

The Benefits of Pesticides
A Story
Worth Telling





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Understanding Benefits Places Risks in Perspective

For decades, discussions among scientists and the public have focused on the real, predicted, and perceived risks that pesticides pose to people and the environment. Each use of a pesticide poses some level of risk, so it is not surprising that scientists, the regulated community, government officials, and the public need a realistic understanding of the risks associated with pesticide use. We must analyze how risk is assessed, identify the risks, and determine an appropriate level of concern.

There are significant risks associated with leaving certain pests uncontrolled; and, in some cases, pesticides are the only viable alternative. Properly used, pesticides provide benefits essential to our way of life. Uncontrolled pests can cause serious consequences:

- A person bitten by mosquitoes carrying West Nile virus may die.
- A child stung by bees, wasps, or ants may suffer a severe allergic reaction.
- A dog infested with fleas may become stressed to the point of illness.
- A farmer's diseased tomatoes may be declined by the cannery.
- A load of wheat contaminated with wild garlic may be rejected by the mill.
- A homeowner may have to spend thousands of dollars to repair structural damage caused by termites.

The benefits of pesticides commonly go unnoticed by the public. For example, if left unchecked, trees and brush growing beneath power lines (lower left) would cause power outages. Herbicide use by utility companies to prevent

undergrowth eliminates the problem and provides unobstructed access for maintenance and repairs. Road crews also use herbicides to control vegetation along highways, for safety reasons; clear roadsides increase visibility for drivers and allow water to escape more efficiently during a downpour or flooding. Herbicides also are used to fight invasive weeds in parks, wetlands, and natural areas.

Fred Whitford



Pesticides are used around our homes and businesses in ways we often take for granted. Plastics, paints, and caulks may contain fungicides to prevent mold. Toilet bowl cleaners and disinfectants often contain pesticides. Raw commodities and packaged grocery products—the foods we eat—are protected from insect contamination by the controlled use of insecticides in processing, manufacturing, and packaging facilities. Pesticides are used in grocery stores to manage insects and rodents attracted to food and food waste. There is little doubt that the proper use of pesticides improves our quality of life, protects our property, and promotes a better environment.

Benefits of Use Add to the Discussion of Risk

Understanding generates perspective, no matter the subject; and understanding the benefits of pesticides is essential to weighing the risks.

To identify potential risks associated with pesticide use, we must understand how risk is determined, what factors (including characteristics of the exposed population) control the potential for risk, what experience has shown about the risk, and what can be done to minimize the risk. Our conclusions then must be weighed against the benefits of pesticide use, factoring in any available alternatives as well as the benefits and risks of those alternatives.

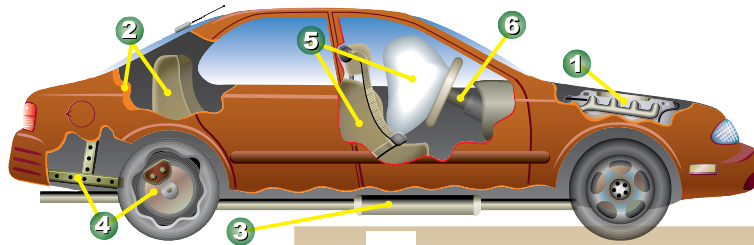
The following discussion on driving provides a benefit versus risk analogy that can be used in our discussion of pesticides.

Statistically, driving motor vehicles is risky: every nine seconds a person is injured in an automobile collision, and every 12½ minutes someone dies; that is 42,000 deaths due to motor vehicle accidents every year in the United States. If we are injured, we are likely to suffer loss of income while recovering. If we damage public or private property, we are liable for repairing or replacing it. And if we are held liable for the injury or death of someone else, the financial consequences can be astronomical. If we die in an accident, our families suffer both emotionally and financially.

Motor vehicles also impact the environment. Our land and oceans are continually explored for oil in support of the vast quantities we use. Vehicle exhaust releases carbon monoxide into the air, and we expose ourselves to gasoline and diesel fuels, which are known carcinogens. We kill countless butterflies, birds, and mammals on the highways, which commonly are built on productive farmland and, sometimes, sensitive environmental areas. The risks and losses are real and measurable, but the benefits are obvious—and most of us consider motor vehicles essential to everyday life.

The degree to which we feel in control influences our perception of risk.

the Automobile Analogy: Reducing Risk



RISKS	HOW REDUCED
Causes air pollution	1 Burn cleaner fuel
Depletes natural resources	2 Use renewable resources and recycling
Produces toxic gases	3 Install anti-smog devices
Susceptible to loss of control and damage	4 Engineer to handle better
Injurious to passengers in crashes	5 Equip with safety belts and airbags
Dangerous when driven recklessly	6 Enforce traffic laws

We generally agree that the benefits of driving a vehicle outweigh the risks of personal injury, death, or damage to the environment. But we are in control of certain decisions that affect the risk potential: what type of vehicle to purchase, how often it is used, how fast it is driven, whether to wear seat belts, etc. We continually seek to reduce driving risks by building safer vehicles and highways, by removing dangerous and incompetent drivers from the road, and by requiring drivers to pass a competency test and carry insurance. When we are in control of factors that contribute to risk, we accept it more readily.

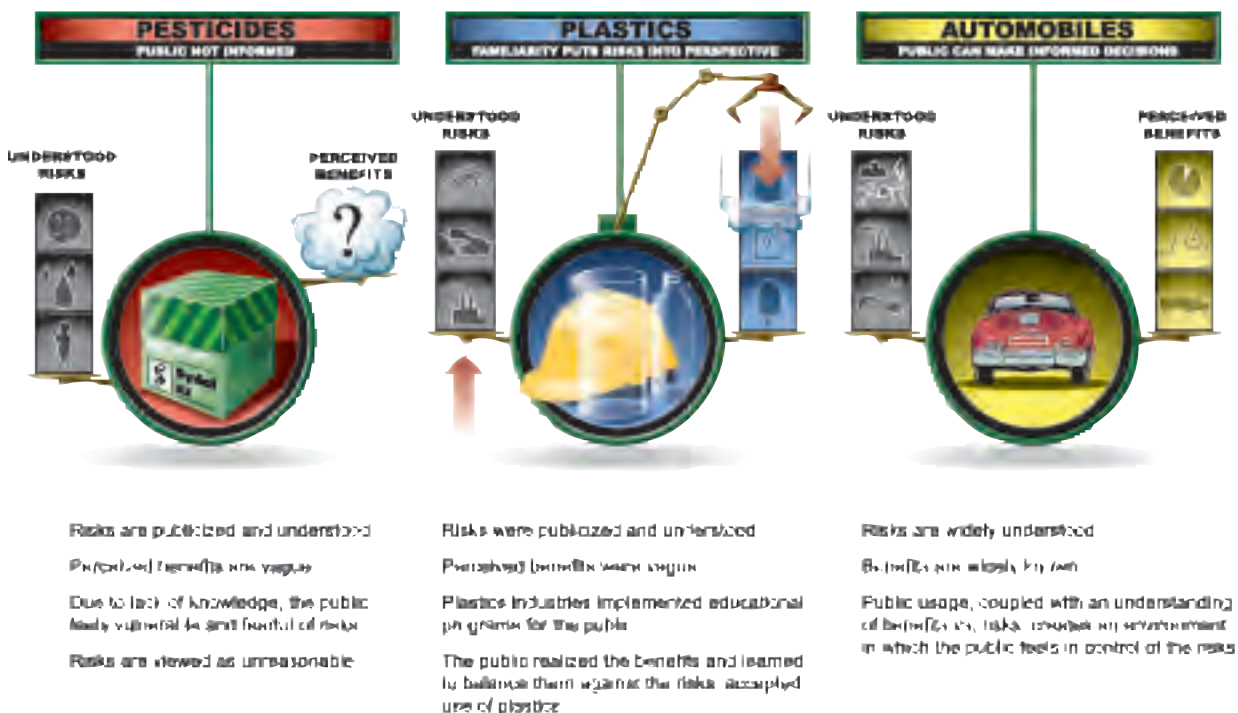
The federal government regulates risks associated with modern technologies. For example, the Food and Drug Administration (FDA) reviews the benefits and risks associated with new medicines. FDA registration guidelines require pharmaceutical companies to write instructions for physicians and patients, indicating possible side effects and what actions to take if they occur. As a society, we clearly want the benefits of prescription and over-the-counter medications, but we expect associated risks to be minimized through regulatory oversight; and we have the benefit of a final, personal level of control in deciding whether or not to use them.

The public may not recognize or fully understand the benefits of pesticides, or they may take them for granted. Most people are not knowledgeable of the federal and state regulatory requirements and the extensive registration approval process that must be met before a pesticide can be offered for sale. Likewise, many are unaware of the training and testing that professional pesticide applicators and farmers undergo to become certified. Most states

require certification and/or licensing of individuals who recommend or apply pesticides. Just as with medications prescribed by medical doctors, certain pesticides may be purchased only by licensed pesticide applicators and applied by or under the supervision of certified applicators. State and federal regulations govern how pesticide products may be used, and compliance is enforced at both levels.

Pesticide Benefits: A Story Worth Telling

Most of us acknowledge that the benefits of pesticides outweigh the risks, as evidenced by the continuing demand for more products to solve an ever-increasing array of pest problems: bacteria in hospitals, mold in homes, the gypsy moth in hardwood forests, etc. The pesticide debate is somewhat analogous to that of the plastics industry. We benefit from the use of plastics in great quantities, but media stories and publicity generated a few years ago created uncertainty that the benefits outweighed the risks. The plastics industry faced overwhelming opposition due to the risks: pollution of natural areas, landfill concerns, injury to wildlife (birds getting entangled in six-pack holders), human exposure to chemicals that might mimic human hormones, etc. But studies conducted by the American Plastics Council (<http://www.plastics.org>) suggested that providing the public factual information on the benefits of plastics would generate a more favorable attitude.



The American Plastics Council responded by running television commercials expounding the benefits of plastics in everyday products. The ads demonstrated that plastics are more than drinking cups and milk jugs. The council's message addressed the magnitude of plastics in our everyday lives: medicine containers, unbreakable plastic food containers, smoke alarms, eye glasses, sports and safety equipment, vehicle parts, refrigerators, soda containers, credit cards, toys, appliances, packaging materials, and much, much more. The advertising campaign made us realize that plastics provide benefits we take for granted. It also heightened environmental concerns over the volume of plastics entering our landfills, leading to widespread public participation in recycling programs.

Pesticides Provide Multiple Benefits

Overall, the public overlooks the benefits of pesticides. We have grown accustomed to buying fresh produce that is free of blemishes, and we expect canned fruits and vegetables to be free of insects. But do we give any thought to how this is achieved? Do we typically ponder the role of pesticides in keeping restaurants, malls, parks, and playgrounds free of insects, rodents, and poisonous weeds? It's a story worth telling.

Fred Whitford



Pesticides play a key role in keeping malls (left) and parks (below) clean, safe, and attractive.

Arlene Blessing



Chris Gunter



Wai-Ki Frankie Lam



John Woodmansee

Above: Pigweed infestation in a pumpkin patch.
Top Right: Early symptoms of bacterial wilt on muskmelons are wilted leaves and stunted plants; later symptoms are dead plants.
Right: Septoria leaf spot on tomatoes.
Background: The disease gummy stem blight has killed most of the green tissue of these watermelon vines; the melons will not ripen properly.





For decades, field crop producers in the Midwest were able to disrupt the corn rootworm life cycle using crop rotation. This prevented rootworm damage by larval feeding (top left and right) without the use of soil insecticides. Over time, this cultural practice has altered the behavior of the adult beetle in some areas. Female beetles once laid eggs exclusively in corn, but now they will move to soybean and other non-corn crops to feed on foliage (far left) and lay eggs. Eggs laid in these fields overwinter in the soil and hatch the following spring where corn has been planted. The subsequent larval feeding causes lodging and “goose-necking” of corn plants (above) that significantly reduces yield and harvest ability.








Corn rootworm photos by John Obermeyer

Bill Johnson



A no-till soybean field is overtaken by golden ragwort (cressleaf groundsel). No-till farming would be impossible without herbicides for weed control.

Benefits of Pesticides

	Crop Production	Pesticide technology enables American farmers to produce more today than at any time in our agricultural history. High agricultural productivity leads to a favorable export market, which benefits our balance of trade.
	Biodiversity and Wildlife Habitat	Pesticide use maximizes yields on farm ground, helping preserve wildlife habitat that might otherwise be converted to farm land. Pesticides improve the aquatic environment by eliminating weeds that choke aquatic life. Pesticides slow the spread of invasive species, giving the scientific community more time to develop alternate control strategies.
	Public Health	Pesticides control harmful bacteria in drinking water. They offer control of rodents and mosquitoes to prevent the spread of disease.
	Livestock Health and Production	Pesticides control biting insects around livestock. They reduce the number of poisonous plants found in pastures. Pesticides allow for the production of high quality forage for livestock feed.
	Property	Pesticides are used to control destructive termites in buildings. Pesticide-treated lumber allows structures to be somewhat resistant to insects and wood-rot fungi. Pesticides are used to control unwanted vegetation along ditches, allowing water to flow, preventing flooding to adjacent properties.
	A Stronger Society	Pesticides, along with other agriculture tools, make it possible for less than 2% of the population to produce our food supply, which allows the vast majority of people to engage in other vocations and professions that contribute to the public good in other ways.
	Transportation & Utilities	Pesticides are used to eliminate brush and tall weeds around intersections, stop signs, and guardrails, affording better roadside visibility. Electric utility companies use herbicides to suppress the growth of seedling trees that, left untreated, would interfere with power lines and disrupt electricity to their customers.

Crop Production

Farmers benefit from technological innovations such as improved crop genetics, more efficient tractors and harvesters, and better fertilizers; they enjoy increased crop yield and quality due to advances in pest management. Pesticide technology and environmentally sound farming practices have enabled American farmers to manage large productive enterprises in the global market. Today they harvest higher yields from fewer acres than ever before, and this increased production allows the United States to contribute significant quantities of food when natural disasters occur around the world.

Don B. Stevenson, The Stock Solution



Environment

Pesticides play a very important and prominent role in environmental protection.

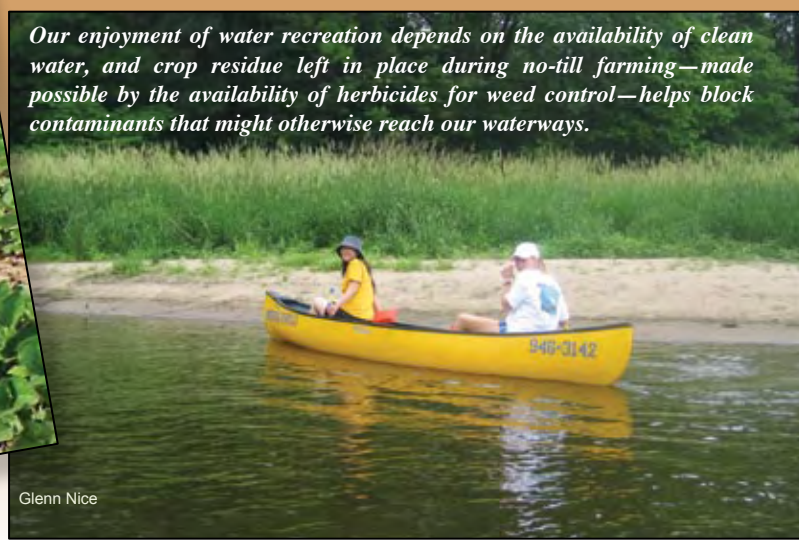
Pesticides Promote Biodiversity

One very significant benefit of pesticide use is the preservation of wildlife habitat. Farmers who produce corn, milk, or vegetables make a living by the bushel, gallon, or pound; and they must produce enough to generate a decent profit. Pesticides help maximize profit by eliminating pests that reduce yields; the result is more product per acre, which lessens the need to convert natural areas such as woods and forests, native prairies, wetlands, plains, and other wildlife habitat into farm ground. Encouraging high levels of production on high-yielding land, thus preserving habitat critical to wildlife and native plant species, helps protect the planet's biodiversity.

Pesticides Contribute to Erosion Control

Generations of farmers tilled the land by hand or with animal- or tractor-powered implements, not only preparing the seed bed for planting but also controlling weeds and reducing insect and disease problems. These practices did little to control erosion, however, which became a major problem in farm fields that have steep slopes that allow soil to wash away during heavy rains.

Over the last two decades, herbicides have made no-till farming a viable alternative, enabling farmers to reduce erosion by leaving the soil largely undisturbed. Herbicides are used for weed control in no-till crop production, eliminating the need for cultivation; residue from the previous crop holds the soil in place during wind and rain. Crop residue also impedes runoff of agricultural chemicals and soil that might otherwise affect aquatic habitat and fresh water supplies downstream.



Pesticides Control Invasive Pests

The acceleration of world trade has increased the potential for entrance of exotic pests into the United States. Once introduced, some pests aggressively replace native species, thus disturbing plant and wildlife ecology. Since invading species (e.g., Japanese beetle, gypsy moth, emerald ash borer, starlings) seldom bring along natural predators and diseases, their aggression toward crops, native plants, and human health goes unchallenged.

Pesticides are commonly used to slow the spread of exotic pest populations. For example, piscicides have been useful in confining the spread of the northern snakehead fish in Maryland; herbicides control the weed purple loosestrife (p. 26) in marshes and wetlands, as well as Canada

Mature gypsy moth caterpillar on an oak leaf (below). Gypsy moth male and female (lower left). Defoliation of forest by gypsy moths (lower right).



Robert Hauck



Asian longhorn beetle adults on maple (above). Asian longhorn beetle and exit hole (right).

Robert Hauck



USDA/Aphis



USDA/Aphis

USDA/Aphis





Victoria Nuzzo



Jim Swearingen

Dense garlic mustard rosettes carpeting a flood plain forest understory (upper left). Flowering garlic mustard (above). Closeup of garlic mustard, showing first-year leaves (left).



First adult emerald ash borer found in Indiana [Steuben County] (left). Emerald ash borer larval damage underneath the bark of an ash tree (below). Emerald ash borer larvae feeding beneath the bark of the tree (lower left).

Photos by Jodie Ellis



thistle and Johnsongrass along rights-of-way and in farm fields. Herbicides control aquatic weeds and help maintain a safe environment for boating, swimming, and recreational water sports nationwide. Pesticides often are used to contain new invasive species, buying time for the scientific community to develop alternative strategies such as biological control.

Yoav Gazit
The Israel Cohen Institute for Biological Control
Washington State University

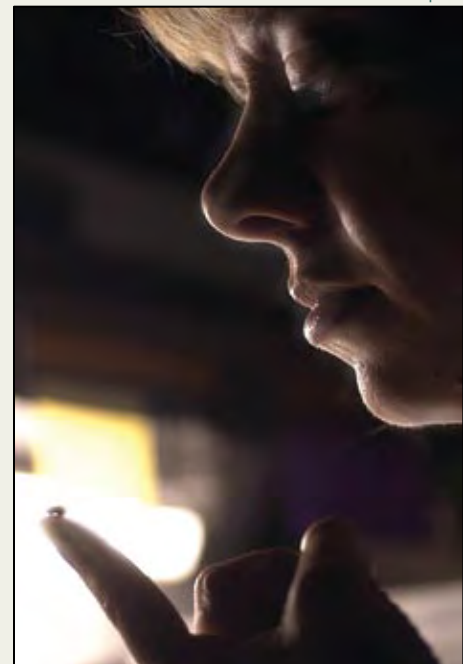
Left untreated, the Mediterranean fruit fly (right) could devastate the fruit and vegetable industry in the United States; thus, annual monitoring of this insect is critical. Outbreaks of the Mediterranean fruit fly often originate from uncontrolled populations in residential fruit trees; and, when populations exceed threshold levels, area-wide application of an insecticide is essential for the survival of the commercial fruit industry.



Health

The role of pesticides in protecting public health is broad and varied. Water utility companies apply the pesticide chlorine to public drinking water to kill harmful bacteria. Pesticides known as disinfectants eliminate dangerous organisms that cause Legionnaire's disease, and hospitals rely on disinfectants to prevent the spread of bacteria such as *Staphylococcus*. Rodenticides are used in public housing units to control rodents that carry diseases such as the deadly hantavirus. Avicides are used to control birds near silos and grain storage buildings, reducing the likelihood of grain contamination and exposure of workers to the lung disease histoplasmosis. Healthcare professionals recommend the use of DEET to repel insects that vector Lyme disease, West Nile virus (p. 25), malaria, etc. Herbicides control allergin-producing weeds such as ragweed and poison ivy.

Tom Campbell



Catherine Hill, a Purdue entomology professor, balances a deer tick on her fingertip. Ticks can spread Lyme disease, Rocky Mountain spotted fever, and other diseases to humans and animals.

Rosie Lerner



Poison ivy causes an itchy, blistering rash; severe cases sometimes warrant hospitalization.

Livestock Production

Ranchers and farmers who raise cattle, sheep, goats, hogs, chickens, etc., are linked by a fundamental scientific principle: contented, well fed animals (lower half of page) are better producers than their unattended counterparts.

Clemson University



Pesticides Control Infectious, Annoying Insects

Livestock is plagued by flies and other nuisance pests that vector disease, inflict painful bites, and cause stress. Insecticides control these insects when applied to the animals and/or their stalls, pens, corrals, barns, and containment facilities. As a result, the animals convert their feed into meat and milk more efficiently and advance to market quicker, thus lowering the cost of production. Consumers benefit directly from higher quality animal products.

Face flies on a beef cow (left). Peggy K. Powell, Ph.D., in a paper titled "Face Fly Biology and Management," West Virginia University Extension Service, 1995, stated that "12-14 flies per animal...can cause cattle to stop feeding and move into a shady location to escape the flies, resulting in reduced animal production. Dairy cattle will cluster together to reduce face fly attack, thereby increasing heat stress and reducing milk production."



Arlene Blessing



Stephen Ausmus, USDA/ARS



Stephen Ausmus, USDA/ARS



Susan (Sue) Boyer
USDA/ARS/AFSRC



USDA/ARS



Scott Bauer, USDA/ARS



Scott Bauer, USDA/ARS

Pesticides Improve Feed Quality

Pesticides also play a key role in producing high quality grain and forage. Protein from alfalfa is an essential dietary requirement for dairy cattle, but alfalfa plants are very susceptible to diseases and insects. Infestations in alfalfa, left unchecked, can significantly reduce protein content and yield. Insecticides protect alfalfa crops from damaging insects, thereby contributing to our milk supply.

Mark Sulc



Marlin E. Rice



Stephen Ausmus, USDA/ARS

The alfalfa weevil larva (right) can come between a beautiful crop of alfalfa (above) and high quality forage (lower right) for feeding livestock.

There are more than 50 noxious weeds that grow in forage crops and pastures in the United States; when eaten by livestock, they can cause symptoms ranging from sensitivity to the sun, to painful bleeding, to death. Livestock producers place high priority on preventing feed and range contamination from noxious weeds and seeds—and herbicides are one answer.

Insects also can be toxic, and their control is important to livestock producers. The presence of blister beetles in hay can kill horses or make them seriously ill. Insect feeding can damage plants and predispose them to fungal infections that can be poisonous to animals when concentrated in their feed.



Pesticides Improve Pastures

Horse, sheep, and cattle owners understand the importance of prudent herbicide use in maintaining productive pastures. Animals grow and stay healthy by converting grass and legumes into energy and muscle. Weeds crowd out quality plants on which the animals can graze; they are lower in protein and less palatable to animals and, over time, may spread and take over the pasture. When the quality or quantity of forage is insufficient, hay, grain, and feed must be purchased to supplement the animals' diet—and the cost is passed on to the consumer. Poisonous weeds can kill or injure horses, cows, sheep, and hogs. Herbicides are one of the answers.



Herbicides were applied to kill noxious weeds in the pasture and woody brush in the fence row.

Arlene Blessing



Ebert Honey
Lynnville, IA



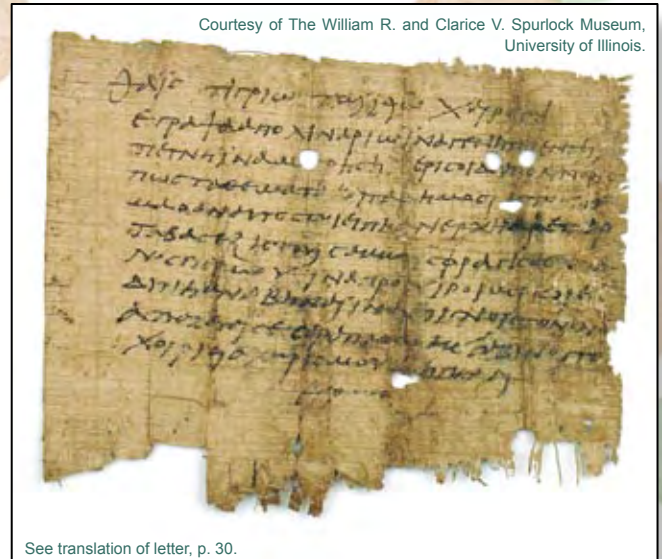
Pesticides Keep Honey Bees Alive

Professional beekeepers contract with fruit and vegetable farmers to deliver truckloads of bee hives to their fields to facilitate the essential pollination of their crops. But *Varoa* mites that live as parasites on bees can significantly reduce honeybee populations. Fortunately, cloth strips treated with a miticide can be hung in hives to kill the mites. As bees enter and exit the hive, they pass through vapor from the strips, which kills the mites without harming the bees.

Property

Insecticides can be used to control termites, carpenter ants, and other structural insects. Museum directors use them to protect irreplaceable and extremely valuable collections from insect feeding; exhibits that contain plant, cloth, leather, and animal specimens are particularly vulnerable. The exhibit shown on the right is a second-century letter, written on papyrus (writing material made from the aquatic plant *Cyperus papyrus*). The letter's value is immeasurable, and it must be protected.

Pests can destroy hundreds or thousands of dollars' worth of plants in a very short time; and those with sentimental value (e.g., mother's old roses) cannot be replaced. Sometimes, pesticides are the best answer to protect the homeowner's investment and the plants she especially wants to maintain.



Upper right: *Oxyrhynchus Papyrus, No. 932* (1914.21.0010). A second-century letter, written in Greek, on papyrus, unearthed at the site of Oxyrhynchus in Egypt, first excavated between 1897 and 1907.



Aphids feeding on ornamental swamp milkweed (above). Hawthorn woolly aphids on hawthorn (right). Cottony maple scale (far right). A homeowner's beautiful landscaping—an investment worth protecting (above right).



County drainage boards apply herbicides to ditch banks to eliminate trees and shrubs, thus keeping ditchwater flowing (left). Left untreated, woody vegetation shades the grass and causes thinning, which allows the release of soil into the ditches. As the ditches fill with soil, flooding increases on adjacent properties and can result in stagnant water that attracts mosquitoes.

The construction industry and homeowners use pesticide-treated lumber to build durable homes, decks, and docks resistant to insects and wood-rot fungi.

Recreation

Pesticides also help maintain recreational areas. Golf courses (below) and parks are more attractive due to the use of fungicides to combat turf diseases, insecticides to control destructive insects, and herbicides to control aggressive weeds. Herbicides are used on athletic fields to promote healthy turf, which has been shown to reduce sports injuries (fewer twisted knees and ankles). Nuisance insects and noxious plants would dominate many of our parks and playgrounds in the absence of pesticides. Even fish populations are enhanced by the use of herbicides. By eliminating a portion of weeds that serve as cover for small fish, more are consumed as prey of bigger fish, thus maintaining a healthy fish population. Owners of land near lakes and ponds benefit from pesticide use which allows fuller utilization of the water for safer swimming and boating; their property values are higher if the water is accessible.



Duckweed covered this lake before treatment with an aquatic herbicide. These before and after photos (left) show the dramatic difference.



Fred Whitford

Society

Pesticides sustain food production at high levels by protecting crops from pests. The efficiency of the farming community determines the reliability of food production for the nation, and pesticides make it possible for U.S. farmers—who represent less than two percent of the population—to produce enough food for all of us. This leaves the vast majority of citizens free to engage in vocations and professions (the arts, science, education, etc.) that contribute to the public good in other ways.

Exports

Pesticides play a vital role in our high agricultural productivity; this leads to a favorable export market, which in turn benefits our balance of trade and offsets the cost of importing foreign oil and other goods.



Grain is loaded on trucks in the field (upper left) and transported to local elevators (upper right). From there it is delivered to facilities where it is loaded onto barges (above left). Ships carry grain to the world (above right).

Photo source(s) unknown

Transportation

Herbicides are used to eliminate brush and tall weeds around intersections, traffic signs, and guardrails, affording better roadside visibility and reducing accident potential. They also are used to control vegetation along the asphalt shoulder to enhance water runoff, thereby reducing the likelihood of accidents caused by hydroplaning and also reducing maintenance costs by extending the life of paved surfaces. Herbicides control weeds and brush along railroad tracks, at crossings, and in railroad yards to increase worker and passenger safety. Wood preservatives protect railroad ties from insect feeding and decay.

Airlines apply fungicides to their jet fuel to reduce the growth of mold in the fuel filters.

Harvey Holt



A traffic sign partially obstructed by vegetation (left). Mowing and cutting can be used repeatedly to minimize the problem, but pesticides often are the best answer for long-term control.

Weeds at a railroad crossing (right) can contribute to accidents involving trains and vehicles. Weeds along tracks (below) can cause deterioration of the area around the rail and lead to unsafe track and ballast areas. Excellent weed control along tracks (lower right) provides a clear view of surrounding terrain.



Photos by Chad Pfitzer

Utilities

Utility companies use herbicides to suppress the growth of seedling trees that would otherwise interfere with power lines and disrupt electrical service. Stump treatments control sprouting where trees have been cut down. Pipeline crews use herbicides to control vegetation that could envelop aboveground pipes and connections; exposure of the pipes is essential to ward off vandalism and to facilitate maintenance inspections and repairs. Herbicides keep power transmission substations from being overgrown by vegetation; they are cheaper and less dangerous than power tree-trimming and assure worker visibility around high voltage power lines.



A tree stump beneath power lines (above) has been treated with a herbicide to prevent sprouting. The area around this power station (left) must be kept vegetation-free to provide workers clear visibility when working around high voltage power lines.

The Integration of Pesticides with Nonchemical Strategies

The discussion on benefits would be incomplete without mentioning that pesticides are routinely combined with nonchemical pest management strategies. Nonchemical pest solutions are effective in certain situations: planting resistant varieties for apple scab control, mowing or tilling for weed control in problem areas, using pheromones (sex attractants) to lure and capture insects, etc. But, while nonchemical approaches are sometimes cheaper, easier, or more convenient than pesticides, pests often adapt to single system approaches and eventually require a combination of methods to achieve satisfactory pest control (p. 11). Pesticides are one solution.

State and federal agencies monitor for insects, plants, and plant pathogens that could threaten public health and safety, natural resources, or private property. A current example is the monitoring of mosquitoes to head off an epidemic of West Nile virus. The first outbreak of the virus in the United States occurred in the Northeast in the fall of 1999; since then, it has been carried south and west

by birds. West Nile virus has resulted in the deaths of hundreds of people and horses and thousands of birds nationwide.

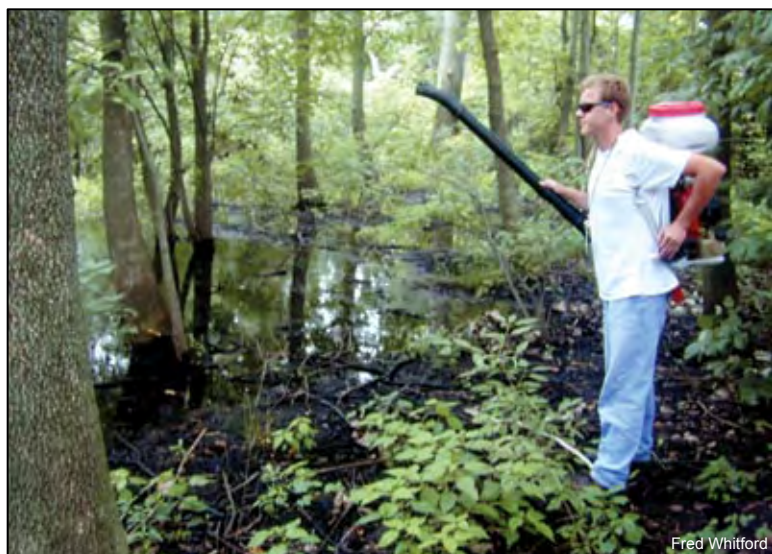
James Gathany



Mosquitoes are vectors for the West Nile virus. Eliminating puddles and small containers of water in residential settings is an effective method used to reduce mosquito populations.

The goal of public health officials is to reduce mosquito numbers to levels that minimize the risk of West Nile virus transmission. Professionals who fight the mosquitoes that carry the virus have long understood that it takes a full arsenal of pest management strategies to gain the upper hand. These include identification and elimination of mosquito breeding sites, use of sentinel species such as crows and blue jays to detect the virus, and the monitoring of adult mosquito populations. Media alerts help citizens protect themselves, and educational programs contribute to control by informing homeowners that they should eliminate prime breeding sites such as standing water in old tires, flower pots, bird baths, and gutters.

However, in spite of our best efforts, mosquito populations sometimes explode beyond acceptable public health standards. When this happens, health officials take immediate action to control adult mosquitoes with insecticides in areas



Fred Whitford

This applicator is applying a granular insecticide to stagnant water where mosquito larvae are living.



where the virus is detected (above). Once the insecticides have controlled the mosquito population, professionals resume their focus on nonpesticidal methods of prevention.

Professionals know that nonchemical systems sometimes fail; and when they do, pesticides are necessary to gain control before the problem becomes intractable. Whether the pests are cockroaches in a restaurant, flour beetles in kitchen cabinets, or rats in a warehouse, best management strategies include both pesticidal and nonchemical methods for long-term control.



The invasive weed Purple loosestrife grows along a pond (above). Although the flowers are beautiful, the weed tends to take over where cattails normally grow; and since very few wildlife species use purple loosestrife, it is considered detrimental to the “natural” system, especially in wetlands where a diverse native flora is highly desired. Herbicides are effective in controlling purple loosestrife (right).



Conclusion

People who argue against the use of pesticides believe that pest elimination can be achieved without their use. While this may be true in a few isolated situations, most pest management programs around the home, on the farm, aboard planes and trucks, and in parks and natural areas rely on a combination of nonchemical and chemical control methods.



Look at the big picture

**Understanding benefits helps
put risks in perspective**

Nonchemical pest management alternatives certainly lessen the need to use pesticides, but they cannot totally eliminate it. Neither pesticides nor nonchemical alternatives such as host plant resistance, timing of planting, painstaking sanitation efforts, etc., offer permanent solutions in all cases. The most effective strategy is an integrated pest management approach.

We must understand both the benefits and the risks of pesticides in developing integrated pest management strategies. Reduced exposure and finely tuned pesticide product selection minimize negative impacts of pesticide use to humans and the environment. Although it may be difficult to convey to the public a sense of balance among pesticide benefits and risks, this issue is central to America's discourse on the continued use of pesticides. Making an informed decision—whether public policy or individual choice—is impossible without evaluating the benefits of use alongside the risks.

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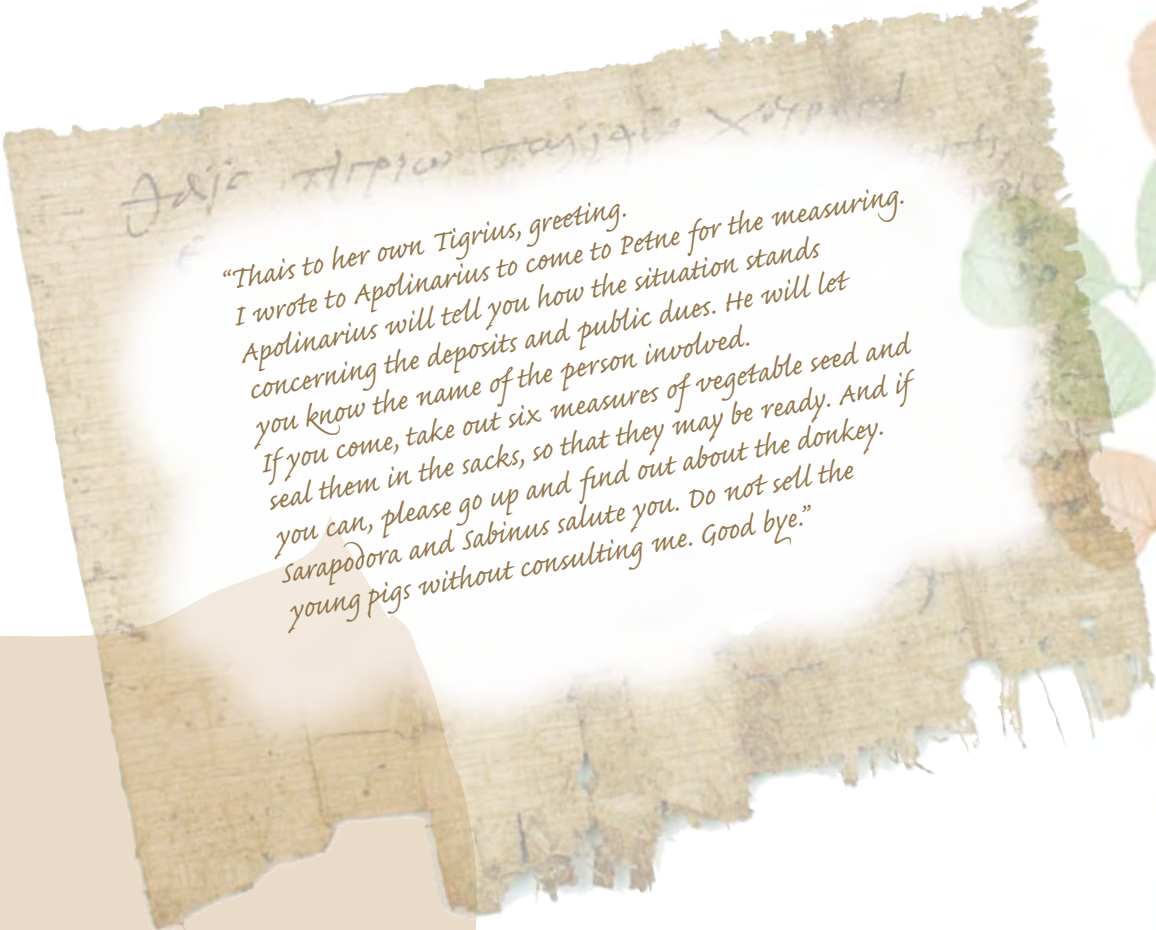
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*“Thais to her own Tigrius, greeting.
I wrote to Apolinarius to come to Petne for the measuring.
Apolinarius will tell you how the situation stands
concerning the deposits and public dues. He will let
you know the name of the person involved.
If you come, take out six measures of vegetable seed and
seal them in the sacks, so that they may be ready. And if
you can, please go up and find out about the donkey.
Sarapodora and Sabinus salute you. Do not sell the
young pigs without consulting me. Good bye.”*



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