
Appendix A

Answers to Review Questions

Chapter 1. Introduction to Regulatory Pest Management

- (1) To prevent the introduction and/or spread of pests through the application of various pest management techniques.
- (2) D.
- (3) Any organism that is introduced to a new, non-native location, and is likely to cause economic or environmental harm or harm to human health.
- (4) D.
- (5) The introduction must be into an area with a suitable environment, suitable host, and include viable pests in sufficient numbers to allow for reproduction and spread.
- (6) Knowledge of the pest's life cycle helps identify the critical life stages at which control measures can be developed that will have a significant impact on reducing the population.

Chapter 2. Elements of a Regulatory Program

- (1) The goal is to prevent the introduction, colonization, and establishment of pests that would cause significant agricultural, environmental, and/or societal harm in an area where the pest does not already occur.
- (2) You must determine if the costs associated with preventing the probable level of harm are worth the benefits.
- (3) C. (4) B. (5) A. (6) A. (7) B. (8) C.
- (9) The use of pesticides.
The release of parasites or predators.

The release of sterile mates.

The removal of the host.

The use of varieties that are resistant to the pest.

- (10) The pest must be identified correctly to know which strategies will work best to prevent or control the pest; keeping accurate records is essential for making valid and meaningful pest pathway studies, risk analyses, and quarantine evaluations.
- (11) The public must know what quarantine restrictions exist and why they exist in order to be motivated to comply with them and to support funding for them.

Chapter 3. Laws and Regulations

- (1) Plants, plant products, biological control organisms, noxious weeds, articles being imported, entered, exported, or moved interstate must:
 - Be accompanied by a permit issued prior to the importation, entry, exportation, or movement in interstate commerce.
 - Be accompanied by a certificate of inspection by appropriate officials of the country or state from which the plant, plant product, biological control organism, noxious weed, or article is to be moved.
 - Be subject to remedial measures to prevent the spread of plant pests or noxious weed.
 - Be grown or handled under post-entry quarantine conditions to determine whether the plant or biological control organism may be infested with plant pests or may be a plant pest or noxious weed.

- (2) True.
- (3) False. Michigan has authority to enact state quarantines through Public Act 189, the Insect Pest and Plant Disease Act.
- (4) Exterior quarantines are designed to restrict movement of pests into Michigan; interior quarantines regulate the movement of pests within the state.
- (5) The state or federal phytosanitary certificate may be required when shipping agricultural products from the United States to a foreign country or from Michigan to another state, or when attempting to bring certain agricultural products into the United States or into Michigan from other areas.
- (6) State or federal inspectors may be required to verify that certain pest control treatments have occurred before these shipping documents can be issued.
- (7) To help reduce the incidence of diseases that are difficult to detect, such as plant viruses, when importing plants from a foreign country to the U.S.
- (8) A.
- (9) False. The MDA conducts surveys for pests not known to occur in the state when there is a serious threat or potential for infestation.
- (10) Supplemental labeling is additional information that is considered part of the pesticide label. It may be supplied at the time of purchase or requested from the pesticide dealer. Supplemental labels may include Special Local Needs labels (24c), Emergency Exemption labels (Section 18) as well as additional use information issued by the pesticide manufacturer. If an applicator applies a pesticide according to a supplemental label, a copy of the supplemental label must be in the applicator's possession at the time of application.
- (11) APHIS manuals, 24 (c) registrations, or Section 18 labels.

Chapter 4. Using Pesticides in Regulatory Programs

- (1) C.
- (2) Biological controls, elimination of the pest's food source or habitat, creation of a buffer zone.
- (3) A.
- (4) Point-source-pollution comes from a specific source or location; non-point source comes from a generalized area or weather event.
- (5) Any five of the following:
 - Use integrated pest management.
 - Consider the geology of your area when locating wells, mix/load sites or equipment washing sites.
 - Be aware of the water table depth and how fast water moves through the geological layers between the soil surface and the groundwater.
 - Select pesticides carefully.
 - Be aware of pesticides that are very water-soluble.
 - Read pesticide labels carefully,
 - Follow pesticide label directions.
 - Calibrate accurately.
 - Measure accurately.
 - Avoid back-siphoning.
 - Consider weather conditions.
 - Mix on an impervious pad.
 - Dispose of wastes and containers properly.
 - Store pesticides safely and away from water sources.
- (6) B. (7) D. (8) A.
- (9) Cross-resistance occurs when pests that are resistant to one pesticide show resistance to chemically related pesticides.
- (10) Use integrated pest management.
 - Use pesticides from different chemical families with different modes of action.

Use pesticides only when needed, and use only as much as necessary to effectively maintain control.

- (11) A. True.
- (12) A map of all areas where pesticide applications occur.

A list of pesticide-sensitive sites located near an application area.

Pesticide label and mandated restrictions that relate to setback provisions from sensitive areas.

Information for persons in sensitive areas regarding the type of pesticide used, the method of application, and the applicator's plan to minimize pesticide drift.

- (13) B.
- (14) The name, address, and phone number of the application firm or individual.
The brand name and active ingredient(s) of the pesticide(s) used.
The method of application.
The scheduled date(s) of application.
The name, address, and phone number of a contact person who is responsible for supplying updated information concerning the application for those people who request it.
Any re-entry restrictions.

- (15) C.

Chapter 5. Pests of Concern

- (1) C.
- (2) Because certain stages of particular insect's life cycle are more susceptible to control measures.
- (3) B. (4) A. (5) A. (6) C. (7) D. (8) B. (9) E. (10) B. (11) D. (12) C. (13) D. (14) C. (15) E. (16) C. (17) A. (18) A. (19) B. (20) C. (21) B. (22) A. (23) C. (24) B.
- (25) Host, pathogen, and environment. By changing any corner of the disease triangle, such as adding an unfavorable environment or using a disease-resistant variety, you can reduce disease development.
- (26) 1. Production of inoculum.
2. Spread of inoculum.
3. Infection.
- (27) C. (28) A. (29) A. (30) C. (31) B. (32) B. (33) B. (34) B. (35) C. (36) D. (37) A. (38) C. (39) D. (40) A.

Appendix B

Conversion Tables

Area

144 square inches	1 square foot
9 square feet	1 square yard
43,560 square feet	1 acre
4,840 square yards	1 acre
160 square rods	1 acre
640 acres	1 square mile
2.5 acres	1 hectare

Length

1 inch	2.54 centimeters	5.5 millimeters	
1 foot		12 inches	
1 yard		3 feet	
1 rod	5.5 yards	16.5 feet	
1 mile	320 rods	1,760 yards	5,280 feet
1 meter	39.4 inches	1.09 yards	
1 kilometer	1,000 meters	0.62 mile	

Volume

1 tablespoon (tbs or T)	3 teaspoons (tsp or t)	
1 fluid ounce	2 tablespoons	
8 fluid ounces	16 tablespoons	1 cup
16 fluid ounces	2 cups	1 pint
32 fluid ounces	4 cups	1 quart
128 fluid ounces	4 quarts	1 gallon
1 liter	33.9 ounces	1.06 quarts

Weight

1 ounce	28.3 grams	
1 pound	16 ounces	453.6 grams
2.2 pounds	1 kilogram	1,000 grams
1 ton	2,000 pounds	907 kilograms
1 metric ton	1,000 kilograms	2,205 pounds

Appendix C

Selected Bibliography

Internet Reference Sites

PestTracker (Joint site by NAPIS, USDA APHIS, USDA PPQ and CAPS):

[<http://ceris.purdue.edu/napis/index.html>]

Invasivespeciesinfo.gov:

[<http://www.invasivespeciesinfo.gov>]

The National Plant Board:

[<http://www.aphis.usda.gov/npb>]

Invasive Species Initiative:

[<http://www.invasivespecies.msu.edu>]

Invasive Species Images:

[<http://www.invasive.org>]

Michigan Department of Agriculture:

[<http://www.michigan.gov/mda>]

Michigan State University Integrated Pest Management Program:

[<http://www.msue.msu.edu/ipm>]

Michigan State University Pesticide Education Program: [<http://www.pested.msu.edu/>]

National Pesticide Information Center:

[<http://ace.orst.edu/info/npic/tech.htm>]

The Extension Toxicology Network:

[<http://ace.orst.edu/info/extoxnet/>]

Environmental Protection Agency (EPA):

[<http://www.epa.gov/>]

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Appendix D

Glossary of Terms for Regulatory Pest Management

ABDOMINAL PROLEGS — The false, peglike legs on the abdomen of a caterpillar.

ABSORPTION — The movement of a chemical into plants, animals (including humans) and/or microorganisms.

ACARICIDE — A pesticide used to control mites and ticks. Amiticide is an acaricide.

ACTION THRESHOLD — See *economic threshold*

ACTIVE INGREDIENT — The chemical or chemicals in a pesticide responsible for killing, poisoning, or repelling the pest. Listed separately in the ingredient statement.

ACUTE TOXICITY — The capacity of a pesticide to cause injury within 24 hours following exposure. LD₅₀ and LC₅₀ are common indicators of the degree of acute toxicity. (See also *chronic toxicity*.)

ADJUVANT — A substance added to a pesticide to improve its effectiveness or safety. Same as additive. Examples: penetrants, spreader-stickers and wetting agents.

ADSORPTION — The process by which chemicals are held or bound to a surface by physical or chemical attraction. Clay and high organic soils tend to adsorb pesticides.

AEROSOL — A material stored in a container under pressure. Fine droplets are produced when the material dissolved in a liquid carrier is released into the air from the pressurized container.

AGGREGATION PHEROMONE — See *pheromone*.

ALLELOPATHY — When one plant species releases toxic chemicals that eliminate a competing species.

ANAL PROLEGS — The false, peglike legs near the anus of a caterpillar.

ANNUAL — A plant that completes its life cycle in one year.

ANTIBIOSIS — A relationship between two or more organisms that negatively affects one of the organisms involved (example: plant characteristics that affect insect behavior).

ANTIDOTE — A treatment used to counteract the effects of pesticide poisoning or some other poison in the body.

ANTI-SIPHONING DEVICE — A device attached to the filling hose that prevents backflow or back-siphoning from a spray tank into a water source.

ARACHNID — A wingless arthropod with two body regions and four pairs of jointed legs. Spiders, ticks and mites are in the class Arachnida.

ARTHROPOD — An invertebrate animal characterized by a jointed body and limbs and usually a hard body covering that is molted at intervals. For example, insects, mites and crayfish are in the phylum Arthropoda.

ARTIFICIAL SPREAD — The movement of pests by people via aircraft, buses, ships, trains, trucks and automobiles.

ATTRACTANT — A substance or device that will lure pests to a trap or poison bait.

AUGMENTATION — A periodic release of natural enemies to increase the present population; a method of biological control.

AVICIDE — A pesticide used to kill or repel birds. Birds are in the class Aves.

BACK-SIPHONING — The movement of a liquid pesticide mixture back through the filling hose and into the water source.

BACTERICIDE — Chemical used to control bacteria.

BACTERIUM (plural BACTERIA) — Microscopic onecelled organisms, some of which are capable of producing diseases in plants and animals. Others are beneficial.

BAIT — A food or other substance used to attract a pest to a pesticide or to a trap.

BAND APPLICATION — The application of a pesticide in a strip or band of a certain width.

BARRIER APPLICATION — Application of a pesticide in a strip alongside or around a structure, a portion of a structure or any object.

BENEFICIAL INSECT — An insect that is useful or helpful to humans; usually insect parasites, predators, pollinators, etc.

BIENNIAL — A plant that requires two growing seasons to complete its life cycle.

BIOLOGICAL CONTROL — Control of pests using predators, parasites and disease-causing organisms. May be naturally occurring or introduced.

BIOMAGNIFICATION — The process whereby one organism accumulates chemical residues in higher concentrations from organisms it consumes.

BOTANICAL PESTICIDE — A pesticide produced from chemicals found in plants. Examples are nicotine, pyrethrins and strychnine.

BRAND NAME — The name or designation of a specific pesticide product or device made by a manufacturer or formulator; a marketing name.

BROADCAST APPLICATION — A uniform pesticide application to a field or site.

CALIBRATE, CALIBRATION OF EQUIPMENT OR APPLICATION METHOD — The measurement of dispersal or output and adjustments made to control the rate of dispersal of pesticides.

CANKER — A diseased or necrotic area on a plant part, especially on a trunk, branch, or twig of a woody plant, usually caused by fungi or bacteria.

CARBAMATES (N-methyl carbamates) — A group of pesticides containing nitrogen, formulated as insecticides, fungicides and herbicides. The N-methyl carbamates are insecticides and inhibit *cholinesterase* in animals.

CARCINOGENIC — The ability of a substance or agent to induce malignant tumors (cancer).

CARRIER — An inert liquid, solid or gas added to an active ingredient to make a pesticide dispense effectively. A carrier is also the material, usually water or oil, used to dilute the formulated product for application.

CARRYOVER (HERBICIDE) — When a herbicide is not broken down during the season of application and persists in quantities large enough to injure succeeding crops.

CERTIFIED APPLICATORS — Individuals who are certified to use or supervise the use of any restricted-use pesticide covered by their certification.

CHEMICAL CONTROL — Pesticide application to kill pests.

CHEMICAL NAME — The scientific name of the active ingredient(s) found in the formulated product. This complex name is derived from the chemical structure of the active ingredient.

CHEMTREC — The Chemical Transportation Emergency Center has a toll-free number (800-424-9300) that provides 24-hour information for chemical emergencies such as a spill, leak, fire or accident.

CHLAMYDOSPORES — A thick-walled fungal spore that often serves as a “resting” spore.

CHLORINATED HYDROCARBON — A pesticide containing chlorine, carbon and hydrogen. Many are persistent in the environment. Examples: chlordane, DDT, methoxychlor. Few are used in structural pest management operations today.

CHLOROPHYLL — The green pigment in plant cells that enables the plant to convert sunlight into food.

CHOLINESTERASE, ACETYLCHOLINESTERASE — An enzyme in animals that helps regulate nerve impulses. This enzyme is depressed by N-methyl carbamate and organophosphate pesticides.

CHRONIC TOXICITY — The ability of a material to cause injury or illness (beyond 24 hours following exposure) from repeated, prolonged exposure to small amounts. (See also acute toxicity.)

CLASSES — See *taxonomy*.

COMMERCIAL APPLICATOR — A certified applicator who uses or supervises the use of any pesticide classified for restricted use for any purpose or on any property other than that producing an agricultural commodity.

COMMON NAME — A name given to a pesticide’s active ingredient by a recognized committee on pesticide nomenclature. Many pesticides are known by a number of trade or brand names, but each active ingredient has only one recognized common name.

COMMUNITY — The various populations of animal species (or plants) that exist together in an ecosystem. (See also *population* and *ecosystem*.)

CONCENTRATION — Refers to the amount of active ingredient in a given volume or weight of formulated product.

CONTACT PESTICIDE — A compound that kills or injures insects when it contacts them. It does not have to be ingested. Often used in reference to a spray applied directly on a pest.

CONTAMINATION — The presence of an unwanted substance (sometimes pesticides) in or on plants, animals, soil, water, air or structures.

COTYLEDONS — The first leaf or pair of leaves of a seedling.

CROSS-RESISTANCE — When a pest develops resistance to one type of pesticide and all other pesticides with a similar mode of action.

CULTIVAR — A plant variety that was created or maintained through cultivation (cultivated variety).

CULTURAL CONTROL — A pest control method that includes changing human habits — e.g., sanitation, work practices, cleaning and garbage pickup schedules, planting and harvest times, etc.

CURATIVE — The application of a control tactic after the pest has arrived.

CYST (NEMATODES) — The body of the dead adult female nematode of the genus *Heterodera* or *Globodera*, which may contain eggs.

DAMPING-OFF — A disease that destroys seedlings near the soil line, resulting in the seedlings falling over on the soil.

DECONTAMINATE — To remove or break down a pesticidal chemical from a surface or substance.

DEFOLIATION — The removal of leaves, often by insects or disease.

DEGRADATION — The process by which a chemical compound or pesticide is reduced to simpler compounds by the action of microorganisms, water, air, sunlight or other agents. Degradation products are usually, but not always, less toxic than the original compound.

DEPOSIT — The amount of pesticide on treated surfaces after application.

DERMAL TOXICITY — The ability of a pesticide to cause acute illness or injury to a human or animal when absorbed through the skin. (See *exposure route*.)

DESICCANT — A type of pesticide that draws moisture or fluids from a pest, causing it to die. Certain desiccant dusts destroy the waxy outer coating that holds moisture within an insect's body.

DETOXIFY — To render a pesticide's active ingredient or other poisonous chemical harmless.

DIAGNOSIS — The positive identification of a problem and its cause.

DILUENT — Any liquid, gas or solid material used to dilute or weaken a concentrated pesticide.

DISEASE — A disturbance of normal plant function; caused by bacteria, fungi, viruses or environmental conditions.

DISEASE CYCLE — The basic chain of events involved in disease development.

DISINFECTANT — A chemical or other agent that kills or inactivates disease-producing microorganisms; chemicals used to clean or surface-sterilize inanimate objects.

DOSE, DOSAGE — Quantity, amount or rate of pesticide applied to a given area or target.

DRIFT — The airborne movement of a pesticide spray or dust beyond the intended target area.

DRIFT MANAGEMENT PLAN — A written plan required of commercial and private applicators by Michigan Regulation 637 whenever there is a chance of a spray application drifting from the target onto nontarget and off-site sensitive areas.

DUST — A finely ground, dry pesticide formulation containing a small amount of active ingredient and a large amount of inert carrier or diluent such as clay or talc.

ECONOMIC DAMAGE — The amount of injury that will justify the cost of applied control measures.

ECONOMIC INJURY LEVEL (EIL) — The smallest pest population that will cause economic loss to the crop.

ECONOMIC THRESHOLD (ET, ACTION THRESHOLD) — The pest density at which a control tactic should be taken to prevent the pest population from increasing to the economic injury level.

ECOSYSTEM — The pest management unit. It includes a community (of *populations*) with the necessary physical and biotic (food, hosts) supporting factors that allow an infestation of pests to persist.

EMULSIFIABLE CONCENTRATE — A pesticide formulation produced by mixing or suspending the active ingredient (the concentrate) and an emulsifying agent in a suitable carrier. When these are added to water, a milky emulsion is formed.

EMULSIFYING AGENT (EMULSIFIER) — A chemical that aids in the suspension of one liquid in another. Normally the two would not mix together.

EMULSION — A mixture of two liquids that are not soluble in each other. One is suspended as very small droplets in the other with the aid of an emulsifying agent.

ENCAPSULATED FORMULATION — A pesticide formulation with the active ingredient enclosed in capsules of polyvinyl or other materials; principally used for slow release.

ENDANGERED SPECIES — A plant or animal species whose population is reduced to the extent that it is near extinction and a federal agency has designated it as being in danger of becoming extinct.

ENTRY INTERVAL — See *reentry interval*.

ENVIRONMENT — All of our physical, chemical and biological surroundings, such as climate, soil, water and air, and all species of plants, animals and microorganisms.

ENVIRONMENTAL PROTECTION AGENCY (EPA) — The federal agency responsible for ensuring the protection of humans and the environment from potentially adverse effects of pesticides.

EPA ESTABLISHMENT NUMBER — A number assigned to each pesticide production plant by the EPA. The number indicates the plant at which the pesticide product was produced and must appear on all labels of that product.

EPA REGISTRATION NUMBER — An identification number assigned to a pesticide product when the product is registered by the EPA for use. The number must appear on all labels for a particular product.

ERADICATION — The complete elimination of a (pest) population from a designated area.

EXOSKELETON — The external hardened covering or skeleton of an insect to which muscles are attached internally; it is periodically shed.

EXOTIC PEST — Any organism that is introduced to a new, non-native location, and is likely to cause economic or environmental harm or harm to human health.

EXTERIOR QUARANTINE — A quarantine imposed by a state government to prevent entry and establishment of pests into their state.

EXPOSURE ROUTE OR COMMON EXPOSURE ROUTE — The manner (dermal, oral or inhalation respiratory) by which a pesticide may enter an organism.

FAMILY — See *taxonomy*.

FEDERAL QUARANTINE — A quarantine imposed by the federal government.

FIFRA — The Federal Insecticide, Fungicide and Rodenticide Act; a federal law and its amendments that control pesticide registration and use.

FLOWABLE — A pesticide formulation in which a very finely ground solid particle is suspended (not dissolved) in a liquid carrier.

FORMULATION — The pesticide product as purchased, containing a mixture of one or more active ingredients, carriers (inert ingredients) and other additives that make it easy to store, dilute and apply.

FRASS — The excrement produced by insects.

FRUITING BODY — The part of a fungus that contains spores.

FUMIGANT — A pesticide formulation that volatilizes, forming a toxic vapor or gas that kills in the gaseous state. Usually, it penetrates voids to kill pests.

FUNGICIDE — A chemical used to control fungi.

FUNGUS (plural FUNGI) — A group of small, often microscopic, organisms in the plant kingdom that cause rot, mold and disease. Fungi need moisture or a damp environment (wood rots require at least 19 percent moisture). Fungi are extremely important in the diet of many insects.

GALLERIES — Tunnels created by insect feeding or excavating, generally found in wood.

GENERAL-USE (UNCLASSIFIED) PESTICIDE — A pesticide that can be purchased and used by the general public. (See also *restricted-use pesticide*.)

but remains immature.

GENUS — See *taxonomy*.

GEOGRAPHIC INFORMATION SYSTEM (GIS) — An organized collection of computer hardware, software, geographic data and personnel designed to capture, manipulate, analyze and display geographically referenced data.

GLOBAL POSITIONING SYSTEM (GPS) — A portable, satellite-based system that will establish the real-world location (position) of the GPS receiver.

GRANULE — A dry pesticide formulation. The active ingredient is either mixed with or coated onto an inert carrier to form a small, ready-to-use, low-concentrate particle that normally does not present a drift hazard. Pellets differ from granules only in their precise uniformity, larger size and shape.

GROUNDWATER — Water sources located beneath the soil surface from which springwater, well water, etc., are obtained. (See also *surface water*.)

HAZARD — See *risk*.

HERBICIDE — A pesticide used to kill plants or inhibit plant growth.

HOPPERBURN — A V-shaped yellow marking resulting from feeding of leafhoppers.

HOST — Any animal or plant on or in which another lives for nourishment, development or protection.

HOST RESISTANCE — The defense mechanism of an animal or plant against a pest; sometimes host plant resistance. (See *resistance*.)

HYPHA (plural HYPHAE) — A single, delicate threadlike structure of fungus.

IGR, INSECT GROWTH REGULATOR, JUVENOID — A pesticide constructed to mimic insect hormones that control molting and the development of some insect systems affecting the change from immature to adult. (See *juvenile hormone*.)

INCUBATION PERIOD — The time between first exposure to a pathogen and the appearance of the first symptoms.

INERT INGREDIENT — In a pesticide formulation, an inactive material without pesticidal activity.

INFECTIOUS DISEASE — The establishment of a pathogen with a host.

INFECTIOUS DISEASE — Disease caused by pathogens such as bacteria, viruses and fungi; can be spread from plant to plant.

INGREDIENT STATEMENT — The portion of the label on a pesticide container that gives the name and amount of each active ingredient and the total amount of inert ingredients in the formulation.

INHALATION — Taking a substance in through the lungs; breathing in. (See *exposure route*.)

INOCULUM — A pathogen source that can infect and cause disease.

INSECT GROWTH REGULATOR — See *IGR*.

INSECTICIDE — A pesticide used to manage or prevent damage caused by insects. Sometimes generalized to be synonymous with pesticide.

INSECTS, INSECTA — A class in the phylum Arthropoda characterized by a body composed of three segments (head, *thorax* and abdomen) and three pairs of legs.

INTEGRATED PEST MANAGEMENT — See *IPM*.

IPM — Integrated pest management. A planned pest control program in which various methods are integrated and used to keep pests from causing economic, health-related or aesthetic injury. IPM includes reducing pests to a tolerable level. Pesticide application is not the primary control method but is an element of IPM — as are cultural, mechanical and biological methods. IPM programs emphasize communication, monitoring, inspection and evaluation (keeping and using records).

INTERIOR QUARANTINE — A quarantine imposed by a state to restrict movement of pests within the state, usually from counties known to have the pest.

INVASIVE SPECIES — A species that is non-native in that ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

JUVENILE — The immature or larval stage of nematodes; commonly referred to as J1, J2, J3 and J4.

JUVENILE HORMONE — A hormone produced by an insect that inhibits change or molting. As long as juvenile hormone is present, the insect does not develop into an adult

LABEL — All printed material attached to or on a pesticide container.

LABELING — The pesticide product label and other accompanying materials that contain directions that pesticide users are legally required to follow.

LARVA (plural LARVAE) — An early developmental stage of insects with complete metamorphosis. Insects hatch out of eggs as larvae before becoming *pupae* (resting stage) and then adults.

LC50 — Lethal concentration. The concentration of a pesticide, usually in air or water, that kills 50 percent of a test population of animals. LC50 is usually expressed in parts per million

(ppm). The lower the LC₅₀ value, the more acutely toxic the chemical.

LD₅₀ — Lethal dose. The dose or amount of a pesticide that can kill 50 percent of the test animals when eaten or absorbed through the skin. LD₅₀ is expressed in milligrams of chemical per kilogram of body weight of the test animal (mg/kg). The lower the LD₅₀, the more acutely toxic the pesticide.

LEACHING — The movement of a substance with water downward through soil.

LIFE STAGE — In an insect life cycle an egg, larva, pupa, nymph or adult.

MESOTHORAX — The second segment of an insect's *thorax*. One pair of legs and usually one pair of wings are attached.

METABOLISM — A biochemical process that breaks a pesticide into other, often less toxic, compounds

METAMORPHOSIS — A change in the shape, or form, of an animal. Usually used when referring to insect development.

METATHORAX — The third segment of an insect's *thorax*. One pair of legs and often one pair of wings are attached.

MICROBIAL DEGRADATION — Breakdown of a chemical by microorganisms.

MICROBIAL PESTICIDE — Bacteria, viruses, fungi and other microorganisms used to control pests. Also called biorationals.

MICROORGANISM — An organism so small it can be seen only with the aid of a microscope.

MITICIDE — A pesticide used to control mites. (See *acaricide*.)

MODE OF ACTION — The way in which a pesticide exerts a toxic effect on the target plant or animal.

MOLLUSCICIDE — A chemical used to control snails and slugs.

MOLT — Periodic shedding of the outer layer (e.g., an insect's *exoskeleton* is shed periodically).

MONITORING — On-going surveillance. Monitoring includes inspection and record keeping. Monitoring records allows technicians to evaluate pest population suppression, identify infested or non-infested sites, and manage the progress of the management or control program.

MYCELIUM — A mass of hyphae; has a fuzzy appearance.

NECROSIS — Death of plant or animal tissues that results in the formation of discolored, sunken or necrotic (dead) areas.

NATURAL SPREAD — The movement that the pest is capable of without the assistance of people. This includes the movement by wind, water, birds and other wildlife.

NEMATOCIDE — A chemical used to control nematodes.

NEMATODE — A small, slender, colorless roundworm; nematodes live in soil and water or as parasites of plants or animals.

NON-INFECTIOUS DISEASE — Disease caused by non-living agents such as drought, soil compaction, temperature or moisture extremes, nutrient deficiency, etc.; cannot reproduce and spread.

NON-POINT SOURCE POLLUTION — Pollution from a generalized area or weather event.

NON-RESIDUAL PESTICIDE — Pesticides applied to obtain effects only during the time of treatment.

NON-TARGET ORGANISM — Any plant or animal other than the intended target(s) of a pesticide application.

NOZZLE FLOW RATE — The amount of material that passes through the nozzle for a specific amount of time; dependent on pressure and tip size.

NYPH — In insects with gradual metamorphosis, the developmental stage that hatches from the egg. Nymphs become adults.

ORAL TOXICITY — The ability of a pesticide to cause injury or acute illness when taken by mouth. One of the common exposure routes.

ORDER — See *taxonomy*.

ORGANOPHOSPHATES — A large group of pesticides that contain the element phosphorus and inhibit *cholinesterase* in animals.

PARASITE — A plant, animal or microorganism living in, on or with another living organism for the purpose of obtaining all or part of its food.

PARASITOID — An organism that lives during its development in or on the body of a single host organism, eventually killing it.

PATHOGEN — A disease-causing organism.

PERENNIAL — A plant that lives for more than two years.

PERSONAL PROTECTIVE EQUIPMENT (PPE) — Devices and clothing intended to protect a person from exposure to pesticides. Includes such items as longsleeved shirts, long trousers, coveralls, suitable hats, gloves, shoes, respirators and other safety items as needed.

PEST — An undesirable organism (plant, animal, bacterium, etc.); any organism that competes with people for food, feed or fiber, causes structural damage, is a public health concern, reduces aesthetic qualities, or impedes industrial or recreational activities.

PESTICIDE — A chemical or other agent used to kill, repel, or otherwise control pests or protect from a pest.

PETIOLE — The stalk of a leaf.

pH — A measure of the acidity/alkalinity of a liquid — below pH 7 is acid; above pH 7 (up to 14) is basic or alkaline.

PHEROMONE — A substance emitted by an animal to influence the behavior of other animals of the same species. Examples are sex pheromones (to attract mates) and aggregation pheromones (to keep members of the same species together in a group). Some pheromones are synthetically produced for use in insect traps.

PHOTODEGRADATION — Breakdown of chemicals by the action of light.

PHYSICAL CONTROL — Habitat alteration or changing the infested physical structure — e.g., caulking holes, sealing cracks, tightening around doors and windows, moisture reduction, ventilation, etc.

PHYTOPLASMA — An organism similar to bacteria but without cell walls that grows in the phloem of host plants.

PHYTOSANITARY CERTIFICATE — A document prepared by a duly authorized federal or state regulatory official that verifies compliance with phytosanitary (quarantine) requirements.

PHYTOTOXICITY — Plant injury caused by a chemical or other agent.

PITCH — A resin from the sap of trees, especially conifers such as pine.

POINT OF RUNOFF — The point at which a spray starts to run or drip from the surface to which it is applied.

POINT SOURCE POLLUTION — Pollution from a specific source.

POISON CONTROL CENTER — A local agency, generally a hospital, that has current information on the proper first aid techniques and antidotes for poisoning emergencies. Centers are listed in telephone directories.

POPULATION — Individuals of the same species. The populations in an area make up a community. (See *ecosystem*.)

POSTEMERGENT HERBICIDE — Herbicide applied after weeds have emerged to kill them by contacting the foliage.

PREEMERGENT HERBICIDE — Herbicide applied before emergence of weeds to kill them as they develop (sprout).

PRECIPITATE — A solid substance that forms in a liquid and settles to the bottom of a container; a material that no longer remains in suspension.

PREDATOR — An animal that attacks, kills and feeds on other animals. Examples of predaceous animals are hawks, owls, snakes, many insects, etc.

PREHARVEST INTERVAL — The minimum amount of time (in days) between the last application and harvest.

PRONOTUM — The area just behind an insect's head (i.e., the upper plate of the *prothorax*).

PROPELLANT — The inert ingredient in pressurized products that forces the active ingredient from the container.

PROTECTANT — A chemical applied to a plant or animal to prevent a pest problem.

PROTHORAX — The first segment of an insect's *thorax*. One pair of legs is attached.

PUPA (plural PUPAE) — In insects with complete metamorphosis, the developmental (resting) stage during which major changes from the larval to the adult form occur.

PUSTULE — A blister-like bump that usually contains fungal spores.

QUALITY PEST — Regulated pests that are not quarantine pests but are regulated under the authority of state law that states that plants being shipped need to be "apparently free of pests."

QUARANTINE — A legal instrument imposed or enacted by a governmental agency as a means of mitigating pest risk. A quarantine enables enforcement of prohibitions, restrictions,

treatment and certification requirements and other measures necessary to prevent the harm or damage caused by the establishment of an exotic pest.

RATE OF APPLICATION — The amount of pesticide applied to a plant, animal, unit area or surface; usually measured as per acre, per 1,000 square feet, per linear foot or per cubic foot.

REENTRY INTERVAL — The length of time following a pesticide application when entry into the treated area is restricted.

REGISTERED PESTICIDES — Pesticide products that have been registered by the Environmental Protection Agency for the uses listed on the label.

REPELLENT — A compound that keeps insects, rodents, birds or other pests away from humans, plants, domestic animals, buildings or other treated areas.

RESIDUAL PESTICIDE — A pesticide that continues to remain effective on a treated surface or area for an extended period following application.

RESIDUE — The pesticide active ingredient or its breakdown product(s) remaining in or on the target after treatment.

RESISTANCE — The inherited ability of a pest to tolerate the toxic effects of a particular pesticide.

RESTRICTED-USE PESTICIDE (RUP) — A pesticide that can be purchased and used only by certified applicators or persons under their direct supervision; pesticide classified for restricted use under FIFRA, Section 3(d)(1)(C).

RHIZOME — An underground stem capable of sending out roots and leafy shoots.

RISK — A probability that a given pesticide will have an adverse effect on humans or the environment in a given situation.

RODENTICIDE — A pesticide used to control rodents.

RUNOFF — The movement of water and associated materials on the soil surface. Runoff usually proceeds to bodies of surface water.

SANITATION — The removal of infected plant parts, decontamination of tools, equipment, hands, etc.

SCLEROTIA — A mass of hyphae and food that allows a fungus to survive long periods of extreme hot or cold temperatures and lack of water.

SCOUTING — Regular monitoring of a crop or site to determine possible pest problems.

SCUTUM — Shieldlike structure located near the front part of the *mesothorax* of an insect.

SIGNAL WORDS — Required word(s) that appear on every pesticide label to denote the relative toxicity of the product. Signal words are DANGER-POISON, DANGER, WARNING and CAUTION.

SITE — Areas of pest infestation. Each site should be treated specifically or individually.

SOIL DRENCH — To soak or wet the ground surface with a pesticide. Large volumes of the pesticide mixture are usually needed to saturate the soil to any depth.

SOIL FUMIGANT — A toxic gas or volatile substance that is used to kill soil microorganisms.

SOIL INCORPORATION — The mechanical mixing of a pesticide product with soil.

SOIL INJECTION — The placement of a pesticide below the surface of the soil; common application method for nematicides.

SOLUTION — A mixture of one or more substances in another substance (usually a liquid) in which all the ingredients are completely dissolved. Example: sugar in water.

SOLVENT — A liquid that will dissolve another substance (solid, liquid or gas) to form a solution.

SPECIES — See *taxonomy*.

SPORANGIA — A structure that produces spores.

SPORE — The reproductive stage of a fungus.

SPRAY DRIFT — Movement of airborne spray from the intended area of application.

STOLON — An aboveground creeping stem that can root and develop new shoots.

STOMACH POISON — A pesticide that must be eaten by a pest to be effective; it will not kill on contact.

STYLET — A long, slender, hollow feeding structure of nematodes and some insects.

SUPPLEMENTAL LABELING — Pesticide label information that appears on a separate piece of paper and contains information regarding the site, pest, rate, etc. Supplemental labeling may be supplied at the time of purchase or requested from the dealer.

SURFACE WATER — Water on the earth's surface: rivers, lakes, ponds, streams, etc. (See also *groundwater*.)

SUSPENSION — Pesticide mixture consisting of fine particles dispersed or floating in a liquid, usually water or oil. Example: wettable powders in water.

TARGET — The plants, animals, structures, areas or pests at which the pesticide or other control method is directed.

TAXONOMY — The classification of living organisms into groups: kingdom, phylum, class, order, family, genus and species.

TECHNICAL MATERIAL — The pesticide active ingredient in pure form as it is manufactured by a chemical company. It is combined with inert ingredients or additives in formulations such as wettable powders, dusts, emulsifiable concentrates or granules.

THORAX — The middle part of an insect's body, between the head and the abdomen. It is divided into three segments — *prothorax*, *mesothorax* and *metathorax*. A pair of legs is attached to each thoracic region.

THRESHOLD — A level of pest density at which the pest or its damage becomes unacceptable and control measures are required.

TOXIC — Poisonous to living organisms.

TOXICANT — A poisonous substance such as the active ingredient in a pesticide formulation.

TOXICITY — The ability of a pesticide to cause harmful, acute, delayed or allergic effects; the degree or extent to which a chemical or substance is poisonous.

TOXIN — A naturally occurring poison produced by plants, animals or microorganisms. Examples: the poison produced by the black widow spider, the venom produced by poisonous snakes and the botulism toxin produced by bacteria.

UNCLASSIFIED PESTICIDE — See *general-use pesticide*.

USE — The performance of pesticide-related activities requiring certification include: application, mixing, loading, transport, storage or handling after the manufacturing seal is broken; care and maintenance of application and handling equipment; and disposal of pesticides and their containers in accordance with label requirements. Uses not needing certification: long-distance transport, long-term storage and ultimate disposal.

VAPOR PRESSURE — The property that causes a chemical to evaporate. The higher the vapor pressure, the more volatile the chemical or the easier it will evaporate.

VECTOR — A carrier, an animal (e.g., insect, nematode, mite) that can carry and transmit a pathogen from one host to another.

VERTEBRATE — Animal characterized by a segmented backbone or spinal column.

VIRUS — Ultramicroscopic parasites composed of proteins. Viruses can multiply only in living tissues and cause many animal and plant diseases.

VOLATILITY — The degree to which a substance changes from a liquid or solid state to a gas at ordinary temperatures when exposed to air.

WATER TABLE — The upper level of the water-saturated zone in the ground.

WETTABLE POWDER — A dry pesticide formulation in powder form that forms a suspension when added to water.

ZOOSPORE — A mobile spore with a "tail" enabling it to swim when a layer of moisture is present.

For further definition of terms, consult:

Pesticide Applicator Core Training Manual, E-2195, Michigan State University Extension.

The Federal Insecticide, Fungicide and Rodenticide Act, as amended. Public Law 92-516, October 21, 1972, as amended by Public Law 94-140, November 28, 1975, and Public Law 95-396, September 30, 1978.

Federal Register, November 7, 1990, Part II Environmental Protection Agency 40, CFR Part 171 Certification of Pesticide Applicator; Proposed Rule.

Region V Office of the EPA, Chicago, Ill.

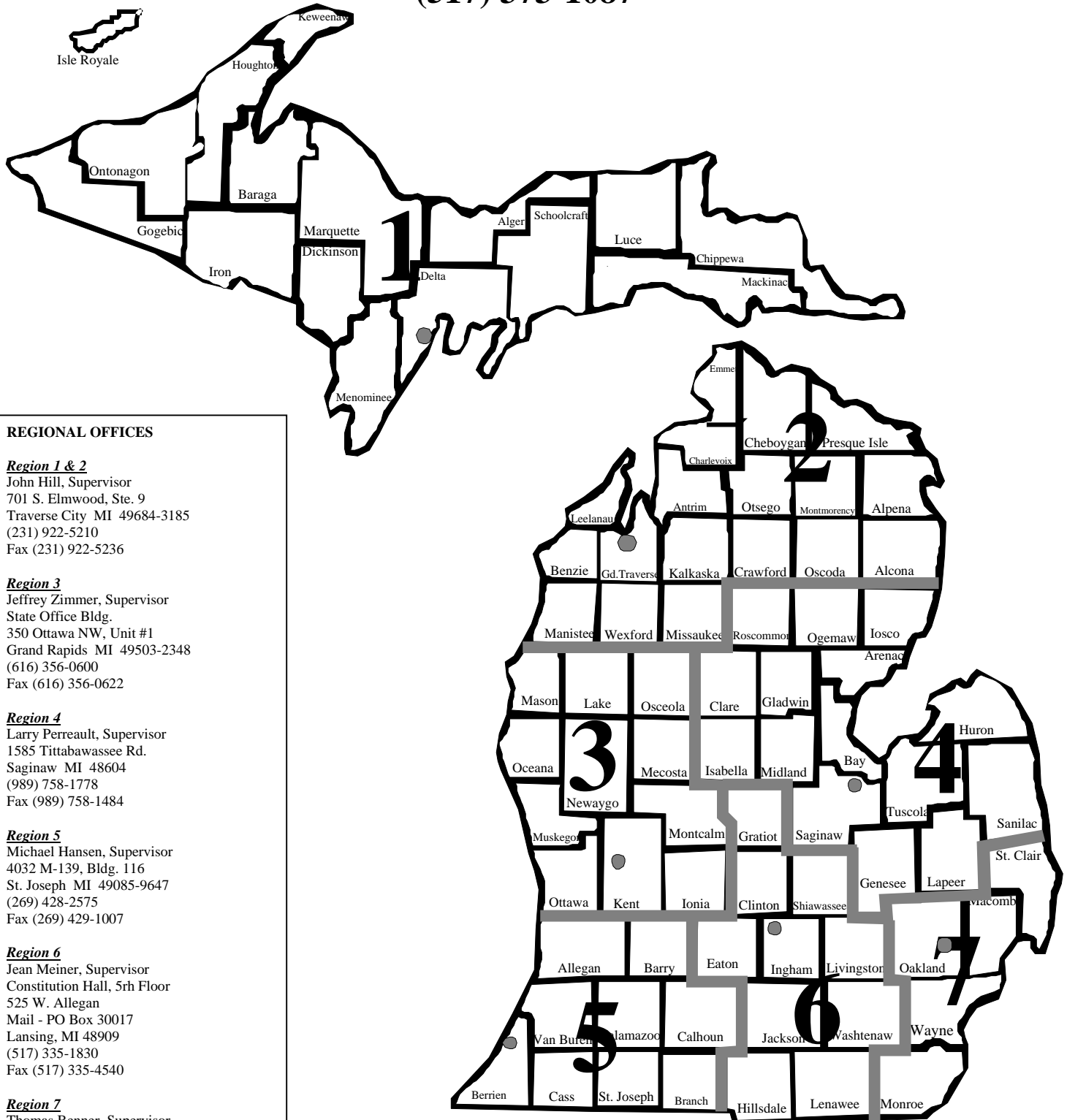
MICHIGAN DEPARTMENT OF AGRICULTURE

Pesticide & Plant Pest Management Division

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Southfield MI 48034
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Fax (248) 356-0374



PESTICIDE EMERGENCY INFORMATION

For any type of an emergency involving a pesticide, immediately contact the following emergency information centers for assistance.

Current as of June 2005



Human Pesticide Poisoning

POISON CONTROL

From anywhere in the United States, call

1 - 8 0 0 - 2 2 2 - 1 2 2 2

Special Pesticide Emergencies

Animal Poisoning

Your veterinarian:

Phone No. _____

or

Animal Poison Control Center (\$50 consultation fee per case)

***1-888-426-4435 *911**

www.aspca.org

*** Telephone Number Operated 24 Hours**

Pesticide Fire

Local fire department:

Phone No. _____

and

Operations Division, Michigan State Police:

***(517) 336-6605**

Traffic Accident

Local police department or sheriff's department:

Phone No. _____

and

MDEQ Pollution Emergency Alerting System (PEAS):

***1-800-292-4706**

also

***1-800-405-0101**

Michigan Department of Agriculture Spill Response

Environmental Pollution

District Michigan Department of Environmental Quality (MDEQ) Office Phone No.

Phone No. _____

and

National Pesticide Information Center
Provides advice on recognizing and managing pesticide poisoning, toxicology, general pesticide information and emergency response assistance. Funded by EPA, based at Oregon State University
7 days a week; excluding holidays
6:30 a.m. – 4:30 p.m. Pacific Time Zone
1-800-858-7378
FAX: 1-541-737-0761
Web: npic.orst.edu