

Assessing the Effectiveness of Restricted Use Pesticide Applicator Trainings
in Madison and Suwannee Counties in Florida

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Masters Project

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Introduction

In Madison and Suwannee counties there are approximately 250 licensed restricted use pesticide applicators. Restricted use pesticide (RUP) licenses are for pesticide applicators that treat agricultural and related sites, such as agricultural fields, plant nurseries, golf courses, industrial sites and highway right-of-ways among others (FDACS, 2004). All private persons who apply or supervise the application of restricted use pesticides to agricultural commodities must have a pesticide applicator license issued by the Bureau of Compliance Monitoring/Pesticide Certification Section. The Private Applicator category is regulated by the Florida Pesticide Law (Florida Statutes, Chapter 487). Applicators seeking a license in this category must demonstrate practical knowledge in the following areas:

- Agricultural plant and animal production and associated pests.
- Chemical control measures that pertain to the prevention or control of such pests.
- Equipment or methodologies used to safely and effectively implement such measures.
- Potential for pesticide residues on such crops.
- Preharvest application intervals.
- Post application re-entry interval restrictions.
- Phytotoxicity.
- Pesticide-related soil or water problems.
- Potential for pesticide-induced environmental contamination.
- Non-target injury.
- Equipment calibration.
- Proper interpretation of pesticide label or labeling requirements for products registered.
- Appropriate use of personal protective equipment and pesticide safety.

The Florida Department of Agriculture, through the Bureau of Compliance Monitoring,

administers this program and the local county Extension Office offers educational programs, trainings and also administers tests for those needing to become certified (FDACS, 2004). The Private Applicator License is the most common category for area agriculture producers in Madison and Suwannee Counties. In order to hold a Private Applicator license, persons must successfully complete two examinations before they can apply for a license. These exams are the Core examination and the Private Applicator Agricultural category examination. Licensed applicators must renew their pesticide applicator licenses every four years (FDACS, 2004). To recertify, applicators may take the examinations again or attend training and obtain 4 continuing education units CEUs approved for the Private Applicator Agriculture category and 4 CEUS for the Core category.

Pesticide trainings are critical for farmers who hold licenses or need to become certified in restricted use pesticides to fight pests. Pesticide applicator training includes trainings for individuals wanting to take the Core and the Private Applicator pesticide exams and for those needing continuing education units CEUs.

Farmers as adult learners

Most of the attendees to the Private Applicator License trainings are agricultural producers. As we try to assess the efficacy of Private Applicator trainings it is important to review the theory of adult learning. As explained by Knowles (1980) the adult learning theory follows four assumptions: adults are competency-based learners in that they wish to apply newly acquired skills or knowledge to their immediate circumstances; an adult's experiences are a rich resource for learning; adults are aware of specific learning needs generated by real-life tasks or problems and adults both desire and enact a tendency toward self-directedness as they mature. In a study conducted by Franz et al. (2010) farmers articulated a learning process that relies mostly on first-hand experiences motivated by saving time and money, learning about cutting edge research, and

engaging in the social aspects of education. Researchers discovered that: a) differences exist in agricultural education needs among types of farmer groups, b) farmers enjoy peer teaching, c) farmers find value in participatory research, d) farmers desire more comprehensive educational programs, and e) farmers want educators to embrace the changing nature of agriculture. The adult learning theory as well as results from research with farmers provides a foundation for designing educational programs for this audience. Furthermore, it allows educators to employ a variety of instructional techniques that are appealing to them. Instructional techniques and strategies often evolve naturally from what has to be taught (Knox, 1987). In many instances these techniques and strategies evolve over time as the instructor becomes more experienced. This experience not only comes from knowledge of the subject matter being presented but also from knowing the program participants and their learning styles.

Few studies have been conducted that have placed an emphasis on instructional methods used in adult education in agriculture (Creswell, 1993). Most studies have focused on the need for adult education. Those studies which have focused on instructional methods recommended further research was needed on the appropriate methods and tools to use in adult education programs in agriculture (Bouare & Bowen, 1990).

Purpose and Objectives

The purpose of this study was to determine if Private Applicator trainings are effectively educating participants. This study was directed at two populations: 1) those participants taking the Private applicator test and 2) those needing to earn CEUs to renew their licenses. There is a strong need to separate these two groups based on their current knowledge of pesticide applications. Most participants who are attending the training to take the test for the first time lack experience in pesticide applications. In contrast, those attending the trainings for the CEUs are experienced in pesticide applications. It is important to acknowledge prior knowledge and experiences of learners,

including their ability to recognize their own skills as lifelong learners (Merriam, 1999). The objectives of this study are to gain a better understanding of the effectiveness of pesticide applicator trainings among the two distinct groups. Two basic questions will be answered: 1) *are pesticide applicator trainings properly preparing participants to pass the RUP test?* And 2) *are participants who attend training for CEU's gaining new knowledge needed to apply pesticides correctly?* Basically, are the two different types of participants receiving the correct information and are they using this information to enhance their skills as pesticide applicators.

Definition of Terms and Acronyms

CEU- Continuing Education Unit- is a measure used in continuing education programs, particularly those required in a licensed profession, in order for the professional to maintain the license.

FDACS- Florida Department of Agriculture and Consumer Services

IFAS- Institute of Food and Agricultural Sciences- is a federal-state-county partnership dedicated to developing knowledge in agriculture, human and natural resources, and the life sciences, and enhancing and sustaining the quality of human life by making that information accessible.

IPM- Integrated Pest Management- is an integrated approach of crop management to solve ecological problems when applied in agriculture.

UF- University of Florida

RUP- Restricted Use Pesticide- are pesticides for retail sale to, and use by, only certified applicators or persons under their direct supervision and only for those purposes covered by the applicator's certification.

Limitations of the Study

The following is acknowledged as limitations:

1. This study will be limited to pesticide training participants in the Northeast region of Florida taking the RUP exams or earning CEU's after attending the training.
2. Participants who have certain characteristics that predispose them to have certain outcomes (education level, years of experience, etc.).
3. Participants who do not answer all of the questions on the instrument.

Basic Assumptions

1. It is assumed participants will answer honestly and accurately when taking the instrument.
2. All participants will understand the survey and it will not be misleading.

Significance of Problem

Restricted Use Pesticides have the potential to cause environmental or human health hazards if they are not handled and applied correctly. Most restricted use pesticides in the market are the result of years of research by industry and scientists. Specific guidelines are delineated for their use in different crops and varying agronomic circumstances. Therefore, restricted use pesticides are key components to effectively controlling pests. Restricted use pesticide trainings seek to provide applicators with the knowledge needed to apply pesticides correctly and safely. This study will give Extension agents, educators and stakeholders information regarding the effectiveness of restricted use pesticide applicator trainings. Through understanding the perspectives of participants following pesticide training events, educators can improve the delivery of educational programs in this general area. The results will be beneficial for Extension agents to make program adjustments to enhance future trainings. The results of this study can also lead to continued support for this program area and the advancement in adult learning methods. They also

can be used for year-end reporting to the County advisory committees and UF IFAS administration.

Theoretical Framework

The Adult learning theory (Knowles, 1980) is based on the fact that adults learn from their experiences; new information has to be relevant to their immediate circumstances and specific learning needs are generated by real-life tasks or problems. Pesticide applicator trainings in Northeast Florida are conducted as a result of a required licensing process to buy and apply restricted use pesticides on agricultural lands. For the most part, participants attend the trainings with one of two goals in mind: pass the test or earn CEU's. The Adult Learning theory teaches that adult learning is problem-centered rather than content-oriented. In contrast, educators like to focus on content-oriented trainings rather than problem-centered trainings. Content-oriented trainings are designed by the educator to present information without regard to the participants needs. Problem-centered trainings incorporate information that is pertinent to the problems faced by the participants.

The challenge for educators is that potential pesticide applicators have different backgrounds and varying levels of experience in pesticide applications. Furthermore, this means that the information covered during the trainings may or may not be relevant to the participants' immediate circumstances. For those participants that are already licensed, they may have specific learning needs as a result of problems they have faced while conducting pesticide applications in the past. Other participants with no experience in pesticide applications will not have any experiences to relate to during the training. This study seeks to understand the effectiveness of pesticide applicator trainings as it relates to the adult learning theory.

Most of the attendees to the Private Applicator License trainings are agricultural producers or individuals with a farming background. Research has shown that farmers and

adults in general prefer experiential learning experiences to learn new content. A study of 1,100 farmers in Iowa conducted by Trede and Miller (2000) showed that active experimentation (learning by doing) seemed to be the preferred learning mode for agricultural topics related to physical farming resources (land, crops, livestock, machinery, and buildings) while abstract learning by observing others were the preferred learning modes for more critical thinking activities such as markets and prices, whole farm planning, and financial management. The results from this study are very representative of the way farmers like to learn new information.

Methods

Population and Sample

The population for this study was all pesticide applicators who attended UF/IFAS trainings in Madison and Suwannee Counties during 2013. These training sites were listed on the Florida Department of Agriculture's web site <http://app1.flaes.org/ceu/> and most are also posted either on IFAS http://solutionsforyourlife.ufl.edu/education/pest_control.html or County Extension web sites.

In Madison and Suwannee counties there are approximately 250 licensed RUP applicators. Class sizes generally consist of 10-20 participants and trainings are conducted approximately 4 times per year. Usually, 30-40 percent of the participants are attending to take the test to receive their license. The remaining 60-70 percent are attending to receive CEU's.

Research Design

This study used a quantitative research design and was administered at the conclusion of pesticide training events. The ordinal data that was collected is most appropriately gathered through this type of design. Items were measured on a Likert scale. Likert-type or frequency scales use fixed choice response formats and are designed to measure attitudes or opinions. They are primarily used in questionnaires to obtain participant's preferences or degree of

agreement with a statement or set of statements. The survey instrument used was created by the researcher and was revised with the assistance of other Extension agents familiar with these types of trainings. The survey instrument was then pilot tested with a like group to ensure reliability.

The first section of the questionnaire asks basic questions such as: date, location and for test or CEU's. Next is the program evaluation section. This section contains 4-5 questions regarding the participant's thoughts about the training session. They are rated on a scale of excellent (5) – poor (1). The third part contains “did you learn anything new?” questions to evaluate the effectiveness of the material presented. For these questions a scale of considerable new information (3) – didn't learn anything (1) is used. The final section contains current versus future pesticide applicator practices. This is a behavior section with a two part answer (after today/ before today), scaled from always (4) - never (1). Finally there is a space for comments at the end.

This retrospective pretest evaluation was given to all participants of these pesticide trainings to evaluate knowledge gained. A retrospective pretest evaluation can document changes in knowledge and behavior, simply and efficiently. Also, since it is administered only once, only a few minutes are required to complete the questionnaire. The questionnaire was given to all participants at the conclusion of the training. This questionnaire was then collected and reviewed. RUP exam pass/fail rates were evaluated for those taking the exam.

For this study I could have used a qualitative design. This could include follow up interviews with participants either by phone, mail or in person. This would require more time to complete and possibly not include all of the participants. The post training survey administered at the conclusion of the trainings was completed by all participants and doesn't take much time to complete. A weakness of this questioner is participants may respond to what they think the

researcher wants and not what they feel. This could be done in an effort to help the workshop presenters look good. In other words learning took place regardless of whether or not it did. Also, self-report data and the recall of information through reflection may be subject to problems of insufficient recall as well as offer the potential for fabricated or biased responses

Training Description

The private applicator restricted use pesticide training provided pesticide applicators the information needed to become certified as licensed pesticide applicators under the provisions of the Florida Pesticide Law. The material presented offered pesticide applicators the basic knowledge and skills required to fully prepare for their certification exams. Also, the information provided can be a source for future general reference. The program was planned in a logical order of importance and follows the two pesticide manuals. Applying Pesticides Correctly, A Study Guide for the General Certifications Standards (Core) and Private Applicator Agricultural Pest Control.

The first unit includes a program overview and RUP rules/laws. This unit includes an introductory section and two power point presentations. It addresses the rules and laws for applying RUPs and proper pesticide application procedures. The introductory section gives participants an overview of the training program. The first power point presentation covers the federal and state laws regarding pesticide applications. The second power point presentation presents a generalized overview of applying pesticides correctly. This important first step sets the ground work for the training ahead. This unit covered the first few sections of the Applying Pesticides Correctly (Core) manual. It is important for Individuals to first understand the rules and laws for RUPs and what is required to receive an RUP certification.

The second unit covers the middle sections of the core manual; interpreting a pesticide label and pesticide formulations. This unit is divided into two parts. The first part is a power point

presentation covering pesticide formulations. During the second part of this unit participants are given a pesticide label and interactively discuss the various components of it. This section focuses on pesticide formulations and labels. An understanding of the label and its various components is very important. “The label is the law”.

The third unit is the final unit of the core section and covers pesticide safety and personal protective equipment. Unit three covers pesticide safety and is divided into two parts. The first part covers potential hazards and the precautions needed to prevent damage to the environment. The second part covers personal protective equipment (PPE). This includes a power point presentation and a PPE demonstration. Participants are also given a pesticide label and asked to describe the required PPE. This unit logically follows the label unit, since the instructions for pesticide use and safety is specified on the product labels. After this third unit is completed, the Core exam is administered.

Unit four begins the Private Applicator component of the program. This unit covers agriculture pest control and picks up where the previous three units left off. Two important aspects covered in this unit include: pest identification and factors involved in deciding when to spray. This unit is a presentation on identifying pests and thresholds. Various habits and life cycles of pests are included. These are key markers for correctly identifying pests.

Unit five involves pesticide application equipment and calibration. This unit starts with a brief presentation in the classroom covering various components of a pesticide sprayer. Next is an outside field component. During this section an actual pesticide sprayer will be reviewed and calibrated. Participants are asked to identify various sprayer components and check the calibration of the sprayer.

Unit six, the final unit, is pesticide arithmetic. Unit six involves an interactive mathematical session. As a group participants work through land area and volume metric

calculations. These calculations will help participants learn the steps required to purchase and apply the correct amount of pesticide needed for a given site. This unit brings it all together. We have developed an understanding of the concepts needed to safely apply pesticides, identified a pest, calibrated our sprayer, and now we need to know how much to purchase and spray. The Private App exam is administered at the conclusion of this unit. These exams are then sent to Florida Department of Agriculture and Consumer Services for grading and further processing.

Course/Workshop Understandings

Learners will understand that:

1. Restricted use pesticides are governed by rules and laws.
2. The importance of correctly identifying pests.
3. A pesticide label is the law.
4. Proper calibration of sprayers reduces the risk of environmental contamination.

Essential Questions:

1. How are restricted use pesticides regulated?

Objective 1: Describe the rules and laws for applying RUPs.

Objective 2: Identify proper pesticide applications procedures.

2. How do I apply the correct pesticide?

Objective 3: Interpret a pesticide label.

Objective 4: Identify various pesticide formulations.

3. How do I protect the environment and myself from harmful pesticide exposure?

Objective 5: Describe the factors that affect environmental contamination and how to prevent them.

Objective 6: Identify personal protective equipment (PPE) components.

4. When do I spray for pest control?

Objective 7: Explain the importance of correctly identifying pests.

Objective 8: List the factors involved in deciding when to spray.

5. How do I insure the correct amount of pesticide is applied?

Objective 9: Identify various types and components of pesticide application equipment.

Objective 10: Demonstrate proper sprayer calibration.

6. How do I determine the total amount of pesticide to needed?

Objective 11: Calculate land area in acres to be sprayed.

Objective 12: Calculate volume of pesticide to be sprayed.

Text/References: *(the power point presentations for this training were developed from these two study manuals and follows them by each chapter)*

Fishel, Fredrick M. (2010). *Applying Pesticides Correctly*, A Study Guide for the General Certifications Standards (Core) Exam 7th Edition, SM 1, University of Florida, IFAS.

Fishel, Fredrick M. (2008). *Private Applicator Agricultural Pest Control*, 2nd Edition, SM 53, University of Florida, IFAS.

Cornerstone Tasks:

- 1. Identifying Pests:** Based on information presented in class:
 - Participants will be given a weed assessment worksheet. Participants will correctly match the four stages of plant development and the three life cycles of plants.
 - Participants will be given a worksheet with descriptions of the four general types of insect mouth parts and will correctly match the insects with them.
- 2. Pesticide Label:** Upon completion of the applying pesticides correctly program. Given a pesticide label:
 - Participants will describe the four major label components (safety, environmental,

product, and use information).

- Participants will correctly explain the steps needed to safely apply pesticides.
- Participants will be given a field's length and width in feet. They will then calculate the acreage of the given field and then determine the amount of pesticide needed.

3. **Sprayer Calibration:** Given a tractor with a mounted pesticide sprayer, participants will calibrate the pesticide sprayer and correctly identify each step required to do so.

Assessment and Evaluation:

The General Certifications Standards (Core) and the Private Applicator Agricultural Pest Control exams from the Florida Department of Agriculture and Consumer Services (FDACS) will be given at the conclusion of the program. They are the administrator of this certification. A participant must pass with a score of 70 or better to become certified. Passing these tests will certify producers as Restricted use pesticide (RUP) applicators. Restricted use pesticide licenses are for pesticide applicators that treat agricultural and related sites, such as agricultural fields, plant nurseries, golf courses, industrial sites and highway right-of-ways among others. The Florida Department of Agriculture and Consumer Services (FDACS), through the Bureau of Compliance Monitoring, administers this program and the local county Extension Office offers educational programs, trainings and administers tests for those needing to become certified. Also, a post program survey will be administered. This survey will focus on topics such as: location, presentation methods, instructor, and knowledge gained. In addition, the cornerstone tasks will be evaluated when completed.

Instrument and Data Collection

A retrospective pretest evaluation is administered at the conclusion of the pesticide training programs. (Instrument is attached at the end of this paper). A Likert type scale will be used to record responses. It is the most widely used approach to scaling responses in survey

research. This retrospective pretest evaluation can document changes in knowledge and behavior, simply and efficiently. Also, since it is administered only once, only a few minutes are required to complete the questionnaire. The questionnaire will be given to all participants at the conclusion of the training. The evaluation will be done for each of the trainings on a continuing basis. Pesticide applicator training is done throughout the year and trainings will be held as long as there is a need. The agent is responsible for collecting and reviewing the evaluations.

The first section of the questionnaire asks basic questions such as: date, location and whether it is training for the test or CEUs. Next is the program evaluation section. This section contains 4-5 questions regarding the participant's thoughts about the training session. They are rated on a scale of excellent (5) – poor (1). The third part contains “did you learn anything new?” questions to evaluate the effectiveness of the material presented. For these questions a scale of considerable new information (3) – didn't learn anything (1) is used. The final section contains current versus future pesticide applicator practices. This is a behavior section with a two part answer (after today/ before today), scaled from always (4) - never (1). Finally there is a space for comments at the end. The questionnaire is given to all participants at the conclusion of the pesticide training events. This questionnaire is then collected by the agent and reviewed.

Data Analysis

Most of the data will be collected using a Likert scale. The results for the different variables in the data set will be tabulated into two sets, one for the initial training and the other for those attending for CEU's.

Results

A total of 34 participants attended trainings during 2013, during 4 sessions. 14 were attending their initial pesticide training and 20 were attending to earn CEUs for license renewal. The results of the survey for participants (n=14) with no prior pesticide training are listed below.

	Excellent	Very Good	Good	Fair	Poor
Relevance of topics to you	14% (n=2)	86% (n=12)	0	0	0
Quality of teaching materials	57% (n=8)	43% (n=6)	0	0	0
Presenter's knowledge of topic	43% (n=6)	57% (n=8)	0	0	0

Using the scale below, please indicate how much you learned:

	Considerable New Information	Some New Information	Didn't Learn Anything
Managing pests (weeds, insects and diseases)	86% (n=12)	14% (n=2)	0
Integrated pest management (IPM)	71% (n=10)	29% (n=4)	0
Pesticide labels and formulations	57% (n=8)	43% (n=6)	0
Personal protective equipment	57% (n=8)	43% (n=6)	0
Equipment calibration	57% (n=8)	43% (n=6)	0

Pesticide applicator practices

	Before today, did you				After today, will you			
	Always	Often	Frequently	Never	Always	Often	Frequently	Never
Check equipment calibration	0	14%	29%	57%	100%	0	0	0
Use protective goggles?	0	29%	71%	0	100%	0	0	0
Use protective gloves?	14%	14%	71%	0	100%	0	0	0

It is evident that most of the information covered during this training was new to the attendees; this was the first time they were exposed to formal pesticide training. More than 57%

of the content covered was new to the participants. This represents a challenge for the instructors as there is a significant amount of information that needs to be covered during a short time frame. However, this is an opportunity to provide attendees with a foundation of pesticide application principles and practices. This group plans to make changes to their pesticide applicator practices after attending the class. The class strives to provide a combination of lectures, arithmetic and hands-on activities to accomplish training. According to the survey, 43% of the attendees found the power point presentations most beneficial while 57% found the hands-on calibration most beneficial.

Twelve of the fourteen participants, who took the exams, passed both sections and are now licensed applicators. One of the other participants passed the Core section but failed to score 70% on the private applicator section. He will have 6 months to acquire a passing score on that section to receive a license without having to retake the core section. The other participant had no prior pesticide experience and failed to receive a passing score on either exam.

The results for participants (n=20) with prior pesticide training who attended the training to receive CEU's are listed below. It is important to note that most attendees have been licensed applicators for 4 years or longer. They come to this training with prior experience and having attended other educational pesticide programs. For those seeking recertification, this becomes a mandatory training to receive CEUs if they do not want to take the test again. Licensed applicators attending for CEUs are not required to take a knowledge exam at the conclusion of the training. They are however required to attend fifty minutes of training for each CEU received.

	Excellent	Very Good	Good	Fair	Poor
Relevance of topics to you	60% (n=12)	40% (n=8)	0	0	0
Quality of teaching materials	75% (n=15)	25% (n=5)	0	0	0
Presenter's knowledge of topic	90% (n=18)	10% (n=2)	0	0	0

Using the scale below, please indicate how much you learned:

	Considerable New Information	Some New Information	Didn't Learn Anything
Managing pests (weeds, insects and diseases)	30% (n=6)	70% (n=14)	0
Integrated pest management (IPM)	30% (n=6)	70% (n=14)	0
Pesticide labels and formulations	50% (n=10)	50% (n=10)	0
Personal protective equipment	40% (n=8)	55% (n=11)	5% (n=1)
Equipment calibration	50% (n=10)	50% (n=10)	0

Pesticide applicator practices

	Before today, did you				After today, will you			
	Always	Often	Frequently	Never	Always	Often	Frequently	Never
Check equipment calibration	5%	20%	70%	5%	10%	85%	5%	0
Use protective goggles?	0	50%	45%	5%	45%	55%	0	0
Use protective gloves?	5%	50%	45%	0	50%	50%	0	0

The surveys show that 60% (n=12) of the attendees found the program to be excellent while the remaining 40% (8) list it as “very good”. This is important as all the participants in this category have prior experience and have attended numerous pesticide trainings in the past. The surveys revealed that 75% (15) of the attendees believed the quality of teaching materials is excellent and 90% (18) stated that presenter’s knowledge of the topic is excellent. About 2/3 of the attendees in this group learned “some new information” during the training. This is important, as it shows that topics are updated and relevant for

experienced pesticide applicators. As we review pesticide applicator practices, it is noticeable that a large percentage of participants expect to increase their safe pesticide handling practices such as equipment calibration and use of personal protective equipment (ie. goggles and gloves). An emphasis is placed on these practices during trainings to prevent human and environmental hazards during applications. During the trainings, instructors use supporting materials to discuss the human health hazards that occur from improper use of personal protective equipment and applicator error.

Conclusions

The two groups studied have varying degrees knowledge and expertise. Attendees have different goals when attending this training. This provides a challenge to the instructors as it is hard to deliver the information using a basic and an advanced level at the same time. However, as instructors engage with attendees during the training, it becomes easier to use examples that are relevant to the group based on their experiences. Pesticide trainings are lengthy and often involve a large amount of detailed information. It is challenging, for adult learners who are not used to being a classroom setting, to learn the amount of information delivered. It is important to note that Core and Pesticide Applicator tests are not open book. Test takers need to be able to understand, retain and analyze the content of the trainings to successfully pass the tests. Twelve of the fourteen participants, who took the exams, passed both sections and are now licensed applicators. The feedback received from the survey from those who need CEUs infers that instructors are well qualified and are presenting information that is relevant to their needs. Nonetheless, the training content has to follow the instruction manuals which may not necessarily cover local issues. Therefore, open discussion and interaction with experienced applicators is essential to engage participants and keep the trainings relevant.

This study will give Extension agents, educators and stakeholders information regarding

the effectiveness of restricted use pesticide applicator trainings. Through understanding the perspectives of participants following pesticide training events, educators can improve the delivery of educational programs in this general area. The results will be beneficial for Extension agents to make program adjustments to enhance future trainings. The results of this study can also lead to continued support for this program area and the advancement in adult learning methods. They also can be used for year-end reporting to the County advisory committees and UF IFAS administration.

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Insect Mouth Part Worksheet

Name: _____

Date: _____

Match all of the insects on right with the matching mouth part description. Each description has at least two correct answers.

1) Insects that have chewing mouth parts.

_____ ' _____ ' _____

2) Insects with piercing and sucking mouth parts.

_____ ' _____ ' _____

3) Insects with siphoning mouth parts.

_____ ' _____ ' _____

4) Insects with sponging mouth parts.

_____ ' _____ ' _____

A) Mosquito

B) Butterfly

C) Housefly

D) Aphid

E) Grasshopper

F) Moth

G) Beetle

H) Ants

I) Whiteflies

J) Horse fly

Weed Assessment Worksheet

Name: _____

Date: _____

Stages of plant development

Fill in the blank to complete each sentence.

- 1) Plants are in the _____ stage of development, when in fast growth.
Production of stems, roots, and foliage occur at this stage.
- 2) Little or no growth or movement of water and nutrients indicates _____ stage of development.
- 3) _____ is a young plant, developing from a seed.
- 4) Energy is directed toward reproduction at _____ stage.

Life cycles of plants

Match the plants listed on the right with the definitions.

- | | |
|---|--------------|
| 1) Plants with a two-year life cycle. _____ | A) Perennial |
| 2) Plants that normally live more than two years. _____ | B) Annual |
| 3) Plants that live one year. _____ | C) Biennial |

Pesticide Math Calculations Worksheet

Name: _____

Date: _____

1. What is the travel speed (mph) of a sprayer that covers a 500 ft course in 55 seconds?

Need to know: 5,280 ft = 1 mile 3,600 sec = 1 hour

2. Convert an application of 2 quarts per 1,000 ft² to gallons per acre.

Need to know: 2 qts = 0.5 gal 1 acre = 43,560 ft²

3. What is the output per nozzle in gallons per minute of a sprayer with a 30 foot boom, 24 in nozzle spacing, 10 gallons per acre, travel speed of 6.0 mph?

Need to know: 1 mph = 1.47 feet / sec 1 acre = 43,560 ft²

4. A 2 gallon sprayer will be used to apply a herbicide in a 2% solution. How many ounces of product should be mixed into the tank?

Need to know: 1 g = 128 oz

5. A 3 gallon sprayer with a 5 nozzle boom will be used to apply herbicide. Label rate of 10 oz product per acre. How much of product needed? Applicator will be walking @ 3mph, nozzles 18" apart, rate 25 gpa.

6. How much product is required to treat a field 3000 ft long by 1500 ft wide. Sprayer is calibrated at 10 gallons per acre. Tank capacity is 500 gallons. Label rate is 0.5 qts per acre.

Need to know: 1 acre = 43,560 ft² 4 qts = 1 gallon

7. How much granular product is applied per acre if 6.0 pounds of material were collected and the spreader width of 30 feet over a test run of 300 feet at 6.0 mph.

Need to know: 1 acre = 43,560 ft²

8. How much of a powder should be mixed into 200 gal of water for treating a triangle shaped area 1000 feet long and 500 feet across. Label rate is 1 lb per acre.

Need to know: Area of triangle = $\frac{1}{2}$ base * height 1 acre = 43,560 ft²

9. How many pounds of a granular product are needed to treat a circular area with a diameter of 1000 feet. Label rate is 5 lbs per acre.

Need to know: Area of circle = $\pi * R * R$ Radius = $\frac{1}{2}$ diameter $\pi = 3.14$ 1 acre = 43,560 ft²

10. How many gallons per acre applied by a sprayer that has a 500 gallon tank, 40 ft boom, 30" nozzle spacing, traveling at 5 mph, applying a rate of 0.78 gallons per minute.

Need to know: 1 mph = 1.47 ft/sec 1 acre = 43,560 ft² 30" = 2.5 ft

PESTICIDE APPLICATOR TRAINING SURVEY

This survey is being conducted to evaluate this program's effectiveness and to improve future programs.

Location _____

Date _____

Please circle one answer for each of the following three questions:

Is this your initial training? Yes / No

Is this for Recertification (CEU's)? Yes / No

Which part of the program did you find most beneficial?

- A) Power point presentation lecture
- B) Math calculations exercise
- C) Hands on calibration

Please evaluate the program by circling the appropriate number:

	Excellent	Very Good	Good	Fair	Poor
Relevance of topics to you	5	4	3	2	1
Quality of teaching materials	5	4	3	2	1
Presenter's knowledge of topic	5	4	3	2	1
Location/facilities	5	4	3	2	1

Using the scale below, please indicate

	Considerable	Some	Didn't learn
How much you learned:	New information	new information	Anything

Managing pests (weeds, insects and diseases)	3	2	1
Integrated pest management (IPM)	3	2	1
Pesticide labels and formulations	3	2	1
Personal protective equipment	3	2	1
Equipment calibration	3	2	1

Pesticide applicator practices	Before today, did you...				After today, will you...			
	Always	Often	Frequently	Never	Always	Often	Frequently	Never
Check equipment calibration?	4	3	2	1	4	3	2	1
Use protective goggles?	4	3	2	1	4	3	2	1
Use protective gloves?	4	3	2	1	4	3	2	1

Thank you for completing this survey and please add any additional comments.