

STUDY GUIDE

Category 6 – Right-of-Way Pest Control

Characteristics of Rights-of-Way

[Category 6 Training Manual¹ pp.2-3]

Rights-of-way are areas used for common transport and are typically long and narrow. They include areas along highways, roads, railroads, public airports, electric utilities, pipelines, public drainage ways and irrigation waterways, banks of public barge ways and areas around locks and dams, and public bicycle, bridle, and other public paths or trails.

Rights-of-way are found everywhere and placed in every type of terrain, soil, climate, vegetation complex, and land-use area.

The type of vegetation present include undesirable plants that 1) create a safety hazard or nuisance; 2) disturb the normal operation or functional activities of the right-of-way; 3) are considered “noxious”; 4) overcrowd desirable vegetation; 5) damage right-of-way structures; 6) provide cover for undesirable wildlife; and 7) are a pest to other crops and cropland if allowed to spread.

The principal goal of vegetation management is to ensure the protection, operation, stability, continuance, and safety of the common transport involved.

Pesticide Laws

[KY Core Manual² pp 1-4]

Laws and Agencies that regulate and register pesticides within the U.S. and KY

EPA - Environmental Protection Agency (federal agency)

FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act (federal law)

Kentucky Department of Agriculture - Division of Environmental Services administers pesticide regulations (state agency)

KRS 217b - The Kentucky Fertilizer and Pesticides Storage, Pesticide Use and Application Act of 1996 (state law)

General rules for Worker Protection Standards (WPS)

- 1) Displaying of information about pesticide applications
- 2) Training workers and handlers about pesticide safety
- 3) Helping to get medical assistance in case of an emergency and setting up decontamination sites
- 4) Compliance with Restricted-Entry Intervals
- 5) Notification requirements
- 6) Personal Protective Equipment requirements (PPE)

Kentucky's requirements for certification and recertification of commercial and non-commercial pesticide applicators (minimum standards for all applicators)

- Commercial pesticide applicators **must be both certified and licensed**
- **Certification** valid for 3 years
 - Requires 12 Continuing Education Units (CEUs) during 3 year period (9 general units; 3 category specific units)
- **License** must be renewed annually (valid for one year)

Proper Pest Identification – Weeds

[Category 6 Training Manual¹ pp.4-6; KY Core Manual² pp 7-9]

Define a “Pest” – Plants, insects, pathogens, animals, or organism which interferes with man’s activities and well-being.

Weeds are plant pests that interfere with man’s activities and well-being or a plant growing where it is not wanted.

Weed Classification – Recognize the difference between grasses, sedges, and broadleaf plants. Understand the difference of woody plants relative to herbaceous plants

Define and give examples for life cycle of plants (weeds)

- Annuals
 - Summer annuals eg. marehail, foxtail, pigweeds
 - Winter annuals eg. common chickweed, brome grasses
- Biennials eg. Musk thistle, poison hemlock, Queen Anne’s lace (wild carrot)
- Perennials
 - Simple perennials eg. dandelions, plantain
 - Creeping perennials eg. Canada thistle, johnsongrass
 - Bulbous perennials eg. wild garlic
- Woody plants eg. trees, shrubs, and woody vines

Know how plants reproduce and spread (disseminate)

- Seed [sexual]
- Vegetative methods [asexual] such as by rhizomes, taproots, creeping roots, or root sprouts and suckers

Know the importance of **seed dormancy** and how it affects when seeds may germinate or the length of time that weed seeds remain viable in the environment

Weed Control Methods

[Category 6 Training Manual¹ p 6; KY Core Manual² pp 9-10, 22-25]

Know the difference between “prevention”, “suppression”, and “eradication” of a pest

Methods of control

- Prevention
- Cultural practices
- Biological control agents (eg. animal grazing, Thistle-head weevil)
- Mechanical controls (eg. mowing, cutting or pruning)
- Chemical control by use of herbicides or tree growth regulators

Understand the importance and use of Integrated Vegetation Management (IVM) programs

Herbicide Classification and Characteristics

[Category 6 Training Manual¹ pp 6-8, 9-10; KY Core Manual² pp 9-11]

Contact vs Translocated

- **Contact herbicides** kill only the parts of the plant the chemical touches
- **Translocated herbicides** are absorbed by plant leaves or roots and carried throughout the plant (also referred to as “systemic” herbicides)

Selected vs Non-Selective

- **Selective herbicides** are used to kill weeds or vegetation without causing significant damage to desirable plants growing within the area treated (eg. Arsenal, Escort, Telar, Garlon)
- **Non-selective** herbicides will kill all plant vegetation in the area treated (eg. Accord, Roundup, Hyvar X)

Understand factors that affect herbicide selectivity:

- application rate
- time of application
- method of application
- environmental conditions
- stage (age) of plant growth

Persistent vs Non-Persistent

- **Persistent herbicides** may stay on or in the soil and give long-term weed control. These products are sometimes called “residual” herbicides. If present in the soil they can sometimes cause injury to sensitive plants later planted into treated areas. (eg. Hyvar X, Pramitol, Spike)
- **Non-persistent herbicides** often break down quickly to non-active forms soon after application (eg. 2,4-D, Garlon, Vanquish)
NOTE: The **half-life** of the herbicide in the soil determines its potential persistence in the environment

Soil factors that can influence herbicide persistence and effectiveness:

- Soil pH
- Organic matter
- Soil texture (clay, sand)
- Soil moisture / rainfall

Know how environmental factors influence herbicides

- Soil moisture (i.e. extreme dry or wet conditions)
- Temperature
- Relative humidity
- Rainfall
- Sunlight

Understand the importance of stage of plant growth for soil-applied and foliar herbicide applications:

- before plant emergence
- dormant plants
- actively growing plants
- young vegetative growth stage
- full leaf expansion or development

Recognize the major herbicide families used on rights-of-way areas:

- Glycines – such as glyphosate [Roundup, Accord, etc.]
- Imidazolinones – such as imazapyr [Arsenal, Chopper, Habitat]
- Phenoxy (auxin-type) herbicides – such as 2,4-D, triclopyr [Garlon], dicamba [Vanquish]
- Picolinic acids (auxin-type) – such as clopyralid [Transline], aminopyralid [Milestone], picloram [Tordon]
- Sulfonylureas – such as chlorsulfuron [Telar], metsulfuron [Escort], sulfometuron [Oust]
- Triazines – such as prometon [Pramitol]
- Uracils – such as bromacil [Hyvar X]
- Ureas – such as diuron [Karmex], tebuthiuron [Spike]

Understand **herbicide resistance**. Know how to minimize the development of herbicide resistant weeds (eg. avoid repeated use of the same herbicide mode of action group)

Herbicide Application Methods

[Category 6 Training Manual¹ pp 8-9]

Understand where and how each application method below is used

- Foliar broadcast applications (i.e postemergence to plant foliage)
 - High volume spraying
 - Low volume spraying
- Spot treatments
- Basal bark treatments
- Cut stump treatments
- Tree injections
- Pellets
- Soil-applied (preemergence)

Pesticide Labeling

[KY Core Manual² pp 27-35]

Define a "Pesticide" and know some of the major types of pesticides

Herbicides = chemicals used to control weedy vegetation or plants

Insecticides = chemicals used to control insects

Fungicides = chemicals used to combat fungal or other disease organisms

The pesticide product label and labeling is the main way a pesticide manufacturer communicates with pesticide users.

- The **label** is information printed on or attached to the pesticide container
- **Labeling** includes the label, plus all other product information received from the manufacturer when you buy it.

The label is the law - pesticide users are required by law to follow all the instructions and directions for use on the pesticide label

EPA reviews and approves all pesticide products for registration

Pesticides must also be registered with the Kentucky Department of Agriculture before it is legal to sell and use them in the state.

Types of pesticide registrations

- Federal registration (Section 3) [EPA approves label]
- Emergency Exemptions (Section 18) [EPA approves label]
- State or Special Local Needs (Section 24-c) [State label with EPA approval]

Classification of Pesticide Uses:

Understand the difference between "**General Use**" and "**Restricted Use**" pesticides

Understand the major parts of the pesticide label

- brand name
- active ingredients (common names and chemical names)
- inert ingredients
- EPA registration and establishment number
- name and address of manufacturer
- net contents
- type of pesticide
- type of formulation
- restricted-use designation (if required)
- precautionary statements
- signal words and symbols
- statement of practical treatment (first aid)
- hazards to humans and domestic animals
- personal protective equipment statements
- environmental hazards
- physical or chemical hazards
- directions for use

Recognize the following terms on a pesticide label

- Signal Words [Warning, Caution, Danger, Danger-Poison]
- "Keep out of reach of children"
- Emergency Procedures
- Environmental Hazards
- Application Precautions
- Personal Protective Equipment

Understand **uses that are considered inconsistent with pesticide labeling**

- A pesticide may be used only on the plants, animals, or sites named in the "*Directions for Use*"
- May not use higher doses, higher concentrations, or more frequent applications than allowed by the label
- You must follow all directions for use (includes directions concerning safety, mixing, storage, and proper disposal)
- You must wear the personal protective equipment specified on the label

Types of Pesticide (Herbicide) Formulations:

[KY Core Manual² pp 36-42]

Pesticide formulations:

- Liquids (L or S)
- Flowables (F or L)
- Emulsifiable Concentrates (EC or E)
- Dry Flowables (DF)
- Water Dispersible Granules (WDG)
- Ready to Use (RTU)
- Solubles (S)
- Pellets (P)

Define an **adjuvant** and recognize the different types:

Common adjuvants are “surface-active agents” that alter the spreading and wetting properties of spray droplets

- Non-Ionic Surfactant
- Crop Oil Concentrates
- Methylated Seed Oils

Other spray tank additives include:

- anti-foaming agents
- compatibility agents
- buffers
- drift retardants
- basal treatment oils

Environmental Hazards & Protection

[Category 6 Training Manual¹ pp 10-11; KY Core Manual² pp 43-58]

The **environment** includes everything around us including other people, animals, and the air, soil, water, plants, and other components of our world.

Pesticides can affect 1) the immediate environment where it is being used and 2) there could be dangers if the pesticide moved out of the use site and it may cause harm to off-target parts of the environment

Responsible pesticide users know and follow good practices *that achieve effective pest control with very little risk of environmental damage.*

Be aware of Environment Statements on the label such as precautions for:

- potential ground or surface water contamination
- Toxicity to birds, animals, or aquatic organisms
- Endangered Species

Define “point-source” and “non point-source” pollution

- **Point-source** pollution comes from a specific, identifiable place (point)
- **Non point-source** pollution may come from applications in a wide area

Be aware of crops, other desirable vegetation, or sensitive areas in or near the area where a pesticide will be applied

Understand the potential for pesticide movement to non-target locations that can result in damage and/or complaints

- by Air – through wind or air currents
 - Spray drift
 - Volatilization
- by Water – through surface runoff or leaching into ground water
- on Objects, Plants, or Animals

Understand pesticide residues and persistence:

- **Residue** is the part of a pesticide remaining in the environment after an application
- A **persistent** pesticide (herbicide) can be desirable for long-term control, but in some cases can leave residues that stay in the environment for long periods of time which may later cause harm to sensitive plants or others that come in contact with them

Know the importance of Ground and Surface waters and practices for avoiding pesticide contamination of drinking water sources

Factors which can contribute to off-target movement of pesticides into the environment

- Herbicide (pesticide) characteristics
- Soil characteristics
- Distance of ground water to the surface
- Pesticide applicator

Understand the importance and responsibilities for protection of Endangered Species

Pesticide Toxicity and Emergency Response

[KY Core Manual² pp 59-68]

Hazard is the risk of harmful effects from pesticides. The hazard depends on both the **toxicity** of the pesticide and your **exposure**

$$\text{Hazard} = \text{Toxicity} \times \text{Exposure}$$

Types of Exposures

- Oral – when you swallow a pesticide
- Inhalation – when you breathe in a pesticide
- Ocular – through the eyes
- Dermal – through the skin

Avoid and reduce exposures by using safety systems and wearing appropriate personal protective equipment (PPE)

NOTE: The skin is the part of the body that is most likely to receive exposure to pesticides

The toxicity of a chemical to cause harmful effects can depend on the types and amounts of active ingredient(s), inert ingredient(s), solvents, and/or formulation

Recognize that harmful human effects can be either acute, delayed, or allergic.

- **Acute** effects are illnesses or injuries that appear immediately after exposure (usually within 24 hours).
- **Delayed** or “**chronic effects**” are illnesses or injuries that do not appear immediately after exposure. Effects may be several days or a long time, sometimes several years, after exposure.
- **Allergic** effects are harmful effects developed by people to substances that do not cause the same reaction in most other people.

Recognize how LD₅₀ is used to compare toxicity potential of pesticide products

LD₅₀ = Lethal Dose to affect 50% of the test population

Know how to handle pesticides in case of emergency

- Human exposure
- Pesticide spills

Know how to respond to a pesticide poisoning emergency

- Stop the source of pesticide exposure as quickly as possible
- The pesticide label gives specific first aid instructions
- In an emergency take the pesticide label to the physician

Personal Protective Equipment and Pesticide Handling Decisions

[KY Core Manual² pp 69-82]

Personal Protective Equipment (PPE) is clothing and devices worn to protect the human body from contact with pesticides or pesticide residues

The pesticide label lists the *minimum* personal protective equipment you must wear while handling the pesticide. You are legally required to follow all personal protective equipment instructions on the label or with the labeling.

Choose chemical resistant materials – avoid use of cotton, leather, canvas, and other absorbent type materials

Examples of label requirements for personal body protection when using some pesticide products

- Long-sleeved shirt and long-legged pants (minimal requirement)
- Coveralls
- Chemical-resistant suit
- Chemical-resistant apron
- Hand and foot protection
- Eyewear protection
- Respirator

Know recommended procedures for washing work clothing and personal protective equipment

Before handling a pesticide consider the following pesticide handling decisions:

- Have I read the labeling?
- How can I avoid exposure to pesticides?
- What personal protective equipment is needed?
- Is the equipment ready and safe?
- Am I avoiding the accidental spread of a pesticide?
- Have I properly instructed the pesticide handlers I supervise?
- Am I prepared for emergencies?
 - Personal decontamination equipment
 - First aid equipment available
 - Spill cleanup equipment on hand
- Are people and animals out of the area?

Mixing, Loading and Application

[KY Core Manual² pp 83-95]

Handlers who mix and load concentrated pesticides have one of the highest risks for exposure to harmful amounts of pesticides

Select an appropriate area for pesticide mixing and loading. It should be in a well-ventilated area away from unprotected people, animals, food, or other items that may become contaminated.

Observe all label requirements to protect potential surface and ground water contamination

Protect water sources by use of check valves, anti-siphoning devices, or other equipment to avoid back-siphoning into the water source

Use precautions to avoid pesticide spills

Understand the general guidelines for combining two or more pesticides together for making one application;

- Under federal law, combining pesticides is legal unless the pesticide labeling of any of the pesticides involved instructs you not to combine them.
- However, recognize that not all pesticides work well when mixed together:
 - They must be physically compatible without creating undesirable reactions that can make the mixture difficult to apply (eg. form lumps, gels or separate into layers)
 - Mixing should not cause the pesticide to lose its effectiveness
 - Mixing should not increase its toxicity to the pesticide handler
- Consult the label for testing compatibility

Recognize the important parts of a sprayer:

- spray tank
- pump
- In-line strainers for filtering
- hoses
- pressure gauges
- pressure regulator
- agitation system
- spray nozzles

Recognize the different types of spray nozzles:

- Solid stream nozzles
- Flat Fan (regular flat fan vs even flat fan)
- Flood nozzles
- Cone nozzles
- Boomless tips (eg. Boombuster nozzles)
- Radiarc

Application procedures – every time you apply a pesticide follow basic procedures to make sure that you are using the pesticide safely and effectively:

- deliver the pesticide to the target
- check the delivery rate
- check for appearance
- avoid non-target organisms
- avoid non-target surfaces
- operate equipment safely

Understand ways to control or reduce the potential for **spray drift** and know how environmental factors may affect potential drift for some herbicide products

- wind speed and direction
- temperature
- humidity
- application method
- herbicide formulation and characteristics

Know proper equipment cleaning procedures and proper disposal of rinsates after pesticide application

Understand methods for proper personal cleanup procedures

Understand the laws and regulations for proper **Recordkeeping**

- Know the type of information required to be kept for accurate records
- Kentucky laws require commercial and private applicators to keep records of pesticide use and applications for a period of 3 years following application

Calculating Application Rates

[Category 6 Training Manual¹ pp 11-12; KY Core Manual² pp 96-101]

Applying either too little or too much pesticide can cause problems:

- Under-dosing the application rate may not fully control the pest
- Overdosing or using more than the labeling recommends is illegal and may not do a better job of controlling the pest. It may also cause damage or leave illegal residues
- Study the “*Directions for Use*” section of the pesticide label to find out the amount of pesticide to apply

When calibrating a sprayer know how these factors affect application rate:

- Speed
- Spray pressure
- Nozzle size

When mixing pesticides you should know 1) how much your spray tank will hold; 2) how much mixture your equipment applies per unit of area; and 3) the size of the site you need to treat

Measure accurately and check calibration often

Transportation, Storage, Disposal, and Cleanup

[KY Core Manual² pp 102-111]

Know vehicle safety and how to properly transport pesticide products in the back of a truck

Proper storage facilities for pesticide products:

- Use a secure site
- Prevent potential water damage
- Well-ventilated with adequate temperature controls
- Adequate lighting
- Floor of nonporous materials
- Properly maintain the storage site

Use proper procedures for rinsing empty pesticide containers that cannot be refilled, recycled, or returned to the manufacturer:

- **Triple-rinse** or use **pressure rinsing** to remove all the pesticide from the container
- Puncture or crush the container to make the containers unusable
- Dispose of properly rinsed containers in accordance with label directions and with federal, state, and local laws and regulations

Know how to properly dispose of unwanted pesticides, pesticide containers, and other pesticide wastes.

Know how to deal with a pesticide spill:

- Control the spill
 - protect yourself
 - stop the source
 - protect others
 - stay at the site
- Contain the spill
 - confine the spill
 - protect water sources
 - absorb liquids
 - cover dry materials
- Clean up the spill

¹Category 6 Training Manual for right-of-way pest control titled “Training Manual for Right-of-Way Vegetation Management” [PAT-1-6] (revised 7/2001)

²Kentucky’s Core Manual for pesticide applicators titled “Apply Pesticides Correctly – A Guide for Private and Commercial Applicators” (revised 9/2007)