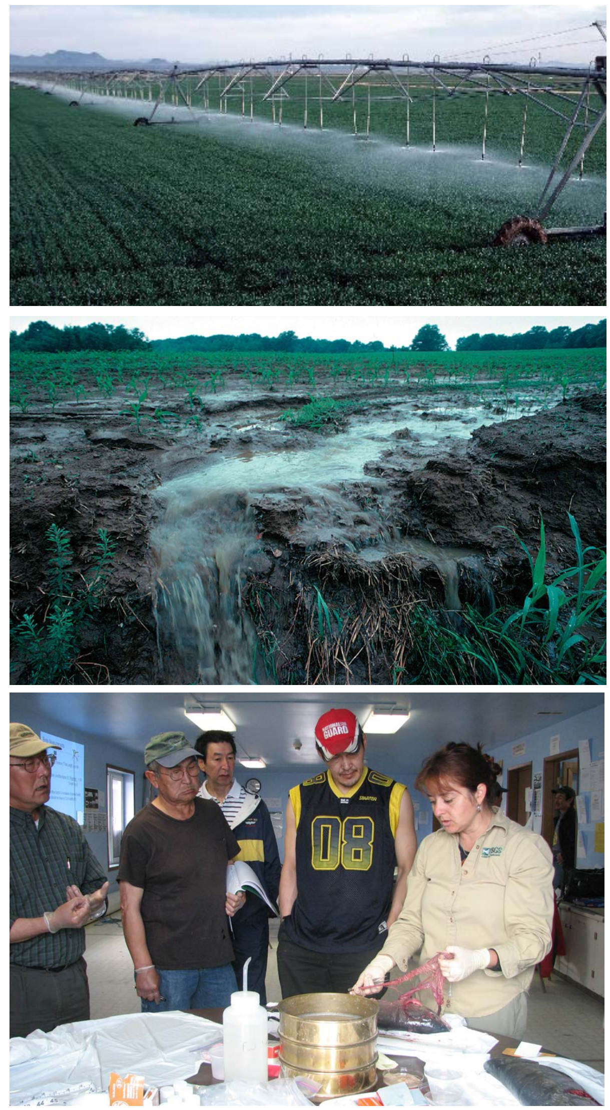
Mitigating Agrochemical Impacts

This project has advanced our understanding of the fate and effects of agrochemicals and led to mitigation technologies that reduce the risks to human and environmental health.

Who cares and why?

Agrochemicals (e.g., pesticides, fertilizers, antibiotics, and disinfectants) are used to protect crops and livestock from pests, diseases, and other stressors. As the human population continues to increase, these chemicals play an important role in helping farmers meet demands for food production. Agrochemicals are also used on golf courses, sports fields, parks, and residential lawns and may be used in homes as pest foggers and in pet flea control products. In these ways, agrochemicals are public health tools, protecting people against diseases—like West Nile virus—that are spread by pests. Despite many important uses, agrochemicals may pose significant risks to environmental quality and human health if exposures are too high. Some agrochemicals or their byproducts may linger in the air or soil and can pollute surface and ground water. Farm workers and their families are most susceptible to chemical exposure on the farm. Neighboring rural and urban areas may be exposed to chemicals that can travel long distances through the air, soil, or water. Agrochemical exposure may lead to a variety of human health problems, and these chemicals can contaminate food, degrade habitat, and negatively affect the health of many organisms. Therefore, mitigating unacceptable agrochemical exposure is a high priority, especially in regions where sensitive human populations may be exposed and where species are protected by the Endangered Species Act.



Agrochemicals include pesticides and other chemicals used in crop and livestock production. W-2045 researchers have studied how chemical residues that runoff into ground and surface waters may harm aquatic organisms. For example, Dr. Sepulveda has worked closely with native communities in Hooper Bay, Alaska, teaching them how to examine fish health. Top photo by Gene Alexander, USDA. Middle photo by Lynn Betts, USDA-NRCS. Bottom photo courtesy of the Department of Forestry and Natural Resources and School of Civil Engineering, Purdue University.

What has the project done so far?

Since 1956, the W-2045 project has provided leadership in identifying where agrochemicals end up in urban and rural ecosystems, what effects they can have, and what can be done to mitigate adverse impacts. By supporting the work of researchers and Extension specialists whose expertise crosses disciplinary and state boundaries, this project has been able to provide key information to public and environmental health regulatory agencies, natural resource managers, agricultural commodity groups, and agrochemical users across the nation. W-2045 researchers have not only shed light on land management practices that contribute to, and possibly accelerate, the movement of agrochemical residues, but have also helped develop effective mitigation practices and technologies now commonly used in large scale agriculture. Models developed by W-2045 scientists to test the impact of agrochemical exposures on aquatic organisms and migratory birds have been successfully applied to the Deepwater Horizon Oil Spill. Scientists who tested fish, crab, shrimp, and oyster samples found that the chemical profiles of these organisms were similar to profiles prior to the oil spill and were not cause for concern. Other researchers have provided new insights into human health and ecological risks from pesticides used to manage mosquito populations and the spread of West Nile virus. W-2045 scientists have also assisted with the registration of safer agrochemicals for the more than 300 specialty crops produced in the U.S. These research findings and recommendations have been shared in numerous journals, workshops, and trainings and have been cited in popular textbooks.

Impact Statements

Reduced adverse environmental and human impacts of agrochemicals with ways to mitigate unacceptable exposure.

Made it possible to detect and mitigate problems before injury occurs by designing systems that accurately measure agrochemical exposure and effects.

Helped growers maintain crop yields and profits while meeting environmental protection standards. This ensures consumers have a steady supply of high-quality food.

Promoted better public health by determining effective ways to apply insecticides that control diseases like West Nile virus.

Ensured effective recovery responses to incidents like oil spills.

Informed regulations, including many tests required to register agrochemicals throughout the world.

Advanced research, education, and outreach in the field of environmental toxicology.

What research is needed?

Multidisciplinary research on all scales—from organisms to landscapes—is needed to better understand the fate of agrochemicals and their effects on human and environmental health. Researchers also need to develop ways to control the movement of agrochemicals through ecosystems. Better options for integrated pest management are also needed.

Left: W-2045 research and models have been used to assess how birds are impacted by exposure to oil spill chemicals. This research helps ensure that the ecosystem will recover successfully. Photo by Petty Officer Caleb Critchfield, U.S. Coast Guard.

Right: Some agrochemicals are neurotoxins and may impair the navigation abilities of exposed birds. In one study, W-2045 researchers attached transmitters to pigeons that were exposed to methylmercury and recorded how long it took the birds to return. To determine if delays were due to navigation difficulties, researchers attached GPS dataloggers to the birds and traced their flight paths. Photo by Chris Pritsos, University of Nevada, Reno.

Left: W-2045 research has demonstrated the need to continually seek prudent emergency control options for vector-borne diseases like on West Nile virus (WNV), while limiting public exposure to chemicals. Montana State University researchers studied bystander exposure to mosquito sprays to compare the risks of WNV and mosquito management tactics. In a cost-benefit analysis, researchers found that only 15 cases of WNV would need to have been prevented to make emergency spray cost-effective during a 2005 outbreak in Sacramento, California, where mosquito control costs totaled $701,800 and total economic impact of WNV was estimated at $2.98 million. Photo by Robert Peterson.

Want to know more?

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Compiled and designed by Sara Delheimer