



**NATIONAL**  
**RIGHT-OF-WAY**  
**HERBICIDE APPLICATOR**  
**TEST PLAN AND**  
**TRAINING SYLLABUS**





**NATIONAL**  
**RIGHT-OF-WAY**  
**HERBICIDE APPLICATOR**  
**TEST PLAN AND**  
**TRAINING SYLLABUS**

*Published by the National Association of State Departments  
of Agriculture Research Foundation*

**2010**

*This publication was developed under  
Cooperative Agreement No. X8-83235401  
awarded by the U.S. Environmental Protection  
Agency to the National Association of State  
Departments of Agriculture Research Foundation.  
EPA made comments and suggestions on the  
document intended to improve the scientific  
analysis and technical accuracy of the document.  
However, the views expressed in this document  
are those of its authors and EPA does not  
endorse any products or commercial services  
mentioned in this publication.*



# ACKNOWLEDGMENTS

**T**he *National Right-of-Way Herbicide Applicator Test Plan and Training Syllabus* is a committee-based effort. It reflects the energy, interest, and attention of an advisory board whose members included:

Kathryn Davis, *United States Environmental Protection Agency*

Ronald Gardner, *Cornell Cooperative Extension*

Richard Herrett, *National Association of State Departments of Agriculture*

Harvey Holt, *Purdue University Cooperative Extension*

Andrew Martin, *Purdue University Cooperative Extension*

Leo Reed, *Office of Indiana State Chemist*

David Scott, *Office of Indiana State Chemist*

Dan Wixted, *Cornell Cooperative Extension*

Fred Whitford, *Purdue University Cooperative Extension*

Ronald Gardner and Dan Wixted, Cornell Cooperative Extension, developed the performance objectives that permit this publication to be used both as a test plan and a training syllabus. Andrew Martin, Purdue University Cooperative Extension, provided technical direction and served as project coordinator.

Finally, special recognition is extended to the nine industry professionals who made this project possible. Over the course of a year, these dedicated individuals generously gave their time and expertise towards the development of this document. They remain anonymous out of respect for their rights as research participants.



# CONTENTS

<b>HOW THIS DOCUMENT WAS DEVELOPED</b> .....	1
<b>HOW TO USE THIS DOCUMENT</b> .....	3
<b>Job Duty: A</b> Organize Work Plan (12%) .....	8
<b>Job Duty: B</b> Manage Herbicide (and Other Chemical) Products (12%) ...	12
<b>Job Duty: C-I</b> Develop Vegetation Management Plan (20%) .....	14
<b>Job Duty: C-II</b> Confirm Application Accuracy (15%) .....	22
<b>Job Duty: C-III</b> Treat Target Vegetation (12%) .....	26
<b>Job Duty: D</b> Protect Nontarget Areas (15%) .....	28
<b>Job Duty: E</b> Maintain Application Equipment (9%) .....	34
<b>Job Duty: F</b> Practice Professional Obligations (5%) .....	36





# HOW THIS DOCUMENT WAS DEVELOPED

**T**he *National Right-of-Way Herbicide Applicator Test Plan and Training Syllabus* is the product of comprehensive, consensus-building activities among industry professionals, state and federal regulatory personnel, and Cooperative Extension Service specialists. The goal of this project is to provide the states with a practical, adaptable tool to develop right-of-way herbicide applicator certification tests and training materials that address important applicator job knowledge and skills and which accommodate state-specific interests.

Nine subject matter experts (SMEs) were selected from around the country to represent roadside, railroad, utility line, and related industrial site interests; governmental and private sectors; and large and small organizations. They convened along with nine Cooperative Extension, state lead agency, and federal participants to determine what tasks (i.e., work activities) describe the job of a right-of-way herbicide applicator.

The SME committee established initially that a certified, right-of-way herbicide applicator is an individual who reports to a supervisor/foreman and may supervise other employees (e.g., mixer/loaders, tender truck drivers, technicians). The certified applicator may interact with mechanics, mowing crews, construction crews, traffic control, and risk management internal to the employing organization and, externally with customers, suppliers,

adjacent landowners, state regulatory personnel, local government officials, and the general public. The SME committee proceeded to identify, organize, and sequence 52 important tasks, describing the job of right-of-way herbicide applicator in sufficient detail for licensure purposes.

The task list was later transformed into an occupational analysis questionnaire and distributed by mail to the SMEs and to randomly sampled applicators in two states: Colorado and North Carolina, selected for maximum variance. Respondents were requested to rate each task in terms of its importance to overall job performance. Response differences between the two states were found to be minimal and there was a high degree of observed agreement between state and SME responses, providing preliminary evidence that additional survey work was unnecessary.

The SME committee met a second time and came to agreement on 74 specific knowledge and skill statements that support successful task performance. They also specified, for testing purposes, characteristics of an entry-level applicator: an individual who will be performing repetitive, physically demanding work, which does not require a prolonged period of formal education, but where reading and basic arithmetic are essential job-related skills. Consequently, a written exam was deemed appropriate for licensure

purposes. The multiple-choice format was selected for reasons of breadth of content coverage and scoring efficiency.

The SME committee met a third and final time to review, and agree on, 109 performance objectives that represent mastery of the job knowledge and skill statements. Content weights were assigned to each subject area (i.e., percent coverage per topic), simultaneously finalizing the test plan and syllabus.

Test items (i.e., questions) in the accompanying item bank were written by 15 cooperative extension service and state pesticide regulatory personnel from around the nation who are familiar with item writing guidelines and who also have knowledge of right-of-way herbicide use. Items were written specifically to reflect the performance objectives on the test plan. Industry SMEs reviewed all items for technical accuracy and the item bank was piloted, and further refined, at the National Railroad Contractors Association annual meeting in January 2010. The item bank is large enough so there should be little difficulty selecting 70-90 items, in a manner that matches the test plan, to build a certification test tailored to meet any state's needs.

The *National Right-of-Way Herbicide Applicator Test Plan and Training Syllabus* and item bank offer the states an effective means to construct tests and training materials which capture important applicator job knowledge and skills and yet still allow sufficient flexibility to address state-specific concerns. It is anticipated that this approach to shared content will benefit the states, their federal partners, and the right-of-way applicators.

## **Emerging Issues**

The *National Right-of-Way Herbicide Applicator Test Plan and Training Syllabus* identifies knowledge and skill areas necessary, at present, to manage vegetation on rights-of-way. It is, however, a dynamic document open to revision, as the need arises, to address evolving federal and state regulations, industry practices, and application technologies. A three-year review schedule is proposed to incorporate new material (and delete dated topics) deemed appropriate by subject matter expert consensus. Accordingly, individuals using this document are encouraged to submit to the authors their thoughts on emerging issues relevant to right-of-way herbicide applicators.

# HOW TO USE THIS DOCUMENT

## Terminology

**Job** A stable, coherent collection of tasks.

**Task** An observable unit of work that generates a product, service or a decision.

**Duty** A job subdivision composed of related tasks.

**Knowledge** An article of information that jobholders need to possess in order to perform a task.

**Skill** An acquired proficiency that jobholders need to develop in order to perform a task.

**Performance objective** A statement which describes what the learner is expected to achieve as a result of instruction. Also referred to as “learning objective” or “instructional objective.”

**Item** The basic unit of a test. Commonly referred to as a “question.”

**Item bank** A pool of test items.

## Format

The *National Right-of-Way Herbicide Applicator Test Plan and Training Syllabus* is organized into eight right-of-way applicator Job Duties. Each job duty is weighted to indicate content emphasis on an exam. The

left column within each job duty section lists specific right-of-way Applicator Tasks (bold) and Required Knowledge and Skills (italicized) that support task performance. The right column specifies Performance Objectives that represent mastery of required knowledge and skills. The performance objectives provide direction for selecting and writing test items (i.e., questions), developing a training curriculum, and writing educational materials. Some performance objectives relate to state-specific situations, which allows users to tailor the test and training to suit local needs. This approach ensures that the test and training are flexible to meet the needs of each certifying agency and training organization.

For example, on pages 8 and 9, Job Duty A is Organize Work Plan. It represents content that will comprise 12 percent of a right-of-way applicator certification exam. There are 12 applicator tasks under Job Duty A. The left column lists, for example, one of the applicator tasks as 3. Select application equipment/tools. Listed under Applicator Task 3 is the required knowledge needed to perform the task. It is a. Knowledge of equipment capabilities and limitations. The right column lists the performance objective associated with Task/Knowledge 3.a. It is (1) List the uses of: (a) Backpack sprayers (including mist blowers). The full citation for this

performance objective is A.3.a.(1) for Job Duty A, Task 3, Knowledge a, and Performance Objective (1). The entire document is organized in this fashion. The linkages among applicator tasks, their supporting required knowledge and skills statements and associated performance objectives are read in the same manner across the facing pages.

The reader will observe that some performance objectives are flagged with a yellow arrow and refer to state-specific situations. Note that Performance Objective A.6.a.(1) reads, “Describe *[your state]* laws concerning appropriate product mixing locations.” Performance objectives like this one provide the opportunity to include state-specific material on tests and in training materials.

The reader will also observe that some tasks do not have a supporting knowledge and skill statement (e.g., Job Duty A, Task 2). This is because the supporting skill does not lend itself to assessment by paper and pencil measures. Consequently there are no corresponding performance objectives.

In other instances, a task and its supporting knowledge and skill statements (e.g., Job Duty A, Task 1, Required Knowledge and Skills a) do not have associated performance objectives because the same knowledge and skills are addressed later in the test plan. In several cases, knowledge and skill statements (e.g., Job Duty A, Task 7, Required Knowledge and Skills a) reflect Core knowledge that does not assume any additional significance in a right-of-way context. Consequently, no associated performance objectives are provided. In each of these cases, however, the task and knowledge and skill statements (if any) were deemed important to the job of right-of-way applicator. Trainers may, therefore, elect to develop educational materials that cover these areas even though there is no corresponding test content.

## Test Development

### *Determine Total Number of Items To Include on Test*

The test developer who uses this document to build a right-of-way applicator certification test is advised to first determine a total number of items to include on the test. Seventy, at a minimum, is recommended, but this is left to the discretion of the individual test developer. Using a 70-item test as an example, 12 percent of Job Duty A (eight or nine items) should relate to the performance objectives under Job Duty A and they should be selected from the accompanying item bank to maximize coverage of performance objectives in Job Duty A.

### *Select Items from the Item Bank in Proportion to Job Duty Content Weights*

Every question in the item bank is preceded by a citation, indicated previously, which identifies the performance objective that it addresses. Consider Performance Objective A.3.a.(1) examined earlier. A potential test item from the item bank which relates to this performance objective is:

**A.3.a.(1) Which is the best equipment choice for selective basal treatment of small trees and brush?**

- A. boom sprayer
- B. backpack sprayer \*
- C. granular applicator
- D. trunk injector

(The asterisk indicates the correct response to this item.) Note that any item in the item bank that is preceded by A.3.a.(1) may be used to address this performance objective. However, the test developer should exercise caution and avoid selecting items that are duplicative or that cue the correct response to another item.

### ***Write State-Specific Items, As Needed, According to State-Specific Performance Objectives***

Some performance objectives, flagged with a yellow arrow, refer to specific state situations, such as laws, product use restrictions and common weeds, and have no corresponding questions in the item bank. These performance objectives represent state-specific issues for which the test developer will—where appropriate—have to draft their own state-specific items.

### ***Balance Response Options on Selected Items***

The process of selecting items from the item bank by matching performance objective citations with items, in proportion to job duty content weight, is repeated for each remaining job duty. When all of the selected test items are assembled, determine how many times each response option (A, B, C, and D) is correct. Correct responses should be balanced such that approximately 25 percent of the test items are scored A, 25 percent are scored B, etc. If this is not the case, then reorder the options on those items where the correct response is proportionately too high to achieve the desired balance. Balancing correct responses minimizes the possibility of individuals who are unfamiliar with the subject matter from achieving higher scores by consistently selecting the same response option.

### ***Establish a Passing Score***

A passing score may now be established for the resulting test (e.g., by application of state requirements or on recommendation of a standard setting committee).

### ***Determine a Testing Time Limit***

Allow candidates sufficient time to complete the test by allotting approximately one minute per test item.

## **Curriculum Development**

The trainer who uses this document to revise an existing right-of-way applicator-training curriculum, or to develop a new one, should also focus on the performance objectives under each job duty. The performance objectives offer educational content for training manuals and classroom instruction.

A trainer revising an existing manual might begin by gauging how closely manual content addresses the performance objectives in this document. Additional material may be included in the subsequent revision to ensure close correspondence between the newly revised manual and the performance objectives. Note that there is no compelling reason to organize a manual according to the various job duties and content coverage percentages presented in this document. Manual organization and presentation are left to the discretion of the trainer. However, the trainer is encouraged to precede each chapter or manual section with a list of the performance objectives from this document which the chapter covers, in order to alert the learner to what is expected of them.

In the case of a new manual, the trainer will first have to make a decision about the general outline of the manual. For example, based on prior experience, the trainer might elect to establish chapters that correspond to classroom presentations or stand-alone topics (e.g., right-of-way plant biology and identification, herbicide choices, equipment types, calibration, environmental concerns, and applicable state laws). After a general structure is determined, text is drafted to address the performance objectives in this document, following essentially the same suggestions described in the previous paragraph.

Application of performance objectives to classroom instruction parallels manual development. It is anticipated that these performance objectives will suggest some new ideas for training content for both initial and recertification purposes. As you begin to work with this document to develop

your right-of-way herbicide applicator training materials and certification test, it will become evident that the performance objectives are the thread that ties the job, training manual, and certification test together.

If, at any time, you find yourself uncertain about how to use this document, please feel free to contact [info@nasda.org](mailto:info@nasda.org) or 202/296-9680 for suggestions and clarification.



# JOB DUTY: A

## Organize Work Plan (12%)

### APPLICATOR'S TASKS

---

#### Required Knowledge and Skills

##### 1. Review job specifications

*a. Knowledge of treatment methods terminology*

##### 2. Locate work site

##### 3. Select application equipment/tools

*a. Knowledge of equipment capabilities and limitations*

##### 4. Access telephone call list

##### 5. Locate water source for mixing

*a. Knowledge of state water use restrictions*

##### 6. Identify herbicide product mix site

*a. Knowledge of state restrictions on product mixing locations*





## PERFORMANCE OBJECTIVES

(1) Addressed under C-I.2.b.(4), page 17

(1) List the uses of:

- (a) Backpack sprayers (including mist blowers)
- (b) Handheld hydraulic spray guns
- (c) Boom and boomless broadcast spray equipment (including injection systems)
- (d) Stem injection equipment (including lances and hatchets)
- (e) Trigger pump sprayers
- (f) Granular applicators

(1) Describe *[your state]* laws which prohibit use of a particular water source for mixing.

← STATE LAW

(2) Describe *[your state]* laws concerning backflow prevention during mixing.

← STATE LAW

(1) Describe *[your state]* laws concerning appropriate product mixing locations (e.g., pads, containment, setbacks from wells and surface water).

← STATE LAW



## APPLICATOR'S TASKS

---

### Required Knowledge and Skills

#### 7. Select personal protective equipment (PPE) for job

- a. Knowledge of PPE label requirements*
- b. Knowledge of proper PPE use*
- c. Knowledge of proper PPE removal (where and in what order)*
- d. Knowledge of proper PPE storage (at job site and place of business)*

#### 8. Clean PPE

- a. Knowledge of proper PPE cleaning practices*

#### 9. Replace worn PPE

- a. Knowledge of when to inspect PPE*
- b. Knowledge of how to dispose of PPE*

#### 10. Test communication equipment

- a. Knowledge of state voice contact requirements*

#### 11. Participate in on-site safety briefing

- a. Knowledge of label re-entry requirements*
- b. Knowledge of spray practices to avoid exposure*

#### 12. Assign tasks to other crew members

- a. Knowledge of state supervision requirements*



## PERFORMANCE OBJECTIVES

(1) Determine which PPE requirements on a label pertain to right-of-way applicators.

(1) Determine which PPE is suitable for a particular herbicide handling activity (e.g., mixing versus applying).

Core knowledge: Omitted from category examination content

Core knowledge: Omitted from category examination content

Core knowledge: Omitted from category examination content

Core knowledge: Omitted from category examination content

Core knowledge: Omitted from category examination content

(1) Describe *[your state's]* requirements regarding proximity and/or communication between a certified applicator and someone working under their supervision.

← STATE LAW

(1) Determine which re-entry requirements on a herbicide label pertain to right-of-way applications.

(2) Describe an applicator's responsibilities with respect to re-entry requirements.

(1) Discuss application decisions that reduce applicator exposure.

(1) Regarding *[your state]* law, determine whether a crew member's herbicide handling activity will require supervision by a certified applicator (including the maximum number of employees that a certified applicator may supervise).

← STATE LAW



# JOB DUTY: B

## *Manage Herbicide (and Other Chemical) Products (12%)*

### APPLICATOR'S TASKS

#### *Required Knowledge and Skills*

##### **1. Obtain herbicide product**

##### **2. Secure herbicide product during transport**

*a. Knowledge of how to secure herbicide containers during transport*

##### **3. Manage empty herbicide product containers**

*a. Knowledge of herbicide container disposal options*

##### **4. Clean herbicide application equipment**

*a. Knowledge of tank cleaning procedures*

*b. Knowledge of herbicide residue characteristics*

*c. Knowledge of where to wash off application equipment*

##### **5. Store products securely**

*a. Knowledge of good security practices*

##### **6. Respond to product spills promptly**

*a. Knowledge of how spill site characteristics affect the potential environmental impact of a spill*

*b. Knowledge of spill control procedures*



## PERFORMANCE OBJECTIVES

Not applicable

(1) Addressed in B.5.a.(2), page 13

Core knowledge: Omitted from category examination content

- (1) Discuss the options for properly dealing with leftover herbicide spray mix.
- (2) List the steps for cleaning the inside of a herbicide sprayer (including what to do with the rinse water).

(1) Describe problems that can arise when applying a herbicide if the applicator fails to clean out all the residue from a previous spray mix.

- (1) Identify features of a suitable site for washing herbicide application equipment.
- (2) Give examples of off-target damage that can occur if proper precautions are not taken when cleaning herbicide application equipment.

- (1) Describe the risks of inadequate security.
- (2) List steps to prevent unauthorized access to herbicides (including in vehicles and permanent or temporary storage facilities).

(1) Explain how site characteristics such as slope, soil type, vegetative cover, and proximity to surface water will affect the potential environmental impact of a spill.

- (1) Tell what constitutes a spill.
- (2) Determine when to report a spill to *[your local, state]*, and/or federal authorities (including requirements regarding spill proximity to water).
- (3) Describe the steps involved in responding to a spill.

← STATE LAW



# JOB DUTY: C-I *Develop Vegetation Management Plan (20%)*

## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*

#### **1. Identify target vegetation**

*a. Knowledge of plant types*

*b. Knowledge of basic plant structures*

*c. Knowledge of plant life cycles*

*d. Skill at identifying common regional weeds*



## PERFORMANCE OBJECTIVES

---

- (1) List the characteristics that distinguish:
  - (a) Grasses from broadleaf plants
  - (b) Herbaceous plants from woody plants
  - (c) Trees from brush and shrubs
- (1) Describe the function of:
  - (a) Leaves (foliage)
  - (b) Cuticle
  - (c) Stems
  - (d) Stolons
  - (e) Roots
  - (f) Rhizomes
  - (g) Xylem
  - (h) Phloem
  - (i) Cambium
- (1) Describe the life cycles of annual, biennial, and perennial plants.
- (2) Indicate which types of plants can re-sprout or spread by means other than seed.
- (3) Explain why a weed's growth stage is an important consideration when selecting a management method.
- (1) Identify by sight the most common right-of-way weeds in *[your state]*.  
*(Note to test/curriculum developers: Confer with your Extension weed specialist about the most important right-of-way weeds in your area.)*



STATE WEEDS

## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*

#### **2. Determine vegetation management method**

---

- a. Knowledge of why vegetation management is necessary*
  - b. Knowledge of types of vegetation management methods*
- 

- c. Knowledge of techniques to minimize brownout*
- 





## PERFORMANCE OBJECTIVES

---

(1) List reasons for managing vegetation on all types of rights-of-way.

(1) Define Integrated Vegetation Management (IVM).

(2) List the benefits of IVM.

(3) List the categories of control options available to the IVM manager.

(4) Define the following herbicide treatment terms (including how and when they are made):

(a) Selective vegetation control

(b) Non-selective vegetation control

(c) Bareground

(d) Foliage application

(e) Soil application

(f) Broadcast application

(g) Spot treatment

(h) Cut surface

(i) Cut-stump treatment

(j) Basal spray application

(k) Girdling

(l) Frilling

(m) Trunk injection

(n) Hack and squirt

(5) Discuss the effectiveness and limitations of mechanical control in managing vegetation.

(6) List advantages and disadvantages of using herbicides.

(1) Define brownout.

(2) Explain the causes of brownout.

(3) Explain why and where brownout can be a problem in rights-of-way.

(4) Discuss options for minimizing brownout.



## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*



#### **3. Select appropriate product mix**

*a. Knowledge of state product use restrictions*

*b. Knowledge of herbicide characteristics*

*c. Knowledge of product compatibility*

*d. Knowledge of plant life cycles*

*e. Knowledge of adjuvant characteristics*

## PERFORMANCE OBJECTIVES

- (1) Describe [your state's] product use restrictions (including use rates and use prohibitions).
- (1) Contrast the following herbicide terms:
  - (a) Contact versus translocated
  - (b) Foliage- versus soil-applied
  - (c) Pre- versus post-emergence
  - (d) Persistent versus non-persistent
  - (e) Selective versus non-selective
- (2) List the weed types controlled, how the active ingredient gets into and moves within the plant, and whether the product is applied to foliage or soil (or both) for common right-of-way herbicides including:
  - (a) 2,4-D
  - (b) triclopyr
  - (c) picloram
  - (d) diuron
  - (e) tebuthiuron
  - (f) glyphosate
  - (g) sulfometuron methyl
  - (h) metsulfuron methyl
  - (i) imazapyr
  - (j) fosamine
- (3) Describe how growth regulator herbicides work.
- (4) List examples of growth regulator herbicides commonly used on rights-of-way.
- (1) Determine which label directions to follow when mixing two or more herbicides together (e.g., compatability, mixing order).
- (1) Addressed under C-I.1.c.(1)-(3), page 15
- (1) Describe the function of adjuvants commonly used with right-of-way herbicides (including surfactants, defoamers, anti-drift agents, and colorants).

← STATE LAW



## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*

#### **4. Evaluate previous treatment**

- a. Knowledge of plant types*
- b. Knowledge of why herbicide applications fail*

- 
- c. Knowledge of types of vegetation management methods*



## PERFORMANCE OBJECTIVES

---

(1) Addressed under C-I.1.a.(1), page 15

- (1) Discuss what influences herbicide uptake by plants.
- (2) List reasons why foliage-applied treatments fail.
- (3) List reasons why soil-applied treatments fail.
- (4) Explain how herbicide resistance develops in weed populations.
- (5) List management practices that reduce the potential for resistance to develop in a weed population.

(1) Addressed under C-I.2.b.(3)-(4), page 17



# JOB DUTY: C-II *Confirm Application Accuracy* (15%)

## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*

#### 1. Calculate area of treatment site

*a. Skill at basic arithmetic*

#### 2. Calculate product mix rate

*a. Skill at basic arithmetic*



## PERFORMANCE OBJECTIVES

---

- (1) Given length and width, calculate area.
- (2) Convert area measurements from square feet to acres.

*(Note to test/curriculum developers: Provide all necessary equations and conversions in the test booklet and training materials.)*

- (1) Given gallons applied per acres treated, calculate gallon per acre application rate.
- (2) Given gallons per acre application rate and tank capacity, calculate how many acres a full tank can treat.
- (3) Given gallons per acre application rate and tank capacity, calculate how much herbicide product and adjuvant are needed to mix a full tank.
- (4) Calculate how much herbicide product is needed to yield the correct concentration for a specific tank size.

*(Note to test/curriculum developers: Provide all necessary equations and conversions in the test booklet and training materials.)*



## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*

#### **3. Calibrate application equipment**

*a. Skill at basic arithmetic*

*b. Knowledge of the purpose of calibration*

*c. Knowledge of calibration methods*

*d. Knowledge of variables that affect application rate*





## PERFORMANCE OBJECTIVES

- (1) Given length of calibration run, swath width, and gallons of mix or pounds of granules applied, calculate the application rate (gallons or pounds per acre).
- (2) Given ground speed in miles per hour, spray swath width, and spray flow rate in gallons per minute, calculate the gallon per acre application rate.

*(Note to test/curriculum developers: Provide all necessary equations and conversions in the test booklet and training materials.)*

- (1) State why herbicide application equipment must be calibrated.

- (1) Describe procedures for determining the application rate for equipment used on rights-of-way.
- (2) Describe a procedure for determining ground speed, in miles per hour, for equipment used on rights-of-way.

- (1) List factors that affect the amount of herbicide deposited on targeted weeds.

*(Note to test/curriculum developers: Examples include herbicide tank concentration, nozzle output, ground speed, uniformity of coverage.)*

- (2) Tell how changing each of the following affects the application rate of the sprayer:
  - (a) Nozzle swath width
  - (b) Nozzle orifice size
  - (c) Spray pressure
  - (d) Ground speed



# JOB DUTY: C-III

## *Treat Target Vegetation (12%)*

### **APPLICATOR'S TASKS**

---

#### *Required Knowledge and Skills*

##### **1. Prepare product mix**

- a. Knowledge of state setback requirements*
- b. Knowledge of safe mixing locations*
- c. Knowledge of PPE label requirements*
- d. Knowledge of proper tank mix sequence*
- e. Knowledge of proper product transfer processes*

##### **2. Apply product mix to treatment site**

- a. Knowledge of nozzle spray pattern*
- b. Knowledge of plant types*

## PERFORMANCE OBJECTIVES

---

(1) Addressed under A.6.a.(1), page 9

(1) List the features of a mixing site selected to minimize contamination problems.

(1) Addressed under A.7.a.(1) and A.7.b.(1), page 11

(1) Discuss the procedures and sequence for adding herbicides and adjuvants to a spray tank.

(1) Describe proper methods for preventing back-siphoning herbicides into water supplies.

(1) Describe the spray pattern produced (including shape and coverage) by different nozzle types including:

- (a) Fan (regular and even)
- (b) Flood
- (c) Raindrop
- (d) Off-center
- (e) Adjustable cone jet
- (f) Straight stream

(1) Addressed under C-I.1.a.(1), page 15



# JOB DUTY: D *Protect Nontarget Areas (15%)*

## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*

#### **1. Transfer sensitive site information to work plan**

*a. Knowledge of sensitive site information*

#### **2. Select management techniques to minimize environmental impact**

*a. Knowledge of herbicide hazards to nontarget sites*

*b. Knowledge of herbicide mobility*

*c. Knowledge of herbicide characteristics*

*d. Knowledge of adjuvant characteristics*

*e. Knowledge of types of vegetation management methods*



## PERFORMANCE OBJECTIVES

- (1) Give examples of sensitive sites that may be present in or near rights-of-way.

*(Note to test/curriculum developers: Examples include public places, residential property, cropland, pastures, ornamental nurseries, natural and manmade water sources)*

- (2) List resources for identifying sensitive sites near a job site.

*(Note to test/curriculum developers: Examples include sensitive site registries, chemically sensitive individuals registries, regulatory agency websites)*

- (3) Describe [your state] requirements protecting sensitive areas with application setbacks.

- (1) Give examples of problems that can arise when herbicides end up in nontarget areas.

- (1) Discuss factors that affect a herbicide's likelihood of moving away from the site of application in:

- (a) Air (e.g., drift, volatilization)
- (b) Water (e.g., runoff, leaching)
- (c) Soil (e.g., adsorption, erosion)

- (1) Addressed under C-I.3.b.(1)-(4), page 19

- (1) Addressed under C-I.3.e.(1), page 19

- (1) Addressed under C-I.2.b., page 17



## APPLICATOR'S TASKS

---

### Required Knowledge and Skills

#### 3. Recognize conditions conducive to volatility

- a. *Knowledge of why volatilization is undesirable*
- b. *Knowledge of weather-related causes of volatilization*
- c. *Knowledge of chemical-related causes of volatilization*
- d. *Knowledge of techniques to minimize volatilization*

#### 4. Manage spray drift

- a. *Knowledge of why spray drift is undesirable*
- b. *Knowledge of difference between spray drift and volatilization*
- c. *Knowledge of weather conditions that contribute to spray drift*
- d. *Knowledge of relationship between droplet size and spray drift potential*
- e. *Knowledge of factors that increase droplet size*
- f. *Knowledge of techniques to minimize spray drift*



## PERFORMANCE OBJECTIVES

---

- (1) Define herbicide volatilization.
  - (2) Tell what problems can arise because of herbicide volatilization.
  - (3) State how labels indicate a volatility problem.
- (1) Describe weather factors that can increase the risk of volatilization.
- (1) Give examples of herbicides and formulations prone to volatilization.  
*(Note to test/curriculum developers: Examples include growth regulator herbicides, ester formulations)*
- (1) List steps to minimize herbicide volatilization.
- 
- (1) Define spray drift.
  - (2) Tell what problems can arise because of spray drift.
- (1) Distinguish between spray drift and volatilization.
- (1) State the relationship between wind speed, direction, and the risk of spray drift.
  - (2) Describe the effects of temperature inversions on spray drift.
  - (3) Cite clues that suggest the presence of a temperature inversion.
- (1) Tell how spray droplet size affects the risk of spray drift.
- (1) Identify nozzle types that reduce the risk of drift.  
*(Note to test/curriculum developers: Examples include flood, raindrop, and straight stream)*
  - (2) Explain how the use of invert emulsions and anti-drift agents affect droplet size.
- (1) Describe drift reduction practices (including factors that reduce the portion of fine droplets).



## APPLICATOR'S TASKS

---

### Required Knowledge and Skills

#### 5. Prevent herbicide runoff and leaching

*a. Knowledge of why runoff and leaching are undesirable*

*b. Knowledge of conditions that contribute to runoff and leaching*

#### 6. Identify sensitive sites during application

*a. Knowledge of sensitive site information*

*b. Knowledge of herbicide mobility*

*c. Knowledge of federal and state laws regarding herbicide application near, over, or to surface water*





## PERFORMANCE OBJECTIVES

---

- (1) Define herbicide runoff.
  - (2) Give examples of problems that can result from herbicide runoff.
  - (3) Define herbicide leaching.
  - (4) Give examples of problems that can result from herbicide leaching.
- (1) Tell how each of the following can affect the risk of herbicide runoff and leaching:
    - (a) Pre- and postapplication weather conditions
    - (b) Site conditions  
*(Note to test/curriculum developers: Examples include slope, soil, and vegetative cover)*
    - (c) Herbicide characteristics

(1) Addressed under D.1.a.(1)-(3), page 29

(1) Addressed under D.2.b.(1), page 29

(1) Describe federal *[and your state]* laws that regulate the application of herbicides to water.

← STATE LAW

# JOB DUTY: E

## *Maintain Application Equipment (9%)*

### APPLICATOR'S TASKS

#### *Required Knowledge and Skills*

##### **1. Conduct truck inspection**

*a. Knowledge of [applicable] U.S. DOT regulations*

##### **2. Inspect spray equipment for proper working order**

*a. Knowledge of common equipment problems*

##### **3. Inventory on-board safety supplies**

*a. Knowledge of PPE label requirements*

##### **4. Carry government- and company-required documents**

*a. Knowledge of state on-board record requirements*

##### **5. Label service containers**

*a. Knowledge of best-handling management practices*

##### **6. Monitor equipment performance during application**

*a. Knowledge of variables that affect application rate*

*b. Knowledge of nozzle spray pattern*

*c. Knowledge of common equipment problems*

##### **7. Perform in-field adjustments and repairs**

*a. Knowledge of common maintenance procedures*



## PERFORMANCE OBJECTIVES

Not testable: Outside of scope of category examination

- (1) Tell where leaks are likely to develop in application equipment.
- (2) List common problems operators should monitor during operation.  
*(Note to test/curriculum developers: Examples include system pressure and nozzle pattern changes)*
- (3) Explain how nozzle wear is determined and how to decide when one or more nozzles need to be replaced.

(1) Addressed under A.7.a.(1), page 11

(1) Identify *[your state]* on-board record requirements (e.g., applicator license, product labels, MSDS).

- (1) Regarding *[your state's]* service container requirements:
  - (a) Define service container (e.g., backpack sprayer, trigger pump spray bottle).
  - (b) Describe proper labeling of service containers.
- (2) Describe precautions taken during container-to-container product transfers.

(1) Addressed under C-II.3.d.(1)-(2), page 25

(1) Addressed under C-III.2.a.(1), page 27

(1) Addressed under E.2.a.(1)-(3), page 35

(1) Discuss proper way to clean strainers, screens, and nozzles.

STATE LAW

STATE LAW



# JOB DUTY: F

## *Practice Professional Obligations* (5%)

### APPLICATOR'S TASKS

---

#### *Required Knowledge and Skills*

##### **1. Record environmental conditions**

- a. Knowledge of conditions conducive to off-target movement*
- b. Knowledge of kinds of weather and site data to record*

##### **2. Document application information**

- a. Knowledge of state recordkeeping requirements*

##### **3. Record unusual incidents/observations**

- a. Knowledge of potential complaint generators (e.g., proximity to organic gardens/farms, schools/day care centers, elaborate ornamental plantings)*

##### **4. Maintain professional appearance**

- a. Knowledge of company policy (public conduct and appearance)*

##### **5. Explain job to customer's employees**

- a. Knowledge of types of vegetation management methods*
- b. Knowledge of label re-entry requirements*



## PERFORMANCE OBJECTIVES

---

(1) Addressed under D.3.b.(1) and D.4.c.(1)-(3), page 31 and D.5.b.(1), page 33

Not testable: Outside of scope of category examination

(1) Regarding *[your state's]* pesticide application recordkeeping requirements, tell:

- (a) The types of information you must record
- (b) When you must record the information
- (c) How long you must keep records on file
- (d) When and to whom you must send the records

← STATE LAW

Not testable: Outside of scope of category examination

Not testable: Outside of scope of category examination

(1) Addressed under C-I.2.b.(3)-(4), page 17

(1) Addressed under A.11.a.(1)-(2), page 11



## APPLICATOR'S TASKS

---

### *Required Knowledge and Skills*

#### **6. Notify public about application**

*a. Knowledge of state notification requirements*

#### **7. Promote appearance of right-of-way**

*a. Knowledge of techniques to minimize brownout*

#### **8. Respond courteously to public inquiries**

*a. Knowledge of why vegetation management is necessary*

*b. Knowledge of label re-entry requirements*

*c. Skill at recognizing when to refer job-related inquiries to supervisors*

#### **9. Fulfill state pesticide applicator recertification requirements**

*a. Knowledge of state recertification requirements*

#### **10. Attend educational seminars**

*a. Knowledge of job-related training resources*

#### **11. Read professional materials**

*a. Knowledge of job-related educational literature*

#### **12. Participate in professional mentoring**

*a. Knowledge of company policy*



## PERFORMANCE OBJECTIVES

- (1) Identify situations in which *[your state]* law either prohibits a particular herbicide application or requires you to notify individuals before doing so.  
*(Note to test/curriculum developers: Examples include chemically sensitive persons registries, no spray zones, and posting treated sites)*
- (2) Describe *[your state]* notification requirements with which you must comply before making a particular herbicide application.
- (3) Regarding *[your state]* posting requirements, tell:
  - (a) When posting is required
  - (b) What must appear on posted signs
  - (c) Where, and for how long, you must post the signs

← STATE LAW

← STATE LAW

← STATE LAW

(1) Addressed under C-I.2.c.(1)-(4), page 17

(1) Describe the public benefits of Integrated Vegetation Management on rights-of-way.

(1) Addressed under A.11.a.(1)-(2), page 11

Not testable: Outside of scope of category examination

(1) Describe *[your state's]* certification term and options for recertification.

← STATE LAW

Not testable: Outside of scope of category examination

Not testable: Outside of scope of category examination

Not testable: Outside of scope of category examination









