed a science plan to coordinate continuing USGS activities with other agencies and to guide continued data collection and analysis to ensure support for recovery and restoration efforts. The plan is titled "*Meeting the Science Needs of the Nation in the Wake of Hurricane Sandy—A U.S. Geological Survey Science Plan for Support of Restoration and Recovery*". Data, information, and tools produced by implementing this plan will: (1) further characterize impacts and changes, (2) guide mitigation and restoration of impacted communities and ecosystems, (3) inform a redevelopment strategy aimed at developing resilient coastal communities and ecosystems, (4) improve preparedness and responsiveness to the next hurricane or similar coastal disaster, and (5) enable improved hazard assessment, response, and recovery for future storms along the hurricane prone shoreline of the United States.

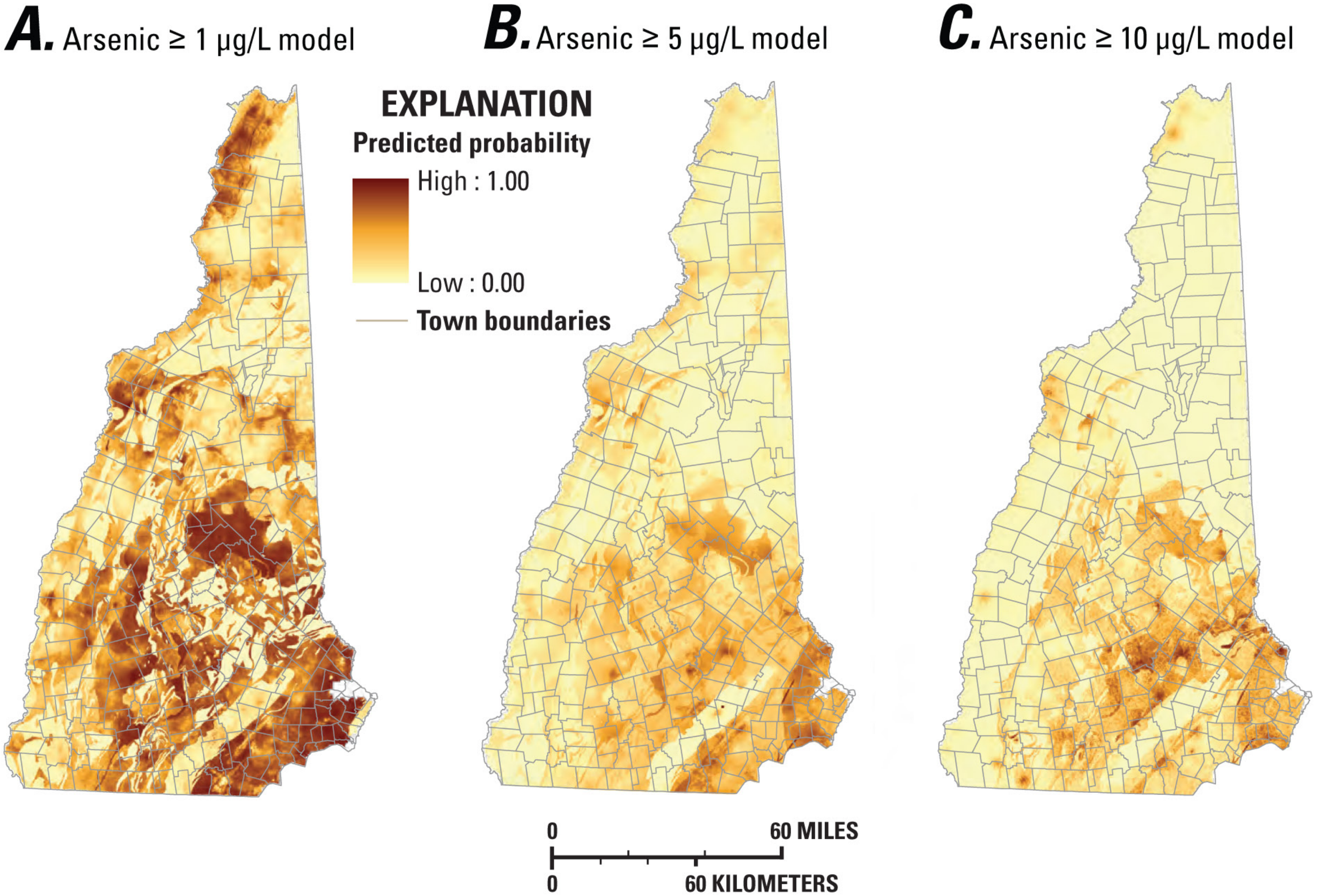
The activities outlined in this plan are organized in five themes.

1. Coastal topography and bathymetry.
2. Impacts to coastal beaches and barriers.
3. Impacts of storm surge and estuarine and bay hydrology.
4. Impacts on environmental quality and persisting contaminant exposures.
5. Impacts to coastal ecosystems, habitats, and fish and wildlife.

A major emphasis for implementation of the plan is interacting with stakeholders to better understand their specific data and information needs; this understanding will help define the best way to make information available and also support the application of USGS science and expertise to decisionmaking.

New Hampshire Groundwater Used for Drinking Water Contains Arsenic: What's the Risk?

USGS scientists have developed a new approach for helping people understand the risk of exposure to arsenic, a common drinking-water contaminant in New Hampshire. The approach consists of a set of models that predict the probability of arsenic occurring in the groundwater within bedrock aquifers at concentrations of 1, 5, and 10 micrograms per liter (µg/L). The U.S Environmental Protection Agency has set the standard for arsenic in public drinking water to 10 µg/L—known as the Maximum Contaminant Level (MCL)—to protect people served by public-water systems from the effects of long-term exposure to arsenic. The new models were developed for the New Hampshire Environmental Public Health Tracking Program, a Centers for Disease Control and Prevention (CDC) funded program designed to help connect the dots between environmental hazards and health outcomes. The models are available to the public, public health scientists, and others. to. The models can help identify parts of the State at risk for high levels of arsenic in drinking water, and support



Model-predicted probabilities of arsenic concentrations in groundwater from bedrock aquifers in New Hampshire: (A), greater than or equal to 1 microgram per liter (µg/L); (B), greater than or equal to 5 µg/L; and (C), greater than or equal to 10 µg/L. Image source: USGS Scientific Investigations Report 2012-5156.

studies related to human health. The statewide maps generated from the models are not designed to predict arsenic concentraion in any single well, but they are expected to provide useful information in areas of the State that currently contain little to no data on arsenic concentration.

USGS scientists estimate that approximately 39 percent of groundwater in New Hampshire bedrock has at least a 50-percent chance of containing an arsenic concentration greater than or equal to 1 µg/L. This compares to about 5 percent of the State having at least a 50-percent chance of having an arsenic concentration at or above 10 µg/L. Not surprisingly, significant predictors of arsenic in groundwater from bedrock aquifers included geology, water chemistry, land use, hydrology, topography, and demographic factors. The models predict that the probability of arsenic greater than 1 µg/L is widespread throughout the State.

The scientists used more than 1,700 measurements of arsenic concentration from a combination of public and private water-supply wells to develop the models. The approach may aid public health officials determine the risk of human exposure and potential health effects of exposure to arsenic from private drinking-water wells.

The study was supported under grant number #1U38EH000947-02 from the National Center for Environmental Health at the CDC in Atlanta. The USGS Cooperative Water Program also provided funding for the study.

Coal-Tar-Based Pavement Sealers Are Associated With Increased Cancer Risk

Coal-tar-based sealcoat—a product marketed to protect and beautify asphalt pavement—is a potent source of polycyclic aromatic hydrocarbons (PAHs) to air, soils, streams and lakes, and homes. PAHs are a group of hundreds of organic chemicals, many of which are probable carcinogens. A new study by Baylor University and USGS scientists indicates that living adjacent to coal-tar-sealed pavement is associated with an increase in estimated excess lifetime cancer risk, much of which occurs during early childhood.

Coal-tar-based sealant is the black liquid sprayed or painted on many parking lots, driveways, and playgrounds, and is used primarily in the central, southern, and eastern United States. Coal-tar sealcoat typically is 20 to 35 percent coal-tar pitch, a known human carcinogen that contains about 200 different PAHs. Friction from vehicle tires grinds pavement sealcoat into small particles, which are transported by wind, rain, and snowplows to nearby soil, and some are tracked into homes where they become part of household dust.

Incidental ingestion of soil and house dust is an exposure pathway to many chemicals, especially for children. Using data collected by USGS scientists a Baylor University scientist estimated that the lifetime dose of carcinogenic PAHs for someone living adjacent to coal-tar-sealcoated pavement was 38 times greater than for someone living adjacent to unsealed asphalt pavement, and half of that dose

Coal-tar-based sealcoat makes parking lots and driveways look like new, but may increase exposure to polycyclic aromatic hydrocarbons (PAHs). Photo credit: ©Ansgar photography/Corbis.

occurs during childhood (0 to 6 years of age). For the average person who lives adjacent to coal-tar-sealed pavement for a lifetime, the excess cancer risk is estimated to be greater than 1 in 10,000, a level which the U.S. Environmental Protection Agency considers to be a risk factor sufficiently large that remediation is desirable.

This project was funded by the University of Baylor and the USGS National Water-Quality Assessment Program.

Natural Attenuation Accelerating Pump-and-Treat Cleanup of TCE in Fractured Rock

USGS scientists find that the natural attenuation of trichloroethylene (TCE) in a contaminated fractured rock aquifer in New Jersey significantly adds to the effectiveness of site cleanup operations. An active pump-and-treat cleanup system is presently removing about 630 kilograms of TCE per year (kg/yr) at the site. Naturally occurring biodegradation processes remove an additional 500 kg/yr. Natural TCE biodegradation is a welcome addition to overall cleanup operations at this site because it does not incur the economic costs of a pump-and-treat system, and will accelerate cleanup.

USGS scientist collecting water samples from a monitoring well for chemical analysis. Photo credit: USGS

A team of USGS scientists working at the Naval Air Warfare Center (NAWC) Research Site in West Trenton, New Jersey, estimated TCE biodegradation rates by combining 20-years worth of data on the concentrations of two degradation products of TCE and chloride from observation wells with estimates of rock porosities and groundwater residence times. The methodology that the scientists used to estimate the natural attenuation of TCE in fractured rock is now available to be applied at other fractured bedrock sites. Fractured bedrock is widely regarded by environmental professionals as being particularly difficult to clean up because residual pure TCE can be distributed in fractures and TCE diffuses from the fractures into the surrounding rock. Once the TCE is in the surrounding rock it only diffuses back out very slowly. Therefore, this new methodology has the potential to help assess the role of natural attenuation at fractured bedrock contamination sites.

The USGS Toxic Substances Hydrology Program and the U.S. Navy provided funding for this study.

Groundwater Restoration Slowed by Organic Materials on Sediments

The USGS Toxic Substances Hydrology Program research site, Cape Cod, Massachusetts, where USGS scientists are studying the persistence and fate wastewater disposed through infiltration beds from a municipal wastewater treatment plant. The subsurface wastewater plume extends from the rectangular infiltration beds (foreground) to Ashumet Pond (background). Photo credit: USGS.

The amount of organic material stored on an aquifer's sediments can slow down natural processes that are often relied on to restore groundwater quality in a wastewater-contaminated aquifer. A team of USGS scientists found that analysis of sediment cores is an important part of developing reliable predictions for how long groundwater restoration will take. This observation resulted from a long-term study of a wastewater plume on Cape Cod, Massachusetts that is taking much longer to return to cleaner conditions than the scientists initially predicted. The ability to predict how long restoration will take is often the basis for decisions about whether or not to rely on monitored natural attenuation to remediate contaminated sites.

The scientists conducted long-term detailed sampling of groundwater and sediment from the wastewater plume. In the 15 years since wastewater disposal was stopped, the dissolved oxygen concentration has not returned to pristine levels near the disposal site, even though conservative chemicals in the wastewater such as chloride and boron have been flushed from the area. The scientists estimate that the return of dissolved oxygen to the aquifer, even near the disposal site, could take decades depending on the amount of biodegradable organic compounds that remain stored on the sediments from past disposal.

The USGS Toxic Substances Hydrology and Hydrologic Research and Development Programs funded this study.

USGS Links Lead Poisoning From Artisanal Gold Mining in Nigeria to Bioavailable Mineral

USGS scientists are helping the Centers for Disease Control and Prevention (CDC), Agency for Toxic Substances and Disease Registry (ATSDR), and TerraGraphics Environmental Engineering, Inc. understand sources and exposure pathways for an unusual outbreak of childhood lead poisoning linked to artisanal gold mining in northern Nigeria. By the summer 2010 the outbreak had killed hundreds young children and affected thousands more. At the request of the CDC, the USGS analyzed samples of raw and processed ore, contaminated soils, dust and loose soils from eating areas in family compounds, and grain foodstuffs from local markets.

USGS analyses showed that:

- Lead was abundant in all samples in a form that is highly soluble in stomach acids.
- Soil and sweep samples had lead concentrations up to 18,500 parts per million (ppm) and plant foodstuff samples had up to 145 ppm lead.
- The same suite of lead minerals was found in all sample types.

These findings helped CDC determine that incidental ingestion of soils via hand-mouth transmission and inhalation of dusts are the dominant exposure pathways by which children develop acute lead poisoning. Consumption of contaminated water and foodstuffs are lesser but significant exposure pathways. Older children, pregnant women, and adult workers are also at substantial risk for lead poisoning.

In several villages of Zamfara State, Nigeria, gold ores are first crushed by hand, and then pulverized in grain grinders such as this one. Small-scale (artisanal) gold-ore processing activities are a potential and suspected source of lead poisoning among children in northern Nigeria. Photo credit: Carrie Dooyema (CDC) and Casey Bartrem (TerraGraphics).

The USGS results indicate that other areas occur globally where artisanal mining of specific ore deposit types could enhance the potential for similar lead poisoning. Funding for the USGS component of the study was provided by the USGS Mineral Resources Program.

Assessing Acid Mine Drainage Mitigation Strategies

Field-based approaches developed by a team of USGS scientists have been used to evaluate strategies for the mitigation of acid mine drainage. The approaches were used to estimate post-cleanup water quality in two streams impacted by abandoned mines in Colorado and to identify the major sources of contamination in another Colorado stream. The approaches include prescribed field studies that are analyzed and interpreted using computer simulation models.

- In Mineral Creek, USGS scientists used a computer model to accurately predict water quality in the stream after cleanup. A comparison of model predictions and water-quality data before and after cleanup showed that the model accurately predicted attainment (or non-attainment) of water-quality standards in most of the scenarios tested.
- In Cement Creek, best management practices were evaluated for their ability to meet regulatory standards known as Total Maximum Daily Loads (TMDLs). The contributions to stream-water quality from groundwater sources and the effects of chemical transformations within the stream were found to decrease the effectiveness of the planned best management practices.

The influx of metal-rich groundwater from natural springs (foreground) to Cement Creek, Colorado (background) can complicate the selection of best management practices. Photo credit: Briant Kimball, USGS.

- In Peru Creek, the scientists applied a new approach for identifying the major sources of contamination to a mining-impacted stream. The approach includes determining the uncertainty in estimated contaminant loads associated with (1) natural variation in concentration of contaminants caused by daily cycles, (2) variability in laboratory analyses of constituent and tracer concentrations, and (3) variations introduced by field sampling. The measure of uncertainty is made possible by collecting replicate water-quality samples at key points along the stream. Consideration of uncertainty allowed cleanup managers to evaluate contaminant sources in light of potential errors, thereby lessening the potential for the misidentification of sources.

Funding for these studies was provided by the USGS Toxic Substances Hydrology Program, the Colorado Department of Public Health and Environment, and the U.S. Environmental Protection Agency. Cooperation with the Animas River Stakeholders Group, San Juan County, Colorado, and the San Juan Resource Conservation and Development Program helped make the studies possible.

Aquatic Organisms Absorb Metals From Ingested Mineral Particles

Aquatic organisms, such as insect larva and snails, living on the bottom of streams can directly absorb copper in mineral particles that are in the food they eat. Scientists have known that some organisms absorb metals from their food. Now it seems that the mineral particles in stream water and sediment are a potentially important source of metals to sediment dwellers and the food web.

At the confluence of Cement Creek (left) and the Animas River (right) in Colorado, aluminum and iron oxide particles are formed when the acid mine drainage from Cement Creek mixes with the near neutral water from the Animas River. Photo credit: Dan Cain, USGS

USGS scientists developed methods to investigate how the chemical properties of mineral particles consumed by aquatic organisms affect the absorption of metals. The new methods use isotopically enriched metals as tracers to measure metal absorption during feeding experiments with freshwater organisms, such as the larva of mayflies (Serratella tibialis). The scientists developed a novel reverse labeling technique, which involves artificially enriching the test organisms with a rare isotope of the metal under study rather than adding the tracer to the natural mineral particles to be tested. Subsequent exposure to the element from the natural source particles shifts the isotopic ratio of the element in the test organism from the rare isotope to the natural isotope as the natural isotope is absorbed. The scientists can then measure the absorption of the metals from natural particles by measuring how much of the natural isotope replaces the rare isotope in the organism. This eliminates the need to alter the natural particles for the test.

This new technique will provide important information for regulators, resource managers, and scientists addressing contamination with metals in streams affected by acid mine drainage.

This study was funded by the USGS Toxic Substances Hydrology Program and Hydrologic Research and Development Program.

Potential Migration of Radionuclides from Active Uranium Mill

USGS scientists assessed the potential for offsite migration of radionuclides from an active uranium mill site near White Mesa, Utah. The mill site is currently the only conventional uranium mill operating in the United States. The scientists sampled groundwater, stream sediments, and plants to determine what the implications might be for offsite migration of contaminants from the mill site.

A USGS scientist collects a sample of sediment from an intermittent (ephemeral) stream near the White Mesa uranium mill site, White Mesa, Utah. Photo credit: Dave Naftz, USGS

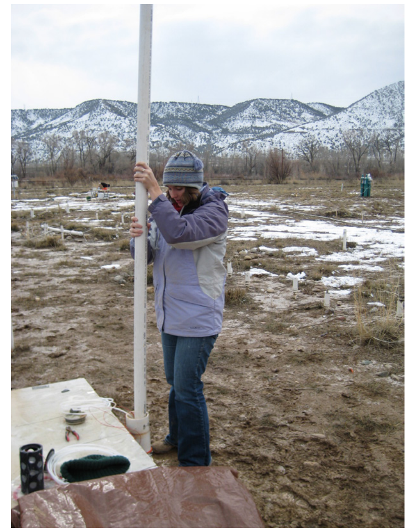
Uranium concentrations in sediment from three intermittent (ephemeral) streams east of the mill boundary exceeded natural background levels. Wind-blown dusts are a potential source of uranium contamination in two springs. Elevated concentrations of uranium and vanadium in sagebrush samples collected north-northeast, east, and south of the mill site also were suspected to be the result of wind-blown dust deposited on the pants and/or from dust transported to soil near the plants where it's taken up by the plants.

Measuring uranium concentrations in various environmental media provided added insights into uranium sources and exposure pathways. Based on the results of their study, the scientists proposed potential monitoring strategies to stakeholders.

The USGS conducted the study at the request of the Ute Mountain Ute Tribe. Funding for the study was provided by the U.S. Environmental Protection Agency, Ute Mountain Ute Tribe, and USGS Cooperative Water Program.

Improving Uranium Cleanup Methods

Scientists studying the transformation of uranium in subsurface sediments at a site with uranium contamination have discovered multiple pathways for the chemical reactions that transform hexavalent uranium [U(VI)], which is soluble and mobile in groundwater, to more insoluble forms of tetravalent uranium [U(IV)]. The multiple reaction pathways can take place concurrently. Unfortunately, some forms of U(IV) are not as insoluble as others, and it is important for cleanup professionals to know which forms are present at contamination sites. This information could lead to improved cleanup methods that involve the transformation of soluble U(VI) to insoluble forms of U(IV), such as the mineral uraninite (UO2). The objective of such remediation is to stabilize uranium plumes or to immobilize uranium in place.



A USGS scientist installing a reaction chamber in a groundwater well at the Rifle, Colorado, field site. Photo credit: John Barger, SLAC National Accelerator Laboratory

A team of scientists from the SLAC National Accelerator Laboratory; Lawrence Berkeley National Laboratory; U.S. Geological Survey (USGS); Ecole Polytechnique Fédérale de Lausanne, Switzerland; and Washington University in St. Louis, Missouri, showed that transformations of U(VI) to U(IV) in subsurface sediments can result in the formation of more than one form of U(IV)—at the same time and in the same location. The most desired from of U(IV) is the mineral uraninite, because it is insoluble and is less likely to move in groundwater, which makes it the preferred end point for groundwater cleanup. Other forms of U(IV) the scientists studied are more soluble than uraninite, and could conceivably be re-dissolved if the chemistry of the groundwater changes in the future, which could undo cleanup actions. The study findings also have direct implications not only for our understanding of uranium cleanup approaches (such as bioremediation systems) but for our understanding of the geology of uranium ore formation and our understanding of global geochemical processes.

This study was funded by the U.S. Department of Energy, USGS National Research Council Postdoctoral Fellowship Program, Swiss National Science Foundation, Marie Curie Grant Program, and National Institutes of Health.

Soil in Ukraine Contaminated with Mercury and Arsenic

USGS scientists, collaborating with U.S. and Ukrainian scientists, found high concentrations of mercury and arsenic in soils from the Donets Basin, a metal-rich coal-mining region in eastern Ukraine. Soils near mines and mining areas can become contaminated, and humans can be exposed to contaminants in a number of ways. For example, leaching of contaminants into groundwater used for drinking water, uptake contaminants by crop plants, and unintentional ingestion of contaminated soils. The scientists collected soils from industrial areas as well as playgrounds and public spaces. Analysis confirmed that more than 90 percent of the soils collected from Ukrainian residential areas exceeded the U.S. Environmental Protection Agency soil screening level for arsenic. Leaching studies predicted that the arsenic in the soil had potentially more potential to be absorbed or ingested by humans than mercury.

Abandoned mine working and tailing piles at the Nikitovka mines, Gorlovka, Ukraine. For more than 50 years, the largest mercury production facility of the former Soviet Union operated in Horlivka (Gorlovka, Russian spelling), a city of approximately 300,000 residents in the Donets Basin. During this period about 30,000 metric tons of mercury was produced from the ore taken from the adjacent Mykytivka (Nikitovka) mines. Photo credit: Kathryn Conko, USGS.

Mercury in local soil and dust vacuumed from carpets in homes were both good predictors of blood and urinary mercury. The results of this study show the extent of environmental contamination in this region and how exposure to the contaminated soil could impact the residents. This study was supported, in part, by a U.S. Civilian Research and Development Foundation Cooperative Grant and the USGS Toxic Substances Hydrology, Hydrologic Research and Development, and Energy Resources Programs.

Mercury Levels in Tree Swallows and Loons Controlled by Lake pH

The common loon lives on many northern lakes. Photo credit: Kevin Kenow, USGS

Tree swallows accumulate higher concentrations of mercury in their blood when they live on lakes with low pH than on lakes with more neutral-pH water. A team of USGS, Wisconsin Department of Natural Resources, and U.S. Environmental Protection Agency scientists came to this conclusion after studying tree swallows (Tachycineta bicolor) on eleven northern Wisconsin lakes with differing pH levels. The study was designed to assess the effects of lake pH on the accumulation of mercury and other trace elements in tree swallows and common loons (Gavia immer). Predictions of mercury exposure to wildlife based on water-quality and other nonbiological data are difficult because of complicated chemical and biological processes affecting how mercury is absorbed and processed by wildlife.

The scientists also gathered data on mercury exposure in loons and used the data to determine whether mercury exposure in swallows could be used to predict loon mercury exposure. Predictions, rather than direct sampling of loons, may be desirable because loons may not nest on all lakes where data are needed or they may be difficult to sample.

Although mercury exposure was approximately 15 times higher in loon eggs than in swallow eggs, there was a reasonably good association between the two species. Sampling the blood of tree swallows in addition to loons may enhance the assessment of the relative risk of mercury exposure to common loons, allowing wildlife scientists to cover a greater area with less cost. Mercury continues to be a contaminant of concern because source control remains difficult.

The USGS Contaminant Biology Program, Wisconsin Department of Natural Resources, and the U.S. Environmental Protection Agency provided funding for this study.

Is it Safe to Swim Today? New Models for Small Lakes Help Provide Answers

For more than a decade, predictive models have been used by public-health agencies for water-quality assessments of coastal recreational waters (such as swimming beaches on Lake Erie), but the effectiveness of the models has not been studied in inland waters. These new models address small inland lakes for the first time.

Alum Creek State Park beach, north of Columbus, Ohio. Photo credit: Donna S. Francy, USGS

USGS scientists have developed predictive models that provide daily estimates of recreational water quality for swimming beaches on small lakes in Ohio. Traditionally, swim advisories or closings are issued by beach managers based on counts of indicator bacteria in water samples. This method takes at least 18 to 24 hours to complete and recreational water-quality may change during this time, leading to errors in assessments of public-health risk. The new predictive models use easily measured environmental and water-quality variables to estimate bacterial-indicator concentrations or the probability of exceeding target concentrations.

To develop the models, USGS scientists collected data from eight lakes during the recreational seasons of 2010 and 2011. They then constructed computer models for 13 swimming beaches. Some of the variables included in models at inland lake beach sites were rainfall, wind direction and speed, turbidity (a measure of the clarity of the water), and water temperature.

Predictive models at lakes with high swimmer densities provided better estimates of public health risk than the bacterial count methods currently used. Model results were not effective at some beaches because different climatic conditions occurred during the model development (very moist and moderate drought). Additional years of data collection during seasons with a variety of weather conditions may remedy this. These models will be a valuable resource for beach managers and the public.

The Ohio Water Development Authority, USGS Cooperative Water Program, and U.S. Environmental Protection Agency through its Office of Research and Development provided support for this study.

The Muskingum Watershed Conservancy District, Clark County Combined Health District, Ohio Department of Natural Resources, and City of Celina Water Plant provided services that helped advance the study.

Restoring Historic Wetlands May Take Years

Despite being restored for over 5 years, the chemistry and biology of a historic wetland between the Upper Klamath and Agency Lakes in Oregon is still in transition. Scientists from the USGS and U.S. Bureau of Reclamation say the study area has not yet returned to the more natural state of a nearby wetland refuge.

Pore-water profilers (foreground) in a wetland between Upper Klamath and Agency Lakes, Oregon. USGS scientists developed the profilers (U.S. Patent # US 8,051,727) to provide detailed information on the quality of water in sediment pores with depth. The concentration profiles help the scientists determine the movement of solutes, such as phosphate, into and out of bottom sediments. Photo credit: Francis Parchaso, USGS.

The wetland had been drained and was used for agricultural production for seven decades. Explosive charges were used to remove large sections of multiple levees, which reconnected the former wetlands to the lakes and allowed water to flow into the wetlands again. One of the goals for the reconnection was to create additional habitat for wildlife, including two endangered fish species. Wildlife and water-resource managers were concerned about how long the recovery of the historic wetland would take.

Scientists monitored the water quality of the new wetland and also tracked the amount of nutrients (nitrate, ammonia, phosphorus) and metals (iron, manganese) moving in and out of the wetland sediments. They also monitored colonizing organisms, such as worms, leeches, and insect larvae that live on the bottom of the wetland. After 3 years, they found some things, such as dissolved organic matter and the community of organisms living on the bottom, had returned to levels and populations seen in much of Upper Klamath Lake. However, other essential elements, such as phosphorus, nitrogen, iron, and manganese, will take more time, perhaps even decades to return to a natural state.

The information provided by the scientists on the timescales and the interdependent processes involved in the restoration of the wetland will help resource managers develop appropriate management plans, as well as set appropriate expectations for the chemical, physical, and biological transitions associated with wetland restoration.

This study is being followed by an extended 5-year study of the entire Upper Klamath Lake to continue to look at how conditions on the bottom of the lake affect overall lake water quality. The USGS Toxic Substances Hydrology and Hydrologic Research and Development Programs and the U.S. Bureau of Reclamation funded this study.

Complex Mixture of Contaminants in Streams Found Miles from the Source

Discharge pipe and cap from a wastewater treatment plant on Fourmile Creek, Iowa. USGS scientists have been studying the fate and transport of emerging contaminants in the creek. Photo credit: USGS

Natural processes such as dilution, chemical transformations, and microbial degradation are known to reduce concentrations of some contaminants from streams to below levels that can cause harm to aquatic organisms. USGS scientists, however, have shown that some chemicals discharged from municipal wastewater treatment facilities persist for miles downstream at levels known, or suspected, to cause adverse health effects in aquatic organisms—including endocrine disruption in fish. The scientists also found that these persistent chemicals occur in complex mixtures. The effect of these complex mixtures on the health of aquatic animals is unknown.

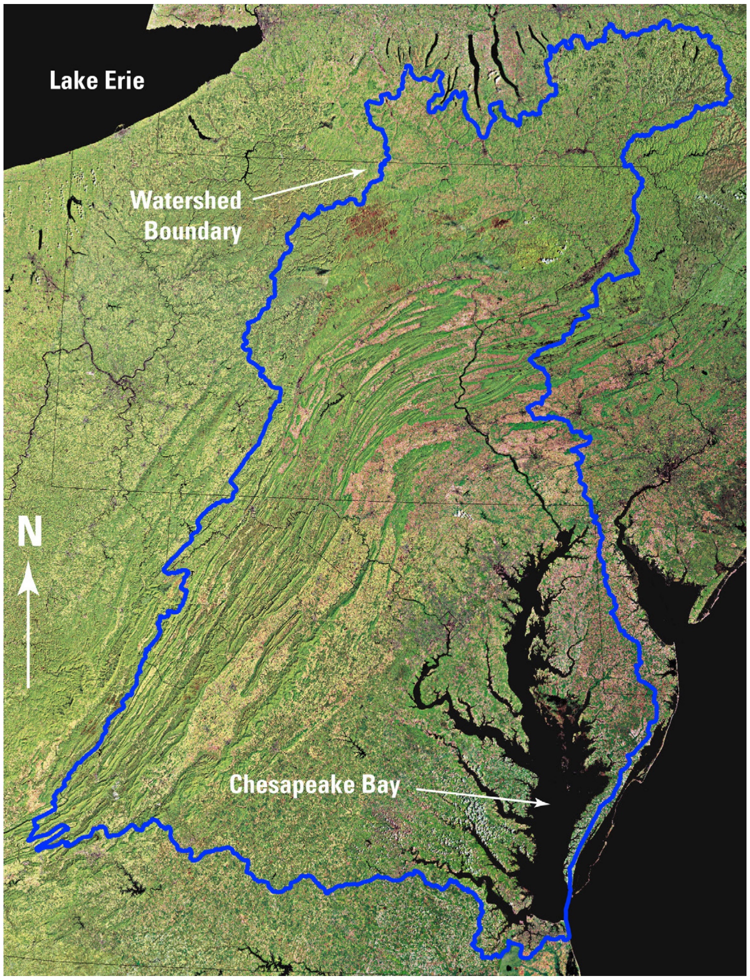
The scientists tracked water on two streams (Boulder Creek, Colorado, and Fourmile Creek, Iowa) as it flowed downstream from the point of wastewater discharge. The scientists then collected water samples from the same water as it moved downstream for analysis of a wide range of organic chemicals common in wastewater. Many of the chemicals showed little decrease in concentration downstream, other than that caused by dilution, as they flowed down the 6- to 8-mile segments of the two streams studied. Significantly, some of these contaminants persisted at concentrations that are known, or suspected, to cause sublethal health effects in exposed organisms.

Chemicals, such as steroidal hormones that mimic estrogen and could have additive effects were found in the chemical mixtures. The estrogen mimics and other chemicals could have multiple health effects that are additive.

The USGS Toxic Substances Hydrology and Hydrologic Research and Development Programs funded this study. Additional support was received by the U.S. Environmental Protection Agency.

Contaminants Impact Wildlife and Fish in the Chesapeake Bay

Legacy contaminants (chemicals no longer approved for use) and contaminants of emerging concern that persist in the environment are affecting the health of wildlife and fish in the Chesapeake Bay and its watershed. Many State agencies in the Chesapeake Bay watershed continue to report impaired water resources due to the persistence and toxicity of some previously banned pollutants. In addition, other contaminants of emerging concern are released to the environment at levels known, or suspected, to harm the health of fish and wildlife. These findings are documented in a recent report on toxic contaminants in the Chesapeake Bay and its watershed. The



Chesapeake Bay watershed, outlined in blue. Modified from USGS poster The Chesapeake Bay Watershed

report is the result of an assessment of the Bay done by a team of scientists and managers from the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Hampton Roads Sanitation District of Virginia, and U.S. Geological Survey (USGS). The team reviewed State water-quality assessment reports, agency documents, and the peer-reviewed literature to summarize the state of knowledge about contaminants in the Chesapeake Bay watershed. This study is the first review of a comprehensive group of contaminants (including polychlorinated biphenyls (PCBs), dioxins, polycyclic aromatic hydrocarbons (PAHs), metals, pharmaceuticals, pesticides, personal-care products, hormones, and others) that were scientifically evaluated for the watershed. The report will be used to help the Chesapeake Bay Program partnership make decisions about strategies to minimize the impact of contaminants on the environmental health of the Chesapeake Bay watershed.

USGS participation in creating the report was sponsored in part by the USGS Priority Ecosystems Science, Toxic Substances Hydrology, and Contaminants Biology Programs.

Evidence of Little-Studied Class of Steroid Hormones in U.S. Streams

The National Cancer Institute (NCI), Laboratory of Receptor Biology and Gene Expression in colaboration with the USGS, looked for evidence of glucocorticoid and androgenic activity in streams. Glucocoricoids and androgens are both potential endocrine disruptors. Scientists tested water samples using a new cell-based bioassay that identified molecular responses triggered by the presence of glucocorticoids and androgens in natural stream water. They found glucocorticoid and androgen activity in 27 and 35 percent of the water samples, respectively, potentially indicating the widespread occurrence of these hormones in U.S. streams.

A tributary of the Shenandoah River located in agriculturally-dominated lands tested positive for androgen and glucocorticoid biological activity. Photo credit: Luke R. Iwanowicz, USGS

Glucocorticoids are steroid hormones commonly referred to as “stress hormones,” are known for their potential to decrease immune responses. Glucocorticoid-based pharmaceuticals (prednisone and hydrocortisone, for example) are widely prescribed to relieve inflammation. Androgens are anabolic steroids that affect the development and maintenance of male characteristics as well as other physiological functions. Depending on the timing of exposure, these glucocorticoids and androgens can have significant endocrine-disrupting effects, but unlike estrogenic chemicals, not much is known about their occurrence in the environment.

USGS scientists provided extracts for testing from more than 100 water samples from streams and rivers located in 14 States. The testing method the NCI researchers developed allowed them to detect the activation of cell receptors or genes that respond specifically to glucocorticoids or androgens. Activation of the fluorescently tagged cell receptors led visual evidence of the presence of glucocorticoids or androgens in the samples of stream water. Other molecular methods were used to confirm that specific genes were turned on.

Considering that both glucocorticoids and androgens influence body development and metabolism, and have the potential to influence normal reproductive, endocrine, and immune system function, their presence in the environment has potential implications for wildlife and human health.

This study was funded by:

- USGS
  - Chesapeake Bay Priority Ecosystems Science
  - Toxic Substances Hydrology Program
  - Fisheries: Aquatic and Endangered Resources Program
  - Contaminants Biology Program
- National Cancer Institute
  - Center for Cancer Research
- The U.S. Fish and Wildlife Service
  - Environmental Contaminants Program
- Great Lakes Restoration Initiative
- West Virginia
  - Division of Natural Resources
  - Department of Environmental Protection
- Virginia Department of Game and Inland Fisheries
- Maryland Department of Natural Resources
- Pennsylvania Fish and Boat Commission
- National Institutes of Health
  - Intramural Research Program

Intersex Fish and Contaminant Mixtures Found at Smallmouth Bass Nests

Contaminants including hormones, pesticides, and pharmaceuticals have been detected at fish nesting sites in the Potomac River watershed where smallmouth bass (*Micropterus dolomieu*) were found with evidence of endocrine disruption, such as intersex (having both female and male characteristics). Although these contaminants

USGS scientist dissecting a fish to determine possible effects from exposure to endocrine disrupting chemicals. Photo credit: USGS.

are known to originate from a variety of animal and human-waste sources, results of a recent USGS study support previous studies suggesting that seasonal runoff from agricultural activities could be an important source of exposure to endocrine disrupting chemicals by smallmouth bass during their early life stages, including eggs, larvae, and hatchlings (fry).

USGS scientists collected bed sediment and water samples from sites where smallmouth bass spawn and build nests in the Potomac River watershed. The samples were analyzed for a wide range of chemicals including those that are suspected endocrine disruptors. The scientists also studied adult fish collected from the nesting sites. This study and others will help resource managers and others determine factors contributing to abnormal fish health, such as intersex, observed in this region.

The Toxic Substances Hydrology, Contaminant Biology, Priority Ecosystems Science, and Fisheries: Aquatic and Endangered Resources Programs of the USGS supported this study. Funding was also provided by the West Virginia Division of Natural Resources, West Virginia Department of Environmental Protection, Virginia Departments of Game and Inland Fisheries and Environmental Quality, and Maryland Department of Natural Resources.

Fungicides Found in Streams and Groundwater in High-Use Agricultural Settings

USGS scientist measuring water quality at an irrigation ditch near Parma, Idaho. Photo credit: Timothy Reilly, USGS.

USGS scientists have documented the occurrence of several previously unreported fungicides in water and sediment in streams located near farm fields. Fungicides are used to control the outbreak of persistent plant diseases, which are a concern across the Nation because they can significantly reduce crop yields. Although more than 3,600 pesticide products containing fungicides are currently registered with the U.S. Environmental Protection Agency, few studies have investigated the occurrence or potential effects of fungicides in the environment.

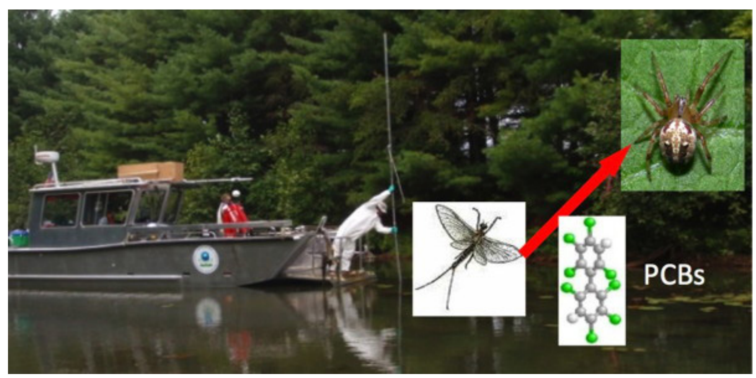
A recent USGS study has shown that many fungicides are transported from areas of intense use to nearby streams and groundwater. In many case the fungicides are found at concentrations that may be a concern for environmental health. Currently, limited toxicological information is available on the effects of fungicides on beneficial fungi, which are important to stream ecosystems. USGS scientists tested water and sediment from three geographic areas (Presque Isle, Maine; Parma, Idaho; and Hancock, Wisconsin) where fungicides are used intensively. They found at least one fungicide in 75 percent of the surface waters sampled and in 58 percent of the groundwater wells sampled. They also found at least two fungicides in 55 percent of the bed sediment samples and in 83 percent of the suspended sediment samples that were collected.

The results of this study indicate the importance of including fungicides in pesticide-monitoring programs, particularly in areas where crops are grown that require frequent treatments to prevent fungal diseases. This study will provide additional information to regulators and water-resource managers about the occurrence of fungicides in the environment across the Nation.

The USGS Toxic Substances Hydrology Program provided the funding for this study.

EPA Award for Tracking Contaminant Exposure and Effects in Food Webs

USGS scientist David Walters and his U.S. Environmental Protection Agency (EPA) collaborators won a Level 1 Scientific and Technological Achievement Award (STAA)—the highest research award given out by EPA. Criteria for these annual awards include scientific or technological research of exceptionally high quality, of national significance, of high impact on a broad area of science/technology, and recognizable as a major scientific/technological achievement within its field of study.



Scientists collecting sediment in a backwater of the Manistique River on Michigan's Upper Peninsula. Aquatic insects accumulate contaminants like polychlorinated biphenyls (PCBs) in their tissues as larvae, then transfer them to predators, such as spiders, when they emerge from the water. Photo credit: David Walters, USGS

Results of the study "Identifying Mechanisms of Contaminant Bioaccumulation and Developing Indicators of Ecosystem Recovery" were published in Environmental Science and Technology and in Ecological Applications. The scientists identified mechanisms of contaminant exposure in aquatic organisms and then explored how this exposure propagates into food webs via the emergence of adult insects from contaminated aquatic ecosystems. Insects emerging from aquatic habitats affect the distribution, abundance, production, and diversity of predators. Contaminants, aquatic insects, and their predators interact in two important ways:

- Aquatic insects accumulate compounds and elements in their tissues as larvae, which are transferred to predators, such as birds, when they emerge from the water; and
- Toxic contaminants like metals limit insect emergence, thereby severing the ecological linkage between aquatic and land based ecosystems.

The U.S. Environmental Protection Agency provided the funds for the team's study.

Upcoming Meetings

MEDGEO 2013—The Natural Environment and Health: Hidden Dangers, Unlimited Opportunities, Arlington, Virginia, August 25-29, 2013

MEDGEO 2013 is sponsored by the International Medical Geology Association (IMGA), Geology and Health Division of the Geological Society of America (GSA), American Geosciences Institute, and the USGS. The conference will feature a wide variety of topics related to the intersection of human health and the natural environment. Technical sessions at the conference include:

> Come visit our booth on USGS Environmental Health Science in the exhibit hall. USGS staff will be on hand to answer questions, and fact sheets on a variety of environmental health topics will be available.

- Keynote Session
  USGS Presentation
  - Mineral Resources, Science, and Civilization, by Meinert, L.D. (USGS)
- Arsenic and Other Toxic Oxyanions in the Environment
- Biogeochemical Biomarkers of Human Health
- Children's Health and the Environment
- Climate Change and Human Health
  USGS Presentations
  - Saharan Dust, PM10, Bioactive and Biotoxic Metals, and Human Health in a Dustier World, by Garrison, V.H. (USGS), Konde, L. (U.S. Department of State [USDS]), Otto, R.D. (USDS), Tsuneoka, Y. (Embassy of Japan, Sri Lanka), and Wolf, R.E. (USGS)
  - The Influence of Climate Related Factors on Emerging and Reemerging Zoonotic and Vector-Borne Disease, by Morman, S.A. (USGS)
- Environmental Exposure to Asbestos and Other Natural Fibers
  USGS Presentation
  - Earth Science Input for Evaluating Spatially-Distributed Mesothelioma Risk Factors Associated with Environmental Exposures to Erionite and other Elongate Mineral Particles, by Plumlee, G.S. (USGS), Meeker, G.P. (USGS), Van Gosen, B.S. (USGS), San Juan, C.A. (USGS), Blitz, T. (USGS), Ellefsen, K.J. (USGS), Morman, S.A. (USGS), Buck, B.J. (University of Nevada), Merkler, D. (Natural Resources Conservation Service), and Miller, A. (National Institute of Environmental Health Sciences)
- Energy Related Health Issues
  USGS Presentations
  - Lithogenic Atmospheric Particulates in the Vicinity of Mountaintop Coal Mines, West Virginia, USA, by Kolker, A. (USGS), Engle, M.A. (USGS), Kurth, L.M. (West Virginia University [WVU]), Orem, W.H. (USGS), Geboy, N.J. (USGS), Hendryx, M.S. (WVU), Tatu, C. (University of Medicine and Pharmacy, Timisoara, Romania [UMPTR]), Crosby, L.M. (USGS), McCawley, M. (USGS), Varonka, M.S. (USGS), and Devera, Christina (USGS)
  - Surface Mining of Coal and Water Chemistry – Case Study in West Virginia, USA, by Orem, W.H. (USGS), Tatu, C. (USGS), Crosby, L.M. (USGS), Varonka, M.S. (USGS), Bates, A.L. (USGS), Geboy, N.J. (USGS), and Hendryx, M.S. (WVU)
  - Stone Coal in Southern Shaanxi Province, China: Mineralogy of Environmentally Hazardous Elements, by Belkin, H.E. (USGS), and Luo, K. (Chinese Academy of Sciences)
- Characterization and Health Impact of Natural and Anthropogenic Dust
  USGS Presentation
  - Anticipating Health Risks from Atmospheric Dust Through Detection of Sources, Compositions, and Transport Paths of Regional Dust, by Reynolds, R.L. (USGS), Goldstein, H.L. (USGS), Breit, G.N. (USGS), Urban, F. (USGS), Bogle, R. (USGS), Morman, S.A. (USGS), Miller, M.E. (National Park Service), Whitney, J.W. (USGS), and Ghio, A.J. (U.S. Environmental Protection Agency)
- Health Impacts of Global Artisanal Mining
  USGS Presentation
  - Medical Geology and Geochemistry Insights into the Global Potential for Lead Poisoning Linked to Artisanal or Recreational Metal Mining, by Plumlee, G.S. (USGS), Morman, S.A. (USGS), and Fernette, G. (USGS)
- Health Risks Assessment of Hydraulic Fracking for Gas Recovery
  USGS Presentations
  - Organic Substances in Produced Water From Unconventional Natural Gas Production - Potential Health Concerns, by Orem, W.H. (USGS), Tatu, C., (UMPTR), Varonka, M.S. (USGS), Crosby, L.M. (USGS), and Engle, M. (USGS)
  - Measurement of the In-Vitro Toxicity of Produced Waters, by Crosby, L.M. (USGS), Devera, C. (USGS), Charles, K. (USGS), and Orem, W.H. (USGS)
- ISPRS: Earth Observing Data and Tools for Health Studies
  USGS Presentation
  - Landsat—Monitoring Our Earth's Condition for Over 40 Years, by Cecere, T. (USGS)
- Legacy of Natural Disasters
- Medical Geography
- Mercury and Environmental Health: Paleo-historical, Legacy and Contemporary Effects and Challenges
- Military Applications of Medical Geology
- Occupational Health Issues
- Radioactivity, Geology and Human Health
  USGS Presentation
  - Invited—Geochemistry as a Critical Factor in Defining Radionuclide Occurrence in Water from Principal Drinking-Water Aquifers of the United States, by Szabo, Z. (USGS)
- Soils in Medical Geology
- Therapeutic Uses of Minerals
- Urban Medical Geology: Integrating Geologic and Anthropogenic Processes
  USGS Presentation
  - Environmental and Medical Geochemistry in Disaster Scenarios, by Plumlee, G.S. (USGS)
- Veterinary Geology
- Water and Human Health

http://rock.geosociety.org/GeoHealth/MEDGEO_2013/index.asp

143rd Annual Meeting of the American Fisheries Society, Little Rock, Arkansas, September 8-12, 2013

143rd Annual Meeting of the American Fisheries Society will feature information on the managing and understanding of fisheries of all kinds. The meeting's theme is "Preparing for the Challenges Ahead." Scientists from the USGS will present information on aquatic organisms and aquatic habitats that can help natural resource managers and decision makers do their job. USGS environmental health science will also be featured at the meeting. The following are selected sessions where presentations on USGS environmental health science will be given.

- Session: Watersheds, Land Use, and Fish Habitat
  - Presentation: Effects of Land Use and Associated Factors on Biological Communities of Small Streams in the Illinois River Basin of Arkansas, by James Petersen (USGS), Billy Justus (USGS), Bradley Meredith (USGS)
- Session: Fish Health
  - Presentation: Biological Effects of Environmental Contaminants on Gene Expression Endpoints in Fishes of the Great Lakes, by Cassidy Hahn (West Virginia University), Luke R. Iwanowicz (USGS), Vicki Blazer (USGS), Patricia M. Mazik (USGS)
- Session: Nutrients, Aquatic Food Webs, and Fisheries Management - Part 1
  - Presentation: Potential Nutrient Subsidy Synergies Between Agriculture and Stocked Trout in New York Streams, by Alexander Alexiades (Cornell University), William L. Fisher (USGS)
- Session: Current Research on the Impacts of Unconventional Oil and Gas Extraction on Freshwaters
  - Presentation: Current and Needed Research on the Impacts of Unconventional Oil and Gas Extraction on Freshwater Ecosystems, by Sally Entrekin (University of Central Arkansas), Kelly Maloney (USGS)
  - Presentation: Assessing Shallow Groundwater Quality and Geochemistry in the Fayetteville Shale Gas Production Area, North-Central Arkansas, by Timothy Kresse (USGS), Phil Hays (USGS), Jayson Funkhouser (USGS)
  - Presentation: Understanding the Relationships Between Hydraulic Fracturing and Brook Trout Habitat in the Marcellus Shale Region, by Maya Weltman-Fahs (Cornell University), Jason Taylor (Cornell University), William L. Fisher (USGS)
  - Presentation: Energy Development, Habitat Quality, and Native Fish Communities in Southwestern Wyoming, by Annika Walters (USGS), Carlin Girard (University of Wyoming)

http://afs2013.com/

20th Annual Conference of The Wildlife Society, Milwaukee, Wisconsin, October 5-10, 2013

The Wildlife Society will be holding is annual conference in Milwaukee, Wisconsin, on October 5-10, 2013. The conference will feature information on wildlife conservation challenges. The following environmental health related symposia and workshops are part of the conference.

Symposia

- Impacts of Renewable Energy Development on Wildlife: Potential Impacts and Future Opportunities
- Effects of Wildland Fire and Fire Management on Amphibians and Reptiles
- Current Science of Chronic Wasting Disease: What Have We Learned in the Last 5 Years?
- Wildlife Disease Ecology and Management
- Impacts of Lead Ammunition and Fishing Tackle: Current Issues in the Midwest
- Application of Molecular and Genetic Techniques to Wildlife Epidemiology
- Effects of Wildland Fire and Fire Management on Herptiles

Workshops

- Bat White-Nose Syndrome: Pathology, Epidemiology, Diagnostics, and Management
- Pollutants and Wildlife Management: Ecotoxicology for Biologists and Land Managers
- Monitoring Wildlife Populations: New Slants on Use of Existing Technology (Basic Biology Using Modern Technology)

http://wildlifesociety.org/

8th Biennial State of Lake Michigan and 13th Annual Great Lakes Beach Association Conference, Sheboygan, Wisconsin, October 15-17, 2013

Resource managers, scientists, coastal planners, local officials, and interest groups will attend this joint conference to present research and to work together to improve and protect Great Lakes beaches and Lake Michigan. The conference will feature several sessions on environmental health science topics.

- Session 1 — Developing, implementing, and communicating the use of predictive and rapid tools at beaches
  This session will present information on rapid methods for estimating beach water quality and reporting it to the public. This session has a USGS co-convener.
- Session 2 — Beach remediation and monitoring success stories
- Session 5 — Identifying sources and managing fecal contamination
- Session 7 — Contaminant trends and health advice in Lake Michigan fish
- Session 8 — Lake Michigan monitoring and coastal assessment programs
  Coordinating monitoring and assessment programs is integral to understanding the coastal/nearshore interface. This session will feature presentations that describe how monitoring and coastal assessment programs are being used to better understand coastal/nearshore processes. USGS scientists are convening this session.
- Session 13 — Nuisance algae and nutrient dynamics in the nearshore zone
- Session 14 — Green Bay hypoxia
- Session 15 — Lake Michigan basin TMDLs and phosphorus management

http://www.aqua.wisc.edu/solm/Home.aspx

2013 GSA Annual Meeting and Exposition, Denver, Colorado, October 27-30, 2013

The Geological Society of America (GSA) annual meeting features a broad array of special technical sessions, field trips, short courses, and special lectures. USGS scientists are presenting a wide variety of information on USGS science, including environmental health science. The meeting will feature several sessions on environmental health science topics. Selected examples follow:

> During the GSA Annual Meeting please feel free to stop by the USGS's booth (number 837) in the Colorado Convention Center's exhibit hall. Information will be available on USGS science activities.

- T34 — Advances in Unsaturated Zone Geophysics
  This session will focus on geophysical methods for quantitative estimation and imaging of unsaturated-zone hydrologic properties and processes. A USGS scientist is one of the session's USGS co-conveners.
- T35 — Bottoms Up! Shallow Water Table Influences on Vadose Zone Biogeochemistry and Ecohydrology
  This session will present information on the influence of shallow water table conditions on hydrologic and biologic processes that control the unsaturated zone's biogeochemistry, contaminant fate and transport, and ecological community

structure and composition. The USGS Unsaturated Zone Interest Group (UZIG) is one of the session's sponsors.

- T36 — Impacts of Land-Use Change and Disturbances on Unsaturated-Zone Ecohydrology
Land-use change profoundly impacts unsaturated-zone biotic and hydrologic processes, such as subsurface moisture dynamics, infiltration and runoff, sedimentary erosion and deposition, biodiversity, and ecological function. This session will explore recent work in assessing these process changes and related effects. The USGS Unsaturated Zone Interest Group (UZIG) is one of the session's sponsors.
- T37 — Recent Advances in the Theory, Characterization, and Modeling of Unsaturated Zone Processes
This session focuses on advances in understanding unsaturated zone processes that control gas and water transport using field and laboratory measurements and theoretical and numerical models. The USGS Unsaturated Zone Interest Group (UZIG) is one of the sponsors of the session, which has USGS co-conveners.
- T38 — Vadose Zone Flow and Transport in Natural or Engineered Systems Under Extreme Conditions
This session presents information on theoretical or experimental studies, measurement techniques, simulations, and technologies involving flow and solute transport at low water content, in very coarse materials, low-permeability media, fractured systems, soil-gravel mixtures, and across the soil texture interfaces. The USGS Unsaturated Zone Interest Group (UZIG) is one of the sponsors of this session.
- T41 — Contaminant Migration through the Groundwater–Surface-Water Interface: Processes, Impacts, and Implications for Remediation
- T44 — Environmental Arsenic: The Nexus of Natural Occurrences and Human Health
- T55 — Secondary Water Quality Effects of Natural and Enhanced Attenuation of Contaminants
Anaerobic conditions in contaminant plumes can create secondary plumes containing elements not present in the contaminant source. This session will present information on the hydrologic and biogeochemical processes that control development and persistence of such secondary plumes. This session has USGS co-conveners.
- T46 — Experimental Study and Numerical Simulation of Reactive Chemical Transport in Complex Subsurface Media
- T63 — Transport and Transformation of Non-Solute Materials in Karst Aquifers
- T77 — Environmental and Social Implications of Hydraulic-Fracturing–Driven Oil and Gas Development: Toward a More Holistic Assessment
This session consists of presentations on the environmental and socioeconomic effects of hydraulic-fracturing–driven oil and gas development. This session has a USGS co-convener.
- T78 — Environmental Impacts of Coal Utilization
This session explores the environmental impacts associated with coal utilization. Relevant topics include fate of coal combustion byproducts, emissions from coal-fired power plants, and environmental and health impacts of coal mining. This session has a USGS co-convener.
- T83 — Impact of Winter De-Icing Chemicals on Water Quality and the Environment
- T88 — Pyrogenic Black Carbon, or Biochar, in Soils and Sediments, Its Characterization and Fate, Its Effects on the Carbon Cycle and Carbon Sequestration, and Its Effects on Soil Properties
This session addresses pyrogenic carbon in soils and sediments. The presence of this material can have profound effects on the nature of soil and an increasing role to play in carbon sequestration. This session is convened by USGS scientists.
- T95 — Recent Advances in Medical Geology
- T152 — Celebrating the Scientific Contributions of Kirk Nordstrom—Part 1: Acid to Neutral Mine Drainage, Geochemistry of Iron and Sulfur, Sulfate Minerals, Natural Background, and Geochemical Modeling
This session honors the career achievements of Kirk Nordstrom, USGS hydrogeochemist, by exploring research on mine drainage and related studies including iron and sulfur geochemistry, sulfate minerals, natural background in mining environments, and geochemical modeling. USGS scientists are convening this session.
- T153 — Celebrating the Scientific Contributions of Kirk Nordstrom—Part 2: Geochemistry of Arsenic and Antimony, Microbial Biogeochemistry, Geothermal Systems, Radioactive Waste Disposal, and Geochemical Modeling
This session honors the career achievements of Kirk Nordstrom, USGS hydrogeochemist, by exploring research on arsenic/antimony speciation and redox transformations, microbial biogeochemistry, geothermal systems, water-rock interactions, radioactive waste disposal, and geochemical modeling. USGS scientists are convening this session.
- T154 — Coupling Colloid-Water Interfacial Geochemical Processes with Contaminant Transport: Micro Vehicles for Big Problems
- T158 — Geochemistry of Flowback and Produced Waters from Hydraulically Fractured Black Shale
- T166 — Sources, Transport, Fate, and Toxicology of Trace Elements and Organics in the Environment
- T171 — Disposal of Radioactive Waste: Promise, Progress, Pitfalls, and Path Forward

http://community.geosociety.org/2013AnnualMeeting/Home

2013 APHA Annual Meeting and Exposition, Boston, Massachusetts, November 2-6, 2013

The American Public Health Association (APHA) annual meeting addresses current and emerging health science, policy, and practice issues with the goal to prevent disease and promote health. The theme of the meeting is Think Global Act Local—Best Practices Around the World.

http://www.apha.org/meetings/AnnualMeeting/

SETAC North America 34th Annual Meeting, Nashville, Tennessee, November 17-21, 2013

The Society of Environmental Toxicology and Chemistry (SETAC) Annual Meeting's theme is Harmonizing Science Across Disciplines. The meeting covers environmental health related topics such as aquatic toxicology and ecology, ecological risk assessment, environmental or analytical chemistry, and terrestrial or wildlife toxicology and ecology. USGS scientists present their environmental health research at many of the meeting's sessions. The following are some selected examples of sessions related to environmental health:

- Better Benthic Biomonitoring for Risk Assessments, Criteria Development, and Causal Analyses
- Contaminants of Emerging Concern for Fish: Assessing Exposure and Effects Across Biological Scales
- Ecological Consequences of Exposure to Pharmaceuticals: From the Laboratory to the Field
- Ecotoxicology of Fungicides
- Harmful Algal Bloom Toxins in Inland Waters: Environmental Contaminants of Emerging Concern
- Pyrethroid Pesticides in Aquatic Environments: Exposure, Effects, and Mitigations
- Wastewater Effluents: Chemical and Ecotoxicological Characterization
- What Do We Know About the Ecological Risk of Personal Care Product Ingredients?
- Occurrence, Fate, Transport, and Risks of Veterinary Pharmaceuticals in the Terrestrial Environment
- Contaminant Accumulation in Plants: Mechanisms, Models, and Potential Risk
- Endocrine Disrupting Chemicals and Pharmaceuticals in the Environment
- Mercury Characterization and Contaminated Site Remediation: Methods, Challenges, and Lessons Learned

http://nashville.setac.org/

AGU 46th Annual Fall Meeting, San Francisco, California, December 9-13, 2013

The American Geophysical Union's (AGU) annual fall meeting will cover a wide range of environmental health science topics. The meeting will also feature several themed sessions, called SWIRLs, to promote interdisciplinary collaboration. This meeting's SWIRLS are (1) Characterizing Uncertainty, (2) Dust and Aerosols, (3) Computational Methods across Scales: from Personal to High Performance Platforms, (4) Global Soils, and (5) Urban Systems. The following are a few of the special sessions that are related to environmental health—many of which are going to be convened by USGS scientists.

- A034 — From Air Pollution to Climate Changes in Asia
- A047 — Multi-sensor and Model Aerosol Data Synergy for Climate and Air Quality Applications
- A064 — The Nexus of Geophysical Processes and Exposure Science
- B033 — Land Use and Climate Change Impacts on Water-Related Ecosystem Services
- B042 — Mercury Pollution and Global Environmental Change
  The goal of this session is to highlight recent scientific advances in mercury cycling in relation to environmental change. The session will present information on a variety of topics including: mercury speciation, biogeochemistry, and bioaccumulation in terrestrial, freshwater, and marine ecosystems. This session has a USGS co-convener.
- B043 — Microbial Adaptation and Gene Transfer in the Environment
- B054 — Phenology as Both Forcing and Response: Integrating Measurements and Models Across Terrestrial and Aquatic Ecosystems
- B057 — Quantifying Uncertainty in Biogeochemical Studies
  This session will present information on comparisons of different approaches to uncertainty analysis, and on the use on uncertainty analysis in interpreting results, detecting trends, or designing field studies. This session has a USGS co-convener.
- B068 — The Bio-atmospheric N cycle: N Emissions, Transformations, Deposition, and Terrestrial and Aquatic Ecosystem Impacts
- GC018 — Glacier Change: Implications for Hydrology, Biogeochemistry, Ecology and Oceanography
- H015 — Chemical, Isotopic, and Chronologic Tracers to Understand the Fate and Transport of Nutrients in Watersheds
- H016 — Colloids, Engineered Nanoparticles, and Emerging Contaminants in the Environment
- H026 — From Catchment Hydrological Structure to Catchment Biogeochemical Response
- H035 — Hydro-Epidemiology: Understanding Connections Between Hydrology and Human Health
- H061 — Nonpoint Source Fluxes in the Vadose Zone and Groundwater
  The goal of this session is to improve the understanding of biogeochemical and anthropogenic factors affecting diffuse mass fluxes of nutrients, pesticides, emerging contaminants, trace elements, greenhouse gases, and other chemicals. The session will feature information on assessing governing processes and mass fluxes using field, laboratory, and modeling approaches; and on the linkages between chemical, biological, hydrological, and/or social factors that affect fluxes in the vadose zone. The session has USGS co-conveners.
- H082 — Taking the Riverine Pulse: Monitoring and Research Through the Lens of Continuous Water Quality Data
  This session will highlight studies that collect large continuous water-quality data sets. The goal of the session is to present new ways of interpreting these large data sets to reveal the dynamic nature of terrestrial and aquatic ecosystems. The session has USGS co-conveners.
- H095 — Water Contamination and Environmental Ecosystem in Rivers
- H096 — Water Resources and Water Quality under Changing Climate and Land Use
- NH010 — Hazardous Submarine Groundwater Discharge
- PA007 — Hydraulic Fracturing: Knowns, Unknowns, and Communication to the Public

https://fallmeeting.agu.org/2013/

14th National Conference on Science, Policy, and the Environment, Washington, DC, January 28-30, 2014

The National Council for Science and the Environment (NCSE) will host the 14th annual National Conference on Science, Policy, and the Environment. The theme of the conference is "Building Climate Solutions." The conference will be attended by professionals from the fields of natural and social sciences, humanities and engineering, government and policy, business and civil society. A plenary session will be held on Agriculture and Natural Resources: Food Security, Ecological Integrity, and Ecosystem Services on Land and in the Ocean. USGS environmental health science has been presented at past conferences.

http://www.buildingclimatesolutions.org/

EmCon 2014—4th International Conference on Occurrence, Fate, Effects, and Analysis of Emerging Contaminants in the Environment, Iowa City, Iowa, August 19-22, 2014

USGS scientists are helping organize the EmCon 2014 conference, which is planned to feature research on emerging contaminants such as pharmaceuticals, antibiotics, hormones, personal care products, nanoparticles, and their many degradation products in the environment. USGS scientists have presented information on environmental health science and emerging contaminants at past conferences.

Topical themes for the conference will include:

- Sources and Exposure Pathways
- Treatment Processes and Technologies
- Waste, Wastewater Recycling and Reuse
- Sampling, Analytical and Characterization Methods
- Fate and Transport in Aquatic and Terrestrial Ecosystems
- Aquatic and Terrestrial Effects
- Risk Assessment, Risk Management, Regulations and Policy Trameworks

http://www.emcon2014.com/

New Publications

Coming Soon!

Alvarez, D.A., Maruya, K.A., Dodder, N.G., Lao, W., Furlong, E.T., and Smalling, K.L., in press, Occurrence of contaminants of emerging concern along the California coast (2009-10) using passive sampling devices: Marine Pollution Bulletin, no. 0, doi:10.1016/j.marpolbul.2013.04.022. http://dx.doi.org/10.1016/j.marpolbul.2013.04.022

Barber, L.B., in press, Water reuse and emerging contaminants in the aquatic environment, *in* Ahuja, S., ed., Comprehensive Water Quality and Purification: Elsevier, ISBN:9780123821829.

Gray, J.L., Kanagy, L.K., Furlong, E.T., Kanagy, C.J., McCoy, J.W., Mason, A., and Lauenstein, G., in press, Presence of the corexit component dioctylsulfosuccinate in Gulf of Mexico water after the 2010 Deepwater Horizon oil spill: Chemosphere.

Maruya, K.A., Dodder, N.G., Weisberg, S.B., Gregorio, D., Bishop, J.S., Klosterhaus, S., Alvarez, D.A., Furlong, E.T., Bricker, S., Kimbrough, K.L., and Lauenstein, G.G., in press, The Mussel Watch California pilot study on contaminants of emerging concern (CECs)—Synthesis and next steps: Marine Pollution Bulletin, doi:10.1016/j.marpolbul.2013.04.023. http://dx.doi.org/10.1016/j.marpolbul.2013.04.023

Morman, S.A., and Plumlee, G.S., in press, The role of airborne mineral dusts in human disease: Aeolian Research, doi:10.1016/j.aeolia.2012.12.001. http://dx.doi.org/10.1016/j.aeolia.2012.12.001

Windham-Myers, L., Marvin-DiPasquale, M., A. Stricker, C., Agee, J.L., H. Kieu, L., and Kakouros, E., in press, Mercury cycling in agricultural and managed wetlands of California, USA—Experimental evidence of vegetation-driven changes in sediment biogeochemistry and methylmercury production: Science of the Total Environment, doi:10.1016/j.scitotenv.2013.05.028. http://dx.doi.org/10.1016/j.scitotenv.2013.05.028

Windham-Myers, L., Marvin-DiPasquale, M., Kakouros, E., Agee, J.L., Kieu, L.H., Stricker, C.A., Fleck, J.A., and Ackerman, J.T., in press, Mercury cycling in agricultural and managed wetlands of California, USA—Seasonal influences of vegetation on mercury methylation, storage, and transport: Science of the Total Environment, doi:10.1016/j.scitotenv.2013.05.027. http://dx.doi.org/10.1016/j.scitotenv.2013.05.027

Published Recently!

Abbott, R.C., Osorio, J.E., Bunck, C.M., and Rocke, T.E., 2012, Sylvatic plague vaccine—A new Tool for conservation of threatened and endangered species?: EcoHealth, v. 9, no. 3, p. 243-250, doi:10.1007/s10393-012-0783-5. http://dx.doi.org/10.1007/s10393-012-0783-5

Ackermann, M., Koriabine, M., Hartmann-Fritsch, F., de Jong, P.J., Lewis, T.D., Schetle, N., Work, T.M., Dagenais, J., Balazs, G.H., and Leong, J.A.C., 2012, The genome of chelonid herpesvirus 5 harbors atypical genes: PLoS ONE, v. 7, no. 10, doi:10.1371/journal.pone.0046623. http://dx.doi.org/10.1371/journal.pone.0046623

Alvarez, D.A., Shappell, N.W., Billey, L.O., Bermudez, D.S., Wilson, V.S., Kolpin, D.W., Perkins, S.D., Evans, N., Foreman, W.T., Gray, J.L., Shipitalo, M.J., and Meyer, M.T., 2013, Bioassay of estrogenicity and chemical analyses of estrogens in streams across the United States associated with livestock operations: Water Research, v. 47, no. 10, p. 3347-3363, doi:10.1016/j.watres.2013.03.028. http://dx.doi.org/10.1016/j.watres.2013.03.028

Arcagni, M., Campbell, L., Arribére, M.A., Marvin-DiPasquale, M., Rizzo, A., and Ribeiro Guevara, S., 2013, Differential mercury transfer in the aquatic food web of a double basined lake associated with selenium and habitat: Science of the Total Environment, v. 454-455, p. 170-180, doi:10.1016/j.scitotenv.2013.03.008. http://dx.doi.org/10.1016/j.scitotenv.2013.03.008

Barbaro, J.R., Walter, D.A., and LeBlanc, D.R., 2013, Transport of nitrogen in a treated-wastewater plume to coastal discharge areas, Ashumet Valley, Cape Cod, Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013-5061, 37 p. http://pubs.usgs.gov/sir/2013/5061

Barber, L.B., Keefe, S.H., Brown, G.K., Furlong, E.T., Gray, J.L., Kolpin, D.W., Meyer, M.T., Sandstrom, M.W., and Zaugg, S.D., 2013, Persistence and potential effects of complex organic contaminant mixtures in wastewater-impacted streams: Environmental Science and Technology, v. 47, no. 5, p. 2177-2188, doi:10.1021/es303720g. http://dx.doi.org/10.1021/es303720g

Bargar, J.R., Williams, K.H., Campbell, K.M., Long, P.E., Stubbs, J.E., Suvorova, E.I., Lezama-Pacheco, J.S., Alessi, D.S., Stylo, M., Webb, S.M., Davis, J.A., Giammar, D.E., Blue, L.Y., and Bernier-Latmani, R., 2013, Uranium redox transition pathways in acetate-amended sediments: Proceedings of the National Academy of Sciences, v. 110, no. 12, p. 4506-4511, doi:10.1073/pnas.1219198110. http://dx.doi.org/10.1073/pnas.1219198110

Barringer, J.L., and Reilly, P.A., 2013, Arsenic in groundwater—A summary of sources and the biogeochemical and hydrogeologic factors affecting arsenic occurrence and mobility, *in* Bradley, P.M., ed., Current Perspectives in Contaminant Hydrology and Water Resources Sustainability: New York, InTech, ISBN:9789535110460. http://dx.doi.org/10.5772/54337

Barringer, J.L., Szabo, Z., and Reilly, P.A., 2013, Occurrence and mobility of mercury in groundwater (Chapter 5), *in* Bradley, P.M., ed., Current Perspectives in Contaminant Hydrology and Water Resources Sustainability: New York, InTech, ISBN:9789535110460. http://dx.doi.org/10.5772/54337

Batts, W.N., Goodwin, A.E., and Winton, J.R., 2012, Genetic analysis of a novel nidovirus from fathead minnows: Journal of General Virology, v. 93, no. 6, p. 1247-1252, doi:10.1099/vir.0.041210-0. http://dx.doi.org/10.1099/vir.0.041210-0

Beaulaurier, J., Bickford, N., Gregg, J.L., Grady, C.A., Gannam, A.L., Winton, J.R., and Hershberger, P.K., 2012, Susceptibility of Pacific herring to viral hemorrhagic septicemia is influenced by diet: Journal of Aquatic Animal Health, v. 24, no. 1, p. 43-48, doi:10.1080/08997659.2012.668511. http://dx.doi.org/10.1080/08997659.2012.668511

Blazer, V.S., Pinkney, A.E., Jenkins, J.A., Iwanowicz, L.R., Minkkinen, S., Draugelis-Dale, R.O., and Uphoff, J.H., 2013, Reproductive health of yellow perch *Perca flavescens* in selected tributaries of the Chesapeake Bay: Science of the Total Environment, v. 447, p. 198-209, doi:10.1016/j.scitotenv.2012.12.088. http://dx.doi.org/10.1016/j.scitotenv.2012.12.088

Blazer, V.S., Pinkney, A.E., and Uphoff, J.H., 2013, Reproductive health of yellow perch, *Perca flavescens*, in Chesapeake Bay tributaries: U.S. Geological Survey Fact Sheet 2013-3055, 2 p. http://pubs.usgs.gov/fs/2013/3055/

Bowen, R.A., O'Shea, T.J., Shankar, V., Neubaum, M.A., Neubaum, D.J., and Rupprecht, C.E., 2013, Prevalence of neutralizing antibodies to rabies virus in serum of seven species of insectivorous bats from Colorado and New Mexico, United States: Journal of Wildlife Diseases, v. 49, no. 2, p. 367-374, doi:10.7589/2012-05-124. http://dx.doi.org/10.7589/2012-05-124

Bradbury, K.R., Borchardt, M.A., Gotkowitz, M., Spencer, S.K., Zhu, J., and Hunt, R.J., 2013, Source and transport of human enteric viruses in deep municipal water supply wells: Environmental Science and Technology, v. 47, no. 9, p. 4096-4103, doi:10.1021/es400509b. http://dx.doi.org/10.1021/es400509b

Bradford, S.A., Morales, V.L., Zhang, W., Harvey, R.W., Packman, A.I., Mohanram, A., and Welty, C., 2013, Transport and fate of microbial pathogens in agricultural settings: Critical Reviews in Environmental Science and Technology, v. 43, no. 8, p. 775-893, doi:10.1080/10643389.2012.710449. http://dx.doi.org/10.1080/10643389.2012.710449

Bradley, P.M. ed., 2013, Current perspectives in contaminant hydrology and water resources sustainability: New York, InTech, 333 p., ISBN:9789535110460. http://dx.doi.org/10.5772/54337

Bradley, P.M., Journey, C.A., Brigham, M.E., Burns, D.A., Button, D.T., and Riva-Murray, K., 2013, Intra- and inter-basin mercury comparisons—Importance of basin scale and time-weighted methylmercury estimates: Environmental Pollution, v. 172, p. 42-52, doi:10.1016/j.envpol.2012.08.008. http://dx.doi.org/10.1016/j.envpol.2012.08.008

Bradley, P.M., and Kolpin, D.W., 2013, Managing the effects of endocrine disrupting chemicals in wastewater-impacted streams (Chapter 1), *in* Bradley, P.M., ed., Current Perspectives in Contaminant Hydrology and Water Resources Sustainability: New York, InTech, ISBN:9789535110460. http://dx.doi.org/10.5772/54337

Bradley, W.G., Borenstein, A.R., Nelson, L.M., Codd, G.A., Rosen, B.H., Stommel, E.W., and Cox, P.A., 2013, Is exposure to cyanobacteria an environmental risk factor for amyotrophic lateral sclerosis and other neurodegenerative diseases?: Amyotroph Lateral Scler Frontotemporal Degener, doi:10.3109/21678421.2012.750364. http://dx.doi.org/10.3109/21678421.2012.750364

Breyta, R., Jones, A., Stewart, B., Brunson, R., Thomas, J., Kerwin, J., Bertolini, J., Mumford, S., Patterson, C., and Kurath, G., 2013, Emergence of MD type infectious hematopoietic necrosis virus in Washington state coastal steelhead trout: Diseases of Aquatic Organisms, v. 104, no. 3, p. 179-195, doi:10.3354/dao02596. http://dx.doi.org/10.3354/dao02596

Bright, P.R., Buxton, H.T., Balistrieri, L.S., Barber, L.B., Chapelle, F.H., Cross, Paul, C., Krabbenhoft, D.P., Plumlee, G.S., Sleeman, J.M., Tillitt, D.E., Toccalino, P.L., and Winton, J.R., 2013, U.S. Geological Survey environmental health science strategy—Providing environmental health science for a changing world: U.S. Geological Survey Circular 1383-E, 43 p. http://pubs.usgs.gov/circ/1383e/

Burns, D., Aiken, G., Bradley, P., Journey, C., and Schelker, J., 2013, Specific ultra-violet absorbance as an indicator of mercury sources in an Adirondack River basin: Biogeochemistry, v. 113, no. 1-3, p. 451-466, doi:10.1007/s10533-012-9773-5. http://dx.doi.org/10.1007/s10533-012-9773-5

Buxton, H.T., and Bright, P.R., 2013, Environmental health science at the U.S. Geological Survey: U.S. Geological Survey Fact Sheet 2012-3142, 2 p. http://pubs.usgs.gov/fs/2012/3142/

Byappanahalli, M.N., Nevers, M.B., Korajkic, A., Staley, Z.R., and Harwood, V.J., 2012, Enterococci in the environment: Microbiology and Molecular Biology Reviews, v. 76, no. 4, p. 685-706, doi:10.1128/mmbr.00023-12. http://dx.doi.org/10.1128/mmbr.00023-12

Cain, D.J., Croteau, M.-N., and Fuller, C.C., 2013, Dietary bioavailability of Cu adsorbed to colloidal hydrous ferric oxide: Environmental Science and Technology, v. 47, no. 6, p. 2869-2876, doi:10.1021/es3044856. http://dx.doi.org/10.1021/es3044856

Carlisle, D.M., Meador, M.R., Short, T.M., Tate, C.M., Gurtz, M.E., Bryant, W.L., Falcone, J.A., and Woodside, M.D., 2013, The quality of our Nation's waters—Ecological health in the Nation's streams, 1993-2005: U.S. Geological Survey Circular 1391, 120 p. http://pubs.usgs.gov/circ/1391/

Carlisle, D.M., and Woodside, M.D., 2013, Ecological health in the Nation's streams: U.S. Geological Survey Fact Sheet 2013-3033, 6 p. http://pubs.usgs.gov/fs/2013/3033/

Chalmers, A., Marvin-DiPasquale, M.C., Degnan, J.R., Coles, J., Agee, J.L., and Luce, D., 2013, Characterization of mercury contamination in the Androscoggin River, Coos County, New Hampshire: U.S. Geological Survey Open-File Report 2013-1076, 58 p. (2 XLS Appendices). http://pubs.usgs.gov/of/2013/1076/

Chapelle, F.H., Bradley, P.M., Journey, C.A., and McMahon, P.B., 2013, Assessing the relative bioavailability of DOC in regional groundwater systems: Ground Water, v. 51, no. 3, p. 363-372, doi:10.1111/j.1745-6584.2012.00987.x. http://dx.doi.org/10.1111/j.1745-6584.2012.00987.x

Chapelle, F.H., Campbell, B.G., Widdowson, M.A., and Landon, M.K., 2013, Modeling the long-term fate of agricultural nitrate in groundwater in the San Joaquin Valley, California (Chapter 6), *in* Bradley, P.M., ed., Current Perspectives in Contaminant Hydrology and Water Resources Sustainability: New York, InTech, ISBN:9789535110460. http://dx.doi.org/10.5772/54337

Chun, C.L., Ochsner, U., Byappanahalli, M.N., Whitman, R.L., Tepp, W.H., Lin, G., Johnson, E.A., Peller, J., and Sadowsky, M.J., 2013, Association of toxin-producing *Clostridium botulinum* with the macroalga *Cladophora* in the Great Lakes: Environmental Science and Technology, v. 47, no. 6, p. 2587-2594, doi:10.1021/es304743m. http://dx.doi.org/10.1021/es304743m

Conko, K.M., Landa, E.R., Kolker, A., Kozlov, K., Gibb, H.J., Centeno, J.A., Panov, B.S., and Panov, Y.B., 2013, Arsenic and mercury in the soils of an industrial city in the Donets Basin, Ukraine: Soil and Sediment Contamination—An International Journal, v. 22, no. 5, p. 574-593, doi:10.1080/15320383.2013.750270. http://dx.doi.org/10.1080/15320383.2013.750270

Cornelissen, G., Rutherford, D.W., Arp, H.P.H., Dörsch, P., Kelly, C.N., and Rostad, C.E., 2013, Sorption of pure N_2O to biochars and other organic and inorganic materials under anhydrous conditions: Environmental Science and Technology, v. 47, no. 14, p. 7704-7712, doi:10.1021/es400676q. http://dx.doi.org/10.1021/es400676q

Cornwell, E.R., Eckerlin, G.E., Thompson, T.M., Batts, W.N., Getchell, R.G., Groocock, G.H., Kurath, G., Winton, J.R., Casey, R.N., Casey, J.W., Bain, M.B., and Bowser, P.R., 2012, Predictive factors and viral genetic diversity for viral hemorrhagic septicemia virus infection in Lake Ontario and the St. Lawrence River: Journal of Great Lakes Research, v. 38, no. 2, p. 278-288, doi:10.1016/j.jglr.2012.01.006. http://dx.doi.org/10.1016/j.jglr.2012.01.006

Croteau, M.-N., Cain, D.J., and Fuller, C.C., 2013, Novel and nontraditional use of stable isotope tracers to study metal bioavailability from natural particles: Environmental Science and Technology, v. 47, no. 7, p. 3424-3431, doi:10.1021/es400162f. http://dx.doi.org/10.1021/es400162f

Custer, C.M., Custer, T.W., and Hines, J.E., 2012, Adult tree swallow survival on the polychlorinated biphenyl-contaminated Hudson River, New York, USA, Between 2006 and 2010: Environmental Toxicology and Chemistry, v. 31, no. 8, p. 1788-1792, doi:10.1002/etc.1894. http://dx.doi.org/10.1002/etc.1894

Custer, T.W., Custer, C.M., Thogmartin, W.E., Dummer, P.M., Rossmann, R., Kenow, K.P., and Meyer, M.W., 2012, Mercury and other element exposure in tree swallows nesting at low pH and neutral pH Lakes In northern Wisconsin USA: Environmental Pollution, v. 163, p. 68-76, doi:10.1016/j.envpol.2011.12.017. http://dx.doi.org/10.1016/j.envpol.2011.12.017

De La Cruz, S.E.W., Takekawa, J.Y., Spragens, K.A., Yee, J., Golightly, R.T., Massey, G., Henkel, L.A., Scott Larsen, R., and Ziccardi, M., 2013, Post-release survival of surf scoters following an oil spill—An experimental approach to evaluating rehabilitation success: Marine Pollution Bulletin, v. 67, no. 1-2, p. 100-106, doi:10.1016/j.marpolbul.2012.11.027. http://dx.doi.org/10.1016/j.marpolbul.2012.11.027

Eberts, S.M., Thomas, M.A., and Jagucki, M.L., 2013, The quality of our Nation's waters—Factors affecting public-supply-well vulnerability to contamination—Understanding observed water quality and anticipating future water quality: U.S. Geological Survey Circular 1385, 120 p. http://pubs.usgs.gov/circ/1385/

Ely, C.R., Hall, J.S., Schmutz, J.A., Pearce, J.M., Terenzi, J., Sedinger, J.S., and Ip, H.S., 2013, Evidence that life history characteristics of wild birds influence infection and exposure to influenza A viruses: PLoS ONE, v. 8, no. 3, p. e57614, doi:10.1371/journal.pone.0057614. http://dx.doi.org/10.1371/journal.pone.0057614

Foreman, W.T., Gray, J.L., ReVello, R.C., Lindley, C.E., and Losche, S.A., 2013, An isotope-dilution standard GC/MS/MS method for steroid hormones in water (Chapter 4), *in* Cobb, G.P., and Smith, P.N., eds., Evaluating Veterinary Pharmaceutical Behavior in the Environment: Washington, D.C., American Chemical Society 1126, p. 57-136. http://dx.doi.org/10.1021/bk-2013-1126.ch004

Francy, D.S., Stelzer, E.A., Duris, J.W., Brady, A.M.G., Harrison, J.H., Johnson, H.E., and Ware, M.W., 2013, Predictive models for *Escherichia coli* concentrations at inland lake beaches and relationship of model variables to pathogen detection: Applied and Environmental Microbiology, v. 79, no. 5, p. 1676-1688, doi:10.1128/aem.02995-12. http://dx.doi.org/10.1128/aem.02995-12

Gallegos, T.J., Fuller, C.C., Webb, S.M., and Betterton, W., 2013, Uranium(VI) interactions with mackinawite in the presence and absence of bicarbonate and oxygen: Environmental Science and Technology, v. 47, no. 13, p. 7357-7364, doi:10.1021/es400450z. http://dx.doi.org/10.1021/es400450z

Ginsberg, H.S., Gettman, A., Becker, E., Bandyopadhyay, A.S., and Lebrun, R.A., 2013, Environmental management of mosquito-borne viruses in Rhode Island: Rhode Island Medical Journal, v. 96, no. 7, p. 5. http://www.rimed.org/rimedicaljournal/2013-07/2013-07-37-cont-mosquitos.pdf

Godsey, M.S., Jr., King, R.J., Burkhalter, K., Delorey, M., Colton, L., Charnetzky, D., Sutherland, G., Ezenwa, V.O., Wilson, L.A., Coffey, M., Milheim, L.E., Taylor, V.G., Palmisano, C., Wesson, D.M., and Guptill, S.C., 2013, Ecology of potential West Nile virus vectors in southeastern Louisiana—Enzootic transmission in the relative absence of *Culex quinquefasciatus*: American Journal of Tropical Medicine and Hygiene, v. 88, no. 5, p. 986-996, doi:10.4269/ajtmh.12-0109. http://dx.doi.org/10.4269/ajtmh.12-0109

Golden, H.E., Knightes, C.D., Conrads, P.A., Feaster, T.D., Davis, G.M., Benedict, S.T., and Bradley, P.M., 2013, Climate change and watershed mercury export—A multiple projection and model analysis: Environmental Toxicology and Chemistry, v. 32, no. 9, p. 2165-2174, doi:10.1002/etc.2284. http://dx.doi.org/10.1002/etc.2284

Gonzalez-Martin, C., Teigell-Perez, N., Lyles, M., Valladares, B., and Griffin, D.W., 2013, Epifluorescent direct counts of bacteria and viruses from topsoil of various desert dust storm regions: Research in Microbiology, v. 164, no. 1, p. 17-21, doi:10.1016/j.resmic.2012.08.009. http://dx.doi.org/10.1016/j.resmic.2012.08.009

Graham, A.M., Aiken, G.R., and Gilmour, C.C., 2013, Effect of dissolved organic matter source and character on microbial Hg methylation in Hg-S-DOM solutions: Environmental Science and Technology, doi:10.1021/es400414a (Advanced Web release) http://dx.doi.org/10.1021/es400414a

Grasman, K.A., Echols, K.R., May, T.M., Peterman, P.H., Gale, R.W., and Orazio, C.E., 2013, Immunological and reproductive health assessment in herring gulls and black-crowned night herons in the Hudson-Raritan Estuary: Environmental Toxicology and Chemistry, v. 32, no. 3, p. 548-561, doi:10.1002/etc.2089. http://dx.doi.org/10.1002/etc.2089

Gray, J.E., Pribil, M.J., Van Metre, P.C., Borrok, D.M., and Thapalia, A., 2013, Identification of contamination in a lake sediment core using Hg and Pb isotopic compositions, Lake Ballinger, Washington, USA: Applied Geochemistry, v. 29, p. 1-12, doi:10.1016/j.apgeochem.2012.12.001. http://dx.doi.org/10.1016/j.apgeochem.2012.12.001

Haack, S.K., and Duris, J.W., 2013, Dynamics of fecal indicator bacteria, bacterial pathogen genes, and organic wastewater contaminants in the Little Calumet River—Portage Burns Waterway, Indiana: Journal of Great Lakes Research, v. 39, no. 2, p. 317-326, doi:10.1016/j.jglr.2013.03.015. http://dx.doi.org/10.1016/j.jglr.2013.03.015

Hall, J.S., Krauss, S., Franson, J.C., Teslaa, J.L., Nashold, S.W., Stallknecht, D.E., Webby, R.J., and Webster, R.G., 2013, Avian influenza in shorebirds—Experimental infection of ruddy turnstones (*Arenaria interpres*) with avian influenza virus: Influenza and other Respiratory Viruses, v. 7, no. 1, p. 85-92, doi:10.1111/j.1750-2659.2012.00358.x. http://dx.doi.org/10.1111/j.1750-2659.2012.00358.x

Hall, J.S., TeSlaa, J.L., Nashold, S.W., Halpin, R.A., Stockwell, T., Wentworth, D.E., Dugan, V., and Ip, H.S., 2013, Evolution of a reassortant North American gull influenza virus lineage—Drift, shift and stability: Virology Journal, p. 179, doi:10.1186/1743-422X-10-179. http://dx.doi.org/10.1186/1743-422X-10-179

Hansen, J.D., Woodson, J.C., Hershberger, P.K., Grady, C., Gregg, J.L., and Purcell, M.K., 2012, Induction of anti-viral genes during acute infection with *Viral hemorrhagic septicemia virus* (VHSV) genogroup IVa in Pacific herring (*Clupea pallasii*): Fish and Shellfish Immunology, v. 32, no. 2, p. 259-267, doi:10.1016/j.fsi.2011.11.010. http://dx.doi.org/10.1016/j.fsi.2011.11.010

Hill, N.J., Takekawa, J.Y., Ackerman, J.T., Hobson, K.A., Herring, G., Cardona, C.J., Runstadler, J.A., and Boyce, W.M., 2012, Migration strategy affects avian influenza dynamics in mallards (*Anas platyrhynchos*): Molecular Ecology, v. 21, no. 24, p. 5986-5999, doi:10.1111/j.1365-294X.2012.05735.x. http://dx.doi.org/10.1111/j.1365-294X.2012.05735.x

Journey, C.A., Beaulieu, K.M., and Bradley, P.M., 2013, Environmental factors that influence cyanobacteria and geosmin occurrence in reservoirs (Chapter 2), *in* Bradley, P.M., ed., Current Perspectives in Contaminant Hydrology and Water Resources Sustainability: New York, InTech, ISBN:9789535110460. http://dx.doi.org/10.5772/54337

Kappel, W.M., and Nystrom, E.A., 2012, Dissolved methane in New York groundwater, 1999-2011: U.S. Geological Survey Open-File Report 2012-1162, 6 p. http://pubs.usgs.gov/of/2012/1162/

Kell, A.M., Wargo, A.R., and Kurath, G., 2013, The role of virulence in in vivo superinfection fitness of the vertebrate RNA virus infectious hematopoietic necrosis virus: Journal of Virology, v. 87, no. 14, p. 8145-8157, doi:10.1128/JVI.00089-13. http://dx.doi.org/10.1128/JVI.00089-13

Kemble, N.E., Hardesty, D.K., Ingersoll, C.G., Kunz, J.L., Sibley, P.K., Calhoun, D.L., Gilliom, R.J., Kuivila, K.M., Nowell, L.H., and Moran, P.W., 2013, Contaminants in stream sediments from seven United States metropolitan areas—Part II-Sediment toxicity to the amphipod *Hyalella azteca* and the midge *Chironomus dilutus*: Archives of Environmental Contamination and Toxicology, v. 64, no. 1, p. 52-64, doi:10.1007/s00244-012-9815-y. http://dx.doi.org/10.1007/s00244-012-9815-y

Kesteloot, K., Azizan, A., Whitman, R., and Nevers, M., 2012, New recreational water testing alternatives: Park Science, v. 29, no. 2. http://www.nature.nps.gov/ParkScience/index.cfm?ArticleID=583

Kharaka, Y.K., Thordsen, J.J., Conaway, C.H., and Thomas, R.B., 2013, The energy-water nexus—Potential groundwater-quality degradation associated with production of shale gas: Procedia Earth and Planetary Science, v. 7, no. 0, p. 417-422, doi:10.1016/j.proeps.2013.03.132. http://dx.doi.org/10.1016/j.proeps.2013.03.132

Kolpin, D.W., Blazer, V.S., Gray, J.L., Focazio, M.J., Young, J.A., Alvarez, D.A., Iwanowicz, L.R., Foreman, W.T., Furlong, E.T., Speiran, G.K., Zaugg, S.D., Hubbard, L.E., Meyer, M.T., Sandstrom, M.W., and Barber, L.B., 2013, Chemical contaminants in water and sediment near fish nesting sites in the Potomac River Basin—Determining potential exposures to smallmouth bass (*Micropterus dolomieu*): Science of the Total Environment, v. 443, p. 700-716, doi:10.1016/j.scitotenv.2012.09.063. http://dx.doi.org/10.1016/j.scitotenv.2012.09.063

Kresse, T.M., Warner, N.R., Hays, P.D., Down, A., Vengosh, A., and Jackson, R.B., 2012, Shallow groundwater quality and geochemistry in the Fayetteville Shale gas-production area, north-central Arkansas, 2011: U.S. Geological Survey Scientific Investigations Report 2012-5273, 31 p. http://pubs.usgs.gov/sir/2012/5273/

Kurath, G., 2012, Molecular epidemiology and evolution of Novirhabdoviruses (Chapter 7), *in* Dietzgen, R.G., and Kuzmin, I.V., eds., Rhabdoviruses—Molecular Taxonomy, Evolution, Genomics, Ecology, Cytopathology, and Control: Norfolk, England, Caister Academic Press, ISBN:978-1-908230-11-9. http://www.horizonpress.com/rhabdoviruses

Kuwabara, J.S., Topping, B.R., Carter, J.L., Wood, T.M., Cameron, J.M., Asbill-Case, J.R., and Carlson, R.A., 2012, Changes in benthic nutrient sources within a wetland after hydrologic reconnection: Environmental Toxicology and Chemistry, v. 31, no. 9, p. 1995-2013, doi:10.1002/etc.1914. http://dx.doi.org/10.1002/etc.1914

Landkamer, L.L., Harvey, R.W., Scheibe, T.D., and Ryan, J.N., 2013, Colloid transport in saturated porous Media—Elimination of attachment efficiency in a new colloid transport model: Water Resources Research, doi:10.1002/wrcr.20195 (Advanced Web release) http://dx.doi.org/10.1002/wrcr.20195

Lovy, J., Lewis, N.L., Hershberger, P.K., Bennett, W., Meyers, T.R., and Garver, K.A., 2012, Viral tropism and pathology associated with viral hemorrhagic septicemia in larval and juvenile Pacific herring: Veterinary Microbiology, v. 161, no. 1-2, p. 66-76, doi:10.1016/j.vetmic.2012.07.020. http://dx.doi.org/10.1016/j.vetmic.2012.07.020

Lovy, J., Piesik, P., Hershberger, P.K., and Garver, K.A., 2013, Experimental infection studies demonstrating Atlantic Salmon As a host and reservoir of viral hemorrhagic septicemia virus type Iva with insights into pathology and host immunity: Veterinary Microbiology, v. 166, no. 1-2, p. 91-101, doi:10.1016/j.vetmic.2013.05.019. http://dx.doi.org/10.1016/j.vetmic.2013.05.019

Luis, A.D., Hayman, D.T.S., O'Shea, T.J., Cryan, P.M., Gilbert, A.T., Pulliam, J.R.C., Mills, J.N., Timonin, M.E., Willis, C.K.R., Cunningham, A.A., Fooks, A.R., Rupprecht, C.E., Wood, J.L.N., and Webb, C.T., 2013, A comparison of bats and rodents as reservoirs of zoonotic viruses—Are bats special?: Proceedings of the Royal Society B—Biological Sciences, v. 280, no. 1756, doi:10.1098/rspb.2012.2753. http://dx.doi.org/10.1098/rspb.2012.2753

Maharaj, S.V.M., Orem, W.H., Tatu, C.A., Lerch, H.E., III, and Szilagyi, D.N., 2013, Organic compounds In water extracts of coal—Links to Balkan endemic nephropathy: Environmental Geochemistry and Health, p. 1-17, doi:10.1007/s10653-013-9515-1. http://dx.doi.org/10.1007/s10653-013-9515-1

Mayer, K.U., 2013, Quantifying natural attenuation rates: International Innovation - North America, January 2013, p. 34-37. http://www.international-innovation-northamerica.com/magazines/NA08/index.html

Miller, L.G., Baesman, S.M., Kirshtein, J., Voytek, M.A., and Oremland, R.S., 2013, A biogeochemical and genetic survey of acetylene fermentation by environmental samples and bacterial isolates: Geomicrobiology Journal, v. 30, no. 6, p. 501-516, doi:10.1080/01490451.2012.732662. http://dx.doi.org/10.1080/01490451.2012.732662

Muzaffar, S.B., Hill, N.J., Takekawa, J.Y., Perry, W.M., Smith, L.M., and Boyce, W.M., 2012, Role of bird movements in the epidemiology of west nile and avian influenza virus: Human-Wildlife Interactions, v. 6, no. 1, p. 72-88, doi:10.1007/s10653-012-9477-8. http://dx.doi.org/10.1007/s10653-012-9477-8

Nevers, M.B., Byappanahalli, M.N., and Whitman, R.L., 2013, Choices in recreational water quality monitoring—New opportunities and health risk trade-offs: Environmental Science and Technology, v. 47, no. 7, p. 3073-3081, doi:10.1021/es304408y. http://dx.doi.org/10.1021/es304408y

Nimick, D.A., Caldwell, R.R., Skaar, D.R., and Selch, T.M., 2013, Fate of geothermal mercury from Yellowstone National Park in the Madison and Missouri rivers, USA: Science of the Total Environment, v. 443, no. 0, p. 40-54, doi:10.1016/j.scitotenv.2012.10.080. http://dx.doi.org/10.1016/j.scitotenv.2012.10.080

Nowell, L.H., Moran, P.W., Gilliom, R.J., Calhoun, D.L., Ingersoll, C.G., Kemble, N.E., Kuivila, K.M., and Phillips, P.J., 2013, Contaminants in stream sediments from seven United States metropolitan areas—Part I-Distribution in relation to urbanization: Archives of Environmental Contamination and Toxicology, v. 64, no. 1, p. 32-51, doi:10.1007/s00244-012-9813-0. http://dx.doi.org/10.1007/s00244-012-9813-0

Olson, W., Emmenegger, E., Glenn, J., Simchick, C., Winton, J., and Goetz, F., 2013, Expression kinetics of key genes in the early innate immune response to Great Lakes viral hemorrhagic septicemia virus IVb infection in yellow perch (*Perca flavescens*): Developmental and Comparative Immunology, v. 41, no. 1, p. 11-19, doi:10.1016/j.dci.2013.03.012. http://dx.doi.org/10.1016/j.dci.2013.03.012

Olson, W., Emmenegger, E., Glenn, J., Winton, J., and Goetz, F., 2013, Comparative susceptibility among three stocks of yellow perch, *Perca flavescens* (mitchill), to viral haemorrhagic septicaemia virus strain IVb from the Great Lakes: Journal of Fish Diseases, v. 36, no. 8, p. 711-719, doi:10.1111/jfd.12068. http://dx.doi.org/10.1111/jfd.12068

Osorio, J.E., Ciuoderis, K.A., Lopera, J.G., Piedrahita, L.D., Murphy, D., LeVasseur, J., Carrillo, L., Ocampo, M.C., and Hofmeister, E., 2012, Characterization of West Nile viruses isolated from captive American flamingoes (*Phoenicopterus ruber*) in Medellin, Colombia: American Journal of Tropical Medicine and Hygiene, v. 87, no. 3, p. 565-572, doi:10.4269/ajtmh.2012.11-0655. http://dx.doi.org/10.4269/ajtmh.2012.11-0655

Papoulias, D.M., and Parcher, J.W., 2013, Challenge theme 3—Protecting the environment and safeguarding human health (Chapter 5), *in* United States—Mexican borderlands—Facing tomorrow's challenges through USGS science: Reston, VA, U.S. Geological Survey Circular, p. 24. http://pubs.usgs.gov/circ/1380/downloads/Chapter5.pdf

Pavlović, N.M., Maksimović, V., Maksimović, J.D., Orem, W.H., Tatu, C.A., Lerch, H.E., Bunnell, J.E., Kostić, E.N., Szilagyi, D.N., and Paunescu, V.,, 2013, Possible health impacts of naturally occurring uptake of aristolochic acids by maize and cucumber roots—Links to the etiology of endemic (Balkan) nephropathy: Environmental Geochemistry and Health, v. 35, no. 2, p. 215-226, doi:10.1007/s10653-012-9477-8. http://dx.doi.org/10.1007/s10653-012-9477-8

Plumlee, G.S., Durant, J.T., Morman, S.A., Neri, A., Wolf, R.E., Dooyema, C.A., Hageman, P.L., Lowers, H.A., Fernette, G.L., Meeker, G.P., Benzel, W.M., Driscoll, R.L., Berry, C.J., Crock, J.G., Goldstein, H.L., Adams, M., Bartrem, C.L., Tirima, S., Behbod, B., Lindern, I.v., and Brown, M.J., 2013, Linking geological and health sciences to assess childhood lead poisoning from artisanal gold mining in Nigeria: Environmental Health Perspectives, doi:10.1289/ehp.1206051 (Advanced Web release). http://dx.doi.org/10.1289/ehp.1206051

Plummer, L.N., Sibrell, P.L., Casile, G.C., Busenberg, E., Hunt, A.G., and Schlosser, P., 2013, Tracing groundwater with low-level detections of halogenated VOCs in a fractured carbonate-rock aquifer, Leetown Science Center, West Virginia, USA: Applied Geochemistry, v. 33, no. 0, p. 260-280, doi:10.1016/j.apgeochem.2013.02.021. http://dx.doi.org/10.1016/j.apgeochem.2013.02.021

Presser, T.S., and Luoma, S.N., 2013, Ecosystem-scale selenium model for the San Francisco Bay-Delta Regional Ecosystem Restoration Implementation Plan: San Francisco Estuary and Watershed Science, v. 11, no. 1, p. 1-39, jmie_sfews_11157. http://www.escholarship.org/uc/item/2td0b99t

Purcell, M.K., Laing, K.J., and Winton, J.R., 2012, Immunity to fish rhabdoviruses: Viruses, v. 4, no. 1, p. 140-166, doi:10.3390/v4010140. http://dx.doi.org/10.3390/v4010140

Reeves, A.B., Pearce, J.M., Ramey, A.M., Ely, C.R., Schmutz, J.A., Flint, P.L., Derksen, D.V., Ip, H.S., and Trust, K.A., 2013, Genomic analysis of avian influenza viruses from waterfowl in western Alaska, USA: Journal of Wildlife Diseases, v. 49, no. 3, p. 600-610, doi:10.7589/2012-04-108. http://dx.doi.org/10.7589/2012-04-108

Rhea, D.T., Farag, A.M., Harper, D.D., McConnell, E., and Brumbaugh, W.G., 2013, Mercury and selenium concentrations in biofilm, macroinvertebrates, and fish collected in the yankee fork of the Salmon River, Idaho, USA, and their potential effects on fish health: Archives of Environmental Contamination and Toxicology, v. 64, no. 1, p. 130-139, doi:10.1007/s00244-012-9816-x. http://dx.doi.org/10.1007/s00244-012-9816-x

Riva-Murray, K., Bradley, P.M., Chasar, L.C., Button, D.T., Brigham, M.E., Eikenberry, B.C.S., Journey, C.A., and Lutz, M.A., 2013, Influence of dietary carbon on mercury bioaccumulation in streams of the Adirondack Mountains of New York and the Coastal Plain of South Carolina, USA: Ecotoxicology, v. Volume 22, Issue 1, January 2013, Pages 60-71, no. 1, p. 60-71, doi:10.1007/s10646-012-1003-3. http://dx.doi.org/10.1007/s10646-012-1003-3

Riva-Murray, K., Bradley, P.M., Scudder Eikenberry, B.C., Knightes, C.D., Journey, C.A., Brigham, M.E., and Button, D.T., 2013, Optimizing stream water mercury sampling for calculation of fish bioaccumulation factors: Environmental Science and Technology, doi:10.1021/es303758e (Advanced Web release) http://dx.doi.org/10.1021/es303758e

Rowe, G.L., Jr., Gilliom, R.J., and Woodside, M.D., 2013, Tracking and forecasting the Nation's water quality—Priorities and strategies for 2013-2023: U.S. Geological Survey Fact Sheet 2013-3008, 6 p. http://pubs.usgs.gov/fs/2013/3008/

Rulison, E.L., Kuczaj, I., Pang, G., Hickling, G.J., Tsao, J.I., and Ginsberg, H.S., 2013, Flagging versus dragging as sampling methods for nymphal *Ixodes scapularis* (Acari-Ixodidae): Journal of Vector Ecology, v. 38, no. 1, p. 163-167, doi:10.1111/j.1948-7134.2013.12022.x. http://dx.doi.org/10.1111/j.1948-7134.2013.12022.x

Runkel, R.L., Walton-Day, K., Kimball, B.A., Verplanck, P.L., and Nimick, D.A., 2013, Estimating instream constituent loads using replicate synoptic sampling, Peru Creek, Colorado: Journal of Hydrology, v. 489, no. 0, p. 26-41, doi:10.1016/j.jhydrol.2013.02.031. http://dx.doi.org/10.1016/j.jhydrol.2013.02.031

Sahu, P., Michael, H.A., Voss, C.I., and Sikdar, P.K., 2013, Impacts on groundwater recharge areas of megacity pumping—Analysis of potential contamination of Kolkata, India, water supply: Hydrological Sciences Journal, v. 58, no. 6, p. 1-21, doi:10.1080/02626667.2013.813946. http://dx.doi.org/10.1080/02626667.2013.813946

Seo, H.J., Kim, H.C., Klein, T.A., Ramey, A.M., Lee, J.H., Kyung, S.G., Park, J.Y., Cho, Y.S., Cho, I.S., and Yeh, J.Y., 2013, Molecular detection and genotyping of Japanese encephalitis virus in mosquitoes during a 2010 outbreak in the Republic of Korea: PLoS ONE, v. 8, no. 2, doi:10.1371/journal.pone.0055165. http://dx.doi.org/10.1371/journal.pone.0055165

Smalling, K.L., Fellers, G.M., Kleeman, P.M., and Kuivila, K.M., 2013, Accumulation of pesticides in Pacific Chorus Frogs (*Pseudacris regilla*) from California's Sierra Nevada Mountains, USA: Environmental Toxicology and Chemistry, v. 32, no. 9, p. 2026-2034, doi:10.1002/etc.2308. http://ca.water.usgs.gov/projects/toxics/DOI_10.1002_etc.2308_frogs_pesticides.pdf

Smalling, K.L., Kuivila, K.M., Orlando, J.L., Phillips, B.M., Anderson, B.S., Siegler, K., Hunt, J.W., and Hamilton, M., 2013, Environmental fate of fungicides and other current-use pesticides in a central California estuary: Marine Pollution Bulletin, v. 73, no. 1, p. 144-153, doi:10.1016/j.marpolbul.2013.05.028. http://dx.doi.org/10.1016/j.marpolbul.2013.05.028

Smalling, K.L., Reilly, T.J., Sandstrom, M.W., and Kuivila, K.M., 2013, Occurrence and persistence of fungicides in bed sediments and suspended solids from three targeted use areas in the United States: Science of the Total Environment, v. 447, p. 179-185, doi:10.1016/j.scitotenv.2013.01.021. http://dx.doi.org/10.1016/j.scitotenv.2013.01.021

Smith, D., 2013, Relationships between the health of Alaska native communities and our environment—Phase 1, exploring and communicating: U.S. Geological Survey, 4 p. p. http://pubs.usgs.gov/fs/2013/3066/

Smith, D.J., Jaffe, D.A., Birmele, M.N., Griffin, D.W., Schuerger, A.C., Hee, J., and Roberts, M.S., 2012, Free tropospheric transport of microorganisms from Asia to North America: Microbial Ecology, v. 64, no. 4, p. 973-985, doi:10.1007/s00248-012-0088-9. http://dx.doi.org/10.1007/s00248-012-0088-9

Smith, D.J., Timonen, H.J., Jaffe, D.A., Griffin, D.W., Birmele, M.N., Perry, K.D., Ward, P.D., and Roberts, M.S., 2013, Intercontinental dispersal of bacteria and archaea by transpacific winds: Applied and Environmental Microbiology, v. 79, no. 4, p. 1134-1139, doi:10.1128/aem.03029-12. http://dx.doi.org/10.1128/aem.03029-12

Smith, R.L., Repert, D.A., Barber, L.B., and LeBlanc, D.R., 2013, Long-term groundwater contamination after source removal—The role of sorbed carbon and nitrogen on the rate of reoxygenation of a treated-wastewater plume on Cape Cod, MA, USA: Chemical Geology, v. 337-338, p. 38-47, doi:10.1016/j.chemgeo.2012.11.007. http://dx.doi.org/10.1016/j.chemgeo.2012.11.007

Sovada, M.A., Pietz, P.J., Hofmeister, E.K., and Bartos, A.J., 2013, West Nile Virus in American white pelican chicks—Transmission, immunity, and survival: American Journal of Tropical Medicine and Hygiene, v. 88, no. 6, p. 1152-1158, doi:10.4269/ajtmh.12-0408. http://dx.doi.org/10.4269/ajtmh.12-0408

Stavreva, D.A., George, A.A., Klausmeyer, P., Varticovski, L., Sack, D., Voss, T.C., Schiltz, R.L., Blazer, V.S., Iwanowicz, L.R., and Hager, G.L., 2012, Prevalent glucocorticoid and androgen activity in US water sources: Science Reports, v. 2. http://dx.doi.org/10.1038/srep00937

Stoliker, D.L., Kaviani, N., Kent, D.B., and Davis, J.A., 2013, Evaluating ion exchange resin efficiency and oxidative capacity for the separation of uranium(iv) and uranium(vi): Geochemical Transactions, v. 14, no. 1, doi:10.1186/1467-4866-14-1. http://dx.doi.org/10.1186/1467-4866-14-1

Stoliker, D.L., Liu, C., Kent, D.B., and Zachara, J.M., 2013, Characterizing particle-scale equilibrium adsorption and kinetics of uranium(VI) desorption from U-contaminated sediments: Water Resources Research, v. 49, no. 2, p. 1163-1177, doi:10.1002/wrcr.20104. http://dx.doi.org/10.1002/wrcr.20104

Struckhoff, M.A., Stroh, E.D., and Grabner, K.W., 2013, Effects of mining-associated lead and zinc soil contamination on native floristic quality: Journal of Environmental Management, v. 119, p. 20-28, doi:10.1016/j.jenvman.2013.01.021. http://dx.doi.org/10.1016/j.jenvman.2013.01.021

Terrio, P.J., Ostrodka, L.M., Loftin, K.A., Good, G., and Holland, T., 2013, Initial results from a reconnaissance of cyanobacteria and associated toxins in Illinois, August—October 2012: U.S. Geological Survey Open-File Report 2013-1019, 4 p. http://pubs.usgs.gov/of/2013/1019/

Tesoriero, A.J., Duff, J.H., Saad, D.A., Spahr, N.E., and Wolock, D.M., 2013, Vulnerability of streams to legacy nitrate sources: Environmental Science and Technology, v. 47, no. 8, p. 3623-3629, doi:10.1021/es305026x. http://dx.doi.org/10.1021/es305026x

Thomas, L.K., Widdowson, M.A., Chapelle, F.H., Novak, J.T., Boncal, J.E., and Lebrón, C.A., 2013, Distribution of potentially bioavailable natural organic carbon in aquifer sediments at a chloroethene-contaminated site: Journal of Environmental Engineering, v. 139, no. 1, p. 54-60, doi:10.1061/(asce)ee.1943-7870.0000597. http://dx.doi.org/10.1061/(asce)ee.1943-7870.0000597

Thupaki, P., Phanikumar, M.S., and Whitman, R.L., 2013, Solute dispersion in the coastal boundary layer of southern Lake Michigan: Journal of Geophysical Research C—Oceans, v. 118, no. 3, p. 1606-1617, doi:10.1002/jgrc.20136. http://dx.doi.org/10.1002/jgrc.20136

Tillitt, D.E., and Giesy, J.P., 2013, Ecotoxicology of organochlorine chemicals in birds of the Great Lakes: Environmental Toxicology and Chemistry, v. 32, no. 3, p. 490-492, doi:10.1002/etc.2109. http://dx.doi.org/10.1002/etc.2109

U.S. Environmental Protection Agency, U.S. Geological Survey, and U.S. Fish and Wildlife Service, 2012, Toxic contaminants in the Chesapeake Bay and its watershed—Extent and severity of occurrence and potential biological effects—Technical report—December, 2012: U.S. Environmental Protection Agency Chesapeake Bay Program Office, 175 p. http://executiveorder.chesapeakebay.net/post/Federal-Agencies-release-Technical-Report-on-Toxic-Contaminants-in-the-Chesapeake-Bay-and-its-Watershed.aspx

Van Hemert, C., Pearce, J., Oakley, K., and Whalen, M., 2013, Wildlife disease and environmental health in Alaska: U.S. Geological Survey Fact Sheet 2013-3027, 4 p. http://pubs.usgs.gov/fs/2013/3027/

Vogel, J.R., Griffin, D.W., Ip, H.S., Ashbolt, N.J., Moser, M.T., Lu, J., Beitz, M.K., Ryu, H., and Domingo, J.W.S., 2013, Impacts of migratory sandhill cranes (*Grus canadensis*) on microbial water quality in the Central Platte River, Nebraska, USA: Water, Air, and Soil Pollution, v. 224, no. 6, doi:10.1007/s11270-013-1576-3. http://dx.doi.org/10.1007/s11270-013-1576-3

Waite, I.R., 2013, Development and application of an agricultural intensity index to invertebrate and algal metrics from streams at two scales: JAWRA Journal of the American Water Resources Association, v. 49, no. 2, p. 431-448, doi:10.1111/jawr.12032. http://dx.doi.org/10.1111/jawr.12032

Walter, D.A., 2013, The simulated effects of wastewater-management actions on the hydrologic system and nitrogen-loading rates to wells and ecological receptors, Popponesset Bay watershed, Cape Cod, Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013-5060, 62 p. http://pubs.usgs.gov/sir/2013/5060/

Walter, D.A., and Starn, J.J., 2013, The use of process models to inform and improve statistical models of nitrate occurrence, Great Miami River Basin, southwestern Ohio: U.S. Geological Survey Scientific Investigations Report 2012-5001, 75 p. http://pubs.usgs.gov/sir/2012/5001/

Williams, E.S., Mahler, B.J., and Van Metre, P.C., 2012, Cancer risk from incidental ingestion exposures to PAHs associated with coal-tar-sealed pavement: Environmental Science and Technology, v. 47, no. 2, p. 1101-1109, doi:10.1021/es303371t. http://dx.doi.org/10.1021/es303371t

Wilson, H.M., Hall, J.S., Flint, P.L., Franson, J.C., Ely, C.R., Schmutz, J.A., and Samuel, M.D., 2013, High seroprevalence of antibodies to avian influenza viruses among wild waterfowl in Alaska—Implications for surveillance: PLoS ONE, v. 8, no. 3, p. e58308, doi:10.1371/journal.pone.0058308. http://dx.doi.org/10.1371/journal.pone.0058308

Windham-Myers, L., Ward, K., Marvin-DiPasquale, M., Agee, J.L., Kieu, L.H., and Kakouros, E., 2013, Biogeochemical implications of episodic impoundment in a restored tidal marsh of San Francisco Bay, California: Restoration Ecology, v. 21, no. 1, p. 124-132, doi:10.1111/j.1526-100X.2011.00849.x. http://dx.doi.org/10.1111/j.1526-100X.2011.00849.x

Work, T.M., Russell, R., and Aeby, G.S., 2012, Tissue loss (white syndrome) in the coral *Montipora capitata* is a dynamic disease with multiple host responses and potential causes: Proceedings of the Royal Society B—Biological Sciences, v. 279, no. 1746, p. 4334-4341, doi:10.1098/rspb.2012.1827. http://dx.doi.org/10.1098/rspb.2012.1827

Writer, J.H., Ferrer, I., Barber, L.B., and Thurman, E.M., 2013, Widespread occurrence of neuro-active pharmaceuticals and metabolites in 24 Minnesota rivers and wastewaters: Science of the Total Environment, v. 461-462, p. 519-527, doi:10.1016/j.scitotenv.2013.04.099. http://dx.doi.org/10.1016/j.scitotenv.2013.04.099

Zuray, S., Kocan, R., and Hershberger, P., 2012, Synchronous cycling of ichthyophoniasis with chinook salmon density revealed during the annual Yukon River spawning migration: Transactions of the American Fisheries Society, v. 141, no. 3, p. 615-623, doi:10.1080/00028487.2012.683476. http://dx.doi.org/10.1080/00028487.2012.683476

References for Articles

Ayotte, J.D., Cahillane, M., Hayes, L., and Robinson, K.W., 2012, Estimated probability of arsenic in groundwater from bedrock aquifers in New Hampshire, 2011: U.S. Geological Survey Scientific Investigations Report 2012-5156, 25 p. http://pubs.usgs.gov/sir/2012/5156/

Ayotte, J.D., Cahillane, M., Hayes, L., and Robinson, K.W., 2012, Estimated probability of arsenic in groundwater from bedrock aquifers in New Hampshire, 2011: U.S. Geological Survey Scientific Investigations Report 2012-5156, 25 p. http://pubs.usgs.gov/sir/2012/5156/

Barber, L.B., Keefe, S.H., Brown, G.K., Furlong, E.T., Gray, J.L., Kolpin, D.W., Meyer, M.T., Sandstrom, M.W., and Zaugg, S.D., 2013, Persistence and potential effects of complex organic contaminant mixtures in wastewater-impacted streams: Environmental Science and Technology, v. 47, no. 5, p. 2177-2188, doi:10.1021/es303720g. http://dx.doi.org/10.1021/es303720g

Bargar, J.R., Williams, K.H., Campbell, K.M., Long, P.E., Stubbs, J.E., Suvorova, E.I., Lezama-Pacheco, J.S., Alessi, D.S., Stylo, M., Webb, S.M., Davis, J.A., Giammar, D.E., Blue, L.Y., and Bernier-Latmani, R., 2013, Uranium redox transition pathways in acetate-amended sediments: Proceedings of the National Academy of Sciences, v. 110, no. 12, p. 4506-4511, doi:10.1073/pnas.1219198110. http://dx.doi.org/10.1073/pnas.1219198110

Blazer, V., Iwanowicz, L., Henderson, H., Mazik, P., Jenkins, J., Alvarez, D., and Young, J., 2012, Reproductive endocrine disruption in smallmouth bass (*Micropterus dolomieu*) in the Potomac River Basin—Spatial and temporal comparisons of biological effects: Environmental Monitoring and Assessment, v. 184, no. 7, p. 4309-4334, doi:10.1007/s10661-011-2266-5. http://dx.doi.org/10.1007/s10661-011-2266-5

Buxton, H.T., Andersen, M.E., Focazio, M.J., Haines, J.W., Hainly, H.D.J., and Sugarbaker, L.J., 2013, Meeting the science needs of the Nation in the wake of Hurricane Sandy—A U.S. Geological Survey science plan for support of restoration and recovery: U.S. Geological Survey Circular 1390, 26 p. http://pubs.usgs.gov/circ/1390/

Cain, D.J., Croteau, M.-N., and Fuller, C.C., 2013, Dietary bioavailability of Cu adsorbed to colloidal hydrous ferric oxide: Environmental Science and Technology, v. 47, no. 6, p. 2869-2876, doi:10.1021/es3044856. http://dx.doi.org/10.1021/es3044856

Chapelle, F.H., Lacombe, P.J., and Bradley, P.M., 2012, Estimated trichloroethene transformation rates due to naturally occurring biodegradation in a fractured rock aquifer: Remediation, v. 22, no. 2, p. 7-20, doi:10.1002/rem.21307. http://dx.doi.org/10.1002/rem.21307

Conko, K.M., Landa, E.R., Kolker, A., Kozlov, K., Gibb, H.J., Centeno, J.A., Panov, B.S., and Panov, Y.B., 2013, Arsenic and mercury in the soils of an industrial city in the Donets Basin, Ukraine: Soil and Sediment Contamination—An International Journal, v. 22, no. 5, p. 574-593, doi:10.1080/15320383.2013.750270. http://dx.doi.org/10.1080/15320383.2013.750270

Croteau, M.-N., Cain, D.J., and Fuller, C.C., 2013, Novel and nontraditional use of stable isotope tracers to study metal bioavailability from natural particles: Environmental Science and Technology, v. 47, no. 7, p. 3424-3431, doi:10.1021/es400162f. http://dx.doi.org/10.1021/es400162f

Custer, C.M., Custer, T.W., and Hines, J.E., 2012, Adult tree swallow survival on the polychlorinated biphenyl-contaminated Hudson River, New York, USA, Between 2006 and 2010: Environmental Toxicology and Chemistry, v. 31, no. 8, p. 1788-1792, doi:10.1002/etc.1894. http://dx.doi.org/10.1002/etc.1894

Custer, T.W., Custer, C.M., Thogmartin, W.E., Dummer, P.M., Rossmann, R., Kenow, K.P., and Meyer, M.W., 2012, Mercury and other element exposure in tree swallows nesting at low pH and neutral pH Lakes In northern Wisconsin USA: Environmental Pollution, v. 163, p. 68-76, doi:10.1016/j.envpol.2011.12.017. http://dx.doi.org/10.1016/j.envpol.2011.12.017

Elskus, A.A., 2012, Toxicity, sublethal effects, and potential modes of action of select fungicides on freshwater fish and invertebrates: U.S. Geological Survey Open-File Report 2012-1213, 42 p. http://pubs.usgs.gov/of/2012/1213/

Ely, C.R., Hall, J.S., Schmutz, J.A., Pearce, J.M., Terenzi, J., Sedinger, J.S., and Ip, H.S., 2013, Evidence that life history characteristics of wild birds influence infection and exposure to influenza A viruses: PLoS ONE, v. 8, no. 3, p. e57614, doi:10.1371/journal.pone.0057614. http://dx.doi.org/10.1371/journal.pone.0057614

Francy, D.S., and Stelzer, E.A., 2012, Microbial source tracking markers at three inland recreational Lakes in Ohio, 2011: U.S. Geological Survey Open-File Report 2012-1222, 8 p. http://pubs.usgs.gov/of/2012/1222/

Francy, D.S., Stelzer, E.A., Duris, J.W., Brady, A.M.G., Harrison, J.H., Johnson, H.E., and Ware, M.W., 2013, Predictive models for *Escherichia coli* concentrations at inland lake beaches and relationship of model variables to pathogen detection: Applied and Environmental Microbiology, v. 79, no. 5, p. 1676-1688, doi:10.1128/aem.02995-12. http://dx.doi.org/10.1128/aem.02995-12

Gibb, H., Haver, C., Kozlov, K., Centeno, J.A., Jurgenson, V., Kolker, A., Conko, K.M., Landa, E.R., and Xu, H., 2011, Biomarkers of mercury exposure in two eastern Ukraine cities: Journal of Occupational and Environmental Hygiene, v. 8, no. 4, p. 187-193, doi:10.1080/15459624.2011.556984. http://dx.doi.org/10.1080/15459624.2011.556984

Hill, N.J., Takekawa, J.Y., Ackerman, J.T., Hobson, K.A., Herring, G., Cardona, C.J., Runstadler, J.A., and Boyce, W.M., 2012, Migration strategy affects avian influenza dynamics in mallards (*Anas platyrhynchos*): Molecular Ecology, v. 21, no. 24, p. 5986-5999, doi:10.1111/j.1365-294X.2012.05735.x. http://dx.doi.org/10.1111/j.1365-294X.2012.05735.x

Kappel, W.M., and Nystrom, E.A., 2012, Dissolved methane in New York groundwater, 1999-2011: U.S. Geological Survey Open-File Report 2012-1162, 6 p. http://pubs.usgs.gov/of/2012/1162/

Kolker, A., Panov, B.S., Panov, Y.B., Landa, E.R., Conko, K.M., Korchemagin, V.A., Shendrik, T., and McCord, J.D., 2009, Mercury and trace element contents of Donbas coals and associated mine water in the vicinity of Donetsk, Ukraine: International Journal of Coal Geology, v. 79, no. 3, p. 83-91, doi:10.1016/j.coal.2009.06.003. http://dx.doi.org/10.1016/j.coal.2009.06.003

Kolpin, D.W., Blazer, V.S., Gray, J.L., Focazio, M.J., Young, J.A., Alvarez, D.A., Iwanowicz, L.R., Foreman, W.T., Furlong, E.T., Speiran, G.K., Zaugg, S.D., Hubbard, L.E., Meyer, M.T., Sandstrom, M.W., and Barber, L.B., 2013, Chemical contaminants in water and sediment near fish nesting sites in the Potomac River Basin—Determining potential exposures to smallmouth bass (*Micropterus dolomieu*): Science of the Total Environment, v. 443, p. 700-716, doi:10.1016/j.scitotenv.2012.09.063. http://dx.doi.org/10.1016/j.scitotenv.2012.09.063

Kresse, T.M., Warner, N.R., Hays, P.D., Down, A., Vengosh, A., and Jackson, R.B., 2012, Shallow groundwater quality and geochemistry in the Fayetteville Shale gas-production area, north-central Arkansas, 2011: U.S. Geological Survey Scientific Investigations Report 2012-5273, 31 p. http://pubs.usgs.gov/sir/2012/5273/

Kuwabara, J.S., Topping, B.R., Carter, J.L., Wood, T.M., Cameron, J.M., Asbill-Case, J.R., and Carlson, R.A., 2012, Changes in benthic nutrient sources within a wetland after hydrologic reconnection: Environmental Toxicology and Chemistry, v. 31, no. 9, p. 1995-2013, doi:10.1002/etc.1914. http://dx.doi.org/10.1002/etc.1914

Kuwabara, J.S., Topping, B.R., Carter, J.L., Wood, T.M., Parchaso, F., Cameron, J.M., Asbill, J.R., Carlson, R.A., and Fend, S.V., 2012, Time scales of change in chemical and biological parameters after engineered levee breaches adjacent to Upper Klamath and Agency Lakes, Oregon: U.S. Geological Survey Open-File Report 2012-1057, 26 p. http://pubs.usgs.gov/of/2012/1057/

Naftz, D.L., Ranalli, A.J., Rowland, R.C., and Marston, T.M., 2011, Assessment of potential migration of radionuclides and trace elements from the White Mesa uranium mill to the Ute Mountain Ute Reservation and surrounding areas, southeastern Utah: U.S. Geological Survey Scientific Investigations Report 2011-5231, 75 p. http://pubs.usgs.gov/sir/2011/5231/

Plumlee, G.S., Durant, J.T., Morman, S.A., Neri, A., Wolf, R.E., Dooyema, C.A., Hageman, P.L., Lowers, H.A., Fernette, G.L., Meeker, G.P., Benzel, W.M., Driscoll, R.L., Berry, C.J., Crock, J.G., Goldstein, H.L., Adams, M., Bartrem, C.L., Tirima, S., Behbod, B., Lindern, I.v., and Brown, M.J., 2013, Linking geological and health sciences to assess childhood lead poisoning from artisanal gold mining in Nigeria: Environmental Health Perspectives, doi:10.1289/ehp.1206051 (Advanced Web release). http://dx.doi.org/10.1289/ehp.1206051

Reeves, A.B., Pearce, J.M., Ramey, A.M., Meixell, B.W., and Runstadler, J.A., 2011, Interspecies transmission and limited persistence of low pathogenic avian influenza genomes among Alaska dabbling ducks: Infection, Genetics and Evolution, v. 11, no. 8, p. 2004-2010, doi:10.1016/j.meegid.2011.09.011. http://dx.doi.org/10.1016/j.meegid.2011.09.011

Reilly, T.J., Smalling, K.L., Orlando, J.L., and Kuivila, K.M., 2012, Occurrence of boscalid and other selected fungicides in surface water and groundwater in three targeted use areas in the United States: Chemosphere, v. 89, no. 3, p. 228-234, doi:10.1016/j.chemosphere.2012.04.023. http://dx.doi.org/10.1016/j.chemosphere.2012.04.023

Runkel, R.L., Kimball, B.A., Walton-Day, K., Verplanck, P.L., and Broshears, R.E., 2012, Evaluating remedial alternatives for an acid mine drainage stream—A model post audit: Environmental Science and Technology, v. 46, no. 1, p. 340-347, doi:10.1021/es2038504. http://dx.doi.org/10.1021/es2038504

Runkel, R.L., Walton-Day, K., Kimball, B.A., Verplanck, P.L., and Nimick, D.A., 2013, Estimating instream constituent loads using replicate synoptic sampling, Peru Creek, Colorado: Journal of Hydrology, v. 489, no. 0, p. 26-41, doi:10.1016/j.jhydrol.2013.02.031. http://dx.doi.org/10.1016/j.jhydrol.2013.02.031

Smalling, K.L., Reilly, T.J., Sandstrom, M.W., and Kuivila, K.M., 2013, Occurrence and persistence of fungicides in bed sediments and suspended solids from three targeted use areas in the United States: Science of the Total Environment, v. 447, p. 179-185, doi:10.1016/j.scitotenv.2013.01.021. http://dx.doi.org/10.1016/j.scitotenv.2013.01.021

Smith, R.L., Repert, D.A., Barber, L.B., and LeBlanc, D.R., 2013, Long-term groundwater contamination after source removal—The role of sorbed carbon and nitrogen on the rate of reoxygenation of a treated-wastewater plume on Cape Cod, MA, USA: Chemical Geology, v. 337-338, p. 38-47, doi:10.1016/j.chemgeo.2012.11.007. http://dx.doi.org/10.1016/j.chemgeo.2012.11.007

Stavreva, D.A., George, A.A., Klausmeyer, P., Varticovski, L., Sack, D., Voss, T.C., Schiltz, R.L., Blazer, V.S., Iwanowicz, L.R., and Hager, G.L., 2012, Prevalent glucocorticoid and androgen activity in US water sources: Science Reports, v. 2. http://dx.doi.org/10.1038/srep00937

Terrio, P.J., Ostrodka, L.M., Loftin, K.A., Good, G., and Holland, T., 2013, Initial results from a reconnaissance of cyanobacteria and associated toxins in Illinois, August—October 2012: U.S. Geological Survey Open-File Report 2013-1019, 4 p. http://pubs.usgs.gov/of/2013/1019/

Tillitt, D.E., Ankley, G.T., Giesy, J.P., Ludwig, J.P., Kurita-Matsuba, H., Weseloh, D.V., Ross, P.S., Bishop, C.A., Sileo, L., Stromborg, K.L., Larson, J., and Kubiak, T.J., 1992, Polychlorinated biphenyl residues and egg mortality in double-crested cormorants from the Great Lakes: Environmental Toxicology and Chemistry, v. 11, no. 9, p. 1281-1288, doi:10.1002/etc.5620110908. http://dx.doi.org/10.1002/etc.5620110908

Tillitt, D.E., and Giesy, J.P., 2013, Ecotoxicology of organochlorine chemicals in birds of the Great Lakes: Environmental Toxicology and Chemistry, v. 32, no. 3, p. 490-492, doi:10.1002/etc.2109. http://dx.doi.org/10.1002/etc.2109

U.S. Environmental Protection Agency, U.S. Geological Survey, and U.S. Fish and Wildlife Service, 2012, Toxic contaminants in the Chesapeake Bay and its watershed—Extent and severity of occurrence and potential biological effects—Technical report—December, 2012: U.S. Environmental Protection Agency Chesapeake Bay Program Office, 175 p. http://executiveorder.chesapeakebay.net/post/Federal-Agencies-release-Technical-Report-on-Toxic-Contaminants-in-the-Chesapeake-Bay-and-its-Watershed.aspx

Walters, D.M., Fritz, K.M., Johnson, B.R., Lazorchak, J.M., and McCormick, F.H., 2008, Influence of trophic position and spatial location on polychlorinated biphenyl (PCB) bioaccumulation in a stream food web: Environmental Science and Technology, v. 42, no. 7, p. 2316-2322, doi:10.1021/es0715849. http://dx.doi.org/10.1021/es0715849

Walters, D.M., Fritz, K.M., and Otter, R.R., 2008, The dark side of subsidies—Adult stream insects export organic contaminants to riparian predators: Ecological Applications, v. 18, no. 8, p. 1835-1841, doi:10.1890/08-0354.1. http://dx.doi.org/10.1890/08-0354.1

Walters, D.M., Mills, M.A., Fritz, K.M., and Raikow, D.F., 2009, Spider-mediated flux of PCBs from contaminated sediments to terrestrial ecosystems and potential risks to arachnivorous birds: Environmental Science and Technology, v. 44, no. 8, p. 2849-2856, doi:10.1021/es9023139. http://dx.doi.org/10.1021/es9023139

Walton-Day, K., Runkel, R.L., and Kimball, B.A., 2012, Using spatially detailed water-quality data and solute-transport modeling to support total maximum daily load development: Journal of the American Water Works Association, v. 48, no. 5, p. 949-969, doi:10.1111/j.1752-1688.2012.00662.x. http://dx.doi.org/10.1111/j.1752-1688.2012.00662.x

Williams, E.S., Mahler, B.J., and Van Metre, P.C., 2012, Cancer risk from incidental ingestion exposures to PAHs associated with coal-tar-sealed pavement: Environmental Science and Technology, v. 47, no. 2, p. 1101-1109, doi:10.1021/es303371t. http://dx.doi.org/10.1021/es303371t

Wilson, H.M., Hall, J.S., Flint, P.L., Franson, J.C., Ely, C.R., Schmutz, J.A., and Samuel, M.D., 2013, High seroprevalence of antibodies to avian influenza viruses among wild waterfowl in Alaska—Implications for surveillance: PLoS ONE, v. 8, no. 3, p. e58308, doi:10.1371/journal.pone.0058308. http://dx.doi.org/10.1371/journal.pone.0058308

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