



# OLR RESEARCH REPORT

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## PESTICIDE ISSUES

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You asked:

1. What is the definition of integrated pest management (IPM)?
2. What have been recent developments in the scientific understanding of pesticides, particularly when used in settings such as schools and parks?
3. What significant pesticide legislation have other states, including New York, adopted in recent years?

### SUMMARY

While there are many definitions of IPM, it generally refers to a way of managing pests using a variety of management methods, which may include the use of pesticides, to keep pest populations at an acceptable level. Connecticut law contains two definitions of IPM that identify a range of techniques to cope with pests. Both of Connecticut's statutory definitions, as well as one developed by the U.S. Environmental Protection Agency (EPA), allow for the "judicious" use of pesticides, which include substances used to kill or control weeds, insects, and rodents. The definitions generally call for taking a context-specific approach to pest management.

There is a voluminous and evolving scientific literature on pesticides and it is beyond our capacity to summarize even the most recent developments in this field. Nonetheless, it is clear that there are substantial uncertainties regarding the health and environmental effects of some widely used pesticides. Partially as a result of this, different jurisdictions have handled the same pesticide in different ways. In this report, we summarize a handful of recent scientific studies.

We also summarize significant pesticide legislation that has been enacted in California, the District of Columbia, Illinois, Maine, New York, Oregon, and Virginia. These states have regulated pesticides in various ways. For example, the District of Columbia limits the application of certain pesticides at schools and day care centers, near waterways, and on district property. Illinois requires licensed day care centers to ensure that pesticide products will not be applied to their grounds when children are present. Maine required the Board of Pesticides Control to develop best management practices for establishing and maintaining school lawns, playgrounds, and playing fields. New York (1) prohibits the use of certain pesticides for commercial lawn application and at certain locations including schools and day care centers. Virginia requires the (1) Department of Education to make information on IPM programs available to school boards and (2) state Cooperative Extension Service, in cooperation with the Pesticide Control Board, to develop guidelines for IPM.

For related information, please see the following OLR Reports:

1. [2012-R-0206](#), Pesticide Use Permits in States Surrounding Long Island Sound;
2. [2012-R-0343](#), Pesticide Application at Day Care Centers;
3. [2012-R-0376](#), Pesticide Application at Schools; and
4. [2010-R-0371](#), Roundup and Pesticide Notification Requirements.

## **INTRODUCTION**

### ***State Law***

The Connecticut Pesticide Control Act is the primary state law regulating pesticides (CGS § 22a-46 et seq.). The law defines a pesticide as any substance or mixture of substances intended (1) to prevent, destroy, repel, or mitigate any pest or (2) for use as a plant regulator, defoliant, or desiccant (i.e., those that affect the speed of plant growth,

makes it drop its leaves, or dry it out, respectively) (CGS § 22a-47). Though often misunderstood to refer only to insecticides, the term pesticide also includes herbicides, fungicides, and other substances used to control pests.

Among other things, Connecticut's law requires:

1. pesticides to be registered with the Department of Energy and Environmental Protection (DEEP), which must classify them as acceptable for general use or for restricted use (CGS § [22a-48](#));
2. pesticide applicators to obtain permits or licenses from DEEP (CGS § [22a-54](#)); and
3. pesticide distributors and pesticide application businesses to register with DEEP (CGS §§ [22a-56](#) and [22a-66b](#), respectively).

The law also restricts the application of pesticides at schools and day care centers (CGS §§ [10-231a](#) et seq. and [19a-79a](#), respectively) and establishes notification requirements when pesticides are applied (CGS § [22a-66a](#)).

### ***Federal Law***

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) is the primary federal law regulating pesticides (7 U.S.C § 135 et seq.). Under FIFRA, there are two classifications of pesticides – general-use and restricted-use. Anyone may purchase and use general-use pesticides but only a certified applicator may purchase a restricted-use pesticide. Restricted-use pesticides must be used by a certified applicator or someone under his or her supervision.

Under FIFRA, pesticides must be registered with EPA for specific uses before they can be manufactured, transported, or sold. There are separate registration processes for (1) conventional pesticides, which typically contain synthetic chemicals used predominantly to kill insects, weeds, and fungi; (2) biopesticides, and (3) antimicrobial pesticides. Biopesticides include (1) naturally occurring substances and microorganisms that control pests and (2) pesticides produced by genetically modified plants. Antimicrobial pesticides are used to destroy or suppress the growth of harmful microbiological organisms, and include pesticides that protect inanimate objects and surfaces from organisms such as bacteria, viruses, or fungi.

EPA's decision whether to register a pesticide is based on a risk/benefit analysis. EPA weighs the benefits from allowing a pesticide to be used (e.g., protection of crops or human health) against the risks the pesticide poses to people and the environment.

## **INTEGRATED PEST MANAGEMENT DEFINITIONS**

### ***State Definitions***

For purposes of the Connecticut Pesticide Control Act, the law defines IPM as the use of all available pest control techniques, including judicious use of pesticides when warranted, to maintain a pest population at or below an acceptable level, while decreasing the unnecessary use of pesticides (CGS § [22a-47](#)). The same definition is used in CGS § [10-231a](#) et seq. with regard to applications of pesticide applications at schools. In the context of farming, the law defines IPM somewhat differently and identifies IPM, in this context, as a comprehensive strategy of pest control whose major objective is to maintain high crop quality with a minimum use of pesticides (CGS § [22-11a](#)). It specifies IPM techniques to include pest trapping, use of pest-resistant crop varieties, increased use of biological controls, cultural controls, and judicious use of certain pesticides, among other things.

The laws in other states that are described below are broadly similar to those in Connecticut.

### ***Federal Definitions***

At the federal level, EPA defines IPM as “the coordinated use of pest and environmental information with available pest control methods to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to people, property, and the environment.” IPM takes advantage of all appropriate pest management options including the judicious use of synthetic pesticides.

The [U.S. Department of Agriculture](#) defines IPM as the implementation of diverse methods of pest controls, paired with monitoring to reduce unnecessary pesticide applications. In IPM, pesticides are used with other crop management approaches to minimize the effects of pests while supporting a profitable system that has negligible negative effects.

There is no national certification for growers or other users of IPM. EPA notes that IPM is not a single pest control method, but instead a series of pest management evaluations, decisions, and controls. According to EPA, people typically take four steps in implementing IPM. These are:

1. Setting a point at which pest populations or environmental conditions indicate that pest control action must be taken.
2. Monitoring for pests and identifying them accurately to avoid using pesticides when they are not really needed or using the wrong kind of pesticide.
3. Managing the crop, lawn, or indoor space to prevent pests from becoming a threat. These steps may include rotating between different crops, selecting pest-resistant varieties, and planting pest-free rootstock.
4. First using effective but less risky methods to control pests. These include highly targeted chemicals, such as pheromones to disrupt pest mating, or mechanical controls, such as trapping or weeding. If further monitoring, identifications, and action thresholds indicate that these methods are not working, additional pest control methods, such as targeted spraying of pesticides, would be employed. Broadcast spraying of non-specific pesticides is used as a last resort method of pest control.

## **SCIENCE**

### ***Data Sources***

There has been an enormous amount of scientific research on pesticides. For example, the on-line [library](#) of the California Department of Pesticide Regulation (DPR) includes nearly a quarter million studies. These studies cover such things as the acute and chronic toxicity of pesticides for humans and their toxicity for fish and wildlife.

A pesticide must undergo a lengthy scientific review before EPA registers it. In its review, EPA assesses the hazards that a pesticide may pose to human health and the environment. The review addresses acute, chronic, and ecological toxicity on multiple species. Depending on the class of pesticide and the priority assigned to it, the review process can take several years, although biopesticides and reduced-risk conventional pesticides can sometimes complete the process in as little as a year. During this review, EPA studies, among other things, the pesticide's

chemistry, its fate (how it breaks down in the environment), its environmental effects, and its health effects, including its effect on the human endocrine system.

An EPA [website](#), describes the science behind pesticide regulation. Among other things, it describes:

1. types of pesticides;
2. EPA's environmental chemistry, residue analysis, and microbial testing methods; and
3. its toxicity and exposure models.

Until 2010, Cornell University maintained a [database](#) of cancer risk information on 114 active ingredients found in 3,233 pesticide products then registered for use on turf and lawns in New York. While none of the products or ingredients were considered known cancer risks at that time, 252 products and 19 ingredients were considered probable or likely human carcinogens. Information in the database is still accessible, but has not been updated since March 31, 2010. Among the information that users can access is a pesticide's:

1. type (e.g., insecticide or herbicide);
2. formulation (e.g., liquid or powder);
3. registration status;
4. general or restricted use designation; and
5. toxicity to non-target organisms.

Additionally, the Bio-Integral Research Center, a non-profit organization, has published the *IPM Practitioner's 2013 Directory of Least-Toxic Pest Control Products*. The [directory](#) contains more than 2,000 products produced by more than 600 suppliers.

## ***Uncertainties and Differences in Regulatory Treatment***

In spite of the scope of research completed to date, there are uncertainties regarding the risks pesticides and the products they break into pose to humans and the environment. In addition, despite extensive data from regulatory testing on how pesticides degrade, it remains difficult to anticipate the extent and pathways of pesticide degradation under specific conditions in the environment.

These uncertainties have led different jurisdictions to handle the same pesticide in different ways. For example, the Canadian provinces of Ontario and Quebec, as well as Sweden, Denmark, and Norway have severely restricted use of 2,4-D (2,4-Dichlorophenoxyacetic acid), which is widely used to control weeds in lawns. In Ontario, the provincial government banned using 2,4-D and certain other pesticides to control weeds and insects for “purely cosmetic” reasons. According to the Ministry of Environment’s [website](#), the ban was imposed based on testimony from the Canadian Cancer Society and other medical experts, who made a convincing case for reducing exposure to pesticides, particularly for children who are generally more susceptible to their potentially toxic effects. In contrast, in 2012 EPA denied the Natural Resources Defense Council’s petition to revoke all tolerances and to cancel all registrations of 2,4-D, which is very widely used to control weeds in grass. EPA stated that its comprehensive review confirmed its previous finding that the 2,4-D tolerances are safe. In 2013, Canada’s Pest Management Regulatory Agency came to a similar decision.

In January 2013, the European Food Safety Authority published a study on three commonly used neonicotinoid pesticides. These pesticides are nicotine-like chemicals that affect the nervous systems of insects. While they pose less threat to mammals than many older sprays, the authority found that they pose an “acute risk” to honey bees, which are pollinators that are essential to farming and natural ecosystems. The study recommended that none of these pesticides be used on crops that attract honey bees, including corn. In April 2013, the European Commission (the European Union’s executive body) imposed a 2-year moratorium on the application of these pesticides to these crops. In July 2013, the commission added a related pesticide to the ban. In contrast, the United States permits the use of these pesticides.

## ***Recent Studies on Pesticides***

An [article](#) in the August 16, 2013 issue of *Science* notes that decades of epidemiological studies have suggested that pesticide exposure is connected to the development of Parkinson’s disease, which has been

supported by a recent meta-analysis that combined the data of earlier studies. But the article cautions that there is still much that is not clear about this relationship. The disorder probably has multiple contributing genetic and environmental factors. It is not known how exposure to a particular chemical leads to loss of neurons and the symptoms of the disease.

Another [article](#) in the same issue of *Science* describes three studies that are tracking the long-term consequences on the brain of pesticide exposure during pregnancy and early childhood. The studies are finding IQ deficits and attention deficit-hyperactivity disorder behavioral problems, as well as some evidence that pesticides may interfere with normal sexual development.

The March 13, 2013 edition of *Environmental Science and Technology* includes a [study](#) of exposure to 19 pesticides among children in 20 families in Boston's public housing. It found pesticides in all of the homes, along with indications such as sighting of live pests or pest debris, that traditional pesticides were not effective. The authors argue that their findings, as well as other recent studies conducted in low-income public housing, child care centers, and randomly selected homes in the United States, emphasize the need for alternative pest management programs, such as IPM. According to the article, IPM in multi-family housing focuses on eliminating the cause of pest infestations by minimizing access to food, water, and hiding places, and sealing cracks and other openings in walls to prevent entry of pests.

An article in the September 20, 2013 edition of [Scientific American](#) illustrates the persistence of pesticides. Even though the United States banned the use of DDT (dichlorodiphenyltrichloroethane) in 1972, recent research conducted in northern California found that condor eggs there were 34% thinner than those laid at the same time in southern California, where condors had also been reintroduced. The researchers linked the thinness and malformations of the eggs to DDT and the compound DDE (dichlorodiphenyldichloroethylene), which is formed when the pesticide breaks down.

In November 2012, the Weed Science Society of America, the American Phytopathological Society, and the Plant-Insect Ecosystems section of the Entomological Society of America issued a joint [statement](#) on IPM. (The second group is an organization of scientists who study plant pathology.) While supportive of IPM, they expressed skepticism on the concept of using the "least toxic pesticides" as a "last resort."



The statement notes the phrase "least toxic" implies there are pesticides available for each type of pest that are least toxic to everything else. The statement instead argues that (1) different types of pesticides may affect different persons or organisms (e.g. applicators, farmworkers, livestock, wildlife, pets, beneficial insects, or crops) differently and (2) a pesticide's toxicity depends on whether it is being evaluated in short- or long-term. It notes that toxicity differs from risk, which depends on both toxicity and exposure. A pesticide's toxicity rating does not necessarily equate to actual risk when it is properly applied. For example, the label of a pesticide that may cause skin irritation will also contain requirements for personal protective equipment that safeguards the skin.

Similarly, the joint statement asserts that "last resort" implies that pesticides will work as well when every non-chemical control technique is attempted first. However, delaying application of a pesticide can cause buildup of the pests in crops, gardens, buildings, and other sites, harming health or such things as crop yields. The statement argues that delaying the use of pesticides can significantly increase the ecological and economic damage to crop and non-crop areas.

The three organizations state that pesticides should only be used when needed, when risks to non-target organisms and habitats have been carefully considered, and when diligent attention is given to following all label directions and applicable laws.

## **RECENT LEGISLATION IN OTHER STATES**

### ***California***

Before a pesticide can be possessed, sold, or used in California, it must be registered with the [Department of Pesticide Regulation](#) (DPR). Prior to registration, DPR's scientific staff reviews each product to ensure that it meets stringent standards, as prescribed in the state's Food and Agricultural Code and regulations governing pesticides in the state. Reviews of data include, but are not limited to, potential human health effects, environmental fate, and the chemical properties of the product, intended use patterns, and efficacy.

In 2013, the legislature adopted [Act 584](#), which requires that DPR's determination regarding control measures for each pesticide and any formal comments made by agencies it consults with be made public. It requires that DPR determine the need for control measures and the scope of these measures for each pesticide that is identified as a toxic air contaminant after a risk assessment. It also requires (1) that related comments be made publicly available and (2) the adoption of human health measures.

### ***District of Colombia***

[DC 2012 Act No. 191](#) requires the district's Department of the Environment (DDOE) to create and maintain lists of pesticides the district classifies as district restricted-use or non-essential.

DDOE must, through regulations, designate as district restricted-use any pesticide that (1) when used as directed or in accordance with commonly recognized practice requires additional restrictions to prevent a hazard to human health, the environment, or property or (2) DDOE determines presents a significant, scientifically sound basis justifying that classification. The act allows DDOE to restrict such pesticides at schools, day care centers and other facilities used by children, property within 25 feet of a waterbody, or district property. A person can apply to use an EPA- or district-restricted-use pesticide otherwise prohibited by the act based on a need to protect health, the environment, or property.

DDOE must, through regulations, designate a pesticide as non-essential if it is not critical to pest management in the district. DDOE must presume that a pesticide should not be classified this way if it is primarily intended to promote public health or safety or for certain other uses. The act generally bars the application of non-essential pesticides to the types of property listed above. But a person may apply for an exemption to use a non-essential pesticide on these properties. DDOE may grant an exemption if the applicant demonstrates that (1) effective alternatives are unavailable, (2) providing a waiver will not violate district or federal law, and (3) use of the non-essential pesticide is critical and necessary to protect human health or prevent imminent and significant economic damage.

The act also requires the University of the District of Columbia to:

1. provide courses on IPM, at least once per month district-wide and at least once per year in each of the district's eight wards;

2. develop a course on IPM specifically for pesticide applicators, which must be offered at least once every 90 days; and
3. prepare annual reports for the district's council assessing the effectiveness of its pesticide programs.

## ***Illinois***

[2009 Act No. 424](#) requires school districts in Illinois to adopt a procedure to comply with the state's Lawn Care Products Application and Notice Act and the Structural Pest Control Act. It requires licensed day care centers to ensure that products will not be applied to their grounds when children are present. And it requires day care center owners and operators to (1) maintain a registry of parents and guardians of children in his or her care who have registered to receive written notification before a pesticide is applied to day care center grounds and notify persons on that registry before applying pesticides or having pesticide applied to the grounds or (2) provide written or telephone notice to all parents and guardians before applying pesticide or having pesticide applied to the grounds.

The act also requires applicators applying pesticides to lawns to provide the customer with (1) the brand name and common name of each lawn care product applied rather than just one of these names and (2) the scientific name as well. It requires commercial lawn care applicators, at the request of a customer or any person whose property abuts or is adjacent to the customer's property, to provide a copy of the material safety data sheet and approved pesticide registration label for each applied lawn care product.

## ***Maine***

Maine law establishes a state policy to find ways to use the minimum amount of pesticides needed to effectively control targeted pests in all areas of application ([Me. Rev. Stat. Ann. 22 §1471-X](#)). The state agencies involved in the regulation or use of pesticides must promote the principles and the implementation of IPM and other science-based technology to minimize reliance on pesticides while recognizing that outbreaks of disease, insects and other pests will require fluctuations in pesticide use. The agencies, in cooperation with private interest groups, must work to educate pesticide users and the public on the proper use of pesticides and to determine other actions needed to accomplish the state policy.

In 2009, the legislature amended a proposed Board of Pesticides Control regulation regarding standards for outdoor application of pesticides in order to minimize drift ([2009 Me. Laws Resolve 114](#)). The board had proposed that there be prima facie evidence that pesticides were not applied in a way to minimize pesticide drift if detectable pesticide residue was found in a sensitive area that was likely to be occupied. Instead, the legislature invoked this presumption if the pesticide residues were 1% or more of the intended residue in the target area. The legislature also removed specific distances for buffer zones, allowing site-specific buffer zones to be used.

2011 Act No. 332 repeals the laws requiring the development and maintenance of a registry of the properties of residents, lessees, and property owners who request advance notification of outdoor applications of pesticides. Instead, it directs the Board of Pesticides Control to establish a distance from an aerial application of pesticides within which a person is entitled to receive notification of the application.

In 2011, Maine adopted [Act No. 59](#), which directs the Board of Pesticides Control to develop best management practices for establishing and maintaining school lawns, playgrounds, and playing fields. It requires the board to assess compliance with standards for pesticide applications and public notification in schools.

[2013 Act No. 63](#) requires the education commissioner to collaborate with the Board of Pesticides Control to develop standards and guidelines for school grounds construction that would minimize or avoid the need to use of pesticides on school grounds for new construction. The commissioner and the board's director must report on their recommendations to the Education and Cultural Affairs and Agriculture, Conservation and Forestry committees by March 15, 2014.

[2013 Act No. 13](#) directs the Department of Agriculture, Conservation and Forestry to develop a plan to protect the public health from mosquito-borne diseases by considering the ecological and economic impacts of proposed methods of controlling mosquitoes and preventing their breeding. The plan must use IPM techniques and other science-based technology that minimizes the risk of pesticide use to humans and the environment. It also must establish lines of authority and responsibilities during a public health threat.

Additionally, Maine law requires the University of Maine Cooperative Extension to develop and implement IPM pest management programs ([2013 Me. ch. 290](#)). The extension can seek the advice of the Integrated Pest Management Council in doing so.

## ***New York***

New York law prohibits the use of certain pesticides, characterized by various toxic properties, for commercial lawn application and at certain locations, including schools and day care centers ([NYS Law Chapter 85, Laws of 2010](#)). It also prohibits state or local agencies and school districts from using these pesticides for turf pest control or ornamental purposes.

The law only allows the following pesticide products to be used at schools and daycare centers:

1. antimicrobials,
2. insecticides used to protect individuals from an imminent threat of a stinging or biting insect that are packaged in aerosol cans of 18 ounces or smaller,
3. non-volatile insect and rodent baits in tamper resistant containers,
4. products containing boric acid or disodium octaborate tetrahydrate,
5. horticultural oils and soaps that do not contain synthetic pesticides or synergists, and
6. minimum-risk pesticides as designated by EPA.

The law provides for exemptions if an emergency pesticide application is needed. These exemptions must be approved by the appropriate entity (county health department, the state department of Health or Environmental Conservation, or a local school board).

In addition, New York law requires commercial applicators to provide notice, pursuant to existing regulations, to residents of multiple family dwellings before applying pesticides on the premises ([NYS Law Chapter 324, Laws of 2010](#)). It also requires the building's owner to provide written notice to its residents.

New York law requires that lawn care companies provide information to a property owner pertaining to the pesticides scheduled to be applied to his or her lawn prior to any commercial application. The information includes a list of substances to be applied, including their active ingredients, company information, and the applicator's license number.

The law permits owners or their agents to decide if information should be in written, digital, or electronic format (NYS Laws [Chapter 526, Laws of 2011](#)). It requires that the applicator have a written copy of the information in their possession, including warnings labeled on the pesticides.

Lastly, the law authorizes the Department of Environmental Conservation to adopt regulations on the use of “minimum risk pesticides,” as defined by federal law (NYS Laws [Chapter 305, Laws of 2012](#)). The regulations may include the appropriate method and setting for using these but must encompass all factors needed to prevent damage or injury to health, property, and wildlife.

### ***Oregon***

[OR 2009 Act No. 501](#) requires schools to adopt IPM plans, specifies certain requirements for IPM plans, provides for the state Department of Agriculture enforcement, and makes public pesticide applicator license requirements applicable to pesticide applications at school campuses.

In 2013, Oregon passed [Act No. 289](#), which expands the list of state agencies and public universities required to adopt IPM practices and provide notice regarding pesticide applications. It also establishes the Interagency Integrated Pest Management Coordinating Committee consisting of state agencies and public universities required to implement IPM practices.

### ***Virginia***

[VA 2009 Act No. 440](#) directs the Department of Education to make information available to school boards on IPM programs that address the application of chemical pesticides and other pest control measures on school property. It requires the state Cooperative Extension Service, in cooperation with the Pesticide Control Board, to develop guidelines for IPM.

[VA 2009 Act No. 663](#) requires a landlord to give the same notice to the tenant for the application of insecticides as is required for other pesticide applications. It requires the tenant to (1) prepare the dwelling unit for the application of insecticides or pesticides in accordance with the landlord’s written instructions and (2) to follow any written instructions of the landlord to eliminate any insects or pests that are found following the application of insecticides or pesticides.

[VA 2011 Act No. 264](#) requires condominium associations to post notice of all pesticide applications in or upon all common areas at least 48 hours prior to the application.

## HYPERLINKS

(Last visited December 2, 2013)

EPA pesticides science website:

<http://www2.epa.gov/science-and-technology/pesticides-science>

U.S. Department of Agriculture IPM site:

[www.csrees.usda.gov/nea/pest/pest.cfm](http://www.csrees.usda.gov/nea/pest/pest.cfm)

*IPM Practitioner's 2013 Directory of Least-Toxic Pest Control Products*

<http://www.birc.org/Directory.htm>

Cornell University pesticide database

<http://envirocancer.cornell.edu/turf/dbOverview.cfm>

Ontario Ministry of Environment pesticide website

<http://www.ene.gov.on.ca/environment/en/category/pesticides/index.htm>

Study on relationship between pesticides and Parkinson's disease:

<http://www.sciencemag.org/content/341/6147/722.summary>

Studies on links between pesticide exposure during pregnancy and the early years of life on the brain:

<http://www.sciencemag.org/content/341/6147/740.summary>

Study of pesticide effectiveness in Boston public housing:

<http://pubs.acs.org/doi/abs/10.1021/es303912n>

Article on persistence of DDT:

<http://blogs.scientificamerican.com/extinction-countdown/2013/09/20/banned-pesticide-ddt-is-still-killing-california-condors/>

Joint statement on use of "least toxic" pesticides:

<http://entsoc.org/press-releases/issues-associated-least-toxic-pesticides-applied-last-resort>

California Department of Pesticide Regulation:

<http://www.cdpr.ca.gov/>

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