

# Understanding the Fate of Pesticides after Application

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(<https://pesticidestewardship.org/wp-content/uploads/sites/4/2016/06/Sprayer.jpg>) Pesticides are frequently found in surface and ground water. That statement, although true, does not by itself give a complete picture of the situation. After decades of testing water for the presence of pesticides, very few samples have been found to contain enough pesticide to be a human health concern. Rarely are concentrations found that could affect small aquatic organisms or animals that feed on fish. The National Water Quality Assessment Program (NAWQA) has published a report of pesticides in streams and ground water located



here: <http://pubs.usgs.gov/fs/2006/3028/> (<http://pubs.usgs.gov/fs/2006/3028/>).

Several possible fates await a pesticide after it has been applied outdoors. The most common fates are listed below:

**Absorption** is the uptake of pesticide molecules into plant tissues. This action removes the pesticide from the environment, and prevents the pesticide from becoming a water contaminant.

**Adsorption** is the physical binding of pesticide molecules to soil particles. The strength of the bonds depends on the interaction of the pesticide's chemical properties, its concentration in the soil water, the soil pH and the composition of the soil (percent sand, silt, loam, clay, and organic matter). If bound to the soil, the pesticide is unlikely to leach or runoff. Some highly soluble pesticides bind strongly with soil. The more clay particles and organic matter that are in the soil, the more the pesticide is held by the soil and becomes immobile. Strongly adsorbed pesticide molecules do not leach or move unless the soil

particles to which they are adsorbed move (erosion) with water. The longer the molecules of a pesticide are held, the more likely it is that microbiological degradation will occur, which reduces the risk of leaching and runoff.

**Erosion** is the movement of soil particles from the application site by heavy rains or excess irrigation. If the pesticide is adsorbed to the soil particle, the pesticide is also being moved off site.

**Movement in runoff water** occurs when soluble or insoluble pesticides move from the application site across the soil surface, either dissolved or suspended in runoff waters. Pesticides dissolved or suspended in runoff water may quickly reach surface waters such as lakes, streams and rivers. The water solubility of a pesticide will determine how readily the pesticide will dissolve in water. A highly soluble pesticide has a greater potential of being washed from any surface it has been applied to. Solubility is usually expressed as the maximum amount of pesticide that will dissolve in 1 liter (1.06 quarts) of water. Water solubility is measured in milligrams per liter (mg/l), which is equivalent to one part per million (ppm). The larger this number, the more soluble a pesticide is in water.

**Leaching to groundwater** occurs when soluble pesticides move downward through the soil to the groundwater. A highly soluble pesticide will tend to readily leach into groundwater.

**Degradation:** As soon as the pesticide is applied, it begins to break down or degrade into simpler compounds which are usually less toxic. Each pesticide has its own speed of degradation, which depends on the active ingredient, the formulation, and environmental conditions. There are both benefits and drawbacks to a long degradation time. The longer a pesticide takes to break down, the longer it is present to control the insect, weed, or disease for which it was applied. This is called **residual activity**. One drawback to extended residual activity, or persistence, is that the pesticide may also be available for leaching or runoff over a longer period of time.

## Degradation Processes

(<https://pesticidestewardship.org/wp-content/uploads/sites/4/2016/06/PepperPlnts.jpg>)

**Photolysis (photocomposition):** The degradation of chemicals by light is called photolysis, or photodecomposition. Photolysis occurs on the plant, soil, water, or any other surface that sunlight reaches.

**Hydrolysis:** Water also degrades pesticides by dividing large molecules into smaller ones, breaking them down in the process called **hydrolysis**. Hydrolysis of pesticides can occur on the soil surface, in the root zone, or whenever a source of water is available. Hydrolysis may be very active in warm water at or near the soil surface. As the water temperature cools at depths below the root zone, the rate of hydrolysis slows. In deep groundwater, hydrolysis slows dramatically.



**Microbiological Degradation:** Microorganisms break down or degrade pesticides after application. Most microorganisms—a category which includes bacteria, viruses, fungi, algae, and protozoa—live in the upper foot of soil where they find warm temperatures, moisture, and organic matter, and where they do most of their work degrading pesticides. Microorganisms are most active in soils having high organic matter. As the pesticide moves down below the root zone, microbiological degradation decreases because of less favorable living conditions for the microorganisms.

**Volatilization:** A liquid chemical on a plant or soil surface can be converted into a vapor, which escapes into the atmosphere. Pesticide vapors that drift through the air may be hazardous to plants, humans, and animals. Applicators should read the label carefully to find warnings that will tell them that the pesticide is volatile. Look for a statement like this in the Environmental Hazards section of the label: ***“Vapors from this product may injure susceptible plants in the immediate vicinity.”***

## Additional Information

Pesticides in the Nation’s Streams and Ground Water (<http://pubs.usgs.gov/fs/2006/3028/>) – The results of more than 10 years of study by the National Water-Quality Assessment (NAWQA) Program. Provides a national-scale analysis of pesticide occurrence in streams and groundwater.

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([https://pesticidestewardship.org/wp-content/uploads/sites/4/2016/06/cce\\_2color.gif](https://pesticidestewardship.org/wp-content/uploads/sites/4/2016/06/cce_2color.gif))

National Pesticide Safety Education Month (<https://pesticidestewardship.org/national-pesticide-safety-education-month/>)

The Importance of State PSEP's – videos (<https://pesticidestewardship.org/national-pesticide-safety-education-month/did-you-know/>)

What is a Pesticide? (<https://pesticidestewardship.org/national-pesticide-safety-education-month/what-is-a-pesticide/>)

Some Basic Pesticide Safety Principles (<https://pesticidestewardship.org/national-pesticide-safety-education-month/pesticide-safety-principles/>)

Safety Information on the Label (<https://pesticidestewardship.org/national-pesticide-safety-education-month/safety-information-on-the-pesticide-label/>)

Hazard – Toxicity – Exposure – Risk Management (<https://pesticidestewardship.org/national-pesticide-safety-education-month/hazard-toxicity-exposure-risk-management/>)

Self-Assessment of Safety Practices (<https://pesticidestewardship.org/national-pesticide-safety-education-month/self-assessment-of-personal-pesticide-safety-practices/>)

Hiring a Professional (<https://pesticidestewardship.org/national-pesticide-safety-education-month/hiring-a-pmp/>)

Helpful Educational Links (<https://pesticidestewardship.org/national-pesticide-safety-education-month/helpful-educational-links/>)

Helpful Videos (<https://pesticidestewardship.org/national-pesticide-safety-education-month/helpful-videos/>)

Take the Quiz (<https://pesticidestewardship.org/national-pesticide-safety-education-month/take-the-quiz/>)

Activity Ideas (<https://pesticidestewardship.org/national-pesticide-safety-education-month/activity-ideas/>)

For Retailers (<https://pesticidestewardship.org/national-pesticide-safety-education-month/for-retailers/>)

Pesticide Safety Education Programs (<https://pesticidestewardship.org/national-pesticide-safety-education-month/state-land-grant-university-pesticide-safety-education-programs/>)

What Sponsorship Means (<https://pesticidestewardship.org/wp-content/uploads/sites/4/2019/05/2020-What-Sponsorship-Means.pdf>)

How to Read the Label (<https://pesticidestewardship.org/homeowner/how-to-read-the-label/>)

Calibration (<https://pesticidestewardship.org/calibration/>)

Introduction (<https://pesticidestewardship.org/calibration/calibration-introduction/>)

Doing the Math (<https://pesticidestewardship.org/calibration/doing-the-math/>)

Nozzle Tip Selection (<https://pesticidestewardship.org/calibration/nozzle-tip-selection/>)  
Precalibration (<https://pesticidestewardship.org/calibration/prec calibration/>)  
Formula Calibration Method (<https://pesticidestewardship.org/calibration/formula-calibration-method/>)  
Ounces-to-Gallons Method (<https://pesticidestewardship.org/calibration/ounces-to-gallons-method/>)  
Backpack Sprayer (<https://pesticidestewardship.org/calibration/backpack-sprayer/>)  
Spray Gun (<https://pesticidestewardship.org/calibration/spray-gun/>)  
Rotary Spreader (<https://pesticidestewardship.org/calibration/rotary-spreader/>)  
Drop Spreaders (<https://pesticidestewardship.org/calibration/drop-spreaders/>)  
Band Applicators (<https://pesticidestewardship.org/calibration/band-applicators/>)  
Measurements, Conversions, and Formulas  
(<https://pesticidestewardship.org/calibration/measurements-conversions-and-formulas/>)

Disposal (<https://pesticidestewardship.org/disposal/>)

Pesticide Disposal Options (<https://pesticidestewardship.org/disposal/pesticide-disposal-options/>)

Excess Mixture and Water (<https://pesticidestewardship.org/disposal/excess-mixture-and-water/>)

Unneeded Product and Contaminated Clothing  
(<https://pesticidestewardship.org/disposal/unneeded-product-and-contaminated-clothing/>)

Rinsate and Spill Cleanup Materials (<https://pesticidestewardship.org/disposal/rinsate-and-spill-cleanup-materials/>)

The Law on Pesticide Wastes (<https://pesticidestewardship.org/disposal/federal-laws/>)

How to Deal with Label Changes (<https://pesticidestewardship.org/disposal/how-to-deal-with-label-changes/>)

Pesticide Disposal Assistance Programs  
(<https://pesticidestewardship.org/disposal/pesticide-disposal-assistance-programs/>)

Reduce the Need for Disposal (<https://pesticidestewardship.org/disposal/reduce-the-need-for-disposal/>)

Treated Seed Disposal (<https://pesticidestewardship.org/disposal/treated-seed-disposal/>)

Drift (<https://pesticidestewardship.org/pesticide-drift/>)

Types of Drift (<https://pesticidestewardship.org/pesticide-drift/types-of-drift/>)

Evaluate the Site (<https://pesticidestewardship.org/pesticide-drift/evaluate-the-site/>)

Evaluate the Weather (<https://pesticidestewardship.org/pesticide-drift/evaluate-the-weather/>)

Understanding Droplet Size (<https://pesticidestewardship.org/pesticide-drift/understanding-droplet-size/>)

Managing Drift with Nozzles and Boom Height (<https://pesticidestewardship.org/pesticide-drift/managing-drift-with-nozzles-and-boom-height/>)

Using Buffers to Reduce Pesticide Drift and Wind Erosion  
(<https://pesticidestewardship.org/pesticide-drift/using-buffers-to-reduce-pesticide-drift-and-wind-erosion/>)

More Drift Reduction Methods (<https://pesticidestewardship.org/pesticide-drift/more-drift-reduction-methods/>)

Air Blast Sprayers (<https://pesticidestewardship.org/pesticide-drift/air-blast-sprayers/>)

Aerial Application (<https://pesticidestewardship.org/pesticide-drift/aerial-application/>)

Pesticide Drift Resources (<https://pesticidestewardship.org/pesticide-drift/pesticide-drift-resources/>)

Drift Management Slide Presentation (<https://pesticidestewardship.org/wp-content/uploads/sites/4/2016/06/Drift-PES-1.pptx>)

Pesticide Drift Quizzes (<https://pesticidestewardship.org/pesticide-drift/pesticide-drift-quizzes/>)

Handling Pesticide Containers (<https://pesticidestewardship.org/handling-pesticide-containers/>)

Introduction (<https://pesticidestewardship.org/handling-pesticide-containers/introduction/>)

Paper and Plastic Bags (<https://pesticidestewardship.org/handling-pesticide-containers/paper-and-plastic-bags/>)

Nonrefillable Containers (Plastic) (<https://pesticidestewardship.org/handling-pesticide-containers/nonrefillable-containers-plastic/>)

Refillable Container & Shuttles (<https://pesticidestewardship.org/handling-pesticide-containers/refillable-container-shuttles/>)

Rinsing Instructions (<https://pesticidestewardship.org/handling-pesticide-containers/rinsing-instructions/>)

Disposal Options (<https://pesticidestewardship.org/handling-pesticide-containers/disposal-options/>)

EPA's Refillable Container and Repackaging Requirements  
(<https://pesticidestewardship.org/handling-pesticide-containers/epas-refillable-container-and-repackaging-requirements/>)

Flow Chart 1 (<https://pesticidestewardship.org/handling-pesticide-containers/flow-chart-1/>)

Flow Chart 2 (<https://pesticidestewardship.org/handling-pesticide-containers/flow-chart-2/>)

Flow Chart 3 (<https://pesticidestewardship.org/handling-pesticide-containers/flow-chart-3/>)

Handling Containers Quiz (<https://pesticidestewardship.org/handling-pesticide-containers/handling-containers-quiz/>)

Homeowner (<https://pesticidestewardship.org/homeowner/>)

Understanding Pest Management

(<https://pesticidestewardship.org/homeowner/understanding-pest-management/>)

Selecting a Pesticide (<https://pesticidestewardship.org/homeowner/selecting-a-pesticide/>)

How to Read the Label (<https://pesticidestewardship.org/homeowner/how-to-read-the-label/>)

Using Pesticides Safely and Correctly (<https://pesticidestewardship.org/homeowner/using-pesticides-safely-and-correctly/>)

Transporting Pesticides (<https://pesticidestewardship.org/homeowner/transporting-pesticides/>)

Store Pesticides Safely (<https://pesticidestewardship.org/homeowner/store-pesticides-safely/>)

Pesticide and Container Disposal (<https://pesticidestewardship.org/homeowner/pesticide-and-container-disposal/>)

Prevent Child Poisonings (<https://pesticidestewardship.org/homeowner/prevent-child-poisonings/>)

First Aid (<https://pesticidestewardship.org/homeowner/first-aid/>)

Handling Spills (<https://pesticidestewardship.org/homeowner/handling-spills/>)

Choosing a Pest Control Company (<https://pesticidestewardship.org/homeowner/choosing-a-pest-control-company/>)

Calculating the Correct Amount (<https://pesticidestewardship.org/homeowner/calculating-the-correct-amount/>)

How To Calibrate A Drop Spreader (<https://pesticidestewardship.org/homeowner/how-to-calibrate-a-drop-spreader/>)

Rotary Spreader Calibration (<https://pesticidestewardship.org/homeowner/rotary-spreader-calibration/>)

Compressed Air Sprayer Calibration

(<https://pesticidestewardship.org/homeowner/compressed-air-sprayer-calibration/>)

Hose-end Sprayer Calibration (<https://pesticidestewardship.org/homeowner/hose-end-sprayer-calibration/>)

Siphoning Bucket Sprayer Calibration

(<https://pesticidestewardship.org/homeowner/siphoning-bucket-sprayer-calibration/>)

Trombone Bucket Sprayer Calibration

(<https://pesticidestewardship.org/homeowner/trombone-bucket-sprayer-calibration/>)

Resources for Additional Reading (<https://pesticidestewardship.org/homeowner/resources-for-additional-reading/>)

Integrated Pest Management (<https://pesticidestewardship.org/ipm/>)

Introduction to IPM (<https://pesticidestewardship.org/ipm/introduction-to-ipm/>)

Monitoring (Scouting) (<https://pesticidestewardship.org/ipm/monitoring/>)  
Assessment (<https://pesticidestewardship.org/ipm/assessment/>)  
Taking Action (Control Measures) (<https://pesticidestewardship.org/ipm/taking-action/>)  
More IPM Information (<https://pesticidestewardship.org/ipm/ipm-links/>)  
IPM Educational Module (<https://pesticidestewardship.org/ipm/ipm-educational-module/>)

Pesticides in Organic Production (<https://pesticidestewardship.org/pop/>)

What Organic Means (<https://pesticidestewardship.org/pop/what-organic-means/>)  
Terms to Know (<https://pesticidestewardship.org/pop/terms-to-know/>)  
Organic Certification (<https://pesticidestewardship.org/pop/organic-certification/>)  
When Pesticides Can Be Used (<https://pesticidestewardship.org/pop/when-pesticides-can-be-used/>)  
What Pesticides are Allowed (<https://pesticidestewardship.org/pop/what-pesticides-are-allowed/>)  
Safe Use of Approved Pesticides (<https://pesticidestewardship.org/pop/safe-use-of-approved-pesticides/>)  
Recordkeeping and Worker Safety (<https://pesticidestewardship.org/pop/recordkeeping-and-worker-safety/>)  
Disease Management (<https://pesticidestewardship.org/pop/disease-management/>)  
Insect Management (<https://pesticidestewardship.org/pop/insect-management/>)  
Weed Management (<https://pesticidestewardship.org/pop/weed-management/>)  
Resources (<https://pesticidestewardship.org/pop/resources/>)

OSHA HazCom 2012 (<https://pesticidestewardship.org/osha-hazcom-2012/>)

Personal Protective Equipment (<https://pesticidestewardship.org/personal-protective-equipment/>)

The Label and PPE (<https://pesticidestewardship.org/personal-protective-equipment/the-label-and-personal-protective-equipment/>)  
Selecting PPE (<https://pesticidestewardship.org/personal-protective-equipment/selecting-personal-protective-equipment/>)  
Components of PPE (<https://pesticidestewardship.org/personal-protective-equipment/components-of-personal-protective-equipment/>)  
Cleaning, Maintenance, Storage and Disposal (<https://pesticidestewardship.org/personal-protective-equipment/cleaning-maintenance-storage-and-disposal/>)  
NIOSH Presentations (<https://pesticidestewardship.org/personal-protective-equipment/niosh-presentations/>)

Pollinator Protection (<https://pesticidestewardship.org/pollinator-protection/>)



Honey Bees and Beekeeping (<https://pesticidestewardship.org/pollinator-protection/honey-bees-and-beekeeping/>)

Bees in Peril (<https://pesticidestewardship.org/pollinator-protection/bees-in-peril/>)

Pesticide Toxicity to Bees (<https://pesticidestewardship.org/pollinator-protection/pesticide-toxicity-to-bees/>)

Read and Follow the Label (<https://pesticidestewardship.org/pollinator-protection/read-and-follow-the-label/>)

Pesticide Applicator BMPs (<https://pesticidestewardship.org/pollinator-protection/pesticide-applicator-bmps/>)

Almond BMPs (<https://pesticidestewardship.org/pollinator-protection/pesticide-applicator-bmps/almond-bmps/>)

Canola, Corn and Soybean BMPs (<https://pesticidestewardship.org/pollinator-protection/pesticide-applicator-bmps/soybean-bmps/>)

Treated Seed (<https://pesticidestewardship.org/pollinator-protection/pesticide-applicator-bmps/treated-seed/>)

Fruit and Vegetable BMPs (<https://pesticidestewardship.org/pollinator-protection/pesticide-applicator-bmps/fruit-and-vegetable-bmps/>)

Turfgrass and Ornamentals BMPs (<https://pesticidestewardship.org/pollinator-protection/pesticide-applicator-bmps/turfgrass-and-ornamentals-bmps/>)

Seed Treatment Concerns (<https://pesticidestewardship.org/pollinator-protection/seed-treatment-concerns/>)

Cooperate and Communicate (<https://pesticidestewardship.org/pollinator-protection/cooperate-and-communicate/>)

Recognizing and Reporting Bee Kills (<https://pesticidestewardship.org/pollinator-protection/recognizing-and-reporting-bee-kills/>)

Resources and Suggested Reading (<https://pesticidestewardship.org/pollinator-protection/resources-and-suggested-reading/>)

Presentations on Pollinator Protection (<https://pesticidestewardship.org/pollinator-protection/presentations/>)

Recordkeeping (<https://pesticidestewardship.org/records/>)

Application Recordkeeping (<https://pesticidestewardship.org/records/application-recordkeeping/>)

Private Applicator Requirements (<https://pesticidestewardship.org/records/private-applicator-requirements/>)

Requirements for Non-Private Applicators (<https://pesticidestewardship.org/records/non-private-applicators/>)

Smart Items to Record (<https://pesticidestewardship.org/records/smart-items-that-should-be-recorded/>)

Inspection of Records (<https://pesticidestewardship.org/records/records-inspections/>)

Benefits of Recordkeeping (<https://pesticidestewardship.org/records/benefits-of-recordkeeping/>)

Fact Sheets and Websites (<https://pesticidestewardship.org/records/fact-sheets-and-websites/>)

Resistance (<https://pesticidestewardship.org/resistance/>)

Understanding Resistance (<https://pesticidestewardship.org/resistance/understanding-resistance/>)

Preventing Resistance (<https://pesticidestewardship.org/resistance/preventing-resistance/>)

Herbicide Resistance (<https://pesticidestewardship.org/resistance/herbicide-resistance/>)

Herbicide Resistance Terms to Know

(<https://pesticidestewardship.org/resistance/herbicide-resistance/herbicide-terms-to-know/>)

Is Herbicide Resistance to Blame? (<https://pesticidestewardship.org/resistance/herbicide-resistance/is-herbicide-resistance-to-blame-herbicide/>)

Incidence and History of Herbicide Resistance

(<https://pesticidestewardship.org/resistance/herbicide-resistance/incidence-and-history-of-herbicide-resistance/>)

Mechanisms of Herbicide Resistance

(<https://pesticidestewardship.org/resistance/herbicide-resistance/mechanisms-of-herbicide-resistance/>)

Proactive Herbicide Resistance Management

(<https://pesticidestewardship.org/resistance/herbicide-resistance/proactive-herbicide-resistance-management/>)

How to Manage Herbicide Resistance

(<https://pesticidestewardship.org/resistance/herbicide-resistance/how-to-manage-herbicide-resistance/>)

Herbicide Spraying by the Numbers

(<https://pesticidestewardship.org/resistance/herbicide-resistance/herbicide-spraying-by-the-numbers/>)

Resources and Suggested Reading

(<https://pesticidestewardship.org/resistance/herbicide-resistance/resources-and-suggested-reading-herbicide/>)

Insecticide Resistance (<https://pesticidestewardship.org/resistance/insecticide-resistance/>)

## Insecticide Resistance Mechanisms

(<https://pesticidestewardship.org/resistance/insecticide-resistance/insecticide-resistance-mechanisms/>)

## Is Insecticide Resistance to Blame?

(<https://pesticidestewardship.org/resistance/insecticide-resistance/is-insecticide-resistance-to-blame-insecticides/>)

Raised Resistance Risks (<https://pesticidestewardship.org/resistance/insecticide-resistance/raised-resistance-risks/>)

## Insecticide Spraying by the Numbers

(<https://pesticidestewardship.org/resistance/insecticide-resistance/insecticide-spraying-by-the-numbers/>)

## Take Steps to Avoid Insecticide Resistance

(<https://pesticidestewardship.org/resistance/insecticide-resistance/take-steps-to-avoid-insecticide-resistance/>)

## What Can You Do About Resistant Insects?

(<https://pesticidestewardship.org/resistance/insecticide-resistance/what-can-you-do-about-resistant-insects/>)

## Resources and Suggested Reading

(<https://pesticidestewardship.org/resistance/insecticide-resistance/resources-and-suggested-reading-insecticide/>)

Fungicide Resistance (<https://pesticidestewardship.org/resistance/fungicide-resistance/>)

Fungicide Terms to Know (<https://pesticidestewardship.org/resistance/fungicide-resistance/fungicide-terms-to-know/>)

## How to Manage Fungicide Resistance

(<https://pesticidestewardship.org/resistance/fungicide-resistance/manage-fungicide-resistance/>)

## Is Fungicide Resistance to Blame?

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## Mechanisms of Fungicide Resistance

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## Proactive Fungicide Resistance Avoidance

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Raised Resistance Risks (<https://pesticidestewardship.org/resistance/fungicide-resistance/raised-resistance-risks/>)

Fungicide Spraying by the Numbers

(<https://pesticidestewardship.org/resistance/fungicide-resistance/fungicide-spraying-by-the-numbers/>)

Resources and Suggested Reading

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Respirators (<https://pesticidestewardship.org/respirators/>)

Types of Respirators (<https://pesticidestewardship.org/respirators/types-of-respirators-for-pesticide-users/>)

Purifying Elements (<https://pesticidestewardship.org/respirators/purifying-elements/>)

Particulate Filters (<https://pesticidestewardship.org/respirators/purifying-elements/particulate-filters/>)

Particulate Filter Use Limitations (<https://pesticidestewardship.org/respirators/purifying-elements/particulate-filter-use-limitations/>)

Chemical Cartridges or Canisters (<https://pesticidestewardship.org/respirators/purifying-elements/chemical-cartridges-or-canisters/>)

Cartridge and Canister Use Limitations

(<https://pesticidestewardship.org/respirators/purifying-elements/cartridge-and-canister-use-limitations/>)

Combination Cartridge and Particulate Filters

(<https://pesticidestewardship.org/respirators/purifying-elements/combination-chemical-cartridge-and-particulate-filters/>)

TC Numbers and Cartridge Colors (<https://pesticidestewardship.org/respirators/niosh-tc-certifications/>)

What respirator do I need? (<https://pesticidestewardship.org/respirators/what-respirator-do-i-need/>)

Medical Clearance (<https://pesticidestewardship.org/respirators/medical-clearance/>)

Fit Test (<https://pesticidestewardship.org/respirators/fit-test/>)

Fit Check or Seal Check (<https://pesticidestewardship.org/respirators/fit-check-or-seal-check/>)

Soil Fumigation (<https://pesticidestewardship.org/soil-fumigation/>)

Spills (<https://pesticidestewardship.org/spills/>)

Introduction to Spill Management (<https://pesticidestewardship.org/spills/introduction-to-spill-management/>)

Spill Prevention (<https://pesticidestewardship.org/spills/prevention/>)

Spill Contingency Planning (<https://pesticidestewardship.org/spills/contingency-planning/>)  
Spill Notification (<https://pesticidestewardship.org/spills/notifying-officials/>)  
Spill Crisis Management (<https://pesticidestewardship.org/spills/crisis-management/>)  
Spill Cleanup (<https://pesticidestewardship.org/spills/cleanup/>)  
Disposal of Spill Materials (<https://pesticidestewardship.org/spills/disposal/>)  
Sorbents (<https://pesticidestewardship.org/spills/sorbents/>)  
Pesticide Decontaminants (<https://pesticidestewardship.org/spills/decontaminants/>)  
Spill Kit Contents (<https://pesticidestewardship.org/spills/spillkit/>)  
Spill Educational Module (<https://pesticidestewardship.org/spills/spill-educational-module/>)

## Storage (<https://pesticidestewardship.org/storage/>)

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Container Care (<https://pesticidestewardship.org/storage/container-care/>)  
Plan for Emergencies (<https://pesticidestewardship.org/storage/plan-for-emergencies/>)  
Laws and Regulations (<https://pesticidestewardship.org/storage/laws-and-regulations/>)  
Storage Factsheets (<https://pesticidestewardship.org/storage/factsheets/>)  
Storage Checklist (<https://pesticidestewardship.org/storage/storage-checklist/>)  
Storage Assessment (<https://pesticidestewardship.org/storage/storage-assessment/>)  
Storage Education Module (<https://pesticidestewardship.org/storage/storage-education-module/>)  
Storage Slide Presentation (<https://pesticidestewardship.org/storage/storage-slide-presentation/>)

## Surface and Groundwater (<https://pesticidestewardship.org/water/>)

Pesticide Fate (<https://pesticidestewardship.org/water/pesticide-fate/>)  
The Problem of Runoff (<https://pesticidestewardship.org/water/runoff/>)  
The Problem of Leaching (<https://pesticidestewardship.org/water/leaching/>)  
Prevent Water Contamination (<https://pesticidestewardship.org/water/prevent-contamination/>)  
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Glossary of Water Terminology (<https://pesticidestewardship.org/water/water-terms/>)  
Resources and References (<https://pesticidestewardship.org/water/references/>)  
Using Buffers to Reduce Pesticide Runoff and Water Erosion  
(<https://pesticidestewardship.org/water/using-buffers-to-reduce-runoff/>)

Transportation of Pesticides (<https://pesticidestewardship.org/transportation/>)

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Training Resources (<https://pesticidestewardship.org/wps/training-resources/>)

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