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**ABSTRACT**

This curriculum guide includes teaching packets for 12 areas of study to be included in a core curriculum for 11th-grade or third-year students enrolled in rural agricultural programs in Illinois. Each problem area includes some or all of the following components: suggestions to the teacher, teacher guide, competency inventory, information sheet, student worksheets or assignment sheets with key, demonstrations, job sheets, transparencies, a discussion guide for transparencies, and sample test questions and teacher key. The 12 problem areas of study in this guide are grouped into seven units. Unit A, on orientation to agricultural occupations, contains one problem area, exploring agricultural occupations and careers. In the second unit, on leadership and citizenship, planning and conducting community service programs and becoming acquainted with rural agricultural organizations are covered in the problem areas, while the third unit covers supervised occupational experience. In the fourth unit, on livestock science, problem areas are maintaining livestock health and planning and evaluating livestock confinement systems. The fifth unit, on crop science, contains the problem areas of handling pesticides and maintaining and improving forage crops and pastures. In the sixth unit, on soil, science, and conservation of natural resources, conserving soil, water, and wildlife resources are covered in two problem areas. The final unit, on horticulture, provides instructional materials on growing small fruits and fruit trees. Suggestions to the teacher on ways to use the materials are included in the guide. (KC)

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CORE III MATERIALS  
FOR RURAL  
AGRICULTURE  
PROGRAMS  
UNITS A-G  
Project Staff

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Product Abstract

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16. General Description:

This curriculum guide includes teaching packets for 21 problem areas selected as suggested areas of study to be included in a core curriculum for eleventh-grade or third-year students enrolled in a rural agriculture program.

17. Person Completing this Abstract: Paul E. Hemp

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## SUGGESTIONS FOR USING CORE MATERIALS

These instructional materials and teaching aids have been designed to improve instruction and increase student learning. Each problem area includes some or all of the following components:

1. Suggestions to the teacher
2. Teacher's guide
3. Competency inventory
4. Information sheet
5. Student worksheets or assignment sheets and key
6. Demonstrations
7. Job sheets
8. Transparencies
9. Discussion guide for transparencies
10. Sample test questions and teacher's key

This combination of instructional materials should be utilized as a source unit. This means that teachers should selectively choose those components and those parts which they need to achieve their teaching objectives. The project staff does not recommend that teachers "teach" the core program as it is presented. Instead, the teacher should personalize and localize the materials for the particular group taught and, wherever possible, add other materials and teaching techniques to enrich the core program.

Teachers could teach everything included in the core curriculum but this would not be advisable considering the variations which exist in vocational agriculture programs, students' needs and interests, and program objectives. Instead, teachers should select problem areas for a "local core" and supplement them with other problem areas important in the local area. Another suggestion is that the entire problem area need not be taught to a given group during a given year. For example, teachers may want to teach part of the parliamentary procedure problem area to a beginning class and teach the remaining part to an advanced class.

Specific suggestions for using the different components of a problem area packet are presented in the following section.

1. Suggestions to the teacher. These suggestions are included on the first page of each problem area. Teachers should read these suggestions before problem areas are scheduled for the year. Decisions need to be made regarding which problem areas will be taught, when they will be taught and the approximate number of days to be devoted to each problem area. On the basis of these decisions, teachers can construct a course calendar.

In some cases, the suggestions also indicate the preplanning that needs to be accomplished before instruction begins. Instructional materials not included in the core need to be ordered in advance.

2. Teacher's guide. The teacher's guide is not a lesson plan. It is a source of teaching ideas which may be implemented by the agriculture teacher to conduct an effective instructional program. Each guide includes more material than most teachers would use. Teachers should select from the several interest approaches and teaching activities those suggestions which seem most appropriate for the local situation. The teacher's guide emphasizes a problem solving method and a student-centered, activity approach. Lecture-presentation, rote memorization of facts and subject matter mastery should be kept to a minimum. The teacher's guides include suggestions for carrying learning to the "doing" level. Application of classroom learning to S.O.E.P.'s and FFA activities is an important part of the teaching process.

3. Competency inventory. A listing of job competencies for most problem areas has been included in the Core III materials. These listings are included to help teachers focus on skill development in the instructional program for advanced students. The competency inventories can be used to make students aware of the skills important on the job. By including them in the Core III program, the developers intend to emphasize the importance of competency based instruction for students who are preparing for entry level employment.

4. Information sheet. These sheets have been prepared for those problem areas where subject matter may be difficult to locate. If reference materials are not available, the teacher may want to duplicate copies of the information sheets for class use.

5. Student worksheets or assignment sheets and keys. These exercises are designed as classroom activities for student use. They may provide a change of pace for students when they have grown tired of other activities which may be overused. Most exercises include a teacher's key with suggested answers.

6. Demonstrations. The teaching of certain problem areas often calls for demonstrations of manipulative skills or projects. The demonstration outline may be used by the teacher or students to conduct demonstrations of manipulative skills. Teachers may want to change some of the student activities included in the Teacher's Guide into student demonstrations.

7. Job sheets. In some problem areas, such as the agricultural mechanics areas, job sheets have been provided which include a step-by-step procedure for performing agricultural jobs. These sheets may be used to guide students engaged in individualized learning and to take a load off the busy teacher who has a large class involved in a variety of learning activities.
8. Transparencies. Some of the problem areas include transparency masters which can be used to prepare overlays and others include small reproductions of transparencies developed for the Core Project which are available from Vocational Agriculture Service, University of Illinois.
9. Discussion guide for transparencies. Most of the transparencies included in the core materials do not include on the overlay any narration or explanation. The discussion guide provides teachers with some suggested points to bring out in the discussion of a transparency including explanations, descriptions and discussion questions related to the transparency.
10. Sample test questions and key. The sample test questions are not intended to be used as a test. The teacher can select questions from those included in the problem area if they are appropriate and add others as needed. Some teachers may choose not to administer a test at the close of each problem area and to prepare a comprehensive test at the end of a unit.

The numbering system found at the bottom of each page includes four digits or letters. The first number is a Roman numeral III which stands for Core III. The letters which run from A-I designate the unit. The third character is a numeral which indicates the problem area within the unit (1 means first, 2 for second, etc.). The last digit is the page number. All pages are numbered consecutively and the page in each problem area starts with "one."

The color scheme used in the Illinois Core Curriculum is as follows:

- Salmon--Suggestions to the Teacher
- Tan--Teacher's Guide
- Light Blue--Information Sheets
- Ivory--Student Worksheets
- Pink--Job Sheets
- Lime--Teacher's Key to Student Worksheets
- White--Transparencies and Transparency Discussion Guides
- Yellow--Sample Test Questions
- Green--Teacher's Key to Sample Test Questions
- Gold--Competency Inventories
- Gray--Project Plans
- Raspberry--Introductory Sheets

LIST OF UNITS AND PROBLEM AREAS  
RURAL AGRICULTURE PROGRAM  
CORE III

UNIT A: Orientation to Agricultural Occupations

PROBLEM AREA:

1. Exploring agricultural occupations and careers

UNIT B: Leadership and Citizenship

PROBLEM AREAS:

1. Planning and conducting community service programs
2. Becoming acquainted with rural agricultural organizations

UNIT C: Supervised Occupational Experience

PROBLEM AREA:

1. Expanding my S.O.E.P.

UNIT D: Livestock Science

PROBLEM AREAS:

1. Maintaining livestock health
2. Planning and evaluating livestock confinement systems

UNIT E: Crop Science

PROBLEM AREAS:

1. Handling pesticides safely and passing pesticide certification tests
2. Maintaining and improving forage crops and pastures

UNIT F: Soil Science and Conservation of Natural Resources

PROBLEM AREAS:

1. Conserving soil and water resources
2. Conserving wildlife resources

UNIT G: Horticulture

PROBLEM AREA:

1. Growing small fruits
2. Growing tree fruits

UNIT H: Agricultural Mechanics

PROBLEM AREAS:

1. Constructing and maintaining buildings
2. Developing electrical wiring skills
3. Adjusting and maintaining planting equipment
4. Maintaining and repairing small engines
5. Adjusting and maintaining harvesting equipment
6. Developing concrete and concrete masonry skills

UNIT I: Agricultural Business Management

PROBLEM AREAS:

1. Four ways of doing business in agriculture
2. Marketing agricultural crops
3. Marketing livestock and livestock products

CORE CURRICULUM ADVISORY COMMITTEE  
RURAL AGRICULTURE PROGRAM

1. High School Vocational Agriculture Teachers

- District One - Russell Leman  
Roanoke-Benson High School
- District Two - Richard Dunn  
Seneca High School
- District Three - Charles Ferguson  
Pittsfield High School
- District Four - Allen Hornbrook  
Paris High School
- District Five - Larry Keyser  
Clay City High School

2. Area Vocational Center Representative

Donald Kaufmann  
Grundy County Area Vocational Center

3. Community College Representative

William Martinie  
Illinois Central College

4. Agricultural Business/Industry Representative

- a. Agricultural Service and Supply  
Louis Wagner, Sommer Bros. Seed Co.
- b. Agricultural Mechanics  
Roger Neitfeld  
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- c. Horticulture  
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5. Governmental Agency Representatives

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Illinois Department of Agriculture

6. Joint Staff Representatives

Dr. Len Harzman, Western Illinois University  
Dr. Joe Townsend, Illinois State University  
Mr. Tom Wiles, DAVTE, Illinois State Board of Education

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Appreciation is expressed to the many vocational agriculture teachers who shared their time, knowledge, and instructional aids for the preparation of this core curriculum. Without their cooperation and input, this printing would not have been possible.

Some of the material included in the Rural Core III was written and/or reviewed by the following vocational agriculture instructors. The asterisk (\*) identifies teachers who wrote selected problem area drafts.

### 1. Exploring agricultural occupations and careers

Charles Harn (Spoon River Valley High School)  
Barbara Clayton (Brown County High School)  
Don Hobbs (West Frankfort High School)  
Albert Ticken (Dixon High School)

### 2. Planning and conducting community service programs

Betsy Pech (Wapella High School)  
Al Dietz (Sycamore High School)  
Elmer Gerlach (Mt. Carroll High School)

### 3. Becoming acquainted with rural agricultural organizations

\*Carol Keiser (Carlinville High School)  
Al Dietz (Sycamore High School)  
Elmer Gerlach (Mt. Carroll High School)

### 4. Expanding my S.O.E.P.

Arley Van Doren (Southwestern High School)  
C. Eugene McGrew (Bushnell High School)  
Robert Cone (Salem High School)  
John Conner (Galesburg High School)

### 5. Maintaining livestock health

\*Tom Hand (West Pike High School)  
Kent Johnson (Galva High School)  
Allen Ritter (North Clay High School)  
Everett Moeller (Beecher High School)  
Charles Ferguson (Pittsfield High School)

### 6. Planning and evaluating livestock confinement systems

Charles Ferguson (Pittsfield High School)  
Tom Hand (West Pike High School)  
Kent Johnson (Galva High School)  
Allen Ritter (North Clay High School)  
Everett Moeller (Beecher High School)

7. Handling pesticides safely and passing pesticide certification tests

\*Betsy Pech (Wapella High School)  
Clarence Tipton (Serena High School)  
Clarence Benard (Enfield High School)

8. Maintaining and improving forage crops and pastures

Clarence Tipton (Serena High School)  
Clarence Benard (Enfield High School)  
Carol Keiser (Carlinville High School)

9. Conserving soil and water resources

Floyd W Ehrley (Kewanee High School)  
Darrell Scherer (West Richland High School)  
Steve Hendrix (Sullivan High School)  
Don Prather (Clinton High School)

10. Conserving wildlife resources

\*Joe House (Princeville High School)  
Floyd W Ehrley (Kewanee High School)  
Darrell Scherer (West Richland High School)  
Steve Hendrix (Sullivan High School)  
Don Prather (Clinton High School)

11. Growing small fruits

Allen Hornbrook (Paris High School)  
Harold Lindley (Morton High School)  
Frank Dry (Nashville High School)

12. Growing tree fruits

Allen Hornbrook (Paris High School)  
Harold Lindley (Morton High School)  
Frank Dry (Nashville High School)

13. Constructing and maintaining buildings

Philip Brown (Harvard High School)  
Carl Burkybile (Rantoul High School)  
Rich Dunn (Seneca High School)  
Don Miller (New Holland-Middletown High School)

14. Developing electrical wiring skills

\*Dave Wilson (St. Joseph-Ogden High School)  
Gene Bork (Forrest-Strawn-Wing High School)  
Bobby Whittington (East Richland High School)  
John Rentfrow (Shelbyville High School)  
Max Tessier (Metamora High School)  
Richard Seidel (Altamont High School)

15. Adjusting and maintaining planting equipment

Jack Stork (Jerseyville High School)  
Steve Myers (Lewistown High School)  
Brian Cirks (Alexis High School)

16. Maintaining and repairing small engines

\*Richard Schertz (Moweaqua High School)  
Morris McClelland (Rushville High School)  
Robert Wheeler (Flora High School)  
Richard Watson (Lincolnwood High School)  
Larry Melhouse (Avon High School)

17. Adjusting and maintaining harvesting equipment

Don Bergfield (Paris High School)  
Eldon Chapman (Herscher High School)

18. Developing concrete and concrete masonry skills

\*Dave Trent (Reddick High School)  
\*John Abell (Teutopolis High School)  
Glen Sims (Windsor High School)  
Richard Petrowich (New Athens High School)

19. Four ways of doing business in agriculture

\*Lee West (Mt. Pufaski High School)  
Jim Guilinge (Sycamore High School)  
Ronald Welling (Pecatonica High School)

20. Marketing agricultural crops

Garry Raymond (Hampshire High School)  
Dave Erickson (R.O.V.A. High School)  
Vince Mitchell (Mt. Vernon High School)  
Larry Keyser (Clay City High School)

21. Marketing livestock and livestock products

Garry Raymond (Hampshire High School)  
Dave Erickson (R.O.V.A. High School)  
Vince Mitchell (Mt. Vernon High School)  
Larry Keyser (Clay City High School)

## UNIT A: ORIENTATION TO AGRICULTURAL OCCUPATIONS

### PROBLEM AREA: EXPLORING AGRICULTURAL OCCUPATIONS AND CAREERS

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in vocational agriculture programs. The recommended time for teaching this problem area is at the beginning of new units which focus on career opportunities.

The estimated instructional time for this problem area is 5 to 7 days depending on how far the teacher wishes to go in developing student career plans and identifying job skills. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

#### CREDIT SOURCES:

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The teacher's guide, student worksheet, and test questions were developed by Jerry Pepple, Department of Vocational and Technical Education, University of Illinois. The worksheets and sample test questions were developed from materials originally prepared by Oklahoma State Department of Vocational and Technical Education. Transparency masters and the transparency discussion guide were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Rural Core Curriculum Field Test Teachers. This problem area was reviewed by the following vocational agriculture teachers:

Charles Harn	- Spoon River Valley High School
Barbara Clayton	- Brown County High School
Don Hobbs	- West Frankfort High School
Albert Tieken	- Dixon High School

## TEACHER'S GUIDE

- I. Unit: Orientation to agricultural occupations
- II. Problem area: Exploring agricultural occupations and careers
- III. Objectives: At the end of this problem area students will be able to:
  1. Examine their career plans and re-evaluate the progress made in preparing for employment in their selected occupational area.
  2. Start preparing materials which can be used when seeking employment.
  3. Determine local and state wide employment opportunities for their occupational area of interest.
  4. Identify new and emerging careers and/or technological changes in the agricultural industry.
  5. Identify essential human relations job skills.
- IV. Suggested interest approaches:
  1. Ask each class member to list at least 5 possible career decisions they are going to make by the time they complete their high school education. Ask students to think about and then identify how these decisions may affect their lives. The list of decisions might include such items as; (a) nature of work, (b) location of employment, (c) educational requirements for employment, (d) financial benefits, (e) travel requirements, and (f) marriage plans.
  2. Promote class interest in career planning by identifying former students who made career choices similar to those being discussed by class members. Develop modifications of the plans followed by former students to adapt them to the current students' situations.
- V. Anticipated problems and concerns of students:
  1. What personality characteristics are important?
  2. What personal skills are essential for job success?
  3. How can I take an inventory of my personal abilities, interests, and experiences and match them to possible occupation requirements?
  4. Do I need to attend a community college or a four-year university to get a good job?

5. Should I look for full-time employment immediately after high school graduation?
6. What are some ways to go about locating good jobs in my area of interest?
7. What are some general occupational competencies employers expect beginning employees to possess?

V.1. Suggested learning activities and experiences.

1. Identify students' immediate concerns relating to career plans and goals. Develop tentative solutions to these problems through class discussion. Select an occupational area of interest to the students, then assign students the task of developing a model career plan one could follow to secure the identified occupation.
2. Distribute Worksheet 1, "Comparing Occupational Choices", have students identify three occupations they have researched and complete the worksheet. Refer to Rural Core I, A-3, for suggestions on examining selected occupations. Ask for volunteers to report their results and discuss the importance of this information.
3. Distribute Worksheet 2, "Personal Habits Related to Job Success", have students role-play a job related situation and have rest of the class members evaluate the exercise using Worksheet 2. Discuss their ratings and the importance of these job related factors toward successful employment.
4. Divide the class into pairs and have students evaluate each other's efforts on Worksheet 1 and select the one occupation which most closely matches their personal characteristics. Have students volunteer to present their opinion as to why they "would" or "would not" like to be employed in this occupation.
5. Explain to students the importance of evaluating their progress toward meeting employment requirements and determining the areas which need further skill and knowledge development. Use Worksheet 3, "Evaluating My Career Goals", to help students develop a career plan for one or more occupations in which they are currently interested. Refer to Rural Core I, A-3, for suggested career references.
6. Use the sample test included with this problem area to promote student discussion on the importance of human relations to successful employment experiences.

7. Distribute VAS Unit 6003, "Human Relations in Agricultural Business." Have students select one of the six topic areas and prepare a five-minute report on their area. Use slide film 392, to summarize the essential facts.
  8. Show a film on an agricultural topic and have student identify the various occupations shown in the film and identify the tasks being performed by these people in the identified occupations.
  9. Ask for class volunteers to prepare a bulletin board showing various agricultural skills and competencies needed by workers.
- 
10. Conduct a class debate on the advantages and disadvantages of ownership versus employment.
  11. Use the selected transparencies and discussion guide to promote interest and discussion on the advantages of career planning.

VII. Application procedures:

1. The main purpose of this problem area is to start the student planning for a career and relating these career goals to their S.O.E. and FFA activities.
2. This problem area will introduce students to new and emerging occupations in agriculture.
3. This problem area will provide a means to relate instruction in other problem areas to vocational preparation.

VIII. Evaluation:

1. Evaluate student reports which were presented on occupations.
2. Evaluate students' ability to cooperate and work in groups.
3. Evaluate students' efforts to collect essential occupational information when planning career goals.
4. Collect and evaluate students' worksheets.
5. Prepare and administer a pencil and paper test using the sample test questions.

IX. References and aids:

1. Worksheets
2. Rural Core I, A-3

3. Transparencies and discussion guide
  4. Sample test questions
  5. VAS Unit 6003, "Human Relations in Agricultural Business", Vocational Agriculture Service, University of Illinois.
  6. VAS Slide Film 392, "Human Relations in Agricultural Business", Vocational Agriculture Service, University of Illinois.
-

WORKSHEET 1

COMPARING OCCUPATIONAL CHOICES

Using information you gathered about three occupations of your choice and characteristics about yourself, compare the characteristics required by the occupation and those you possess by answering the following questions.

	Occupation Yes <u>1</u> No	Occupation Yes <u>2</u> No	Occupation Yes <u>3</u> No
1. Does the job description fit your interests?			
2. Is this the level of occupation in which you wish to engage?			
3. Does this type of work appeal to your interests?			
4. Are the working conditions suitable to you?			
5. Will you be satisfied with the salaries and benefits offered?			
6. Can you advance in this occupation as rapidly as you would like?			
7. Does the future outlook satisfy you?			
8. Is there enough demand for this occupation that you should consider entering it?			
9. Do you have or can you get the education needed for the occupation?			
10. Can you get the finances needed to get into the occupation?			
11. Can you meet the health and physical requirements?			
12. Will you be able to meet the entry requirements?			
13. Are there any other reasons you might not be able to enter this occupation?			

14. Is the occupation available locally  
or are you willing to move to a  
part of the country where it is  
available?

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## WORKSHEET 2

### PERSONAL HABITS RELATED TO JOB SUCCESS

Good habits are necessary in order to establish good human relations and a good relationship with co-workers, employer, and customers. Answer each question by circling YES or NO.

(NOTE: If you have not yet been employed, base your evaluation on "work situations" in classroom settings.)

#### RELATIONSHIP TOWARD CO-WORKERS (OR PEERS)

Do you do your own work and not leave it for someone else to do? YES NO

Do you keep your work area cleaned up? YES NO

Are you willing to learn from others about how to do a job better? YES NO

Do you contribute to morale and team spirit at place of business? YES NO

Do you learn names of people with whom you work as soon as possible? YES NO

Do you take a sincere interest in co-workers and their interests? YES NO

Are you a good listener? YES NO

Do you admit mistakes without making excuses? YES NO

Do you accept blame for things that are your fault? YES NO

Do you avoid gossip? YES NO

Do you support co-workers? YES NO

#### RELATIONSHIP TOWARD EMPLOYER (OR TEACHER)

Are you cheerful? YES NO

Do you try always to do the best you can? YES NO

Do you know your job? YES NO

Are you on the job unless excused? YES NO

Are you on time and ready to work? YES NO

(NOTE: Do a day's work for a day's pay!)

Do you try to avoid waste of all kinds (materials, time, equipment)?	YES	NO
Do you look for a better way to do the job?	YES	NO
Do you tell the truth and are you sincere?	YES	NO
Do you ask questions when you need help?	YES	NO
Do you try to see employer's (teacher's) side when there is a problem?	YES	NO

---

**RELATIONSHIP TOWARD CUSTOMERS (OR ANYONE WITH WHOM YOU'RE WORKING)**

Do you give business-like treatment to customers?	YES	NO
Do you keep promises made to customers?	YES	NO
Are you polite to customers?	YES	NO
Are you friendly, interested, and sympathetic?	YES	NO
Do you gain the customer's confidence and listen?	YES	NO
Do you avoid arguing with an angry customer?	YES	NO
Do you avoid comments that might upset a customer?	YES	NO
Do you refer matters which you cannot handle to your supervisor?	YES	NO
Do you treat each customer as an individual?	YES	NO

1. What do you feel are your strengths in personal habits associated with job success?

---



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2. What do you feel are your weaknesses in personal habits associated with job success?

---



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Part II

Now that you have information on an occupation in which you are interested, it is time to identify and develop a short term career plan. In the space below identify essential school courses or special training which you need to obtain before you are qualified for employment. Also identify essential skills or competencies needed in this occupation. Identify the date the training or competency was completed on the line beside it.

Occupation: Conservation Technician (example)

<u>Formal Courses/Special Training</u>		<u>Essential Competencies</u>	
<u>example: Ag. Surveying</u>	<u>Fall 83</u>	<u>Keep records/record data</u>	<u>Fall 83</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Briefly explain how the FFA and your S.O.E.P. can be used to accomplish essential job competencies.

- Example: a. I will participate in FFA Land-use Judging Contest.  
b. I will develop the plans and assist in installing drainage tile on 20 acres of our family farm this fall.



# Career Education In Agriculture

Knowledge about the world of work will help you make informed career choices.

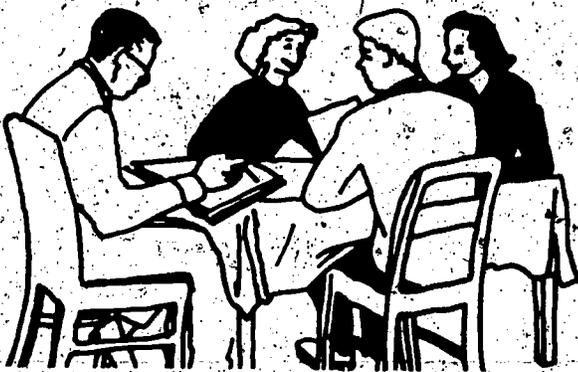
## Career Preparation



## Career Exploration



## Career Awareness

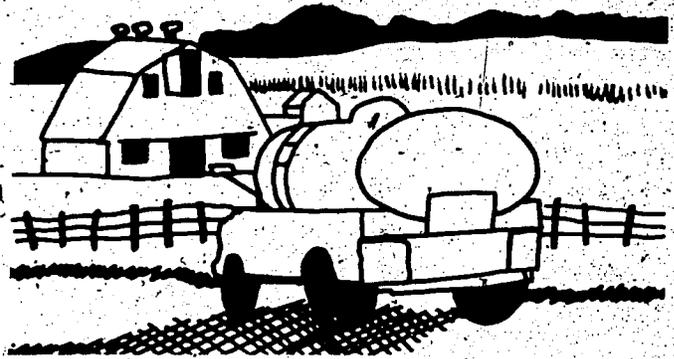


# Changing Work Situations

Work patterns will continue to change as new technology becomes available. You must be able to adapt to changing job demands.



Agrarian



Industrial



Technological

# Job Mobility

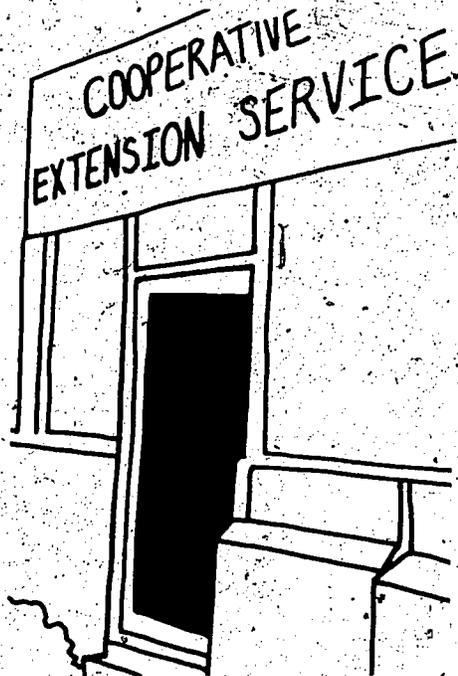
Today workers need to prepare for a series of jobs and not just one occupation.



Loan Officer/  
Professional Farm Manager



Vp-Ag Teacher



Extension Agent

# Skills Needed By Workers

Human Relation Skills



Organizational Skills



Coping Skills



# Basic Occupational Skills Employers Want

## Competencies

## Activities which will develop these areas

- |   |     |
|---|-----|
| 1. Punctuality                              | 1.  |
| 2. Dependability                            | 2.  |
| 3. Getting along with others                | 3.  |
| 4. Working as a team member                 | 4.  |
| 5. Organizing the work activities of others | 5.  |
| 6. Understanding written information        | 6.  |
| 7. Basic writing skills                     | 7.  |
| 8. Basic speaking skills                    | 8.  |
| 9. Being neat and clean in appearance       | 9.  |
| 10. Maintaining good health                 | 10. |
| 11. Knowing your strengths and weaknesses   | 11. |
| 12. Giving an honest day's work             | 12. |
| 13. Loyalty to your organization            | 13. |
| 14. Making independent decisions            | 14. |

# Basic Occupational Skills Employers Want continued

## Competencies

## Activities which will develop these areas

- |   |     |
|---|-----|
| 15. Using initiative and imagination              | 15. |
| 16. Knowing what is expected                      | 16. |
| 17. Basic arithmetic skills                       | 17. |
| 18. Knowing how to use materials and<br>equipment | 18. |
| 19. Locating information                          | 19. |
| 20. Having specialized training                   | 20. |
| 21. Knowledge of operating procedures             | 21. |
| 22. Following instructions                        | 22. |
| 23. Working without close supervision             | 23. |
| 24. Working under pressure                        | 24. |
| 25. Adjusting to work situations                  | 25. |
| 26. Managing time and materials effectively       | 26. |
| 27. Following safety regulations                  | 27. |

## TRANSPARENCY DISCUSSION GUIDE

### EXPLORING AGRICULTURAL OCCUPATIONS AND CAREERS

#### I. Transparency: CAREER EDUCATION IN AGRICULTURE

A. Discuss the three-phase concept utilized in the Illinois Career Education Model.

1. Career Awareness Phase involves activities to introduce students to the world of work. This phase is generally conducted in the elementary grades.

2. Career Exploration Phase involves activities which allow students to investigate and research eventual career choices. This phase is generally conducted during the Jr.-High through Sophomore grade levels.

3. Career Preparation Phase involves activities which allow students the opportunity for technical skill development. This phase is emphasized during the Junior and Senior grade levels and continues through the adult years.

B. Point out the importance of making informed career choices rather than haphazardly trying to find good employment.

C. Discuss the importance of developing the ability to adapt and grow in their occupation. Discuss the different ways workers can up-grade their job skills.

#### II. Transparency: CHANGING WORK SITUATIONS

A. Discuss how the changing from an agrarian society to an industrial society during the nineteenth century influenced the types of jobs available.

B. Have students identify ways in which today's technological jobs are different and how they are similar to typical jobs which were available in our industrial society.

C. Discuss idea of work being an important part of peoples' lives.

D. Ask students to respond to the question: "Do people work because they have to or because they want to work?"

#### III. Transparency: JOB MOBILITY

A. Discuss the importance of job mobility in today's society.

1. As old occupations become obsolete, new ones arise.

2. Have students identify some jobs which are now obsolete.
- B. Define job mobility as:
1. Moving to a new location in the state or country but doing the same job; or
  2. Staying in the same location but changing jobs for professional or personal reasons.
- C. Point out the idea that adults now in the work force and those who are preparing to enter must be able to adapt to change.
- 

#### IV. Transparency: SKILLS NEEDED BY WORKERS

- A. Discuss the following ideas regarding the three general categories of job skill.
1. Human relations:
    - a. Basic to all human interactions.
    - b. Most frequent cause of conflict and job dissatisfaction.
    - c. Human behavior affects productivity.
    - d. Effective human relations can be developed and improved.
  2. Organizational skills:
    - a. Important to understand why people work.
    - b. Important to understand the factors which motivate people to do their best work.
    - c. Creativity, problem solving, and decision making are important occupational skills.
  3. Coping skills:
    - a. Ability to solve unexpected or difficult problems which are mutually acceptable to the involved parties.
    - b. Ability to anticipate future trends in job demands.
- B. Discuss the importance of the three categories to job satisfaction and their relation to job promotion.

V. Transparency: BASIC OCCUPATIONAL SKILLS EMPLOYERS WANT

- A. Have students review the items and identify where they could receive training on each skill (such as FFA, S.O.E., on-the-job, laboratory, etc.)
- B. Divide the class into three groups and have each group "rank order" their nine items on importance to job success using their personal opinions. Let each group discuss their rankings with the rest of the class.
- C. Identify the top ten items by combining the three groups top rankings.
- D. Compare and discuss their ranking with those below which were completed by secondary school personnel, students, and parents.

Overall Ranking		Individual Group Ranking		
		Secondary School Personnel	Rural	
			Students	Parents
1	Have basic speaking skills	1	1	1
2	Have basic arithmetic skills	2	3	2
3	Use initiative and imagination	3	2	3
4	Know what an employer expects	12	4	5
5	Get along with a variety of people	4	5	9
6	Be dependable	5	6	6
7	Maintain good health	11	7	7
8	Have basic writing skills	7	9	4
9	Be punctual	6	8	8
10	Manage time and materials efficiently	19	11	12
11	Work as a team member	9	13	11
12	Work under tension or pressure	16	10	13
13	Adapt to varying work situations	8	12	10
14	Organize work activities of others	17	15	14

15	Use information, materials, equipment	10	14	15
16	Follow instructions	14	17	17
17	Follow safety regulations	13	18	16
18	Be loyal to employer	15	16	19
19	Work without close supervision	18	19	20
20	Make decisions on your own	20	20	18
21	Be neat and clean in appearance	21	21	21

---

TEACHER'S KEY

SAMPLE TEST QUESTIONS

EXPLORING AGRICULTURAL OCCUPATIONS AND CAREERS

NAME \_\_\_\_\_

1. Match the terms on the right to the correct definitions.

- |  |                           |
|--|---------------------------|
| <u>2</u> a. Continuous process of getting along with people.   | 1. Technical knowledge    |
| <u>3</u> b. Way in which one acts and feels about people, things, and ideas.   | 2. Human relations        |
| <u>4</u> c. Type of work which an individual does  | 3. Attitude               |
| <u>1</u> d. What you need to know to do the job  | 4. Job                    |
| <u>5</u> e. Sharing of a message or an idea which results in a high amount of understanding between the sender and the receiver of the message | 5. Communication          |
| <u>7</u> f. Opportunity designed to give a worker a sense of accomplishment and satisfaction with his/her work                                 | 6. Learning attitude      |
| <u>6</u> g. On-going alertness for any departure from present knowledge or training  | 7. Job-enrichment program |
|  | 8. Emotions               |
|  | 9. Career change          |

2. Name two factors which influence job success.

- a. Good human relations
- b. Possesses essential technical skills

3. Match the desirable employee characteristics on the right to the correct definitions. Place the appropriate numbers in the blanks provided.

- |           |  |                  |
|-----------|--|------------------|
| <u>6</u>  | a. Working in harmony with others  | 1. Dependability |
| <u>4</u>  | b. Being truthful in all things  | 2. Enthusiasm    |
| <u>2</u>  | c. Being eager to help or to take part in some activity                        | 3. Initiative    |
| <u>7</u>  | d. Adjusting easily to new situations  | 4. Honesty       |
| <u>11</u> | e. Being able to say the right thing at the right time                         | 5. Loyalty       |
| <u>9</u>  | f. Taking time to do things right  | 6. Cooperation   |
| <u>1</u>  | g. Doing what one has said will be done, and completing duties and assignments | 7. Adaptability  |
| <u>3</u>  | h. Doing things without being told   | 8. Courtesy      |
| <u>5</u>  | i. Being able to keep confidences and avoid gossip about work matters          | 9. Patience      |
| <u>8</u>  | j. Being polite and acting with good manners                                   | 10. Self control |
| <u>10</u> | k. Being able to control one's temper and emotions                             | 11. Tact         |
|           |  | 12. Cheerful     |
|           |  | 13. Punctual     |

4. Select from the following list ways to increase self-satisfaction in a job. Place an "X" in the appropriate spaces.

- a. Learn to be a good loser on the job
- b. Keep a learning attitude
- c. Participate in job enrichment program
- d. Avoid improvement or sharing
- e. Get yourself together

5. Name two reasons people lose jobs.

- a. Poor human relations
- b. Lacks essential technical skills
- c. Shifting economic conditions
- d. Lack of job interest - high absence rate, poor performance, etc.

6. Match barriers of good communications to the correct definitions/ descriptions.

- |          |  |    |                       |
|----------|--|----|-----------------------|
| <u>3</u> | a. Problem resulting from labeling or name-calling and using emotionally loaded words                              | 1. | Bypassing             |
| <u>2</u> | b. Belief that what is said is absolute, complete, certain by the person who said the statement.                   | 2. | Allness               |
| <u>1</u> | c. Result of people forgetting or overlooking that a single word or expression may have several different meanings | 3. | Misuse of language    |
| <u>4</u> | d. Develops as a result of people not being able to maintain and direct their attention toward one purpose.        | 4. | Poor listening skills |
- 

7. Select from the following list methods to improve listening habits.

- X a. Use nonverbal actions to encourage the person who is talking.
- b. Encourage others to listen while you talk.
- X c. Take advantage of our fast-working mind; use time to repeat and rephrase what the person has said.
- d. Interrupt speaker.
- X e. Ask the speaker to repeat what was said when your mind wanders.
- X f. Listen for feelings as well as for facts.

## UNIT B: LEADERSHIP AND CITIZENSHIP

### PROBLEM AREA: PLANNING AND CONDUCTING COMMUNITY SERVICE PROGRAMS

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed to build on the problem area in Core II entitled "Participating in Individual and Group Activities in the FFA". If students have not received instruction in service programs such as BOAC, Chapter Safety and Food for America which are included in Core II, then those areas should be covered in this problem area. This instruction should be scheduled for September so students can use what they learn to develop the annual FFA program of activities.

In some schools, the FFA chapter cooperates with other agencies or organizations on community service projects. The teacher should be aware of any such opportunities that might arise and be ready to suggest such cooperative efforts to the class.

#### CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466, with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Unit, 100 N. First Street, Springfield, Illinois 62777. Opinions expressed herein do not reflect nor should they be construed as policy of opinion of the Illinois State Board of Education or its staff.

The materials included in this problem area were prepared by Paul E. Hemp, Department of Vocational and Technical Education, University of Illinois and reviewed by the Rural Core Curriculum Field Test Teachers. This problem area was reviewed by the following vocational agriculture teachers:

Allen Deitz - Sycamore High School  
Carol Keiser - Carlville High School  
Elmer Gerlach - Mt. Carroll High School

## TEACHER'S GUIDE

- I. Unit: Leadership and citizenship
- II. Problem area: Planning and conducting community service programs.
- III. Objectives: At the close of this problem area the students will:
  1. Be willing to participate in service projects.
  2. Understand why service is important in the community.
  3. Be able to identify the needs for service projects in the community.
  4. Be able to select appropriate service projects for the FFA chapter to sponsor.
  5. Be able to evaluate a service project.
- IV. Suggested interest approaches:
  1. Ask class the following questions to stimulate interest:
    - a. What is service?
    - b. If you do something and get paid for it are you performing a service?
    - c. What service activities did you perform during the past week?
  2. Have class identify persons in the school or community who have done the most service.
  3. Have class identify "service" organizations.
  4. Ask students to list ways that they have benefitted from service projects conducted in the local community?
- V. Anticipated problems and concerns of students:
  1. What is service?
  2. How does it differ from charity?
  3. What are some examples of services one could perform for his or her family, the school, the community?
  4. How can one be of service to needy people in other countries?
  5. Why do we need to be of service to others?
  6. What does the phrase in the FFA Creed "to practice brotherhood" mean?

7. What does the phrase from the FFA Motto "Living to Serve" mean? How can we live up to this part of the motto?
8. What are some FFA programs which involve community service?
9. How many service projects should an FFA chapter conduct each year?
10. How do you decide if a project is feasible and important?
11. Who is responsible for community service projects in our FFA chapter?
12. What will I get out of doing service projects for others?

VI. Suggested learning activities and experiences:

1. Conduct an interest approach using one or more of the suggestions in Section IV.
2. Help class develop group goals for an FFA service program.
3. Show one or more of the visuals listed in Section IX.
4. Review with class the important service projects which the FFA has completed in recent years.
5. Use transparencies on "Community Service" and "How Can We Serve Others?" to generate interest in service activities and to promote an understanding of what community service is.
6. Have students complete the Worksheet "Keeping Score of my Service Record" in order to make them aware of what they are or are not doing. Use this form as a checklist to find out where class is with respect to this problem area.
7. Conduct a "brainstorming" session to bring out ideas for possible service projects. Use Student Worksheet "Brainstorming Community Service Projects" as preparation for the discussion.
8. Review FFA programs which can be tied to community service objectives. Use transparency "FFA Programs for Community Service". Refer to information on BOAC, Chapter Safety and Food for America in Core II. Handout copies of applications.
9. Conduct a discussion of how requests for service can be evaluated. Use transparency, "How to Evaluate a Service Project Request" as a discussion guide.
10. Divide class into small groups or committees and have them develop and plan a small community service project.
11. Write up BOAC application and Program of Activities application and submit them for competition.

VII. Application procedures:

1. Extend plans made in class to the FFA Program of Activities. The enthusiasm generated in class and the knowledge gained should carry over into the FFA program.
2. Involve all students in at least one service project.

VIII. Evaluation:

1. Evaluate outcomes of this problem area on the basis of attitudinal change and increased participation in service activities.
2. Observe changes that occur later in the year such as the winning of service awards.

IX. References and aids:

Publications available from National FFA Supply Service

1. Community Development in VoAg - FFA Programs
2. Community Development - FFA Style
3. FFA Activity Handbook
4. Chapter Guide to FFA Activities
5. FFA Advisor's Handbook
6. FFA Student Handbook

FFA films and slides available from State FFA Office at Roanoke or National FFA Supply Service:

1. Agriculture's New Generation
2. Good for America - FFA Tells the Story
3. The Game Plan (BOAC)
4. Hometown America (BOAC)
5. Safety Makes Sense

## STUDENT WORKSHEET

### "BRAINSTORMING" COMMUNITY SERVICE PROJECTS

"Brainstorming" is an activity which involves all members of a group or class in identifying ideas or suggestions for solving a problem or planning a project. In this exercise you are asked to "brainstorm" ways and means for achieving certain community service goals that your FFA chapter has established. For each goal listed below write down 1-3 ways that the goal could be reached. An example is provided. After you have completed this worksheet a sharing session could be held so that members of your class or your committee might report their ideas to other members of your group.

<u>GOAL</u>	<u>WAYS AND MEANS</u>
1. Beautify the school grounds	1a. <u>Plant flowers in a bed around the school flag pole.</u> 1b. <u>Use weed killer to eliminate weeds from school lawn</u> 1c. <u>Plant shrubs in front of trash burners</u>
2. Sponsor community-wide litter clean-up.	2a. _____ 2b. _____ 2c. _____
3. Conduct agriculture safety campaign.	3a. _____ 3b. _____ 3c. _____
4. Develop picnic area for community use.	4a. _____ 4b. _____ 4c. _____
5. Sponsor a fire prevention campaign.	5a. _____ 5b. _____ 5c. _____

✓

6. Develop nature trail for your local community.

6a.

6b.

6c.

7. Establish a herb garden on land laboratory site.

7a.

7b.

7c.

8. Improve agriculture in the community.

8a.

8b.

8c.

9. Improvement of job opportunities in the community.

9a.

9b.

9c.

10. Other (list)

10a.

10b.

10c.

11. Other (list)

11a.

11b.

11c.

**STUDENT WORKSHEET**  
**KEEPING SCORE OF MY SERVICE RECORD**

1. This record covers the week of \_\_\_\_\_ or the month of \_\_\_\_\_

2. I performed the following services for members of my family:

	<u>Service Performed</u>	<u>Were you paid?</u>
a.	_____	_____
b.	_____	_____
c.	_____	_____
d.	_____	_____

3. I provided or participated with others to provide the following services to my school or social group:

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_

4. I was involved in the following service projects for my community or for groups outside my local community.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



---

# Community Service

## What is Service?

Contribution to the welfare of others

A helpful act

A good turn

## Examples of Service Provided by Individuals:

Giving blood

Donating to charity

Visiting the sick

Providing first aid

## Examples of Service Provided by Groups:

Delivering food baskets to the needy

Erect church and civic signs at edge of town

Provide special services for senior citizens

---

# How Can We Serve Others?

**1. Providing Services for Family and Home**

- a.
- b.
- c.
- d.

**2. Providing Services for the School**

- a.
- b.
- c.
- d.

**3. Providing Services for the Community**

- a.
- b.
- c.
- d.

**4. Providing Services for Mankind**

- a.
- b.
- c.
- d.

---

# FFA Programs for Community Service

1. **Food for America**

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2. **Chapter Safety Award**

3. **BOAC**

4. **Program of Activities-Community Service Section**

5. **Cooperative Activities**

---

6. **Local Chapter Projects**

# How to Evaluate a Service Project Request

## 1. How important is the need?

- a. Was the need for the service clearly demonstrated or documented?
- b. How many people will be benefitted by this service?
- c. What will happen if the need is not satisfied?

## 2. Is the project feasible?

- a. Can our group successfully complete it?
- b. Do we have the resources?
- c. Do we have the "know-how"?
- d. How long will it take?
- e. Is the project too large?

## 3. Does the project fit our educational program?

- a. Is it related to agriculture?
- b. Will it interfere with our school program?
- c. Will the project have any learning value?

## 4. Will school officials approve it?

- a. Is the project appropriate for a school group?
- b. Does it violate school policies?
- c. Will school administration and the board of education approve it?

## UNIT B: LEADERSHIP AND CITIZENSHIP

### PROBLEM AREA: BECOMING ACQUAINTED WITH RURAL AGRICULTURAL ORGANIZATIONS

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the beginning of the year, so that students may use the organizations as resources.

The estimated instructional time for this problem area is 2 to 3 days depending on how far the teacher wishes to go in developing organizational work skills. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. Teachers can utilize the information sheet, included with this problem area, to identify the services the organization has available to schools. Teachers should also supplement the list included with those from the local community. The list included in this problem area is by no means complete; it is just an example of some of the more common ones in the state of Illinois. Any suggestions and additions can be incorporated into the future revision of this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

#### CREDIT SOURCES:

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The teacher's guide, student worksheet, and test questions were developed by Carol Keiser, Vocational Agriculture Teacher, Carlinville High School and Al Zwilling, Department of Vocational and Technical Education, University of Illinois. This problem area was reviewed by the following vocational agriculture teachers:

Carol Keiser - Carlinville High School  
Elmer Gerlach - Mt. Carroll High School  
Al Dietz - Sycamore High School

## TEACHER'S GUIDE

I. Unit: Leadership and citizenship

II. Problem area: Becoming acquainted with rural agricultural organizations

III. Objectives: At the end of this problem area students will be able to:

1. Identify the major agricultural organizations and their purposes.
2. Choose those organizations that they could now be a member of, or those that they could be a member of in the future.
3. Give a brief description of the structure within these organizations.
4. Develop leadership traits, which will be beneficial to organizations.

IV. Suggested interest approaches:

1. Ask one or more of the following lead questions:
  - A. "How many of you or your parents belong to an agricultural organization?"
  - B. "How many of you know some agricultural organizations?"
  - C. "Can anyone describe how an agricultural organization operates?"
2. Have students compile a list of all agricultural organizations common to their area.
3. Contact a member of the community, who belongs to an agricultural organization, to come and speak to your class.

V. Anticipated problems and concerns of students:

1. What are the various agricultural organizations?
2. How can I join one of these organizations?
3. How are these organizations structured?
4. How can I find out more about these organizations?
5. How can we be good members of an organization?
6. What can we gain by belonging to these organizations?

V.I. Suggested learning activities and experiences:

1. Use one or more of the interest approaches listed in Section IV.
2. Have class identify their problems and concerns and record them on the chalkboard.
3. Distribute information sheets, and discuss the various organizations, membership, and how they operate. Distribute information sheet #2. Students may use some or all of the questions to help with their interview, or for writing to the organizations. The sheet may also be used by teachers to locate educational materials that the organization may loan or sell to teachers. After gathering such information the teacher may want to compile this into a notebook for future reference.
4. Have the students choose one of the agricultural organizations, and write to them to collect information about membership, objectives, and officers. Have students make a class presentation on their findings.
5. Have students interview members of their community who belong to some of these organizations, and make class presentations about their interviews.
6. Have the FFA chapter investigate the possibility of becoming a member of local organizations and commodity groups. After the FFA chapter is accepted as a member, representatives could be sent to meetings and become involved in organizational activities.
7. Have FFA members who attend organizational meetings report back to the class regarding what they learned about the organization and its program.
8. Have students develop a bulletin board, with newspaper and magazine clippings of the organizations and their activities.
9. Have students complete the self inventory on leadership style, and discuss their qualities. The purpose of Worksheet #1 is for the students to evaluate their leadership skills. There are many activities which help build an organization. There are also activities which destroy organizations. By completing this worksheet students will be able to evaluate what significant contributions they can make to an organization.
10. Have students complete job sheets, using class volunteers as participants. After completing the activity, then lead a group discussion on problems with oral communication, and solutions to solve or eliminate these problems. The purpose of this activity is to identify the problems in oral communication.

VII. Application procedures:

1. The students should gain insight in the way organizations and groups should work together, and apply this to their own FFA chapter.
2. The skills gained through this unit should be beneficial to the student when they apply for their state FFA degree or award areas.
3. Students may use these skills they acquire to become better agriculture leaders in our society.

VIII. Evaluation of student progress:

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1. Evaluate students' oral presentations on the information they gained from an organization.
2. Evaluate the students' interview presentations.

IX. References and aids:

1. Information sheets on the various organizations.
2. Core I materials for Rural Agriculture Programs. Refer to pages 1-D-1-8 - 1-D-1-13 for breed associations, and addresses.

## AMERICAN AGRICULTURE OF ILLINOIS

P.O. Box 344  
Stonington, Illinois 62567  
217/325-3611

American Agriculture of Illinois' policy has been from the beginning, and will continue to be in the future:

1. 100% parity for all agriculture products
2. All food reserves at 100% parity
3. Farmer board to make agriculture policy
4. Imports would not enter the country below 100% parity
5. Long range plan for agriculture

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Jim Milligan  
Smithshire, IL 61478

## ASSOCIATED MILK PRODUCERS, INC.

A complete dairy farmer cooperative, AMPI is organized, owned, operated and controlled by dairy farmers. Representing some 1,500 Illinois dairy farms, AMPI provides marketing and bargaining for its members along with numerous membership services, including the operation of plants and surplus and standby handling of milk.

Formed in 1969 through the merger of more than 100 smaller predecessor cooperatives, AMPI now includes nearly 30,000 members in 20 states from northern Minnesota and Wisconsin to southern Texas and from western Ohio to New Mexico and Colorado. By working together, dairy farmers are able to provide the volumes of milk at the times and places needed by milk handlers. It is the belief of AMPI members that dairy farm families should be given full opportunity to earn and receive a parity income with Americans in other walks of life.

William Lenschow, President  
R.R. #1  
Sycamore, IL 60178  
(815) 895-9690

**ASSOCIATION OF ILLINOIS  
SOIL AND WATER CONSERVATION  
DISTRICTS**

c/o Roger Rowe  
Route 1  
Marseilles, Illinois 61341  
815/795-2314

The Association of Illinois Soil and Water Conservation Districts is the representative voice of the ninety-eight (98) Soil and Water Conservation Districts in the state. The Association is responsible for advancing the conservation and orderly development, management, improvement, and multiple use of natural resources of the State of Illinois through the districts.

The Association services the Soil and Water Conservation Districts and the people of Illinois through a continuous dedication for the preservation and conservation of our soil and water resources. The Association of Illinois Soil and Water Conservation Districts services include education and information, public relations, and legislation.

State Office:  
3085 Stevenson Drive  
3rd Floor  
Springfield, IL 62703

**ILLINOIS FARM BUREAU**  
1701 Towanda Avenue  
Bloomington, Illinois 61701  
309/557-2111

Farm Bureau in Illinois is a general farm organization which serves the agricultural community of the state. Financed by voluntary dues from its more than 295,000 member families, Farm Bureau works to improve farm income and farming as a way of life.

Farm Bureau serves its members through a wide range of marketing, legislation, education, public relations and business services.

Basic to the strength of Farm Bureau in Illinois is an organizational network of County Farm Bureaus with staff, officers, and local programs serving members throughout the state.

Bill Allen  
Executive Director of Information

ILLINOIS ASSOCIATION OF  
MEAT PROCESSORS

The purpose of the Association is to advance and improve the meat processing industry by encouraging and fostering high ethical standards of good business practices in the industry and to facilitate the cooperation of all engaged in the industry by the interchange of ideas and business methods as a means of increasing efficiency and the usefulness of the industry to the consuming public.

Arlo Crossland  
Crossland Locker Service  
Bowen, IL 62316

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ILLINOIS BEEF INDUSTRY COUNCIL  
AND ILLINOIS BEEF AUXILIARY

The Illinois Beef Industry Council and Illinois Beef Auxiliary are non-profit corporations dedicated to beef promotion, animal research, consumer education, and general development of the beef cattle industry in Illinois.

"Self-Help" programs, such as those conducted by the Illinois Beef Industry Council, provide beef industry people with the opportunity to meet competition most effectively and to preserve and improve their products and their position in both domestic and world markets.

Purposes and objectives of the IBIC and IBA are: to collect and receive monies from public and private sales of beef cattle through a "check-off" program; to provide organizations through which the beef industry can become an influence in the areas of product promotion, animal research, and consumer education; and to promote the development and expansion of the beef industry in Illinois.

Charles Bloomberg  
Executive Vice President  
1700 S. Spring St.  
Springfield, IL 62704

ILLINOIS CORN GROWERS  
ASSOCIATION

1701 Towanda Avenue  
PO. Box 2901  
Bloomington, Illinois 61701  
309/557-3257

Illinois Corn Growers Association is a commodity organization serving corn producers in Illinois. ICGA is organized to promote and develop new and expanded markets for corn and corn products, and to sponsor research on corn production, utilization, and marketing, thus enhancing the livelihood of the Illinois corn producer. Financing comes from voluntary dues paid by members each year.

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Dain Friend, President  
R. R. #1  
Warrensburg, IL 62573

ILLINOIS DRAFT HORSE  
AND MULE ASSOCIATION

The goal of this association is to promote and improve the breeding, growing, and fitting of the draft horse and mule in Illinois; to meet in social gatherings to discuss the experiences for the benefit of young breeders interested in the draft horse and mule in general.

Jack Hale, President  
R. R. #2  
Lovington, IL 61837

ILLINOIS EGG MARKET  
DEVELOPMENT COUNCIL

P. O. Box 9  
Chatham, Illinois 62629  
217/483-4311

The Illinois Egg Market Development Council is the first Illinois commodity checkoff program to be authorized by an act of the legislature. Through this act and a product referendum, it was decided to assess all commercial producers with flocks of three thousand or more birds one-sixth cent per dozen, the proceeds of which are used to promote marketability and consumer acceptance of all eggs and egg products.

This is done on a state, regional, and national basis whereby the council may develop appropriate programming or support the marketing efforts of regional and national organizations established for this purpose. Placing of funds to obtain scientific research and consumer studies is also an activity of the council.

The governing council consists of nine elected producer representatives from three districts within the state. It has the benefit of advisory councilmen from the University of Illinois, the Illinois Department of Agriculture, and the Illinois Agricultural Association.

Rich Timmerman  
Southern Illinois Pullet Sales  
Germantown, IL 62445  
(618)523-4310

ILLINOIS EXHIBITION  
POULTRY, BANTAM AND WATERFOWL  
ASSOCIATION

The Illinois Exhibition Poultry, Bantam and Waterfowl Association is a non-profit organization dedicated to the preservation of the Exhibition Poultry System in Illinois and the breeds it represents. The Association serves as spokesman on all affairs pertaining to the Exhibition Poultry Breeder of Illinois and is affiliated with the American Poultry Association, the nation's oldest livestock organization.

It is the organizer of the highly successful Champion Meat Trio Class at the Illinois State Fair and the sponsor of the Land of Lincoln Gathering Poultry Show.

The Illinois Poultry Association believes that the purebred bird is the cornerstone of our poultry culture.

Marion R. Nash  
P. O. Box 102  
Murphysboro, IL 62966  
(618)684-3811

## ILLINOIS FARM UNION

The principal purpose of the Farmers Union is to see that rural people and farmers in particular get effective legislation.

The Illinois Farm Union is proud that it is the only general farm organization that takes the time to sponsor work programs for the underprivileged, such as Illinois Green Thumb Inc. in rural areas throughout 66 counties in Illinois and the Comprehensive Employment Training Act (CETA) throughout 31 counties in rural Illinois.

Harold Dodd; President

R.R. #1

Loami, IL 62661

(217)624-3781

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## ILLINOIS HAY ASSOCIATION

The Illinois Hay Association is a newly-organized group of interested and concerned hay producers and dealers who are dedicated to improving and advancing hay production in Illinois.

The Association works very closely with the Agricultural Stabilization and Conservation Service, the Illinois Cooperative Extension Service, the Illinois Department of Agriculture, the State Universities, as well as with other states in efforts to not only promote Illinois hay, but also to use hay and components of hay in crop rotations to help conserve the irreplaceable topsoils in our state. Furthermore, the current net return from hay and forage crop has proven that hay production in Illinois is indeed very competitive with other major crops in the state.

Victor Shubert, President

R.R. #1, Box 50

Coulterville, IL 62237

ILLINOIS LAMB  
AND WOOL PRODUCERS, INC.

Purpose--To promote lamb and wool and all products from the same in Illinois. Our membership consists of purebred breeders, commercial breeders, lamb feeders, lamb buyers, wool buyers, and all work in cooperation with the Extension Service of the University of Illinois.

James Handy  
Waverly, IL 62692

ILLINOIS LIVESTOCK ASSOCIATION

The voice of livestock interests in Illinois is the Illinois Livestock Association, which is dedicated to providing livestock feeders and producers with a trade association through which the members can combine their efforts in solving problems of the industry and improvement of the livestock economy.

Aims and purposes of the ILA are:

To provide livestock feeders and producers with a trade association representing their industry in all matters affecting the livestock business;

To have a strong, powerful voluntary group which can effectively work toward solving problems in the livestock industry.

To promote the importance of the livestock industry in Illinois and to enlarge and encourage the demand for the products the industry produces;

To protect the livestock feeders and producers from any groups or individuals who may attempt to infringe upon their rights and privileges as businessmen;

To build and maintain the necessary goodwill that will cause the livestock industry to be held in the highest esteem, and bring both public and governmental recognition to its members;

To bring to its members as much information as possible that will be helpful to them in their business endeavors.

The Illinois Livestock Association serves its members and the Livestock Industry by offering:

Industry Protection and Promotion  
Trade Information  
Market Analysis  
Performance Testing  
Organized Representation

Kan Koons, President  
R.R. #1  
Shirley, IL 61772

ILLINOIS PORK PRODUCERS  
ASSOCIATION

Jerry R. Hicks  
Executive Vice President  
531 East Washington St., Rm. 4E  
Springfield, IL 62701  
(217) 523-0514

ILLINOIS PORKETTES

531 East Washington St., Room 4E  
Springfield, IL 62701  
217/523-0514

Mrs. Clarence Keever, President  
R.R. #1  
Piper City, IL 60959

63

ILLINOIS  
POULTRY INDUSTRY COUNCIL

The two basic goals of the Illinois Poultry Industry Council are:

- 1) To foster, protect and promote the poultry industry of the state of Illinois and,
- 2) To coordinate all segments of the Illinois poultry industry.

Robert Madison, President  
P.O. Box 7  
Illioopolis, IL 62539

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ILLINOIS RABBIT BREEDERS'  
ASSOCIATION, INC.

The Illinois Rabbit Breeders' Association was organized in 1941. The first rabbit show was held in 1948.

At the present time there are 25 local clubs, with a membership of about 600. Thirty sanctioned shows are held each year. The Illinois State Convention is held the latter part of September in Springfield, Illinois.

Ivan Miller  
P.O. Box 25  
Marquon, IL 61458

ILLINOIS STATE  
BEEKEEPERS ASSOCIATION

The Illinois State Beekeepers Association originated in 1891 as a non-profit organization with membership open to anyone interested in honey bees and beekeeping.

Purposes of the Association are:

- 1) to promote good apiary management;
- 2) to encourage legislation that will help in improving beekeeping practices;
- 3) to further the beneficial use of honey bees for pollination of many Illinois food and farm crops; and
- 4) to support the Rules and Regulations of the Illinois Department of Agriculture as administered by the Bureau of Apiary Protection.

At the two annual meetings, problems of the beekeepers are discussed and educational programs are presented. In addition, the Association publishes the bi-monthly Illinois State Beekeepers Association Bulletin which is sent to all active members.

Recognizing the need for additional beekeeping projects, the Association has recently cooperated with the Department of Conservation and the Natural History Survey, in a project to seed roadsides in a selected area. Favorable reports on the results of this effort have been encouraging to beekeepers, conservationists, and ecologists, bringing hopes of an expanded program in Illinois, and a possible innovation that other states may adopt. This is typical of the challenging and worthwhile activities promoted by this relatively small but powerful organization.

Eugene Killion  
522 South Jefferson  
Paris, IL 61944

ILLINOIS STATE GRANGE

Serving Agriculture  
and the  
Rural Community  
Since 1871

The nation's oldest farm and rural family organization dedicated to a better quality of life for those engaged in agriculture and their rural neighbors, through legislation and community service action.

Russell Stauffer  
P.O. Box 1502  
Springfield, IL 62705  
(217) 498-9533

ILLINOIS  
STATE NURSERYMEN'S ASSOCIATION

The Illinois State Nurserymen's Association has been active for the past 56 years. The membership includes most of the leading and progressive nurseries in the state, as well as growers, garden centers, and industry suppliers throughout the country.

The main objective of the ISNA is to promote horticulture in a broad sense, i.e., by promoting increased knowledge and use of nursery products by the public, and by providing safeguards to the planting public.

The Association maintains close liaison with state governmental agencies and institutions of learning. It sponsors trade shows, provides educational services for its members, supports research and issues scholarships.

The nursery industry in Illinois represents thousands of acres and millions of dollars of plant goods and services. This represents a significant factor in the state's economy.

James Hayward  
Suite 1702  
Springfield Hilton  
Springfield, IL 62701

ILLINOIS STATE  
HORTICULTURAL SOCIETY

The Illinois State Horticultural Society was organized in 1957. The Society's objective is the advancement of the science of Pomology and the arts of Horticulture. It is a non-profit organization comprised of fruit producers and other interested individuals.

William Broom  
R.R. #4  
Carlinville, IL 62626

ILLINOIS STATE TURKEY  
ASSOCIATION

P. O. Box 66  
Sigel, Illinois 62462  
217/844-2127

The state association coordinates the work of the National Turkey Federation with the state activities for information and promotion. Directors of the state association meet quarterly to keep the industry informed on current events and projects. A fall meeting and tour of some local turkey farms is held for turkey producers and industry. An annual meeting and program is held each January.

The state association is affiliated with the National Turkey Federation whose headquarters is in Reston, Virginia. The national association has a publicity, development and turkey information service for turkey and turkey products at Salt Lake City, Utah. Complete publicity, TV film, scripts, and other promotion materials are served by the Salt Lake City office.

David Sinn  
R.R. #2  
Delevan, IL 61734

ILLINOIS VEGETABLE GROWERS ASSN.

Serving the state with the Finest Produce

The Voice of the  
Vegetable Industry in Illinois

To Speak To:

Consumers: on the benefits of Illinois grown produce  
Legislators: on the special needs of the vegetable industry  
Growers: to pinpoint common interests

Growers need to:

Suggest areas for cooperative efforts,  
inform the association of special problems,  
support association with membership.

Henry Boi  
17510 Garden Valley Road  
Woodstock, IL 60098

67

## ILLINOIS WOMEN FOR AGRICULTURE

### Objectives:

- To be informed.
- To open lines of communication between farmer and non-farmer.
- To seek ways and means of creating a better understanding of farming.

Illinois Women for Agriculture is a non-profit, non-partisan, public interest group of people concerned about the future of the agricultural industry.

The organization is concerned about rising costs, depressed prices, a disorganized market structure, and unwanted harassment from overlapping social and governmental agencies.

Rise Shears  
R.R. #1  
Illioopolis, IL 62539.

## LAND OF LINCOLN PUREBRED LIVESTOCK BREEDERS ASSOCIATION

A Breeder's Organization Of All Purebred  
Breeds of Livestock in Illinois

### OBJECTIVES

The objectives of this organization are:

- 1) To stimulate and encourage better breeding of livestock in the state of Illinois.
- 2) To study and encourage the adoption of the best methods for marketing purebred livestock.
- 3) To foster social interest among breeders and breed associations.
- 4) To assist the colleges of agriculture and the College of Veterinary Medicine at the University of Illinois.
- 5) To support the management of the Illinois State Fair in keeping it the best of all state fairs.

Lavern Weller  
Dwight, IL 60420  
(815) 584-2683

LAND OF LINCOLN  
SOYBEAN ASSOCIATION

1701 Towanda Avenue  
P.O. Box 2901  
Bloomington, Illinois 61701  
309/557-3255

Land of Lincoln Soybean Association was organized in 1964 and is controlled by a 19-man Board of Directors made up of farmers around the state of Illinois. It is a membership organization primarily interested in developing foreign markets for soybeans and soybean products, providing funds for soybean production and utilization research, and supporting legislative activities pertaining to soybeans and soybean products which are favorable to soybean farmers.

Land of Lincoln Soybean Association is one of 24 state associations affiliated with the American Soybean Association who are actively involved in conducting a worldwide market development program for soybeans and soybean products and expanding soybean research.

Jerry Gates  
R.R. #2  
Tamaroa, IL 62888  
(618) 496-5560

NATIONAL FARMERS ORGANIZATION

For all agricultural producers, the organization desires only to receive the cost of production plus a reasonable profit, through collective bargaining.

Kenneth Stremiau  
Illinois NFO  
R.R. #2  
Mendota, IL 61342

## ILLINOIS YOUNG FARMERS ASSOCIATION

The purpose of this organization is to provide educational programs, designed to meet the particular needs of young men and women who have careers in production agriculture (farming), and other areas.

Mike Moore  
R.R. #2  
La Harpe, IL 61450 (217)659-7623

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## ILLINOIS F.F.A. ALUMNI ASSOCIATION

The purpose of the state association is to serve as a communication link between local affiliates, to direct activities on the state level in support of F.F.A. and vocational agriculture, to provide services to assist in the establishment and development of local affiliates, and to represent Illinois in matters of national interest.

The state association provides materials for the establishment and continued development of local Chapters including: Handbook, membership kit, brochures, and slide tape orientation program.

Richard Sanders  
109 East John  
Forrest, IL 61714 (815)657-8815

## INFORMATION SHEET #2

### POSSIBLE QUESTIONS FOR ORGANIZATIONS

Students may use any or all of the questions listed below as a guide for an interview, or for writing to an organization to gather information. The teacher may use the questions to gather background information or to see if the organization has any educational materials.

1. What is the history of the organization?
2. What are the purposes or objectives of the organization?
3. What are the membership qualifications?
4. How much are the dues for the organization?
5. What is the organizational structure?
6. What does the organization do in the local community?
7. Who are the local officers?
8. Who are the state officers?
9. What role does the individual member play in the local organization?
10. How does the organization benefit the individual?
11. Does your organization provide informative materials that could be of benefit to a high school teacher? If so, please describe the types of material available.

## STUDENT WORKSHEET #1

### SELECTING YOUR LEADERSHIP STYLE

Directions: Mark a cross over the letter in parenthesis that best describes you.

#### Dominance

- (A) I belong to several groups but only attend when something especially interests me.
- (B) I like to work on committees but do not like to chair them.
- (C) I lose interest in groups when they go along in the same old rut and don't listen to my suggestions.
- (D) I consciously seek, and obtain, leadership in many of my groups' activities.
- (E) I am often selected as leader of groups without seeking it.

#### Tact

- (A) People frequently misunderstand my comments.
- (B) My acquaintances tell me that I am noted for handling many difficult situations without arousing ill will.
- (C) People seldom resent it when I must correct what they are doing or must criticize them.
- (D) I consciously study how to handle people tactfully.
- (E) Before I try to get others to accept my point of view, I first try to find out how they feel so I can adapt my ideas to theirs.

#### Communication

- (A) I always assume the other person will be friendly and take the initiative in meeting me more than halfway.
- (B) People tell me they come to me with problems they wouldn't even discuss with their own families.
- (C) I always try to give the other person some incentive or some reason for doing what I want done.
- (D) When a conversation lags at a party of strangers I try to fill in the break by trying to find a topic of general interest.
- (E) I have some definite ideas about the failings and follies of the younger generation and don't hesitate to express them.

## SELECT YOUR LEADERSHIP STYLE Con't.

### Maturity

- (A) I want what I want when I want it, regardless of consequences to myself or others.
- (B) I frequently let others have the last word.
- (C) I have been told that I can take well-meant, constructive criticism graciously.
- (D) I believe in telling others the truth if it is for their own good.
- (E) I take a stand on issues in which I believe even if they are unpopular after looking into the pro's and con's.

### Attitudes

- (A) I get annoyed when people don't do things my way. Sometimes my temper gets the best of me.
- (B) I try to show the attitude toward the other person that I want them to show toward me.
- (C) I believe I should make every effort to accept change and try to keep changing with the times.
- (D) I patiently listen to people with whom I disagree.
- (E) I vacillate when it comes to making a decision; sometimes I wait so long circumstances force a decision upon me.

### Cooperation

- (A) When people have a misunderstanding, I try to intervene and reconcile them.
- (B) In dealing with co-workers, I try to put myself in their shoes and act toward them the way I'd like them to act toward me.
- (C) I am willing to accept the help of others, provided it does not interfere with their work.
- (D) When I want information from others, I feel I have a right to demand it because I am acting on behalf of my boss.
- (E) If my boss says to me, "Tell So-and-So, I want this right away," I change both his message and voice tone to, "The boss would appreciate this as soon as possible."

## LEADERSHIP DEVELOPMENT ACTIVITY

## OBJECTIVES:

1. To identify some problems in oral communication.
2. To develop some probable solutions to the problem.

## MATERIALS:

1. A diagram of a combination of squares, rectangles, and circles.
2. Pencils and paper to be used by the participants.

## PROCEDURES:

1. Select a participant and present to him or her the following diagram. Make sure participants do not see the diagram.
2. Face the presenter in front of the group.
3. The presenter will describe the diagram on the paper, through oral means only. Presenters should not use their hands.
4. Each participant will draw the diagram as they understand the presenter to describe it.
5. A second presenter will then be selected. The second presenter will use the diagram drawn from the first description, and have the students draw another diagram from that description.
6. Have participants compare their drawings.
7. Compare their drawings to the original.

## QUESTIONS:

1. Was your drawing the same as the original? \_\_\_\_\_
2. Is there a difference between your first and second drawing? \_\_\_\_\_  
\_\_\_\_\_ Why? \_\_\_\_\_  
\_\_\_\_\_
3. Why are the drawings not the same as the original? \_\_\_\_\_  
\_\_\_\_\_

4. Does everyone perceive what is said in the same way? \_\_\_\_\_  
\_\_\_\_\_
5. How could the drawings have been improved, if the presenter had not been restricted? \_\_\_\_\_  
\_\_\_\_\_

**OBSERVATIONS:**

Describe how problems in communication arise, and how some of these can be avoided. How does communication affect an organization?

**APPLICATION:**

Relate how this activity could benefit your FFA meetings.

75

# Diagram to be Used with Job Sheet #1



## UNIT C: SUPERVISED OCCUPATIONAL EXPERIENCE

### PROBLEM AREA: EXPANDING MY S.O.E.P.

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed to provide assistance to teachers as they help their students replan and expand their S.O.E. programs. Each year, vocational agriculture students should be required to review their S.O.E. program accomplishments and make future plans. It is important to provide classroom instruction for this area of concern. The recommended time for teaching this problem area is in September of the junior year. Two days should be allocated for this instruction. The following assumptions were made in developing this problem area:

1. The problem areas on S.O.E.P. included in Core I and II have been taught.
2. Students are required to have an S.O.E. program.
3. Students are expected to plan and conduct S.O.E. programs which are educationally sound, economically feasible and appropriate for the student involved.

#### CREDIT SOURCES:

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The materials included in this problem area were prepared by Paul E. Hemp, Department of Vocational and Technical Education, University of Illinois and reviewed by the following vocational agriculture teachers:

John Conner - Galesburg High School  
Robert Cone - Salem High School  
Cecil McGrew - Bushnell High School  
Arley Van Doren - Southwestern High School, Piasa

## TEACHER GUIDE

- I. Unit: Supervised occupational experience!
- II. Problem area: Expanding my S.O.E. P.
- III. Objectives: At the close of this problem area the students will:
  1. Be able to analyze their educational needs and occupational goals as they perceive them.
  2. Understand the relationship between S.O.E. programs and educational needs and occupational goals.
  3. Develop a written plan for their S.O.E. programs during the last two years of high school.
- IV. Suggested interest approaches:
  1. Ask the following lead questions to get class to start thinking about the problem area:
    - a. "How many of you expanded your SOE program last year?"
    - b. "What did you have for an S.O.E. during your freshmen year and your sophomore year?"
    - c. "Do you have plans for expanding your S.O.E. this year?"
  2. Select a student who has expanded his or her S.O.E. program each year to report to the class on how and why the program was expanded.
  3. Review highlights of the problem area "Planning my S.O.E. Program" included in Core I. Use the following transparencies from Core I:
    - a. Steps in Planning an S.O.E. Program.
    - b. Characteristics of a Good S.O.E. Program Plan.
    - c. Goals for your S.O.E. Program.
  4. Use success stories of former students, foundation plaques and outstanding record books to stimulate interest.
- V. Anticipated problems and concerns of students:
  1. Why should I expand my S.O.E. program?
  2. How should my S.O.E. program be changed or improved?
  3. Should my S.O.E. program emphasize production or supply and service?
  4. Should I get a job and enroll in the Cooperative Education program?

5. What will I do with my S.O.E. program if I decide to go to college?
  6. What kind of an S.O.E. program will help me qualify for a State or American FFA degree or a proficiency award?
  7. How will an expanded S.O.E. program help me in my future vocation?
  8. What are some new production projects I could start this year?
- 
9. What projects will fit in with my advanced vocational agriculture courses during the next two years?
  10. Can I expand my S.O.E. program by establishing a partnership with my father?
  11. What are the advantages of establishing a partnership?
  12. What kinds of S.O.E. projects are best for students who plan to become employed in supply or service occupations after high school?
  13. What are the steps in replanning my S.O.E. program?
  14. What other FFA awards are available for S.O.E. programs?

VI. Suggested learning activities and experiences:

1. Conduct an interest approach using one or more of the three suggestions listed in Section VI of this problem area.
2. Lead class in a discussion of the importance of replanning S.O.E. programs at this time. Use the lead question "Why is it important to replan our S.O.E. programs?"
3. To help bring out the need for replanning, have students list changes in their occupational goals or home situations since they originally planned their S.O.E. programs in the freshmen year.
4. Lead class into a problem identification exercise by raising the question "What do we need to know or be able to do before we can develop a sound S.O.E. program plan for the junior and senior year?"
5. Have students read or review study unit entitled "Supervised Occupational Experience Programs" included in Core I.
6. Discuss the importance of relating S.O.E. programs to occupational and educational goals. Make sure students see S.O.E. as a means to achieve their occupational goals, not just a teacher or school requirement.
7. Have students complete the Student Worksheet entitled "Goal Identification and Needs Assessment."

8. Have students complete the Student Worksheet entitled "Replanning my S.O.E. Program."
9. Provide individualized instruction and advice as students replan their programs. Emphasize the importance of expanding these programs both in size and quality.
10. Review the characteristics of a quality S.O.E. program. Stress the importance of engaging in new experiences and higher-level experiences each year.
11. Follow-up classroom instruction with parent conference or home visit to involve parents in the students' S.O.E. program plans and gain parental support.
12. Have the FFA Alumni Association members or Agriculture Advisory Council members interview the students to select proficiency award winners or to provide opportunities for students to tell about their S.O.E. programs or to get advice on how to improve their S.O.E. programs.
13. Have students analyze their S.O.E. programs and identify strengths and weaknesses.

#### VII. Application procedures:

1. The student's S.O.E. program plan should be approved by the instructor and parent or employer.
2. The S.O.E. program plan becomes a part of the student's record book or S.O.E. file.

#### VIII. Evaluation:

1. Review worksheets and written plans. Make comments on the plan or meet with students to discuss their plans.
2. Plans should not be graded; however, a cooperative review of each plan by the teacher, students and parents is important and should be accomplished as a follow-up activity for this problem area.

#### IX. References and aids:

1. Core I Problem Areas C-1 and G-2.
2. Student Worksheets included with this problem area.
3. Record books from former students.
4. Foundation plaques.

# STUDENT WORKSHEET

## GOAL IDENTIFICATION AND NEEDS

1. Some students change their occupational goals several times during high school. In order to update your occupational goal list your first, second and third choice of the occupation you plan to enter.

First \_\_\_\_\_

Second \_\_\_\_\_

Third \_\_\_\_\_

2. Plans for further education beyond high school may affect the type of S.O.E. program you want to conduct during the rest of your high school enrollment. Which of the following educational plans are you considering?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- Attend a four-year college or university.
- Attend a community college.
- Enroll in a technical or vocational program at a private or commercial school.
- Participate in a part-time educational program
- Enlist in the military service
- Other (specify) \_\_\_\_\_

3. Based on your occupational and education plans what needs do you have that might be satisfied with a S.O.E. program? Check all that apply.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- earn money
- learn new job skills
- leadership development
- acquire livestock, machinery or land
- gain experience in production agriculture
- gain experience in off-farm, agricultural occupations
- develop ag. management skills
- work for high achievements in the FFA
- provide services for family or community
- Other (specify) \_\_\_\_\_

4. Which of the following types of S.O.E. activities would help you achieve your goals and satisfy your needs?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- improvement projects
- crop projects
- livestock projects
- agriculture skills
- cooperative education (on-job-training)
- school-based projects or experiences.
- other (specify \_\_\_\_\_)

# STUDENT WORKSHEET

## REPLANNING MY S.O.E. PROGRAM

This worksheet is designed for junior students who need to replan or revise their S.O.E. program plans for the last two years of high school. Because students needs and goals change frequently during high school, S.O.E. program plans need to be reviewed and revised at the beginning of each school year. This worksheet can be used by students to record S.O.E. program plans for the junior and senior years.

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<u>S.O.E. Program</u>	<u>Junior year Scope</u>	<u>Senior year Scope</u>
1. Production Projects (list)		
2. Improvement Projects (list)		
3. Agriculture Skills (list)		
4. School Projects (list)		

S. O. E. Program

Junior year

Senior year

Place of Employment  
and Expected Hours

Place of Employment  
and Expected Hours

5. Coop Program

6. Major Plans and Proposed Activities

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7. Other

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## UNIT D: LIVESTOCK SCIENCE

### PROBLEM AREA: MAINTAINING LIVESTOCK HEALTH

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during late fall or early winter because during this period one may encounter many health problems.

The estimated instructional time for this problem area is five to seven days depending on how far the teacher wishes to go in identifying diseases and their symptoms and cures for their area. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as the instructors adapt these materials to their local situation.

#### CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466, with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, student worksheet, and test questions were developed by Tom Hand, Vocational Agriculture Teacher, West Pike High School and Al Zwilling, Department of Vocational and Technical Education, University of Illinois. Transparency masters and the transparency discussion guide were prepared by Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Rural Core Curriculum Field Test Teachers. This problem area was reviewed by the following vocational agriculture teachers:

Kent Johnson	-	Galva High School
Allen Ritter	-	North Clay High School, Louisville
Everett Moeller	-	Beecher High School
Charlie Ferguson	-	Pittsfield High School
Tom Hand	-	West Pike High School, Kinderhook

## TEACHER'S GUIDE

- I. Unit: Livestock science
- II. Problem area: Maintaining livestock health
- III. Objectives: At the end of this problem area students will be able to:

1. Identify facilities that provide a healthy environment for beef, swine, and sheep.
2. Identify methods to prevent the transmission of diseases from herd to herd.
3. Identify the diseases and parasites that cause significant losses in Illinois.
4. List the symptoms and preventions of the common diseases of beef, swine, and sheep in Illinois.

### IV. Suggested interest approaches:

1. Show slides or pictures of some diseased animals, and discuss how the disease could have been prevented.
2. Have the local veterinarian come into class and do an autopsy on an animal.
3. Ask lead questions:
  1. "Have any of you had any livestock diseases on your home farm?"
  2. "What is the best way to control diseases?"
  3. "What type of set-up do you have for your livestock at home? Do you think it is sanitary, and helps cut down on the chances of disease?"
  4. "What does a healthy animal look and act like?"

### V. Anticipated problems and concerns of students:

1. What does a healthy animal look like?
2. What can I do to provide a more healthful environment for my livestock?
3. How are diseases transmitted from animal to animal and farm to farm?
4. What are the major diseases and their symptoms and treatments for beef, swine, and sheep in the state of Illinois?

5. How should parasites be controlled?
6. What are some of the common parasites of beef, swine and sheep?
7. What is a good management schedule to follow to help maintain livestock health?
8. How do I know when I need to call a veterinarian or treat a problem by myself?

VI. Suggested learning activities and experiences:

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1. Conduct an interest approach using one of those suggested in Section IV.
2. Use Competency Inventory to assess experiences of students.
3. Have students identify their problems and concerns by asking them lead questions.
4. Have students compile a list of management practices that would reduce the possibility of disease. Divide the students into small groups, and then have each group report their results so that the class could compile a list.
5. Develop a class discussion around the economics of losses due to diseases in the livestock industry.
6. Have students compile a notebook of animal diseases giving the names of the diseases, symptoms, treatments, and prevention.
7. Show transparencies provided in this problem area and discuss how better livestock health can be maintained.
8. Have students complete a health check for one of their livestock enterprises or one on a neighbor's farm.
9. Ask local veterinarian to come in and do an autopsy on a small pig so that the students may see how an autopsy is done. Have them explain what they are looking for which would indicate disease or the cause of death.
10. Bring in samples of the various types of syringes and equipment so that students may see what they look like.
11. Have slides of some livestock farm operations and have the students identify the good and bad aspects of situation. The teacher would need to have slides taken in advance.
12. Have students complete the worksheets on diseases and parasites, using the reference materials listed in Section IX.

13. Bring in a collection of syringes and medication equipment. Explain how to properly maintain the equipment. Demonstrate the correct way to fill a syringe; the correct way to remove air from a syringe; and the correct way to sterilize syringes.
14. Bring a litter of newborn pigs into the shop, or take the students to a farm where there are newborn pigs. Have the students give the pigs injections of antibiotics and injectable iron. Demonstrate this procedure to the students before allowing them to give injections.
15. The teacher could contact a local veterinarian, herdsman, or feed salesman, and ask them to recommend a list of the most commonly used antibiotics and drugs for livestock.
16. Have students develop a schedule of routine vaccinations and medications, for the swine, beef, and sheep enterprises.
17. Use Information Sheet #1 to discuss the different forms of medications. Identify some of the common medications used in each manner.

#### VII. Application procedures:

1. Students may use the skills and knowledge acquired in this problem area to improve livestock health on their home farms.
2. Students may use the skills and knowledge acquired in this problem area to use on the job if placed with a veterinarian, or as a herdsman, or used in postsecondary education.
3. Skills acquired in this problem area may be included in students S.O.E. Programs, and would add to their supplementary farm skills in the back of their record books.

#### VIII. Evaluation:

1. Evaluate students' worksheets on diseases.
2. Construct and administer a paper and pencil test using some of the sample test questions included in this problem area.

#### IX. References and aids:

1. VAS Unit 1054 "Health Problems with the Beef Cow Herd."
2. The Stockman's Handbook by M. E. Ensminger, 5th Edition 1978. Available from The Interstate Printers and Publishers Inc., Danville, Illinois.

# COMPETENCY INVENTORY

## MAINTAINING LIVESTOCK HEALTH

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision
6. Student does possess skill.
7. Student does not possess skill.

Competency	Circle One				
1. Use management practices that will aid in preventing and controlling animal diseases.	1	2	3	4	5
2. Disinfect pens and equipment.	1	2	3	4	5
3. Dispose of animal wastes without causing environmental problems.	1	2	3	4	5
4. Disinfect boots and clothing.	1	2	3	4	5
5. Select and use sanitation products effectively.	1	2	3	4	5
6. Follow state health requirements.	1	2	3	4	5
7. Cull and isolate.	1	2	3	4	5
8. Give injections.	1	2	3	4	5
9. Handle animals properly.	1	2	3	4	5
10. Follow a sanitation program.	1	2	3	4	5
11.					
12.					
13.					
14. Identify sick animals.					6 7
15. Recognize symptoms of disease.					6 7
16. Identify animals with parasite problems.					6 7

These are competencies outlined in the National Ag Occupations Competency Study, for entry level positions in agricultural production.

Name \_\_\_\_\_ Date \_\_\_\_\_



INFORMATION SHEET #1  
FORMS OF MEDICATIONS

ORAL

1. Those given in feed.
2. Those given in water.
3. Those given in pill form.

INJECTABLE

1. Those that may be administered with a syringe

OTHER

1. Those that can be used as a spray.
2. Those that can be used as dusts.
3. Those that can be used as a dip.
4. Those that can be used as a drench.
5. Those that are used as salves or ointments.

STUDENT WORKSHEETS  
DISEASES AND PARASITES

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## JOB SHEET #1

### PROPER CARE AND FILLING OF SYRINGES FOR LIVESTOCK

#### OBJECTIVES:

1. To understand the different types of syringes used on livestock.
2. To develop the necessary skills for filling a syringe correctly.
3. To properly clean and store syringes.

#### MATERIALS:

1. Assorted mixture of syringes.
2. Pan with cool water.
3. Stove or hot plate.
4. Bottles of medications.
5. Alcohol and cotton.
6. An orange.

#### PROCEDURES:

1. Identify the different types of syringes to students.
2. Demonstrate boiling the metal and glass syringes to sterilize them.
3. Demonstrate with alcohol how to clean plastic syringes.
4. Demonstrate how to properly fill a syringe with medication, and remove all air from the syringe.
5. Allow students to fill syringes.
6. Have students sterilize a spot on the orange and make an injection.
7. If possible have students make injections into real animals.
8. Have students properly sterilize the needles and syringes and put them away for future use.

#### QUESTIONS:

1. Why is it important that the syringes be sterilized? \_\_\_\_\_  
\_\_\_\_\_
2. Why is it important that all air bubbles be removed from the syringe before the injection? \_\_\_\_\_  
\_\_\_\_\_
3. How will this project make your livestock S.O.E.P. more efficient? \_\_\_\_\_  
\_\_\_\_\_

#### OBSERVATIONS:

1. How far does one insert the needle, for different types of injections? \_\_\_\_\_  
\_\_\_\_\_

2. How does the practice on an orange, help prepare you for the actual injections in an animal? \_\_\_\_\_

CONCLUSIONS:

1. How secure do you feel about giving injections? \_\_\_\_\_
2. Do you feel confident about the different types of injections and where they are given? \_\_\_\_\_

93

TEACHER'S KEY

STUDENT WORKSHEET #1

SWINE DISEASES

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Atrophic Rhinitis	Persistent sneezing, which worsens as pigs get older. Snout begins to wrinkle at 4-8 weeks. 8-16 weeks snout and face twist to one side. Pigs become rough looking and make small gains, with frequent nosebleeds. Pigs 60-80 lbs. most susceptible.	Select breeding stock from herds free of rhinitis. Use clean farrowing quarters. Purchase feeder pigs above 60-80 lbs. because they are less susceptible. Separate different age groups. Can be treated with sulfonamide drugs. Two most common ones are sulfamethiazine and sodium sulfathiazole.
Erysipelas	High fever, breathing with a snoring sound. Purple patches under belly, edema of nose, ears and limbs. Chronic form-knees and hocks are generally swollen and stiff.	Farms infected with disease should administer one of the following products: Erysipelas vaccine (available through vet.); Erysipelas bacterin, or oral Erysipelas vaccine in the water. A serum given in conjunction with penicillin will provide satisfactory treatment.
Influenza	Makes appearance suddenly. High fever loss of appetite, coughing, discharge from eyes and nose. Animals reluctant to move, but may sit up like dogs to help improve their breathing.	Use dry clean hog lots that are rotated. Provide warm dry clean quarters and minimum rations. Antibiotics and sulfonamides may be used on a herd basis to control various bacterial invaders.
Leptospirosis	Abortions, pigs born dead or weak, unthrifty market hogs. Disease is spread by infective urine.	Vaccinate susceptible animals annually if disease is present in area. Purchase clean animals, isolate for 30 days. Treatment should be prescribed by vet. Usually includes administration of selected antibiotics, and good care. Clean environment.

SWINE DISEASES (cont.)

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Parvovirus	Reproductive disease. Failure to breed. Mummified pigs and small litters. Diagnosis can be made by testing the pigs.	Can be prevented by vaccinating the sows prior to breeding and building up a natural immunity in your herd.
Pneumonia	Animal chills, then followed by elevated temperature. Quick shallow respiration, discharge from nostrils and eyes, and a cough. Legs wide apart, loss of appetite, and constipation. Gasping for breath, and crackling noises while breathing.	Provide clean, dry environment. Place sick animals in quiet clean quarters away from drafts, and food they can digest easily. Sulfonamides, and antibiotics are effective in treating acute pneumonia, but are not effective in viral, except to keep down secondary bacterial pathogens.
Pseudorabies	Fever, dullness, loss of appetite, vomiting, weakness, incoordination and convulsions. Death among pigs younger than three weeks is very high. Older pigs, fever, off feed, coughing, sneezing, vomiting, diarrhea, constipation, convulsions, blindness. Sows may abort, or give birth to weak, shaken or still born pigs.	Vaccine is available, but state authorities must authorize vaccine usage. Breeding stock vaccinated twice per year, prior to breeding vaccinate pigs after 3 days old if from unvaccinated sows. Keep area clean and sanitary; try to avoid people and animals that may carry disease away from herd.
Swine Dysentery	Profuse bloody diarrhea. Black feces that contain shreds of tissue. Animals go off feed, moderate rise in temperature. Pigs usually die.	Isolate new animals, and practice rigid sanitation. Medication through drinking water is essential. Antibiotics may be given by vet. Good management is the best prevention.
Salmonellosis	An acute enteritis, that is usually fatal. Affected pigs will go off feed and become listless. Scour a little bit and die.	Sick animals should be moved off to themselves and treated with sulfa drugs, nitrofurans or antibiotics, with the consultation of your vet. Pigs should be posted to identify, which type of bacteria is causing it. Good sanitation and management is the only prevention for disease.

SWINE DISEASES (cont.)

DISEASE	SYMPTOMS	*PREVENTION/TREATMENT
Swine Pox	Small red spots over large area of body, especially on ears, neck, and under surface of body. A hard knot develops in each of the spots, and then blisters, drains, dries up, and scabs off. Some animals show fever, chills, and refusal to feed.	Transmitted by lice, control of those is the best prevention. Good management is best.
Transmissible Gastroenteritis (TGE)	Scouring, vomiting, stomach, and intestines become inflamed. Disease spreads rapidly, the entire herd may be affected in 2-3 days.	Most effective preventive measure consists in exposing sows to the disease before they will get the antibodies from the milk, make sure there is no danger with other animals on farm, and other farms. No effective treatment, good feeding and management is best. Antibiotics or sulfonamides may minimize secondary bacterial complications.

\*Adapted from The Stockmans Handbook, by M. E. Ensminger, 5th Edition. Available from the Interstate Printers and Publishers Inc., Danville, Illinois.

TEACHER'S KEY

STUDENT WORKSHEET 2

SHEEP DISEASES

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Enterotoxemia or Overeating Disease	Loss of appetite, sluggishness, diarrhea, staggering, and convulsions. Animals usually die within a few hours. Affects sheep of all ages in a high state of nutrition on a lush feed of grain, milk or grass.	Make a gradual change from range to feedlot. Vaccinate lambs with either a bacterin or toxoid soon after their arrival in feedlot, can vaccinate pregnant ewes to prevent young lamb losses. No successful treatment.
Foot Rot	Lameness, reddening and swelling of the skin just above the hoof, between the toes, or bulb of heel. Animal may show fever, depression, loss of weight, and may die.	Drain muddy pastures. Purchase stock from a clean source. Allow land previously pastured by sheep to remain idle 4 weeks before turning other sheep on it. Treatment - Examine feet of sheep, trim feet showing infection. Walk sheep through suitable disinfectant solution and move to clean ground. Most widely used are formaldehyde and copper sulfate. Repeat weekly until foot rot disappears.
Listerellosis (Circling Disease)	Depression, staggering, circling, and strange awkward movements. Diagnosis can be made only by lab examination of the brain.	A good way to prevent is to follow this program. Do not store silage in a silo in poor repair. Do not feed the top layer of an upright silo. Never feed moldy silage. Provide clean dry quarters, clean water, control parasites, and avoid stress. Treat with sulfa derivatives, alone, and in combination with antibiotics.
Mastitis (Blue bag)	If untreated, usually results in chronic discharging teats, gangrene and death. Ewes separate from flock. Udder is hot and painful in early stages, secretion from teats, rise in temperature.	Antibiotics or sulfas are the treatments. Should sell ewe after udder has healed.

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SHEEP DISEASES (cont.)

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Pregnancy Disease (Ketosis)	Strikes during the last 2 weeks of pregnancy. Usually affects ewes carrying twins or triplets. Grinding of teeth, dullness, weakness, frequent urination, trembling, complete collapse. Death follows in 90% of cases.	Avoid obesity in early pregnancy. Feed liberally last 6 weeks of pregnancy. Give propylene glycol orally, twice daily.
Sore Mouth	Refuse to eat, appear depressed. Small cysts appear on the lips, gums and tongue, causing them to become red and swollen. These may break and bleed, and then form a scab. May become infected and may spread to the teats, udder, and feet of mother. Usually only affects lambs.	General sanitation. Vaccine will produce an immunity. Should not vaccinate uninfected sheep, because this will infect premises. Infected lips, mouths, and nostrils should be treated by applying an ointment containing a broad spectrum antibiotic to the lesions.
Tetanus (Lockjaw)	Usually associated with a wound. Stiffness around the head, slow weak chewing and awkward swallowing. Inner eyelid protrudes over eyeball. Noises cause spasms. Usually remain standing until close to death.	Immunity against tetanus can be obtained through inoculation with either a toxoid, or an antitoxin. For treatment, place the animal under the care of a veterinarian and keep it quiet. Good nursing is important.
Urinary Calculi	Frequent attempts to urinate, dribbling or stoppage of the urine. Usually only males affected, females may pass obstruction. Bladder may rupture with death following. Otherwise uremic poisoning may set in.	Good feed and management appear to lessen the incidence. Avoid high phosphorus and low calcium. Provide adequate Vitamin A, salt and water.
White Muscle Disease	Founderlike stiffness to sudden death. Whitish areas or streaks in the heart and other muscles can be observed during posting. Selenium deficiency.	Use Vitamin E in the feed according to directions. Can inject Selenium or Vitamin E. Confine affected animals to a stall and give plenty of rest.

\*Adapted from The Stockman's Handbook, by M. E. Ensminger, 5th Edition. Available from the Interstate Printers and Publishers Inc., Danville, Illinois.

TEACHER'S KEY  
STUDENT WORKSHEET #3

BEEF DISEASES

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Anaplasmosis	Anemia, labored breathing, wasting away and death. Straying from herd, nervousness.	Feeding chlortetracycline. A vaccine is available, but should be discussed with your vet. Also intravenous injections of tetracyclines have helped in acutely ill animals.
Bovine Virus Diarrhea (BVD)	Fever, nasal discharge, rapid breathing, coughing, diarrhea, heavy eye discharge. Later elongated hooves, rough hair coat, loss of weight, and arched back.	Vaccine is available, but not highly successful in use. Calves should be vaccinated near weaning. Using combined vaccines.
Brucellosis (Bangs)	Abortions in the last third of pregnancy, retained afterbirth, several services per conception, and uterine infections.	Buy disease free animals. Do not use calftood vaccinations, unless there is a disease problem in the herd. There is no successful treatment.
Calf Scours	Can vary from mild to severe. Main symptom softer than normal feces. Calf looks depressed, lack of appetite, severe diarrhea, yellowish, foul smelling, watery or foamy feces. Death usually occurs 2-3 days after diarrhea occurs.	Live virus vaccine usually 80% effective. Discontinuing feeding milk for 24-48 hours, giving fluids orally to combat infection. Treatment should be recommended by vet.
Infectious Bovine Rhinotracheitis (IBR) Red Nose	Animals go off feed and lose weight, generally cough, pain in swallowing, slobbering, rapid breathing, inflammation of nostrils, trachea, and windpipe. Fever, and lasts about 1 week.	Use of a vaccine which are of two types. No known treatment, but sulfonamides and antibiotics effectively combat secondary bacterial infections.

BEEF DISEASES (cont.)

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Johne's Disease (Paratuberculosis)	Loss of flesh and intermittent diarrhea and constipation; feces are watery. Almost always fatal, but may hang on for 2 years. Upon autopsy, the thickening of the infected part of the intestine is covered by a slimy discharge.	Keep the herd away from infected animals. Purchase disease free animals from disease free herds. No satisfactory treatment is known.
Leptospirosis	High fever, poor appetite, abortions, bloody urine, anemia, ropy milk.	Vaccinate susceptible animals annually. Purchase clean animals, isolate for 30 days and retest. Treatment should be prescribed by vet. May include blood transfusions, administration of antibiotics and good care.
Pinkeye	Liberal flow of tears, and tendency to keep eyes closed. Redness and swelling of the the lining membrane of the eyelids. Blindness will follow if left untreated.	Controlling face flies, good nutrition, adequate Vitamin A and isolation of affected animals. Apply antibiotics or sulfa drugs to the affected eye as ointments, powders or sprays twice a day. Recovery is speeded up by keeping in dark.
Vibrosis	Abortions in middle third of pregnancy. Several services per conception, and irregular heat periods. Diagnosis must be made by lab methods.	Vaccine is available - repeat annually. Avoid contact with diseased animals and contaminated feed and water. Artificial insemination is a rapid and practical method of stopping infection from cow to cow. Treatment involves injecting drugs into the uterus, and allowing sexual rest.
Shipping Fever	High temperature, discharge from eyes and nose, a hacking cough, difficulty in breathing and swelling in the region of the neck. Animals may die.	Eliminate as many factors as possible to reduce stress. Isolate newly acquired animals. Treatment should be handled by veterinarian.

\*Adapted from The Stockman's Handbook by M. E. Ensminger, 5th Edition. Available from the Interstate Printers and Publishers Inc., Danville Illinois.

TEACHER'S KEY

STUDENT WORKSHEET #4

PARASITES

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Blowfly	Infected wounds and soiled hair. Maggots spread over body. Infected animals rapidly become weak, fevered and unthrifty.	Eliminate blowflies by destroying dead animals immediately. Once infected wounds should be treated twice weekly with a smear, dust, or pressurized spray of the proper insecticide.
Lice	Intense irritation, restlessness, and loss of condition. Severe itching and animal may be seen scratching, rubbing and gnawing at the skin.	All members of herds must be treated simultaneously at intervals. Insecticides applied by spraying or dipping are most effective, but some control can be obtained by dusting.
Mites (Mange)	Marked irritation, itching, and scratching, crusting over of the skin, accompanied by formation of thick, tough, wrinkled skin.	Avoid contact with diseased animals, or infested premises. Control by spraying or dipping infested animals with suitable insecticides and quarantine affected herds.
Lungworm	Coughing, labored breathing, loss of appetite, unthriftiness and intermittent diarrhea. Death may follow, probably from suffocation or pneumonia.	Practice rigid sanitation. Do not spread infected manure on pastures. Drench with a wormer, effective against lungworms. It should be given according to manufacturer's recommendations.
Ringworm	Round scaly areas almost devoid of hair appear mainly in the vicinity of the eyes, ears, side of the neck, or the root of the tail. Mild itching also occurs.	Isolate infected animals. Disinfect everything that has been in contact with infested animals. Practice strict sanitation. Clip hair from affected areas remove scabs with brush and mild soap. Put tincture of iodine on the affected areas.

PARASITES (cont.)

*DISEASE	*SYMPTOMS	*PREVENTION/TREATMENT
Screwworm	Loss of appetite and condition, and lowered thrift and vigor.	Keep animal wounds to a minimum. Schedule branding, castrating, docking and other stock operations that necessarily produce wounds during the winter months, or early spring when flies are less active. Apply an insecticide to control.
Stomach Worms	Unthriftiness and marked loss of appetite.	Prevention consists in keeping young animals away from infection. Use compounds recommended for control of internal parasites, according to manufacturer's directions.

\*Adapted from The Stockman's Handbook by M. E. Ensminger, 5th Edition. Available from the Interstate Printers and Publishers Inc., Danville, Illinois.

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# Signs of Good Health

Alertness

Bright eyes

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Contentment

Eating with relish

Normal feces and urine

Normal temperature, pulse rate and breathing rate

Sleek coat with pliable and elastic skin

112

III-D-1-25

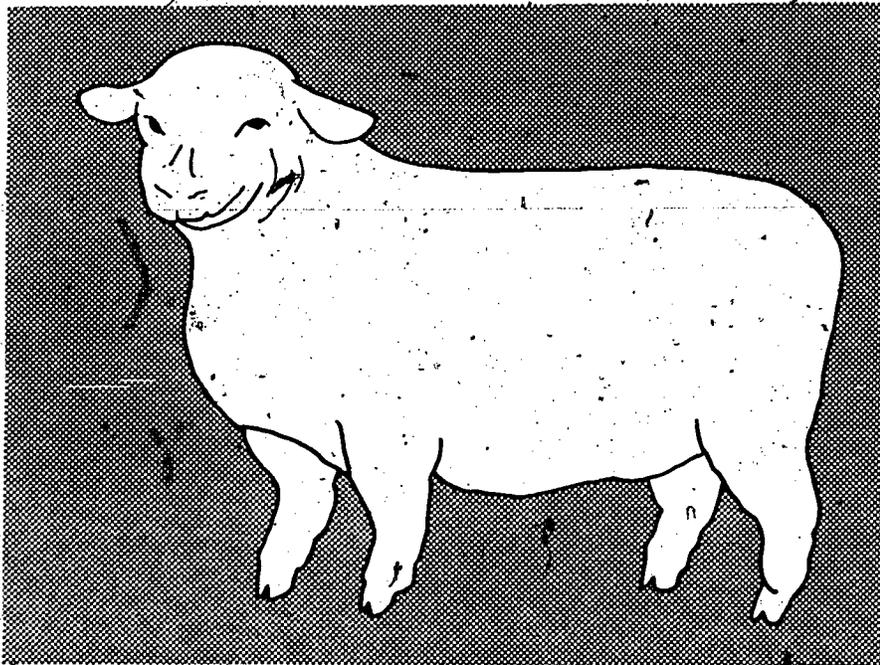
## Normal Temperature, Pulse Rate and Breathing Rate of Farm Animals

Animal	Rectal Temperature	Pulse Rate	Breathing Rate
	°F	Per minute	Per minute
Cattle	101.5°	60-70	10-30
Sheep	102.3°	70-80	12-20
Goats	103.8°	70-80	12-20
Swine	102.6°	60-80	8-13
Horses	100.5°	32-44	8-16
Poultry	106.0°	200-400	15-36

113

# Sheep Health Checklist

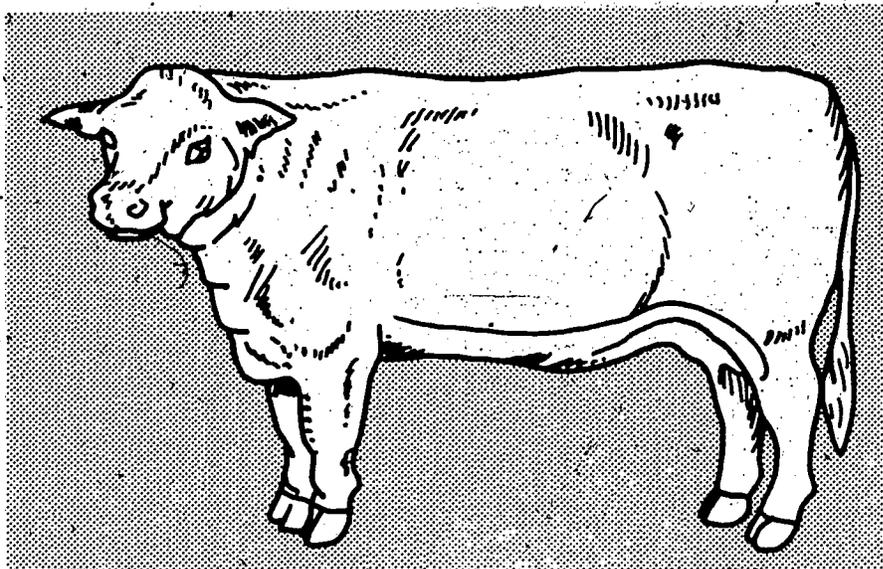
1. Pasture Rotation
2. Parasite Control
3. Vaccinations
4. Sanitation
5. Isolation of New Animals



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# Beef Cattle Health Checklist

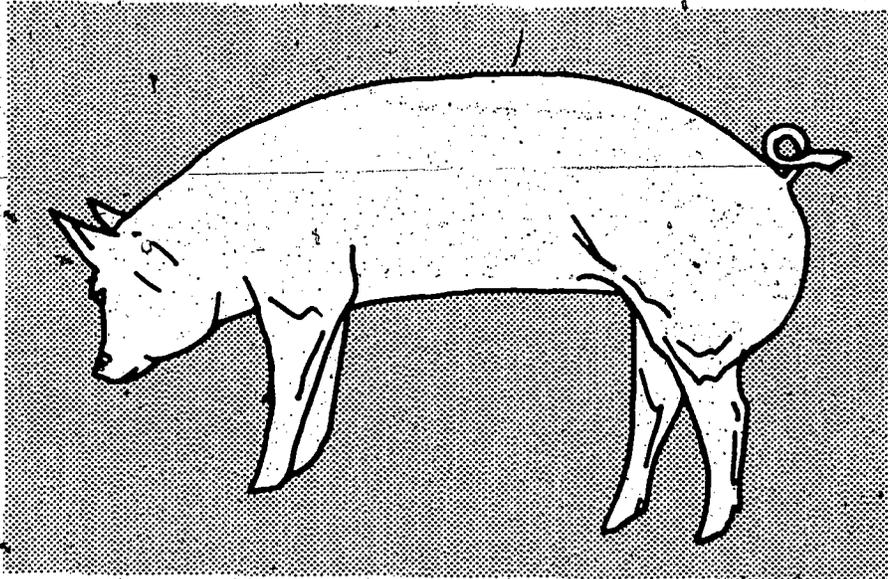
1. Healthy Parents
2. Parasite Control
3. Vaccinations
4. Maternity Stalls
5. Isolation of New Animals



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# Swine Health Checklist

1. Housing and Equipment
2. Vaccinations
3. Parasite Control
4. Isolation of New Animals
5. Observation



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## Approved Practices for Handling Medications

1. Products should be protected from heat and light and refrigerated at 35°-45°F.
2. Vacuum-dried vaccines should be used immediately.
3. Animals should be properly restrained, before administering medication.
4. Product should be used when opened to prevent contamination.
5. Always use sterilized instruments.
6. Uniformed suspensions may be obtained by shaking the vaccine.
7. Always use recommended dosages.
8. Do not attempt to immunize diseased or unhealthy animals.
9. Always read instructions carefully.
10. Always keep out of reach of children and animals.

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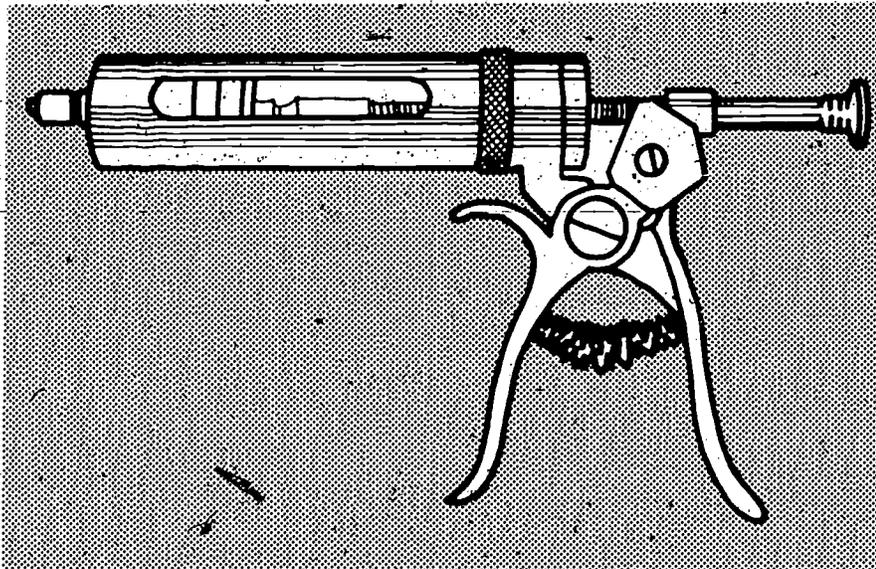
# Kinds of Injections

1. **Paraexternal Methods of Injections**  
Any method other than in the intestinal tract.
2. **Cutaneous**  
The material is applied to the skin or rubbed into the skin.
3. **Intracutaneous or Intradermal**  
The material is injected into the skin.
4. **Subcutaneous**  
The material is injected just under the skin.
5. **Intravenous**  
The material is injected into a vein when fast action is wanted.
6. **Intramuscular**  
The injection is made into large muscles.  
Muscles in the neck and thigh are commonly used.
7. **Intracardial**  
The material is injected directly into the heart.
8. **Intrathoracic**  
The material is injected into the thorax.  
This is not commonly used.
9. **Intraocular**  
An injection is made under the eyelid, into the cornea or into the anterior chamber.

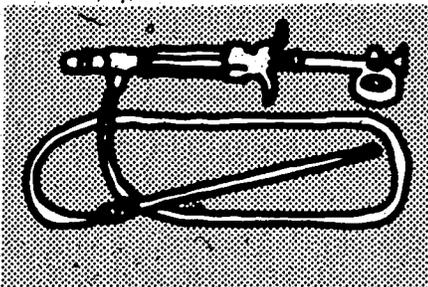
## Kinds of Injections, continued

10. **Epidural**  
An injection is made directly into the spinal canal.
11. **Intrapulmonary**  
The material is injected into a lung.
12. **Inhalation**  
Vapor or dust is inhaled.
13. **Oral**  
The material is taken by mouth or injected through a stomach tube.
14. **Rectal (Enema)**  
The material is injected into the rectum.
15. **Intramammary**  
The material is injected into a mammary gland.
16. **Syringe**  
An instrument used to make injections, consisting of plunger, barrel and various types and sizes of needles.
17. **Stomach Tube**  
A tube to pass materials directly into the stomach. It may be inserted through the mouth or nostril.

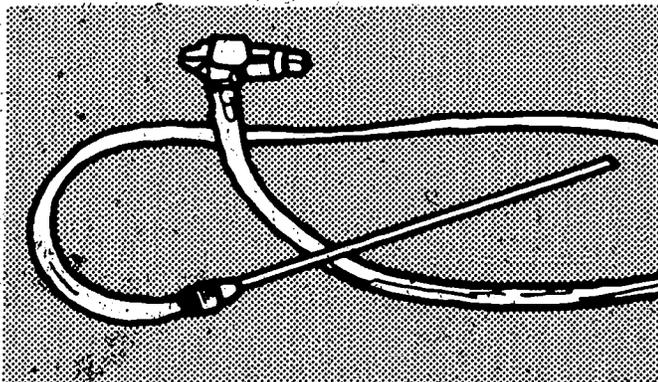
# Vaccinating Equipment



Automatic Repeat (Pistol Grip) Syringe

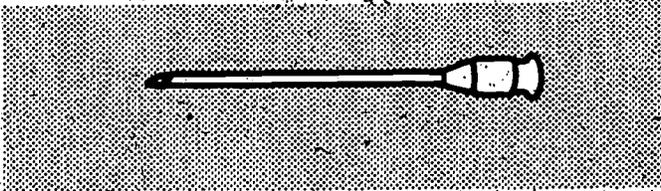


Self-Filling Automatic Syringe (Pump Type)

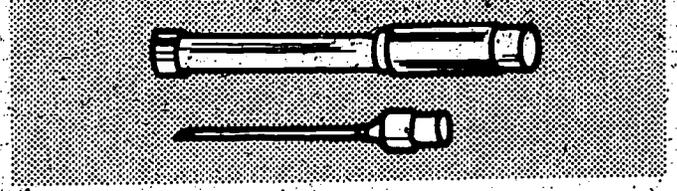


Syringe Filler Attachment

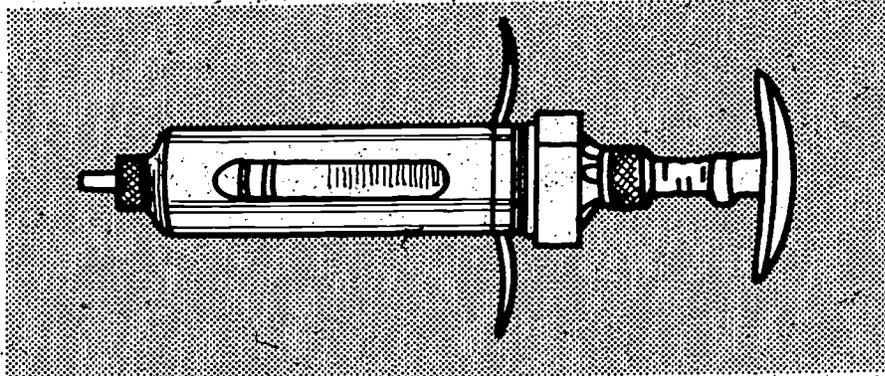
# Vaccinating Equipment



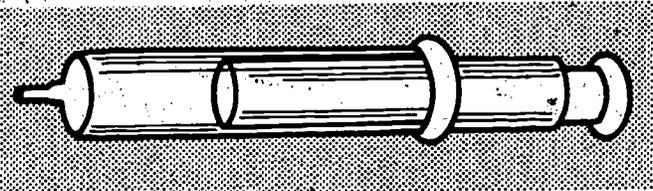
Reusable Stainless Needle



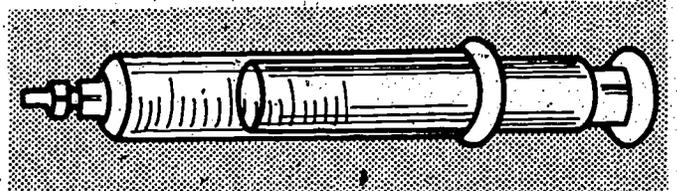
Disposable Sterile Needle



Standard Metal Syringe  
With glass barrel

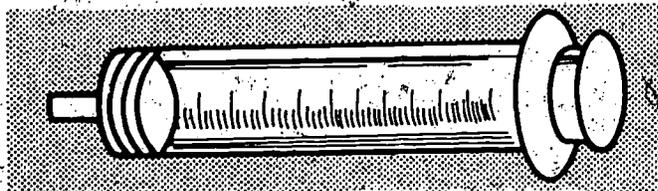


With plain or metal tip



With luer lock tip

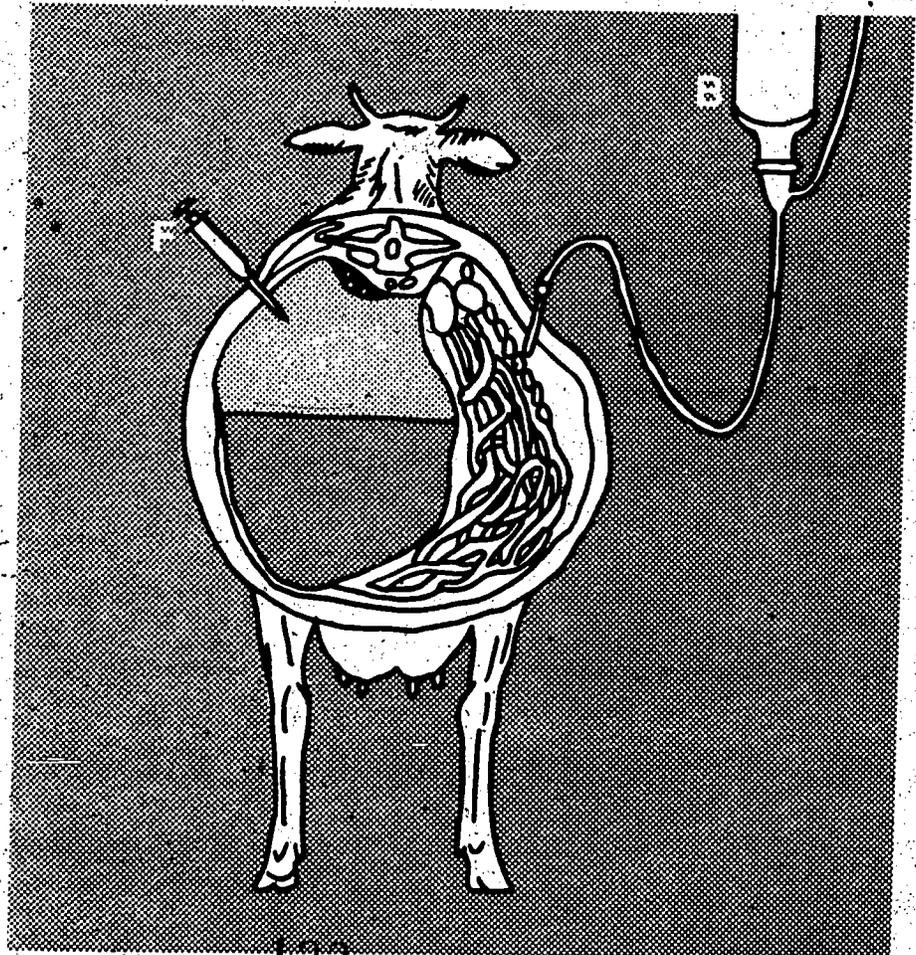
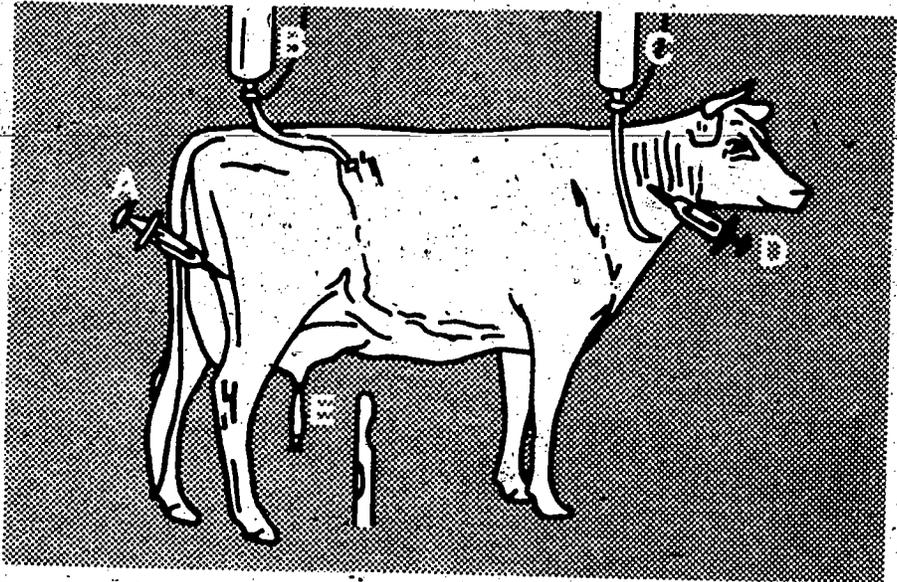
Reusable Glass or Nylon Syringes



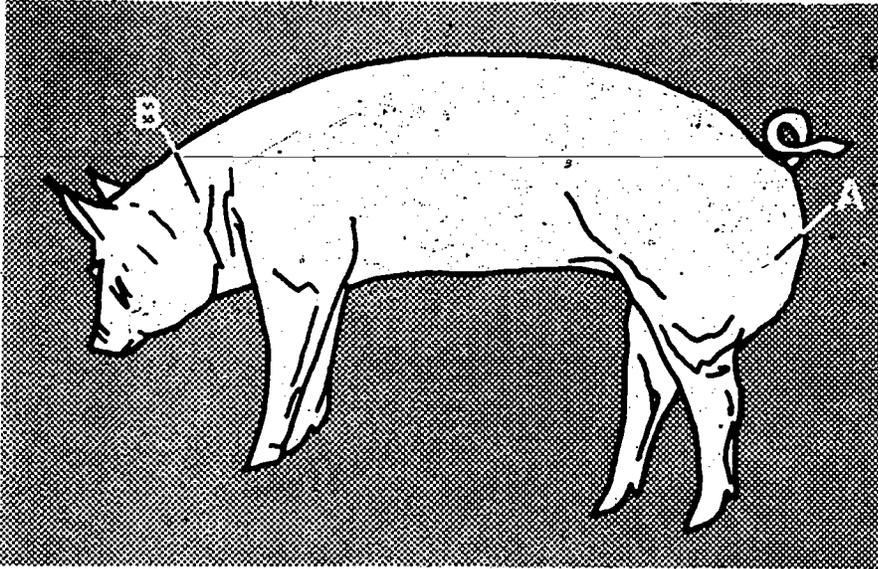
Disposable Plastic Syringe

# Location and Types of Hypodermic Injections for Cattle

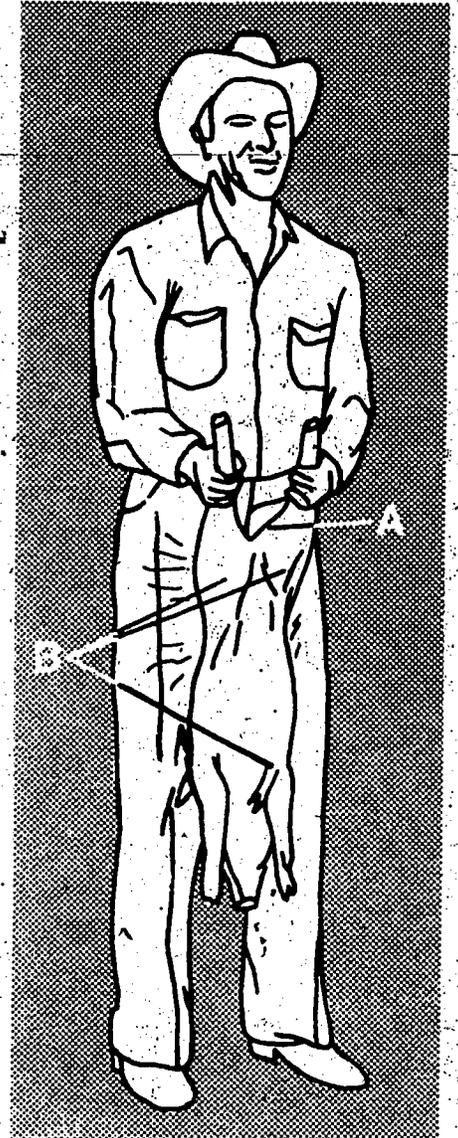
- A. Intramuscular
- B. Intraperitoneal
- C. Intravenous
- D. Subcutaneous
- E. Intramammary
- F. Intraruminal



# Locations and Types of Hypodermic Injections for Swine



- A. Intramuscular
- B. Subcutaneous



123

TRANSPARENCY DISCUSSION GUIDE  
MAINTAINING LIVESTOCK HEALTH

I. Transparency No. 1 - SIGNS OF GOOD HEALTH.

1. Discuss each of the factors as to what to look for in the different species of animals.
2. Have students decide which of these symptoms would probably require a veterinarian's advice.

II. Transparency No. 2 - NORMAL TEMPERATURE, PULSE RATE, AND BREATHING RATE OF FARM ANIMALS.

1. Go over all the rates for different species.
2. Discuss how to check these, and have students relate any of their own experiences.

III. Transparencies No. 3, 4 and 5 - ANIMAL HEALTH CHECKLISTS.

1. Ask students who have the different species to explain what they do to maintain their livestock herds.
2. Go over the factors for each of the species and explain them to students.
3. Compile a list of approved health activities for all of the species.

IV. Transparency No. 6 - APPROVED PRACTICES FOR HANDLING MEDICATIONS.

1. Go over each of the ten practices, and explain why these should be followed.
2. Have students explain the consequences if they are not followed.

V. Transparencies No. 7 & 8 - TYPES OF INJECTIONS.

1. Discuss the various methods of injecting medications.
2. Ask the students if they have used any of these methods, and what were some of the problems they encountered when using them.
3. Refer to transparencies 11 and 12 for the most common types used by stockmen.

VI. Transparencies No. 9 and 10 - VACCINATING EQUIPMENT.

1. Ask students to identify in what way the vaccinating equipment would be used.

2. Discuss the advantages and disadvantages of each of the types of equipment.
3. Describe which medications would work best for the different types of equipment.

VII. Transparencies No. 11 & 12 - LOCATIONS AND TYPES OF HYPODERMIC INJECTIONS FOR CATTLE, AND SWINE.

1. Review each of the various types of injections with students.
2. Have students respond why certain medications need to be administered in different places.
3. Give some examples to students of which medications would be used with the various types of injections.

\*Injections of various medicinal agents are commonly administered by stockmen. Such injections are a convenient and accurate means of treating sick animals or administering vaccines, serums, and bacterins.

Subcutaneous Injections (Sub Q)

Subcutaneous injections may be made in any area over which the skin fits loosely such as the neck, chest wall, "armpit" or flank. A small area is cleansed with alcohol and the needle inserted through the skin and the syringe contents discharged. A fold of skin may be picked up to facilitate entry of the needle. Following the injection, the area may be massaged to facilitate distribution.

Intramuscular Injection (IM)

Intramuscular injections should be made deeply into a large muscle (thigh, shoulder or neck). Cleanse an area as outlined above and insert the needle deeply into the muscle. Use a needle at least 3/4" in length for cattle, sheep, and swine.

Intraperitoneal Injection (IP)

Used mainly for the administration of large quantities of fluid such as Calcium Gluconate, Dextrose, Triple Sulfa, etc., for cattle. (1) Use a long needle - 16 gauge x 2" or 14 gauge x 3". (2) Warm the solution to body temperature prior to administration. Insert the needle into the right flank at a point in the center for the triangle formed by the loin, last rib, and a line from the top of the last rib to the hip bone. Use sterile precautions.

Intrarumen Injection (IR)

Used to administer medication promptly in bloat. Always insert needle through the LEFT flank. Use 14 gauge x 3" needle. Proper position of needle is noted by return through the needle of gas or liquid from the stomach. Rarely used.

Intradermal (ID)

Injection is made with a 20-26 gauge needle into the skin. Proof of intradermal injection is a blister raising consisting of ingredient injected. Hair should be shaved previous to injection.

### Intramammary (IMM)

The infusion can be accomplished by disinfecting the teat, depressing the teat to open the sphincter muscle, inserting the sterile canula, and forcing the medication into the teat canal from the syringe or tube. Disinfect the teat after infusion.

### Intravenous (IV)

This injection is done into a vein - most commonly the jugular vein. This vein is located in a groove that is located from the back point of the jaw bone and angles to the point of the shoulder on either side of the neck. Applying pressure by tourniquet or thumb pressure cutting off the blood flow, and this enlarges the vein to visible size. Disinfect and insert needle through the skin into the vein. Once into the vein, the needle should be directed upward towards the head inside the vein. Always check for blood flow before attaching the intravenous tube and allowing medication to enter blood stream. The flow of product should be slow.

TEACHER'S KEY  
SAMPLE TEST QUESTIONS  
MAINTAINING LIVESTOCK HEALTH

True (+) False (0)

- + 1. Alertness is one of the signs of good health.
- + 2. One should always isolate new animals brought into a herd.
- 
- 0 3. Cattle do not require any parasite control because they do not root in soil like hogs.
- + 4. Sanitation measures should be followed for all types of livestock to prevent diseases.
- 0 5. One should attempt to immunize diseased or unhealthy animals.
- 0 6. Medications should be stored around 50°F for safe storage.
- + 7. A cutaneous injection is one applied to the skin or rubbed into the skin.
- + 8. An oral injection can be where the medication is injected through a stomach tube.
- 0 9. There is only one type of needle used for vaccinations.
- 0 10. Intramammary is a common type of injection on swine.

Listing:

1. List four signs of good health.
- |                |                           |               |
|----------------|---------------------------|---------------|
| a) alertness   | d) eating with relish     | g) sleek coat |
| b) bright eyes | e) normal feces and urine |               |
| c) contentment | f) normal temperature     |               |
2. List three ways diseases are transmitted.
- |                             |                                |
|-----------------------------|--------------------------------|
| a) animal to animal contact | c) not removing dead carcasses |
| b) birds and rodents        | d) visitors from farm to farm  |
3. List 4 common diseases of swine.

Answers may be obtained from student worksheets.

4. List 4 common diseases of cattle.

Answers may be obtained from student worksheets.

5. List 4 common diseases of sheep.

Answers may be obtained from student worksheets.

6. List 4 common parasites.

Answers may be obtained from student worksheets.

7. List 4 types of injections.

Answer from transparency.

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Matching - Match the correct disease to the symptom identified.

- |          |  |                         |
|----------|--|-------------------------|
| <u>G</u> | 1. Snout and face twists to one side.              | A. White Muscle Disease |
| <u>K</u> | 2. Animals may sit up like dogs to breathe.        | B. Foot Rot             |
| <u>C</u> | 3. Abortions in swine and beef                     | C. Leptospirosis        |
| <u>H</u> | 4. Failure to breed                                | D. Swine Pox            |
| <u>O</u> | 5. Crackling noise when breathing                  | E. Brucellosis          |
| <u>D</u> | 6. Stillborn pigs                                  | F. T.G.E.               |
| <u>F</u> | 7. Small red spots over body                       | G. Atrophic Rhinitis    |
| <u>M</u> | 8. Scouring, vomiting, inflamed intestine          | H. Parvovirus           |
| <u>A</u> | 9. Stiffness around the head                       | I. Pseudorabies         |
| <u>B</u> | 10. Selenium deficiency                            | J. Pinkeye              |
| <u>E</u> | 11. Lameness, swelling of hoof                     | K. Influenza            |
| <u>N</u> | 12. Abortions in cattle in last third of pregnancy | L. Shipping fever       |
| <u>J</u> | 13. Soft feces in calves                           | M. Tetanus              |
| <u>L</u> | 14. Closed eyes and tears                          | N. Calf scours          |
|          | 15. High temperature, stress from moving           | O. Pneumonia            |

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List 5 approved practices to maintain livestock health.

## UNIT D: LIVESTOCK SCIENCE

### PROBLEM AREA: PLANNING AND EVALUATING LIVESTOCK CONFINEMENT SYSTEMS

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the first part of the second semester. This would be an excellent time because most farmers are making plans for the new growing season.

The estimated instructional time for this problem area is 5 to 7 days depending on how far the teacher wishes to work with the students in planning a confinement operation. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to identify other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

#### CREDIT SOURCES:

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The teacher's guide, student worksheet, transparency discussion guide, and test questions were developed by Al Zwilling, Department of Vocational and Technical Education, University of Illinois. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. This problem area was reviewed by the following vocational agriculture teachers:

Kent Johnson - Galva High School  
Allen Ritter - North Clay High School, Louisville  
Everett Moeller - Beecher High School  
Charlie Ferguson - Pittsfield High School  
Tom Hand - West Pike High School, Kinderhook

## TEACHER'S GUIDE

I. Unit: Livestock science

II. Problem area: Planning and evaluating livestock confinement systems.

III. Objectives: At the end of this problem area, the students will be able to:

1. Identify the criteria which constitutes a confinement system.
2. List the types of confinement systems.
3. Describe how the different types of confinement systems operate.

IV. Suggested interest approaches:

1. Organize a field trip to a local swine or beef confinement system.
2. Have students prepare a bulletin board showing different types of confinement systems.
3. Have students who have confinement systems at home describe their operations.
4. Show a set of slides that illustrate some of the different types of confinement systems. Allow the students to make observations about the systems shown in the slides.

V. Anticipated problems and concerns of students:

1. What are the differences between a confinement system, and the other methods of raising livestock.
2. What are some of the different types of confinement systems for swine?
3. How are the systems designed?
4. What are the different types of swine waste handling systems?
5. What are the common types of beef confinement systems?
6. What do the systems look like?
7. What are the different beef waste handling systems?
8. What are some of the ventilation systems used in confinement buildings?

## VI. Suggested learning activities and experiences:

1. Have students identify their problems and concerns and record them on a transparency or the chalkboard.
2. Have students complete the Competency Inventory, to assess their present knowledge.
3. Divide class into small groups, and assign them a sample situation. The situations would include size of operation, location of operation, amount of capital available and other variables. The students with these variables would select the best type of confinement system, and discuss why they chose that particular system. One student from each group would then report their recommendations to the class.
4. Divide the class into small groups and assign each group a beef or swine enterprise. Then assign each group the task of preparing a pictorial display of the buildings needed, their arrangements or placement in regard to the rest of the farmstead, and the location of the livestock waste handling system. After the display is finished, have someone in the group explain the reasons for their arrangement.
5. Organize a field trip to a local building manufacturer, or to the Farm Progress Show, so that the students could see some of the different types of confinement housing. Suggest to the students to look at capacity, ventilation, waste removal, and cost. After the field trip conduct a class discussion on the various types of buildings.
6. Have students complete an evaluation of a present operating confinement system. Have the students to list the strengths as well as the weaknesses of the operation.
7. Distribute information sheets. Discuss the material presented on the sheets.
8. Show the filmstrips suggested in references and aids, pointing out the importance of waste management.
9. Show students the transparencies included with this problem area. Point out types, advantages and disadvantages of confinement systems.
10. Complete Job Sheet I using your farm or a neighbor's farm for the example.
11. Select sample questions from Core II materials. Refer to pages II-D-2-7-17, for these sample worksheet questions.

12. Have the students complete the worksheet on space requirements, using the information sheets discussed previously.

#### VII. Application procedures:

1. After the students have worked with determining the feasibility of confinement systems, the students should be able to determine the feasibility of confinement systems for their S.O.E.P., or for their home farms.
2. The students should be able to plan for placement of confinement buildings and waste handling systems.

#### VIII. Evaluation:

1. Evaluate and grade student worksheets.
2. Evaluate the students work on the farm situation exercise.
3. Evaluate the students on their pictorial display of the farm arrangement.
4. Administer and evaluate a test on livestock confinement systems using sample test questions included in this problem area.

#### IX. References and aids:

1. VAS Unit 1059 "Livestock Waste Management"
2. VAS Filmstrip 187 "Cattle Handling Facilities"  
VAS Filmstrip 1109 "An Introduction to Livestock Waste Management"
3. Pork Industry Handbook  
Available from Cooperative Extension Service  
University of Illinois at Urbana-Champaign
4. Beef Housing and Equipment Handbook  
Available from Cooperative Extension Service
5. Swine Handbook Housing and Equipment  
Available from Cooperative Extension Service
6. Livestock Waste Management In a Quality Environment  
Circular #1074. Available from Cooperative Extension Service
7. Illinois Rural Core Curriculum II. Pages II-D-2-1 through II-D-2-35.

# COMPETENCY INVENTORY

## PLANNING AND EVALUATING LIVESTOCK CONFINEMENT SYSTEMS

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

**Competency**

**Circle One**

1. Repair and maintain buildings	1	2	3	4	5		
2. Repair and maintain equipment	1	2	3	4	5		
3. Determine proper space requirements	1	2	3	4	5		
4. Use pressure sprayer to clean stalls, pens and equipment	1	2	3	4	5		
5. Develop adequate ventilation systems for buildings	1	2	3	4	5		
6. Disinfect pens and equipment	1	2	3	4	5		
7. Dispose of animal waste without causing environmental problems	1	2	3	4	5		
8. Select and use sanitation products safely	1	2	3	4	5		
9. Fill and discharge liquid manure wagon	1	2	3	4	5		
10. Adjust feeders	1	2	3	4	5		
11. Adjust waterers	1	2	3	4	5		
12. Maintain equipment to prevent injury	1	2	3	4	5		
13. List safety precautions to be observed	1	2	3	4	5		
14.							
15.							
16.							
17. Plan effective use of equipment						6	7
18. Plan efficient utilization of pens and shelters						6	7
19. Plan efficient utilization of feed, water, and storage facilities						6	7
20. Recognize the different types of confinement systems						6	7

These are competencies outlined in the National Ag Occupations Competency Study, for entry level positions in agricultural production.

Name \_\_\_\_\_

Date \_\_\_\_\_

## INFORMATION SHEET I

### PASTURE VS. CONFINEMENT

Pasture management is most practical for operators who:

1. want to feed out pigs with minimum building investment.
2. have pasture available for proper rotation for disease control.
3. are tenants.
4. farrow once or twice a year.
5. farrow up to about 80 sows per year.

Partial or total confinement systems are recommended when:

1. top level management is available.
2. a multiple litter farrowing schedule is used.
3. labor and available space is limited.
4. capital is available.

Producers raise hogs in confinement:

1. to cut labor and chore time with mechanical feeding and watering.
2. to increase efficiency with better control of feed, diseases, and other management practices.
3. to provide better year-round working conditions for themselves.
4. to reduce animal use of high value land.

## INFORMATION SHEET #2

### BUILDING LOCATION CONSIDERATIONS

DRAINAGE - Drainage should be away from farm home or other buildings.

FUTURE PLANS FOR EXPANSION - Always leave room for more buildings to be located properly with respect to feed storages and roads.

SNOW, SUN AND WIND - Some production requires snow control for best efficiency. Locate facilities downwind from residences to minimize odor problems.

ACCESSIBILITY OF WATER AND ELECTRIC LINES - One does not want to have to run water lines any farther than necessary. Be careful when digging to bury the water or electric lines that it does not interfere with existing lines.

135

## INFORMATION SHEET #3

### VENTILATION

Ventilation - is a process of exchanging air. Air distributed through a building picks up moisture, heat, dust, and odors, and carries them outside the building. By bringing in clean air from outdoors, it is possible to maintain inside conditions within reasonable humidity, odor and dust level.

#### Purposes of Ventilation

---

1. Remove moisture from inside buildings.
2. Remove odors from animal waste.
3. Provides fresh air for animals.
4. Removes excess heat in hot weather.

#### Ventilation requires:

1. Fans to move air.
2. Inlets to distribute incoming air.
3. Outlets to exhaust stale, humid air.
4. Controls to provide automatic operation.

#### Successful ventilation usually requires:

1. Insulation.
2. Vapor barrier.
3. Supplemental heat.
4. Management and equipment maintenance.

INFORMATION SHEET #4

SPACE REQUIREMENTS FOR SWINE

Space recommendations for pigs using partial or total slats.

Pig weight or class	Sq. ft. for partial or total slats
15-30 lb.	1.7-2.5
30-60 lb.	3-4
60-100 lb.	5
100-150 lb.	6
150-market	8
Gestating sows or gilts	14-16
Boars (developing)	20
Boars (mature)	40

Space requirement recommendations for pigs using building with outside apron.

Pig Class	Sq. ft.
Growing-Finishing	6 sq. ft. inside plus 6 sq. ft. outside
Sows	11-12 sq. ft. inside plus 11-12 sq. ft. outside
Boars	40 sq. ft. inside plus 40 sq. ft. outside

Space requirement recommendations for pigs using pasture and shade space.

Pig class	Pasture	Shade or winter housing
Sows	10 sows/acre	15-20 sq. ft./sow
Sows and litters	7 sows and litters/acre	20-30 sq. ft./sow and litter
Boars	1/4 acre/boar	40-60 sq. ft./boar

## INFORMATION SHEET #5

### SPACE REQUIREMENTS FOR BEEF

Space requirement recommendations for cattle in a feedlot.

Condition	Sq. ft./head
Lot surfaced, access to shelter	20 in barn + 30 in lot
Lot unsurfaced, no shelter	50
Lot unsurfaced, and open front buildings	150-800
Sunshade	20-25

Space requirement recommendations for cattle with buildings and feedlots.

Cattle size	Sq. ft./head
600 lb. to market	20-25
Calves to 600 lb.	15-20
Bedding	½ ton/head

Space requirement recommendations for cattle in cold confinement buildings.

Condition	Sq. ft./head
Solid floor, bedded	30
Solid floor, flushing	17-18
Totally or partially slotted	17-18
Calving pen	100
Calving space	1 pen/12 cows

Space requirement recommendations for feeders.

Conditions (all animals eat at once)	In./head along feeder
Calves to 600 lb.	18" - 22"
600 lb. to market	22" - 26"
Mature cows	26" - 30"
Calves	14" - 18"

Condition (feed always available)	In./head along feeder
Hay or silage	4" - 6"
Grain or supplement	3" - 4"
Grain or silage	6"
Creep or supplement	1 space/5 calves

WORKSHEET #1

IDENTIFYING SPACE REQUIREMENTS

<u>Lot type and condition</u>	<u>Sq. ft./head</u>
Partial or total slats for pigs 60-100 lb.	_____
Partial or total slats for gestating sows and gilts	_____
Building for sows with outside apron	_____
Beef lot - surfaced, no shelter	_____
Cold confinement building, solid floor bedded for beef	_____
Cold confinement building totally or partly slotted for beef	_____
Building with feedlot for 600 lb. to market for beef	_____
Swine building using partial or total slats for 150-market	_____
Figure the total amount of space required for the following situations.	
1. How much space would be required for a 120 head of 150 lb. -market hogs in a building with partial or total slats?	_____
2. How much space would be required for 100 sows in a building with an outside apron?	_____
3. How much space would be required for 60 calves with a weight up to 600 lbs. in a building with feedlots.	_____
4. How much space would be required for 50 cattle in a surfaced lot with free access to shelter.	_____

5. How much space would be required in a building for 200 feeder pigs with a weight of 30-60 lb. and 100 pigs with a weight of 100-150 lbs. with partial or total slats.
- 

Figure the capacity of livestock for the following buildings.

1. How many calving pens could be housed in a building that is 50 feet wide and 100 feet long?
- 

2. How many weaning pigs (30-60 lbs.) could be housed in a total confinement building with total slats that is 30 feet wide and 60 feet long?
- 

3. How many finishing pigs (150-market) can be housed in a total slats building with 2000 sq. feet?
- 

4. How many sows and litters could be placed on 10 acres of land, with shades?
- 

5. Measure the size of the school shop. How many 60-100 pound pigs would this facilitate if it were partially slatted?
-

## JOB SHEET #1

### EVALUATING THE CONDITION OF A CONFINEMENT SYSTEM

#### OBJECTIVES:

1. To become aware of the different types of confinement systems
  2. To be able to objectively evaluate a confinement system, and its components
  3. To be able to identify strengths and weaknesses of the confinement system
- 

#### MATERIALS:

1. Questions for Job Sheet #1
2. The confinement system of a student, member of the community or description of one that students could use to answer the questions.

#### PROCEDURES:

1. Distribute question sheet to students.
2. Explain the purpose of the activity, and explain how to complete the questions.
3. Have students complete on their own or as a group activity.
4. Collect sheet and evaluate.

#### OBSERVATIONS:

Briefly explain all the components that should be checked in a confinement system to evaluate the system thoroughly.

#### APPLICATION:

How can these skills benefit your S.O.E.P. or your home farm or place of employment?

JOB SHEET #1

EVALUATING THE CONDITION OF A CONFINEMENT SYSTEM

1. Which type of livestock was the system designed to handle? \_\_\_\_\_  
\_\_\_\_\_
2. What type is the confinement system? \_\_\_\_\_  
\_\_\_\_\_
3. How old are the present facilities? \_\_\_\_\_ Are there any signs  
of deterioration? \_\_\_\_\_ What is deteriorating? \_\_\_\_\_
4. Is the facility large enough for the present number of livestock? \_\_\_\_\_  
What would you do to correct  
this if necessary? \_\_\_\_\_  
\_\_\_\_\_
5. Is the current type of ventilation adequate? \_\_\_\_\_  
How could it be improved? \_\_\_\_\_  
\_\_\_\_\_
6. What type of livestock waste system is being used? \_\_\_\_\_  
How is it working? \_\_\_\_\_  
\_\_\_\_\_
7. What care and maintenance is needed to keep the system in good operat-  
ing condition? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. Are the buildings laid out in an organized manner? \_\_\_\_\_  
If not, how would you have arranged it differently? \_\_\_\_\_  
\_\_\_\_\_
9. Is there any run-off control for the wastes? \_\_\_\_\_  
\_\_\_\_\_
10. How much land does the total confinement system cover? \_\_\_\_\_  
How would this compare with the amount required for a pasture opera-  
tion? \_\_\_\_\_

142

III-D-2-18

TEACHER'S KEY

WORKSHEET #1

IDENTIFYING SPACE REQUIREMENTS

<u>Lot type and condition</u>	<u>Sq. ft./head</u>
Partial or total slats for pigs 60-100 lb.	<u>5</u>
Partial or total slats for gestating sows and gilts	<u>14-16</u>
Building for sows with outside apron	<u>11-12 inside + 11-12 outside</u>
Beef lot - surfaced, no shelter	<u>50</u>
Cold confinement building, solid floor bedded for beef	<u>30</u>
Cold confinement building totally or partly slotted for beef	<u>17-18</u>
Building with feedlot for 600 lb. to market for beef	<u>20-25</u>
Swine building using partial or total slats for 150-market	<u>8</u>

Figure the total amount of space required for the following situations.

- How much space would be required for a 120 head of 150 lb.-market hogs in a building with partial or total slats? 960 sq. ft.
- How much space would be required for 100 sows in a building with an outside apron? 2200 sq. ft.
- How much space would be required for 60 calves with a weight up to 600 lbs. in a building with feedlots. 900-1200 sq. ft.
- How much space would be required for 50 cattle in a surfaced lot with free access to shelter. 2500 sq. ft.  
(1000 in barn)  
(1500 in lot)

5. How much space would be required in a building for 200 feeder pigs with a weight of 30-60 lb. and 100 pigs with a weight of 100-150 lbs. with partial or total slats.

1200 sq. ft.  
(600 for feeder pigs)  
(600 for others)

Figure the capacity of livestock for the following buildings.

1. How many calving pens could be housed in a building that is 50 feet wide and 100 feet long?

50 pens

2. How many weaning pigs (30-60 lbs.) could be housed in a total confinement building with total slats that is 30 feet wide and 60 feet long?

450 pigs

3. How many finishing pigs (150-market) can be housed in a total slats building with 2000 sq. feet?

333 pigs

4. How many sows and litters could be placed on 10 acres of land, with shades?

70 sows and litters

5. Measure the size of the school shop. How many 60-100 pound pigs would this facilitate if it were partially slatted?

(Divide the number of sq. ft. by 5)  
(Sq. ft. = LxW)

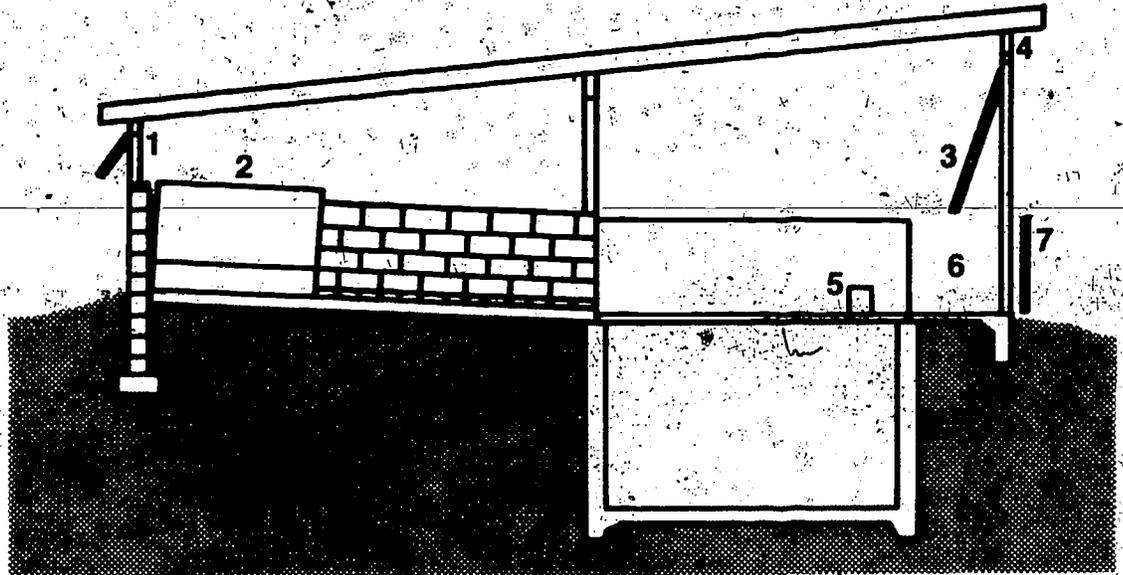
# Types of Swine Buildings



Modified open front, gable style roof

1. Ridge opening
2. Adjustable door for cross ventilation
3. Feeder
4. Translucent panels
5. Waterer
6. Alley
7. Plywood panel

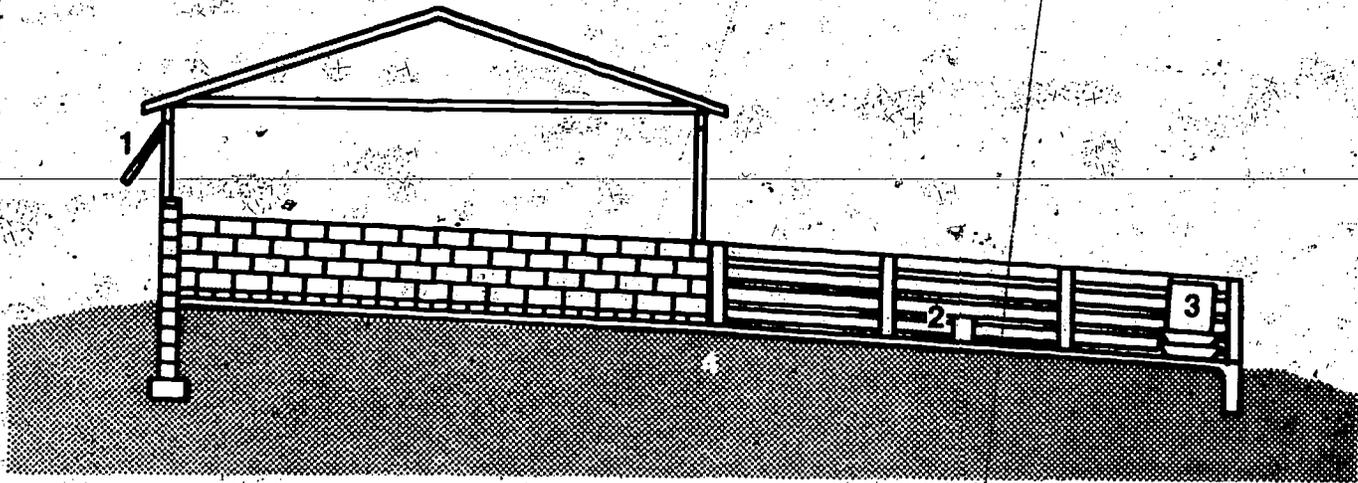
# Types of Swine Buildings



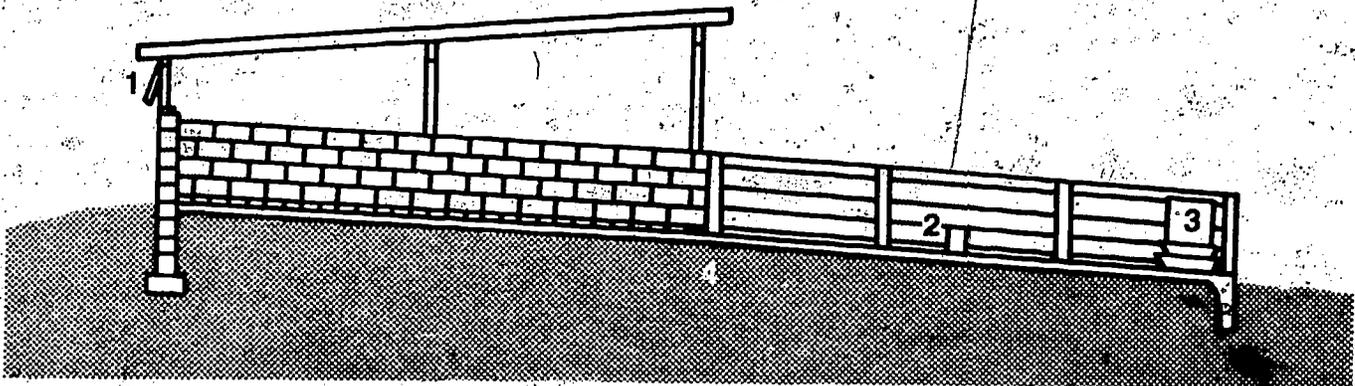
Modified open front, single slope roof

1. Adjustable door for cross ventilation
2. Feeder
3. Translucent panels
4. Opening
5. Waterer
6. Alley
7. Plywood panel

# Types of Swine Buildings



Open front outside apron building with gable style roof

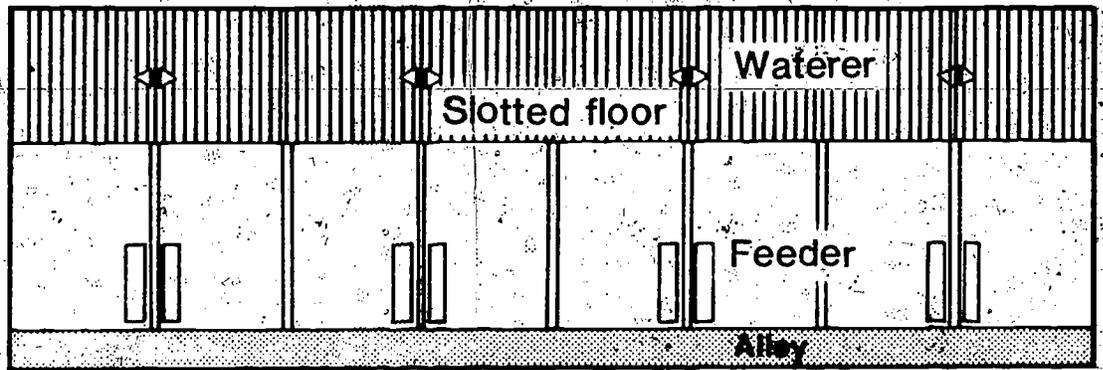


Open front outside apron building with single slope roof

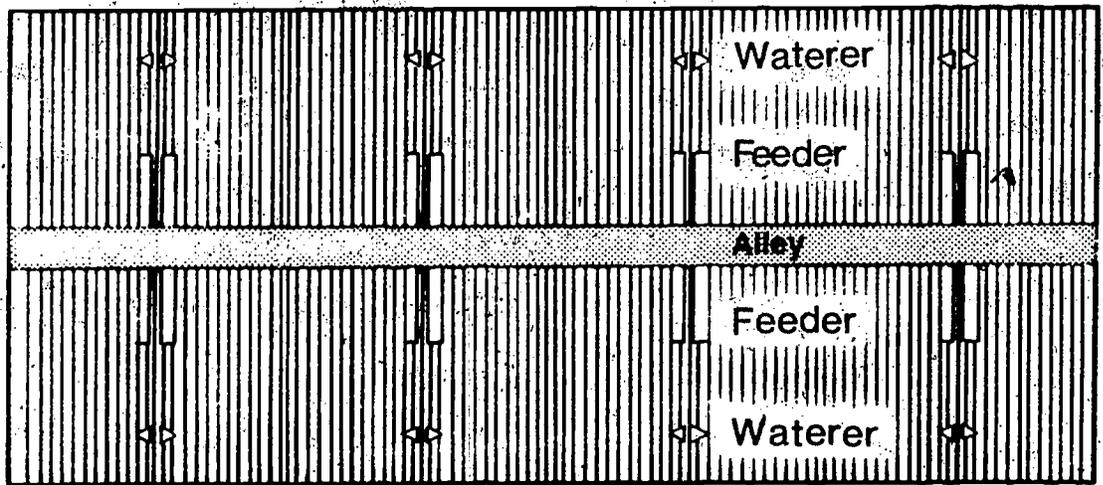
1. Adjustable ventilation door
2. Waterer
3. Feeder
4. Slope

# Types of Swine Buildings

Environmentally controlled buildings.

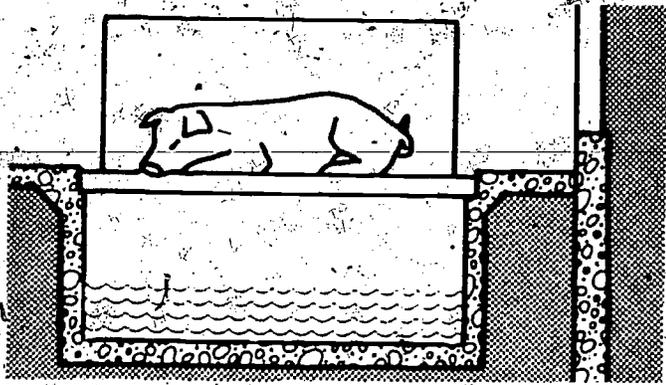


Single rows of pens.

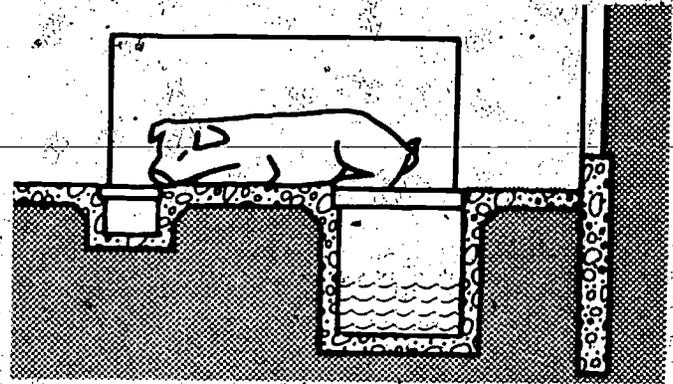


Totally slotted environmentally controlled building with center alley.

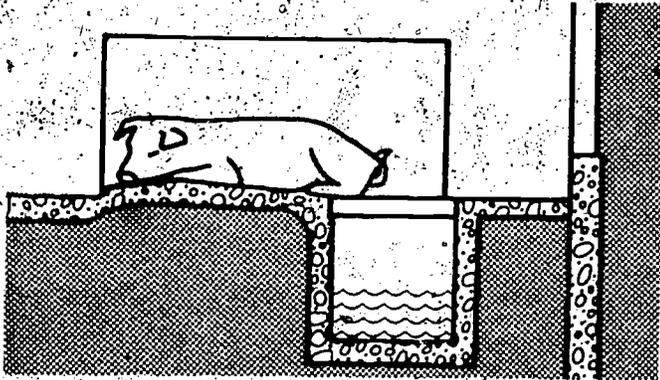
# Floor Arrangements for Farrowing



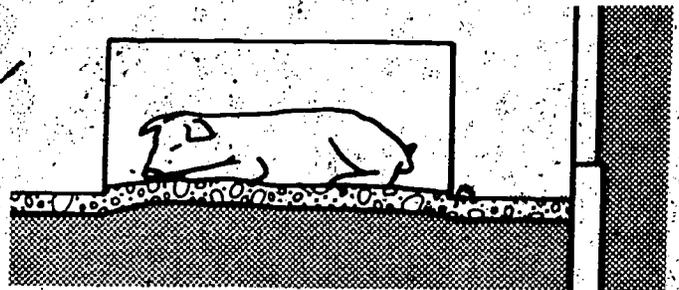
Full pit



Front and rear pit



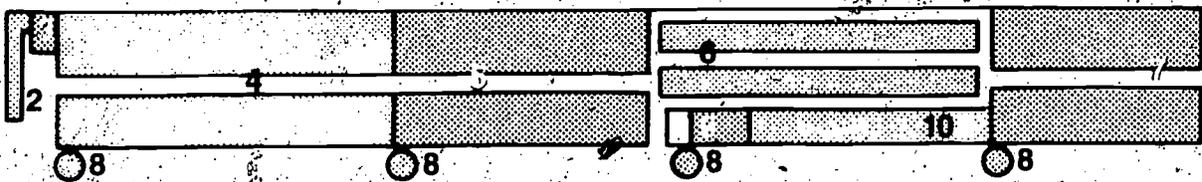
Rear pit



Solid floor

# Building Systems

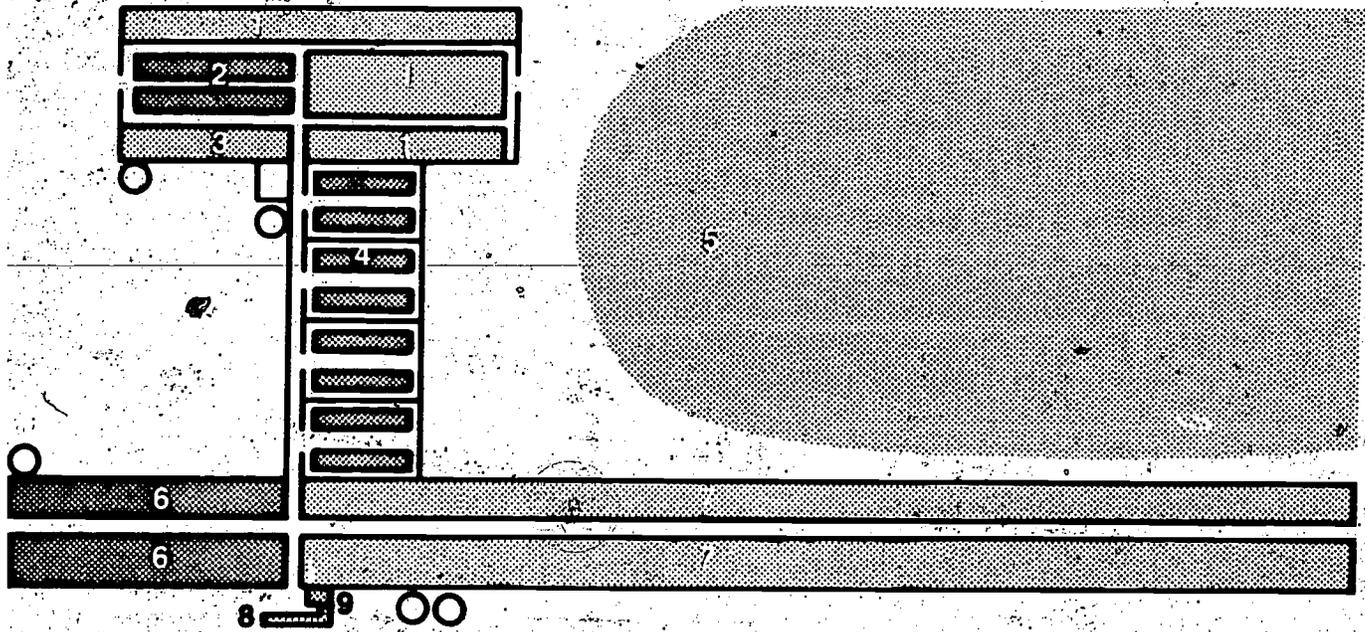
## Production-line system



1. Possible Lagoon Location
2. Loading
3. Scale
4. Growing-Finishing Unit
5. Nursing Unit
6. Farrowing Unit
7. Gestation and Breeding
8. Feed Storage Bins
9. Weaning Pens
10. Sow Holding Pens

# Building Systems

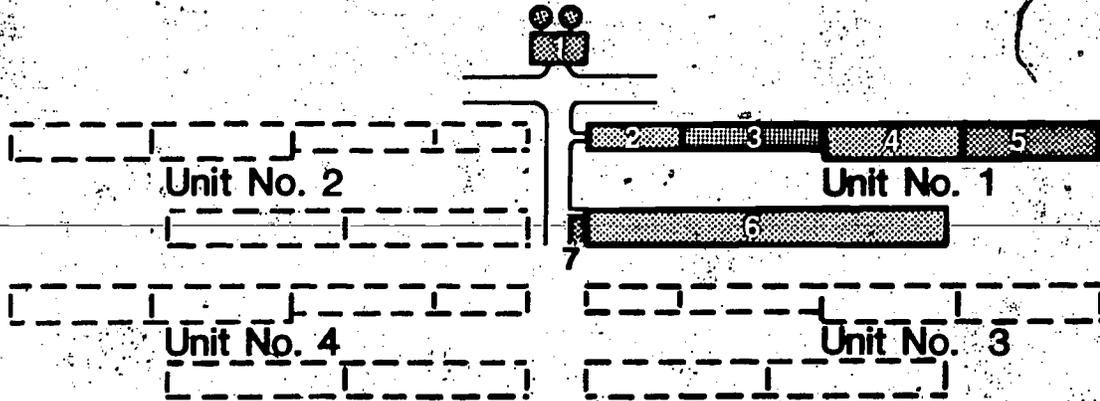
## H system



1. Gestation Pens
2. Individual Sow Stalls
3. Breeding
4. Farrowing Rooms
5. Possible Lagoon Location
6. Nursery Unit
7. Growing-Finishing Unit
8. Scale
9. Handling and Loading

# Building Systems

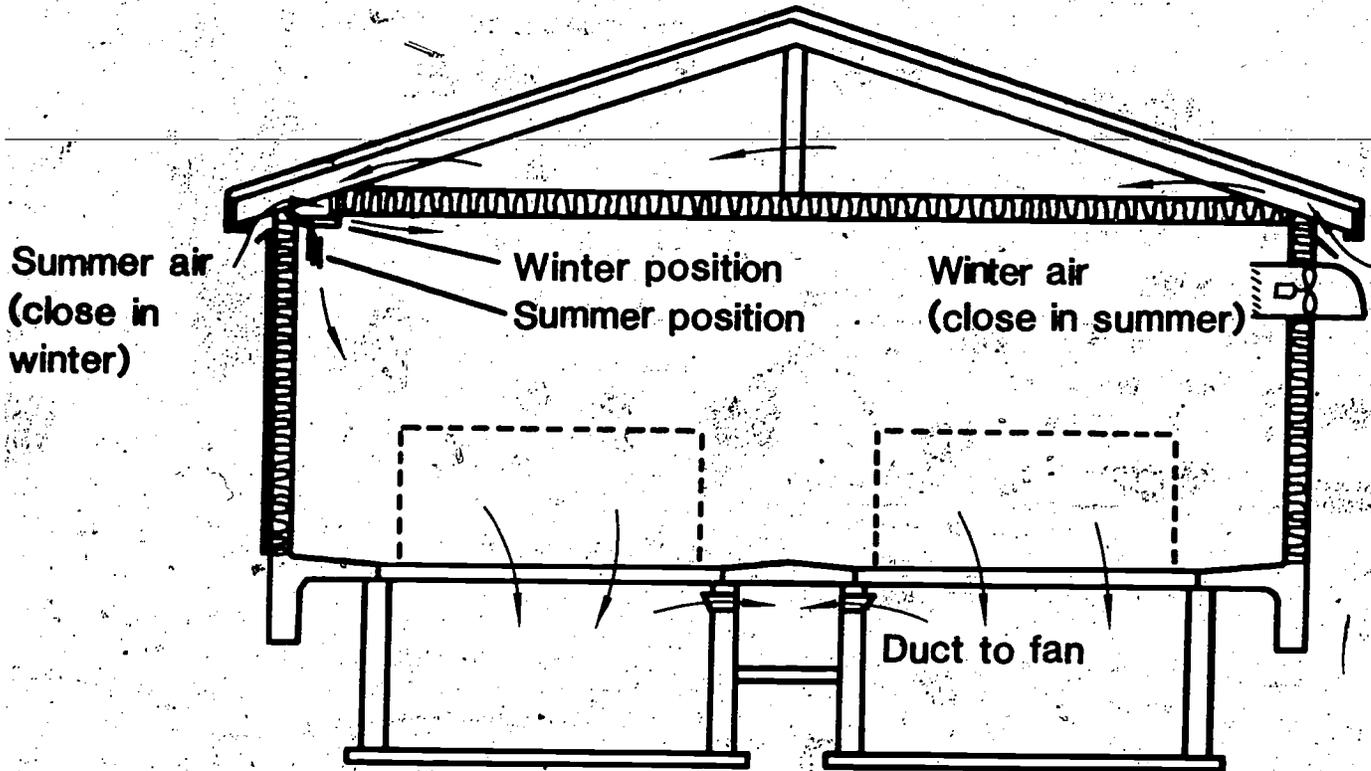
## Unit system



1. Feed Center
2. Weaning
3. Farrowing Rooms
4. Gestation
5. Breeding
6. Growing and Finishing
7. Loading
8. Possible Lagoon Location

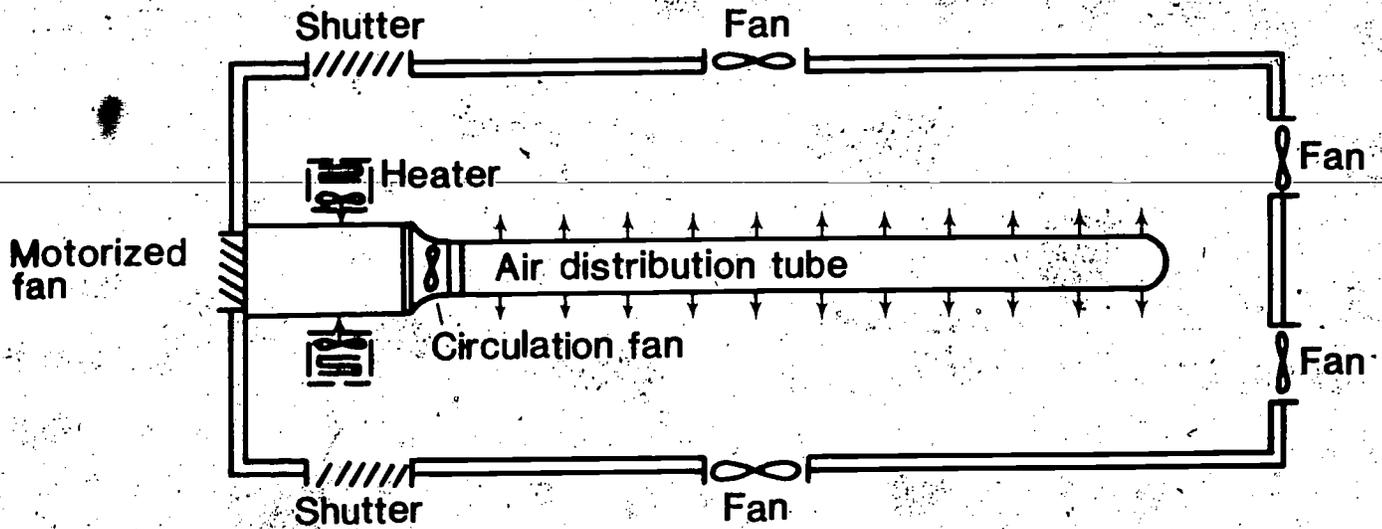
# Ventilation Systems

One type of negative pressure (exhaust) ventilation system with pit ventilation.

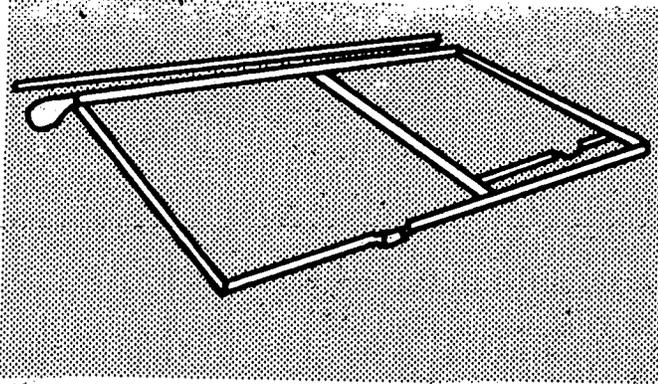


# Ventilation Systems

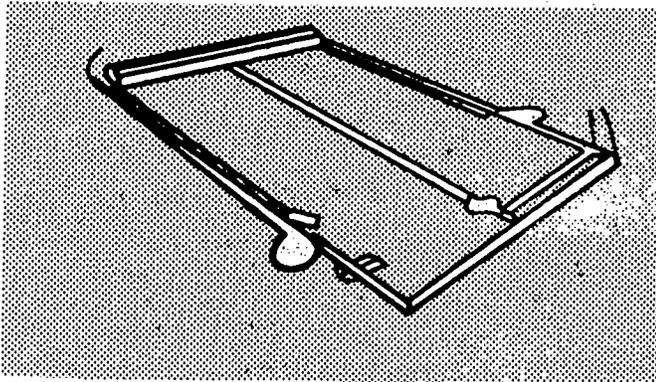
Positive pressure intake and air distribution



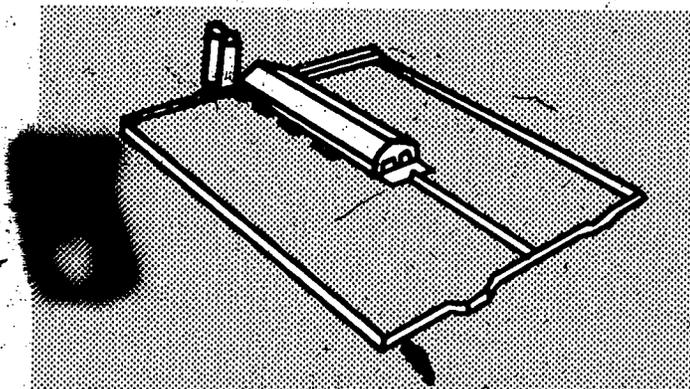
# Types of Beef Buildings



Open feedlot



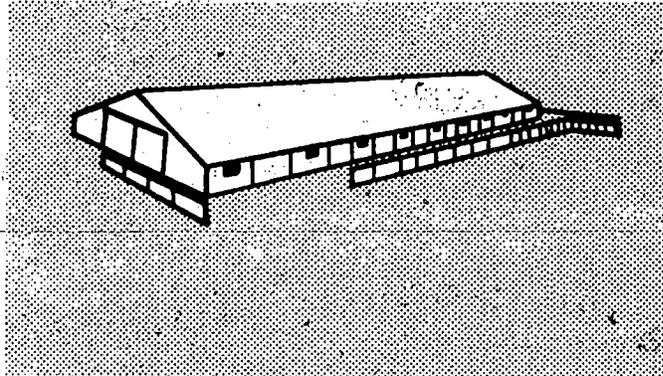
Building and feedlot



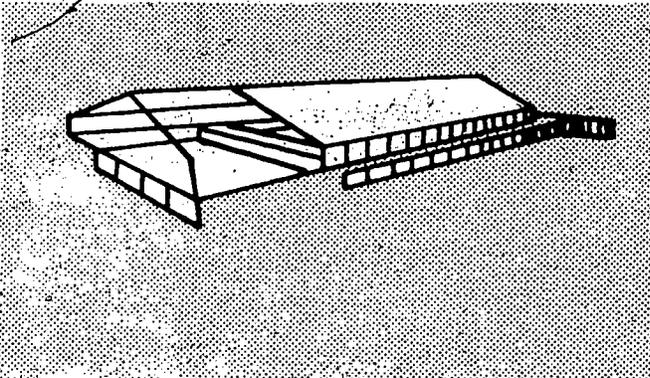
Feeding building and lot

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## Types of Beef Buildings, continued



Confinement building  
Warm-confinement system



Confinement building  
Cold-confinement system

# Swine Waste Management Alternatives

System type

Pasture

Open lot with shelter

Roof confinement

Solids

Runoff

Refeeding

Solids removal

Dilution

Handling and storage

Solid more than 15% solids

Runoff Basin 0-2% solids

Lagoon 0-4% solids

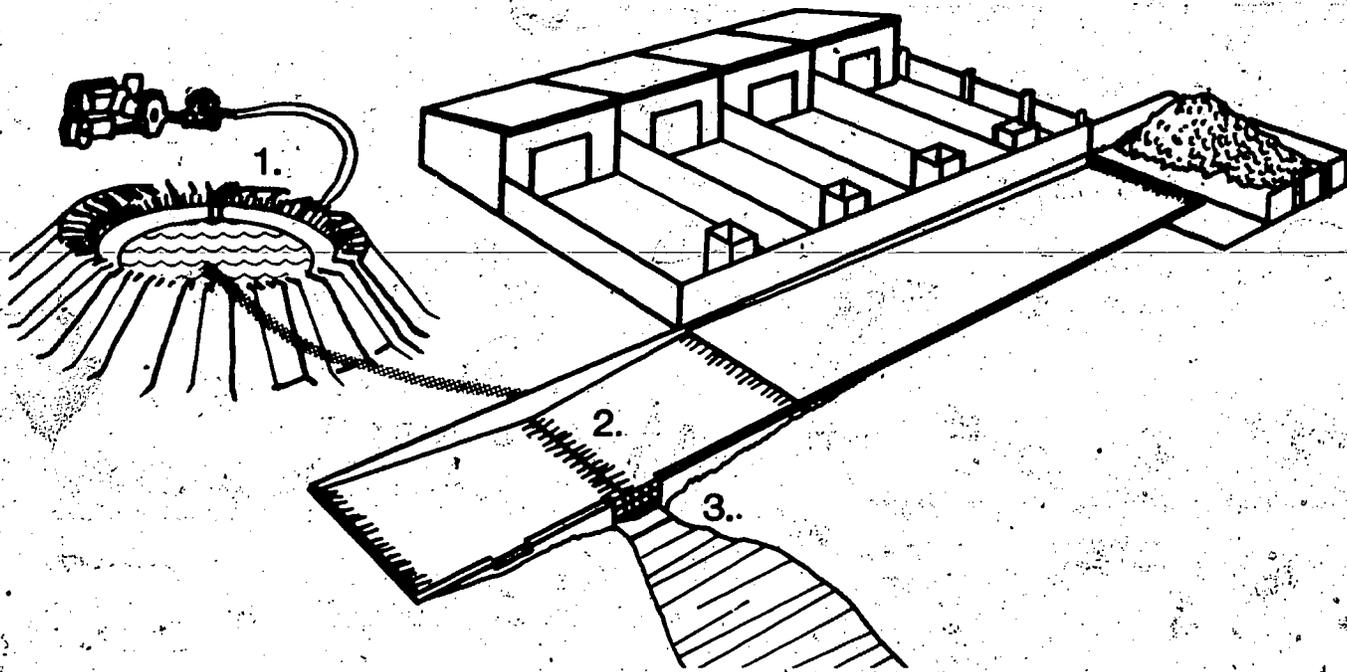
Slurry 4-15% solids

Disposal

Land disposal

Flow chart of common swine waste management

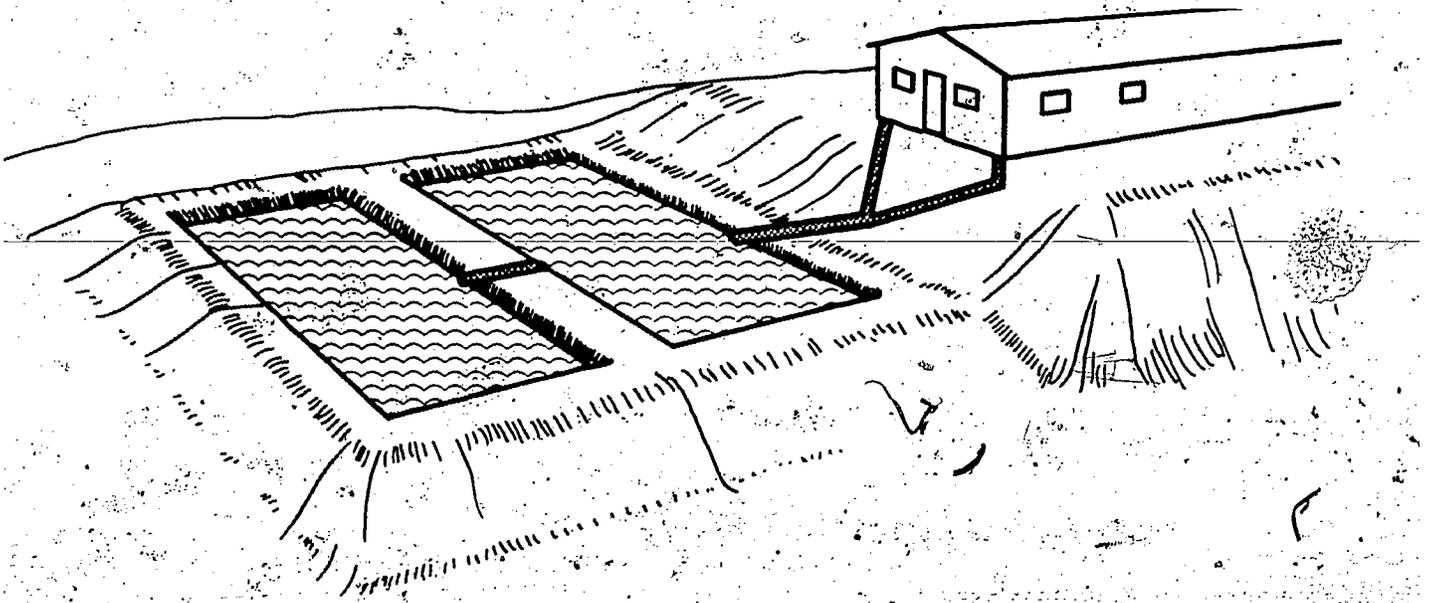
# Livestock Waste Control



Paved lot with shelter, for solid manure handling.

1. Runoff control—Detention and irrigation
2. Solids settling basin
3. Runoff control—Infiltration area

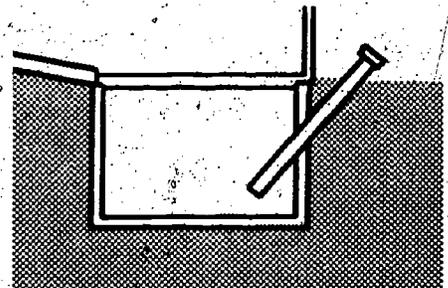
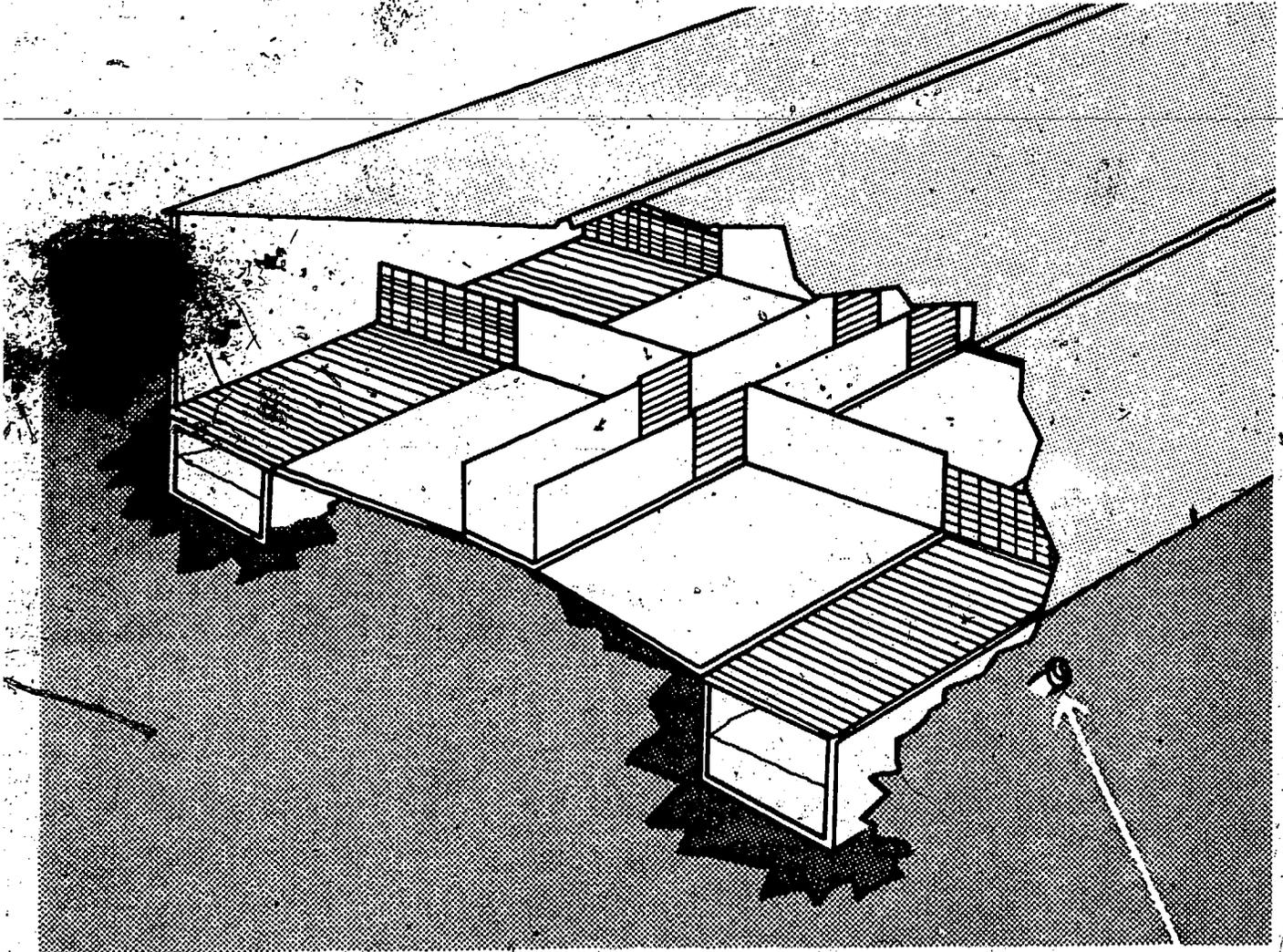
# Livestock Waste Control



Two-stage anaerobic lagoon system for treatment of wastes.

# Livestock Waste Control

Confined, partially slotted floors, pit storage and liquid handling system.



Pump Out Port

## TRANSPARENCY DISCUSSION GUIDE

### PLANNING AND EVALUATING LIVESTOCK CONFINEMENT SYSTEMS

Transparencies 1 and 2: TYPES OF SWINE BUILDINGS - Modified open front, gable style roof, and single slope roof

1. Identify the parts of the buildings listed on the transparencies.
2. Discuss some of the advantages and disadvantages of these types of buildings.

#### Advantages

- A) Can expect the same gain and feed efficiency in this building as the environmentally controlled building in the midwest
- B) Costs less than an environmentally controlled building
- C) Does not require any mechanical ventilation

#### Disadvantages

- A) Does not control components of environment that could restrict the performance of pigs
- B) Pigs must eat and sleep in the same general area, compared to those buildings with an outside apron.

3. Discuss any disadvantages of the gable roof compared to the single slope roof.
  - A) Single slope roof is warmer in winter
  - B) Gable style roof is generally more expensive

Transparency 3: TYPES OF SWINE BUILDING - Open front outside apron building

1. Identify the parts of the buildings listed on the transparency.
2. Discuss some of the advantages and disadvantages of these types of buildings.

#### Advantages

- A) Initial cost is lower than modified open front and environmentally controlled buildings.
- B) Pigs have a division of sleeping and eating areas.
- C) Does not require mechanical ventilation

#### Disadvantages

- A) Growing pigs do not perform as well.
- B) Waste is handled as a solid or semi-solid.

#### Transparency 4: TYPES OF SWINE BUILDINGS / Environmentally controlled buildings

1. Discuss some of the advantages and disadvantages of this type of building.

##### Advantages

- A) Ability to control components of the environment that may restrict the performance of pigs.
- B) Can control temperature and humidity.
- C) Smaller or younger pigs can be put into this type of building sooner than others.
- D) Prevents fly and bird problems.

##### Disadvantages

- A) Most expensive of those types discussed.
  - B) Requires mechanical ventilation system.
  - C) Could have high odor levels.
2. Discuss the two different types of floor plans presented on the transparency, and have students give the pros and cons to the different floor plans.
  3. Summarize that no matter which building is chosen, it should be based on the following factors.
    - A) pig performance
    - B) labor and management abilities
    - C) economics

#### Transparency 5: FLOOR ARRANGEMENTS FOR FARROWING.

Discuss with the students the different types of floors, and pit arrangements. Have students try to identify some advantages and disadvantages of each.

#### Transparencies 6, 7, and 8: BUILDING SYSTEMS.

1. Identify the various components of the different types of building systems, and discuss the placement of each component.
2. Describe each of the building systems.

##### A. Production-line system

It is a very popular system because of the ease of moving hogs. The moving can be accomplished by one person. Expansion could be accomplished by building additional units beside those already present.

**B. H-System**

This system features a breeding and gestation unit, a nursery, and a growing finishing unit, connected by the farrowing unit. With this system one should be able to completely empty each room for easier cleaning. The expansion is difficult, it is usually done by duplicating the system.

**C. Unit System**

This system is used where people plan to expand their operations. As production expands, additional units can be added. When planning a unit system, utilities, power, feed center, and water systems should be planned to handle the maximum size. Waste management could also be a problem.

3. Have students discuss the pros and cons of each of the types of building systems.

**Transparencies 9 and 10: VENTILATION SYSTEMS.**

1. Describe the differences between positive pressure and negative pressure ventilation systems.

**Positive Pressure System**

Fans are used to force fresh air into the building, and to distribute it by the use of lateral ducts. Most are basically pressure intakes, with sidewall exhaust fans to expel moisture, heat, odors, and gases.

**Negative Pressure System**

Fans are used to draw the air from the building, to create a negative pressure. Air is then drawn into the building through designed air intakes.

2. Summarize by telling students that in any ventilation system, the incoming air must be well distributed, and properly mixed or blended so that it can remove moisture and heat and do it without creating drafts.

**Transparencies 11 and 12: TYPES OF BEEF BUILDINGS**

1. Describe to the students each type of beef building.
  - A. Open Feedlot - There are no buildings used in this system. Weather protection for cattle is limited to a windbreak fence in the winter, or a sunshade in the summer. Most lots are dirt except for a strip of concrete along the feed bunks.
  - B. Building and Feedlot - This system consists of an open-front shed or barn with an outside lot that is partly or completely paved. The feed bunks are usually outside, the cattle are fed in mechanical or fence-line bunks.

- C. Feeding Building and Lot - Similar to previous one except that the feed banks are under shelter.
- D. Warm-confinement System - This system uses an enclosed, insulated, fan ventilated building with wintertime control over inside air temperature. The building is ventilated in the summer by opening large doors.
- E. Cold-confinement System - This system uses a building with one side open except for a fence that keeps cattle inside. The air temperature in the building fluctuates according to the outside temperature.

2. Ask students to explain the systems on their home farms.

Transparency 13: SWINE WASTE MANAGEMENT ALTERNATIVES

- 1. The teacher may wish to draw the lines connecting the types of waste management, to the types of production systems.
- 2. The teacher should explain any of the terms on the chart, which the students may not understand.

Transparencies 14, 15, and 16: LIVESTOCK WASTE CONTROL.

1. Transparency 14. Solid Manure Handling  
 This transparency shows different methods of separating and disposing of livestock wastes. Paved lots are sloped for drainage and to assist in manure collection. The scraped manure is stock-piled, or hauled immediately to the land. Runoff from these lots is held in a settling basin. There are two alternatives to dispose of the liquid from the settling basin. The first is to use a grass infiltration area to release the runoff to the land. The second is a detention basin where the runoff is stored and later used for irrigation purposes.

Transparency 15. Two-stage Anaerobic Lagoon System for Treatment of Wastes.

This is commonly used with a flushing system. In order for it to work effectively, it is important to have proper design, adequate volume, and proper dilution. This should only be used if some odor can be tolerated. The wastes are flushed out of the building and into a lagoon. The second lagoon is for overflow from the first. It might be necessary to have some method of disposing of excess water from the lagoon.

Transparency 16: Liquid Handling System.

Liquid wastes fall through the slats and into the pits below. The pits are then pumped out with liquid waste handling equipment. Periodic checking of the pits is important because there are certain times of the year, where it may not be feasible for liquid wastes to be applied to the land.



2. Have students list some of the advantages and disadvantages of each of the livestock waste systems:

## TEACHER'S KEY

### SAMPLE TEST QUESTIONS

#### PLANNING AND EVALUATING LIVESTOCK CONFINEMENT SYSTEMS

True (+) or False (0)

- + 1. Successful ventilation usually requires insulation.
- + 2. One purpose of ventilation is to provide fresh air to animals.
- 0 3. One should not consider the location of the house, when deciding where to put confinement buildings.
- + 4. Solid floors require more square feet per head than do slotted floors in cold confinement buildings.
- 0 5. There is only one type of ventilation system, which can be used in confinement buildings.
- 0 6. Gestating sows require more space than boars on slotted floors.
- 0 7. In the production line building system the buildings are arranged into the shape of an H.
- 0 8. A confinement system would be a good recommendation to a tenant wanting to expand his swine operation.
- + 9. Confinement systems should cut labor time.
- + 10. One advantage of a confinement system is that it could free up valuable land for crop production.

#### LISTING

1. List two types of swine confinement systems and an advantage and disadvantage of each.
2. List two types of beef confinement systems and an advantage and disadvantage of each type.

3. List 2 important building location considerations.

4. List two purposes of ventilation.

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#### ESSAY

Describe one type of confinement system and how it operates. Describe the design of the building, the type of flooring, the type of ventilation system, and the method of livestock waste control and management.

168

## UNIT E: CROP SCIENCE

### PROBLEM AREA: HANDLING PESTICIDES SAFELY AND PASSING CERTIFICATION TESTS

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during early spring before the most intense time for using pesticides.

The estimated instructional time for this problem area is 3 to 5 days depending on how far the teacher wishes to go in developing activities that would help students pass the certification tests. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

#### CREDIT SOURCES:

The materials were developed through a funding agreement, R-33-13-D-0362-466, with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, student worksheet, and test questions were developed by Al Zwilling, Department of Vocational and Technical Education, University of Illinois, and Betsy Pech, Vocational Agriculture Teacher, Wapella High School. Transparency masters and the transparency discussion guide were prepared by Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Rural Core Curriculum Field Test Teachers, and reviewed by the following vocational agriculture teachers:

Betsy Pech - Wapella High School  
Clarence Benard - Enfield High School  
Clarence Tipton - Serena High School

## TEACHER'S GUIDE

- I. Unit: Crop science
- II. Problem area: Handling pesticides safely and passing certification tests
- III. Objectives: At the end of this problem area students will be able to:
  1. Identify safety precautions when working with pesticides.
  2. Select specific controls for specific pests.
  3. Identify major terms associated with pest control.
  4. Interpret essential label information on pesticide containers.
  5. Identify safe storage and disposal methods.
  6. Successfully complete the private applicator's certification test.
- IV. Suggested interest approaches:
  1. Relate stories of incidents where pesticides have been improperly used or stored.
  2. Ask students to name some common pesticides and where they have seen them used. Record the names of the pesticides and their use on the chalkboard.
  3. Ask students how many of them would like to obtain their private applicator's license. Ask students to explain what this permits them to do.
  4. Have a resource person come in and present a program of pesticide safety.
  5. Distribute Competency Inventory sheets. Have students fill out and then discuss. Discuss the areas that the students need more information on.
- V. Anticipated problems and concerns of students:
  1. What are the different types of pesticides, and what do they control?
  2. What are the major terms I should know before working with pesticides?
  3. How do I interpret the information on pesticide labels?

4. What should be done with pesticide containers after use?
  5. How should pesticides be stored?
  6. How should I dress when I work with pesticides?
  7. What safety precautions should be followed?
  8. Why must we be certified? How do I receive a private applicator's license?
- 
9. Where do I go to receive a private applicators license?
  10. What should I do if I want to work for a custom pesticide applicator?
  11. What should be done in the case of an accident with a pesticide?

#### VI. Suggested learning activities and experiences:

1. Use one or more of the suggested interest approaches listed in Section IV.
2. Have students identify problems and concerns relating to pesticide use, storage and certification, and record on board.
3. Distribute VAS Unit 4045a and have students read, trying to find answers to their problems and concerns.
4. Discuss in class the information sheets of terms and definitions.
5. Show VAS slidefilms 1108, "Understanding and Safe Use of Pesticides;" 1108-1.2, "Selecting and Handling Pesticides;" and 1108-2.1, "Safe Use of Pesticides Around the Home." After showing the slidefilms discuss the material presented with the students.
6. Show transparencies included with this problem area and discuss the important aspects of each transparency.
7. Have students complete Worksheet #1 using VAS Unit 4045a during supervised study.
8. Use the Worksheet #1 as a homework assignment. Have the students use a pesticide label from home and fill out the information. Have students attach label to the Worksheet, if possible.
9. Go over the Worksheet as a class project, asking individual students to respond to the specific questions about label information.
10. Ask students to fill out the Competency Inventory at the end of the problem area, so they can assess their progress.

11. Use the Competency Inventory for classroom discussion, to discuss entry level requirements for work in the pesticide field.
  12. Teachers may use the Competency Inventory as a method to evaluate the students' progress.
  13. Have students look at the pesticides which they have at home, and complete Job Sheet #1.
  14. Develop a bulletin board displaying major pesticides. These may be collected from magazines.
- 

#### VII. Application procedures:

1. The purpose of this problem area is for students to recognize safety hazards associated with working with pesticides, and gain awareness in this area.
2. The knowledge gained should be applied into practice when the student works with pesticides on their home farm, or place of employment.
3. The students may conduct a pest control contest as part of their FFA chapter activities.

#### VIII. Evaluation:

1. Collect and evaluate student worksheets.
2. Construct and administer a pencil and paper test using some of the questions included with this problem area.
3. Check progress through use of the Competency Inventory.
4. Have students complete certification test.

#### IX. References and aids:

The following materials are available from Vocational Agriculture Service, University of Illinois, Urbana, IL.

1. VAS Unit 4045a "Handling and Using Pesticides Safely"
2. VAS Slidefilm 1108 "Understanding and Safe Use of Pesticides"
3. VAS Slidefilm 1108-1.2 "Selecting and Handling Pesticides"
4. VAS Slidefilm 1108-2.1 "Safe Use of Pesticides Around the Home"
5. VAS Slidefilm 1108-3.1 "The Pesticide Review Process"
6. VAS Transparencies "Safe Use of Pesticides."

7. "Tips and Facts for Continued Safe Use of Pesticides."
8. Principles of Pesticide Use, Handling, and Application  
Instructional Modules.

173

**COMPETENCY INVENTORY**

**HANDLING PESTICIDES SAFELY AND  
PASSING CERTIFICATION TESTS**

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

Competency	Circle One				
1. Check application equipment for leaks.	1	2	3	4	5
2. Select chemicals for specific problems.	1	2	3	4	5
3. Read and interpret package labels.	1	2	3	4	5
4. Control pests on home farm.	1	2	3	4	5
5. Summarize the precautions which should be followed.	1	2	3	4	5
6. Calibrate pesticide applicator.	1	2	3	4	5
7.	1	2	3	4	5
8.	1	2	3	4	5
9.	1	2	3	4	5
10. Identify pests that are of major concern in your area.					6 7
11. Identify pesticide damage in crops.					6 7
12. Recommend kinds and rates of pesticides.					6 7
13. Describe protective equipment needed.					6 7
14. Describe protective clothing.					6 7
15. Describe places and methods of storage.					6 7
16. Recognize and describe equipment parts.					6 7
17. Follow accepted procedures in accident situations.					6 7
18. Select chemicals for specific problems.					6 7

These are competencies outlined in the National Ag Occupations Competency Study, for entry level positions in agricultural production.

Name \_\_\_\_\_ Date \_\_\_\_\_

## INFORMATION SHEET

### TERMS AND DEFINITIONS

1. APPLICATION--Process of directing or placing pesticides on or in plants, animals, buildings, soil, air, water, or other site
2. CARTRIDGE--Cylinder-shaped part of the respirator which absorbs fumes and vapors from the air
3. CANNISTER--Metal or plastic container filled with absorbent materials to filter fumes and vapors from the air
4. DOSE, DOSAGE--Portion or amount of pesticide mixture which is directed at the target
5. DOWNWIND--Direction toward which the prevailing wind is blowing
6. DRIFT--Movement by wind and air currents of droplets or particles of a pesticide
7. ENVIRONMENT--Surroundings, usually water, air, soil, plants, and animals
8. VAPORIZE--To form a gas and disappear into the air
9. EXPOSURE--Not protected or shielded contact with pesticides through mouth, lungs, or skin
10. FACE SHIELD--Piece of protective equipment used by a pesticide applicator to protect face from exposure
11. FUME--Unpleasant or irritating smoke, vapor, or gas
12. NEOPRENE--A kind of synthetic rubber
13. POLLUTE--To make unclean or unsafe
14. REENTRY INTERVAL--Period of time between a pesticide application and when persons may reenter an area without wearing protective clothing and equipment
15. RESPIRATOR--Face mask which filters out poisonous gases and particles  
(NOTE: A respirator is used to protect the nose, mouth, and lungs from pesticide injury.)
16. TARGET--Pest to be treated with a pesticide
17. PESTICIDE--Chemical or other substance that will destroy or control a pest or protect something from a pest
18. STOMACH POISON--Pesticide which kills when swallowed

19. FUMIGANT POISON--Pesticide which enters the pest in the form of a gas and kills it
20. CONTACT POISON--Pesticide which kills when it touches or is touched by the pest
21. SYSTEMIC--Pesticide that is taken up by one part of a plant or animal and moved to another section where it acts against a pest
22. SHORT-TERM (NONPERSISTENT)--Pesticide that breaks down almost immediately into nontoxic by-products

23. RESIDUAL (PERSISTENT)--Pesticide that remains in the environment for a fairly long time

24. BROAD SPECTRUM (NONSELECTIVE)--Pesticide which is toxic to a wide range of pests; used when several different pests are a problem

(NOTE: Short term, residual, and broad spectrum are often used in describing insecticides and miticides.)

25. SURFACE SPRAY--Pesticide spray which is evenly applied to the outside of the object to be protected

26. SELECTIVE--Pesticide which is more toxic to some types of plants or animals than to others; usually used to describe a particular type of pesticide

Example: A selective herbicide would kill crabgrass in a cornfield but would not injure the corn

27. NONSELECTIVE--Pesticide which is toxic to all or more plants or animals of a type; usually used to describe a particular type of pesticide

Example: A nonselective herbicide would kill or injure all plants in the application site but not all insects, animals, or other organisms

28. ANTIDOTE--Treatment given by a medically trained person to reduce the effects of pesticide poisoning

29. ABSORB--To take a pesticide or other material into a plant, animal, or the soil

30. ACUTE POISONING--Poisoning which occurs after a single exposure to a pesticide

31. CHRONIC POISONING--Poisoning which occurs as a result of repeated exposures to pesticides over a period of time

32. CONTACT--To touch or be touched by

33. DERMAL TOXICITY--How poisonous a pesticide is to an animal when in contact with the skin

34. DILUTE--To make a pesticide thinner or weaker by adding water, oil, or other material; to water down
35. FIRST AID--First effort to help a victim of poisoning while medical help is on the way
36. HAZARD--Risk of danger; chance that injury or harm will come to the applicator, other persons, plants, or animals
37. INHALATION--To take air into the lungs; to breath in
- 
38. INHALATION TOXICITY--How poisonous a pesticide is to man or animal when breathed in through the lungs
39. LC<sub>50</sub>--Concentration of a pesticide in the air which would kill half of a large number of test animals exposed to it.  
(NOTE: The lower the LC number value, the more poisonous the pesticide. It is often used as the measure of acute inhalation toxicity. LC stands for lethal concentration.)
40. LD<sub>50</sub>--Dose or amount of a pesticide which would kill half of a large number of test animals if eaten or absorbed through the skin  
(NOTE: The lower the LD number value, the more poisonous the pesticide. LD number values are the commonly used measures of acute oral or acute dermal toxicity. LD stands for lethal dose.)
41. LETHAL--Deadly
42. ORAL--Through the mouth
43. DISPOSAL--Act or process of correctly discarding pesticides and pesticide containers; can include recycling, deposit-return, reuse, or burning
44. ENCAPSULATION--Method of disposal of pesticides and pesticide containers by sealing them in sturdy, waterproof, chemical-proof container which is then sealed in thick plastic, steel, or concrete to resist damage or breakage  
(NOTE: The whole package is then usually buried in an area where water could not be contaminated even if leakage occurs.)
45. HERBICIDE--Pesticide that is used to control unwanted plants
46. INCINERATOR--Special high-heat furnace or burner which reduces everything to nontoxic ash and gas
47. SOIL INJECTION--Method of disposal of pesticides by putting them within the plow layer of soil by usual tillage practices
48. MONITORING SYSTEM--Regular system of keeping track of and checking up on whether or not pesticides are escaping into the environment

49. ORIGINAL CONTAINER--Package (bag, can, or bottle) in which a pesticide is sold

(NOTE: The package must have a label telling what the pesticide is, how to use it correctly and safely, and how to safely dispose of the empty container.)

50. DILUENT--Liquid, such as water, kerosene, alcohol, or dust, which "waters down" or weakens a concentrated pesticide

51. CONTAMINATE--Pollute or make unfit for use

52. SENSITIVE--Easily injured

53. PRIVATE APPLICATOR--A certified applicator who uses or supervises the use of any pesticide classified for restricted use for the purpose of producing any agricultural commodity on the property owned or rented by him or his employer or on the property of another person producing any agricultural commodity in exchange of personal services

54. TOLERANCE--Maximum amount of pesticide which can legally remain on or in any food or feed crop at harvest or animal at slaughter

55. AGRICULTURAL COMMODITY--Any plant or plant part, animal, or animal product produced by a person

56. CERTIFICATION--Recognition by certifying agency that a person is competent and thus authorized to use or supervise the use of restricted use pesticides

57. PHYTOTOXICITY--Causing injury to plant life

58. EPA--United States Environmental Protection Agency

Definitions taken from Principles of Pesticide Use, Handling, and Application Instructional Modules.

## INFORMATION SHEET #2

### ITEMS PESTICIDE APPLICATORS AND OPERATORS ARE EXPECTED TO KNOW FOR CERTIFICATION

1. Understand labels and labeling information and the classification of pesticides, general or restricted use.
2. Know the causes of pesticide accidents and how to guard against injury.
3. Realize the need for protective clothing and equipment.

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4. Recognize the symptoms of pesticide poisoning and be able to administer appropriate first aid treatment.
5. Know how to handle, store and dispose of pesticides properly.
6. Be aware of the influence of pesticides on the environment.
7. Identify common pests to be controlled.
8. Be familiar with pesticide formulations and factors affecting their effectiveness.
9. Know the common types of equipment and techniques of application.
10. Know how to calibrate application equipment.
11. Understand laws and regulations.

### INFORMATION SHEET #3

## HOW AND WHY TO BE CERTIFIED AS A PRIVATE PESTICIDE APPLICATOR

One way to become certified is to complete a local training session conducted by the Cooperative Extension Service, University of Illinois. An official of the Illinois Department of Agriculture will be present at the training session to register those attending.

Each person seeking certification must fill out an application, complete the questions in a training evaluation form, and sign a statement saying that he or she understands the information presented at the training session, and the legal responsibilities for the use of pesticides, in accordance with label instructions.

OR

A person may take a written examination for certification as a Private Pesticide Applicator as an alternative to participating in a training session. The examination will be graded, and a passing grade must be achieved to obtain certification. The examination is "open book", and is available from the county extension advisor, or the state or regional offices of the Illinois Department of Agriculture. There is no fee for certification as a Private Pesticide Applicator. Certification is valid for five years.

Why must we be certified?

Because of federal regulations.

Federal Environmental Pesticide Control Act (the Federal Insecticide, Fungicide, and Rodenticide Act of 1947, amended in 1972 - FIFRA) regulates the use of pesticides to protect humans and the environment.

1947 Act - was designed to regulate the marketing of pesticides, especially those "economic poisons" which were moved through interstate commerce.

1972 Act - went much farther to regulate the use or misuse of pesticides, certification of applicators, and regulates marketing at both interstate and intrastate levels.

130

INFORMATION SHEET #4

ADVANTAGES AND DISADVANTAGES OF APPLICATION EQUIPMENT

EQUIPMENT

ADVANTAGES

DISADVANTAGES

Aerosol (bomb and generator)

Penetrates cracks and crevices; usually reaches all pests within the area; area can be used soon after treatment by ventilating

No deposit, therefore reaches only the pests in the area during application; difficult to get long term control; special pesticide formulation necessary; drift hazard

Duster (hand and power)

Lightweight; inexpensive; requires no water

Drift hazard; high cost of pesticide; hard to control amount of application; must calibrate for each product

Back rubber (rubbing post, dust bag)

Can work over a long period of time; relatively inexpensive; portable

Livestock only; cannot control amount of application; all animals may not use applicator

Granular applicator

Lightweight; no water needed; often used in fertilizer spreader or seeder

High cost of pesticide; limited foliar use; must calibrate for each size of granule

Hand sprayer

Economical; simple; easy to use and clean

Not practical for large areas; lacks agitation; wettable powder may clog nozzles

Air-blast sprayer

Good coverage and penetration; low pressure pump; mechanical agitation

Drift hazard; chance of overdose; difficult to use in small areas; hard to confine discharge to a limited target

Low pressure field sprayer

Low cost; lightweight; versatile; covers large areas rapidly

Low volume output limits pesticide penetration; agitation is limited

High pressure field sprayer

Well-built; long life; usually has mechanical agitation; very versatile

Expensive; requires large amounts of water, power, and fuel; heavy tire loads; drift hazard

Ultra-low volume sprayer

No water is needed; equal control with less pesticide

Does not provide for thorough wetting; hazard in using high concentrations; chance of overdose; small numbers of pesticides can be used

## INFORMATION SHEET #5

### POISONING SYMPTOMS AND FIRST AID TREATMENTS

#### Mild Poisoning Symptoms

- fatigue
- headache
- dizziness
- blurred vision
- too much sweating and salivation
- nausea and vomiting
- stomach cramps or diarrhea

#### Moderate Poisoning Symptoms

- unable to walk
- weakness
- chest discomfort
- muscle twitches
- constriction of pupil of the eye
- earlier symptoms become more severe

#### Severe Poisoning Symptoms

- unconsciousness
- severe constriction of pupil of eye
- muscle twitches
- secretions from mouth and nose
- breathing difficulty
- death if not treated

Illness may be delayed a few hours. But if signs or symptoms start more than 12 hours after you were exposed to the pesticide, you probably have some other illness. Check with your physician to be sure.

#### First Aid Procedures

Read the directions in the "Statement of Practical Treatment" on each label. These instructions can save your life and the lives of your employees.

If you get a pesticide on your skin:

- Remove the pesticide as quickly as possible. Remove all contaminated clothing. Prompt washing may prevent sickness even when the spill is very large. Don't forget your hair and fingernails. Water-wettable powders or suspensions are easy to remove with plain water. So are most emulsifiable concentrates and emulsions. Solutions of pesticides in petroleum oil or other solvents are harder to remove without soap or a detergent. Detergents work better. Washroom and emergency field washing facilities should have detergents rather than plain soap.

If you inhale a pesticide:

- Get to fresh air right away.

If you splash a pesticide into your mouth or swallow it:

- Rinse your mouth with plenty of water.
  - Go or be taken to a physician immediately.
  - It is sometimes dangerous to cause vomiting; follow label directions.
- 

186

STUDENT WORKSHEET #1  
READING LABEL DIRECTIONS

(For use with example label in VAS Unit 4045a.)

1. What is the classification of the pesticide? \_\_\_\_\_
2. What is the company's brand name? \_\_\_\_\_
3. What type of pesticide is it? \_\_\_\_\_
4. What type of formulation is used in the pesticide? \_\_\_\_\_
5. What is the toxic chemical in the pesticide? \_\_\_\_\_  
What is the percent of active ingredient in the pesticide? \_\_\_\_\_
6. Which pests does this pesticide control? \_\_\_\_\_  
In what form should the mixture be applied? \_\_\_\_\_  
How much should be used? \_\_\_\_\_  
Where should the material be applied? \_\_\_\_\_  
When should it be applied? \_\_\_\_\_
7. How toxic is this pesticide? \_\_\_\_\_
8. What is stated in the Statement of Practical Treatment? \_\_\_\_\_
9. What is the manufacturer's name and address? \_\_\_\_\_  
Why is this important? \_\_\_\_\_
10. How should this pesticide be stored and disposed? \_\_\_\_\_
11. What is the reentry period for this pesticide? \_\_\_\_\_
12. Does this pesticide have any precautionary statement? \_\_\_\_\_

READING LABEL DIRECTIONS

Sample label in VAS Unit 4042a.

classification of the pesticides

company's brand names?

pesticide is it?

of formulation is used in the pesticides?

toxic chemical in the pesticides?

percent of active ingredient in the pesticides?

does the pesticide control?

should the mixture be applied?

should be used?

is the material be applied?

is it be applied?

this pesticides?

ed in the Statement of Practical Treatment?

a manufacturer's name and address?

Why is this important?

this pesticide be stored and disposed?

reentry period for this pesticides?

esticide have any precautionary statements?

## JOB SHEET #1

### IDENTIFICATION AND STORAGE OF PESTICIDES

#### OBJECTIVES:

1. To make the students aware of the pesticides they use at home.
2. To develop the ability to recognize, classify and store pesticides safely.

#### MATERIALS:

1. Sheet of paper
2. Pencil or pen
3. Pesticides on home farm or neighbor's farm

#### PROCEDURES:

1. Have students look at the pesticides they have at home or the instructor may set up a display of pesticides which the students can use for this activity.
2. The students should read the labels of the pesticides and give the following information for each pesticide.
  - A. Name of pesticide
  - B. What it controls
  - C. Classification of pesticide
  - D. How the pesticide should be stored
3. Submit list to instructor for evaluation

#### QUESTIONS:

1. Were most of the pesticides general or restricted use pesticides?
2. Would most require a person to have passed a certification test in order to use them?
3. Were the pesticides stored safely?

#### OBSERVATIONS:

If these pesticides were on your farm, how would you store them and label them.

#### APPLICATIONS:

The students should be able to identify pesticides easier, and locate the important information on the labels.

PASSING CERTIFICATION TESTS

OBJECTIVES:

1. To make students aware of the activities involved in passing certification tests.
2. To have as many students as possible pass the private applicator's certification test.

MATERIALS:

1. Information sheets from packet on who must be certified, and how this may be accomplished.

PROCEDURES:

1. Contact local county extension advisor and inquire when their office will be holding a certification training session.
2. Arrange a field trip to the county extension office for the day of the certification test.
3. Have students complete training session and take certification test.

QUESTIONS:

1. How often are these training sessions held?
2. How else can one be certified if they do not attend one of these training sessions?
3. Why are these held at the local extension offices?

OBSERVATIONS:

Describe what you thought about the training session and the certification test.

APPLICATION:

Students who have passed the certification test will be able to buy and apply restricted use pesticides, around their homes or farms.

TEACHER'S KEY

STUDENT WORKSHEET #1

READING LABEL DIRECTIONS

(For use with example label in VAS Unit 4045a.)

1. What is the classification of the pesticide? Restricted use pesticide.
2. What is the company's brand name? De Pesto
3. What type of pesticide is it? Insecticide.
4. What type of formulation is used in the pesticide? Emulsifiable concentrate
5. What is the toxic chemical in the pesticide? Pestoff--trisalicylic acid.  
What is the percent of active ingredient in the pesticide? 45.0%
6. Which pests does this pesticide control? Alfalfa weevil, snout beetle.  
In what form should the mixture be applied? spray  
How much should be used? (variety of answers)  
Where should the material be applied? Only in pure alfalfa fields.  
When should it be applied? Only once per year when feeding is noticed
7. How toxic is this pesticide? Highly toxic
8. What is stated in the Statement of Practical Treatment?  
If swallowed induce vomiting by giving a tablespoonful of salt in a glass of warm water. Repeat until vomitus is clear. Call a physician immediately. If inhaled--remove to fresh air. Call a physician. If in eyes--flush eyes with plenty of water for at least 15 minutes. Call a physician. If on skin--remove contaminated clothing and immediately wash skin with detergent and water.
9. What is the manufacturer's name and address? A-Z Chemicals,-- Chemton, Nevada Why is this important? In case user has a specific question about use or antidote for treatment
10. How should this pesticide be stored and disposed? Do not contaminate water, food, or feed by storage or disposal. Should be disposed of in a landfill approved for pesticides or buried in a safe place away from water supplies. Containers should be triple rinsed and offered for recycling, reconditioning or disposed of in an approved landfill, or buried in a safe place
11. What is the reentry period for this pesticide? 48 hours
12. Does this pesticide have any precautionary statement? Yes

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## Key Pesticide Indicators

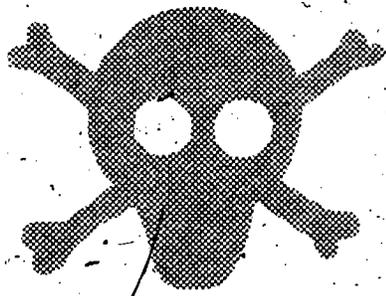
**CAUTION**

Slightly Toxic to Relatively Nontoxic

**WARNING**

Moderately Toxic

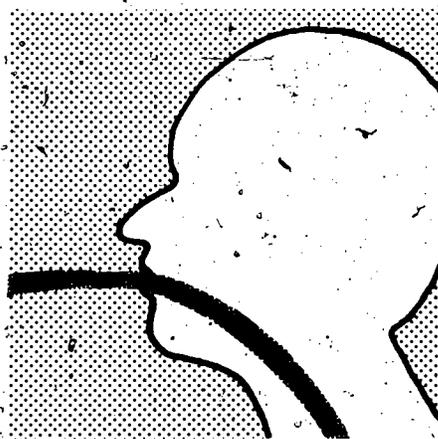
**DANGER**



**POISON**

Highly Toxic

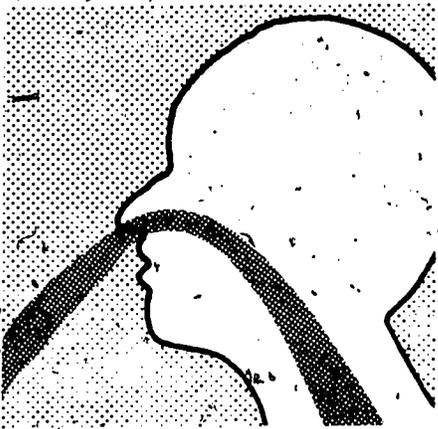
# Methods of Pesticide Poisoning



Swallowing

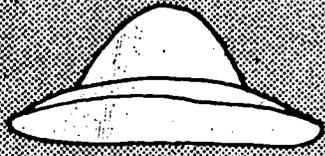


Exposure to Skin

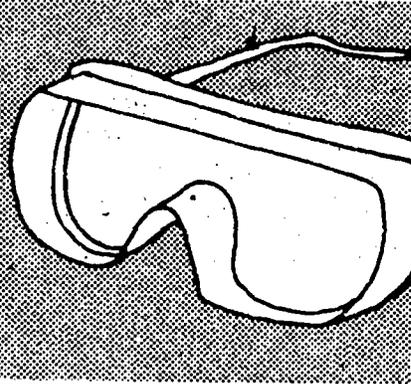


Breathing

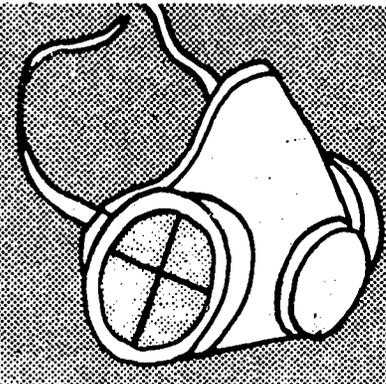
# Recommended Protective Clothing and Equipment



Waterproof Hat



Goggles



Respirator



Closely Woven Fabric Coveralls

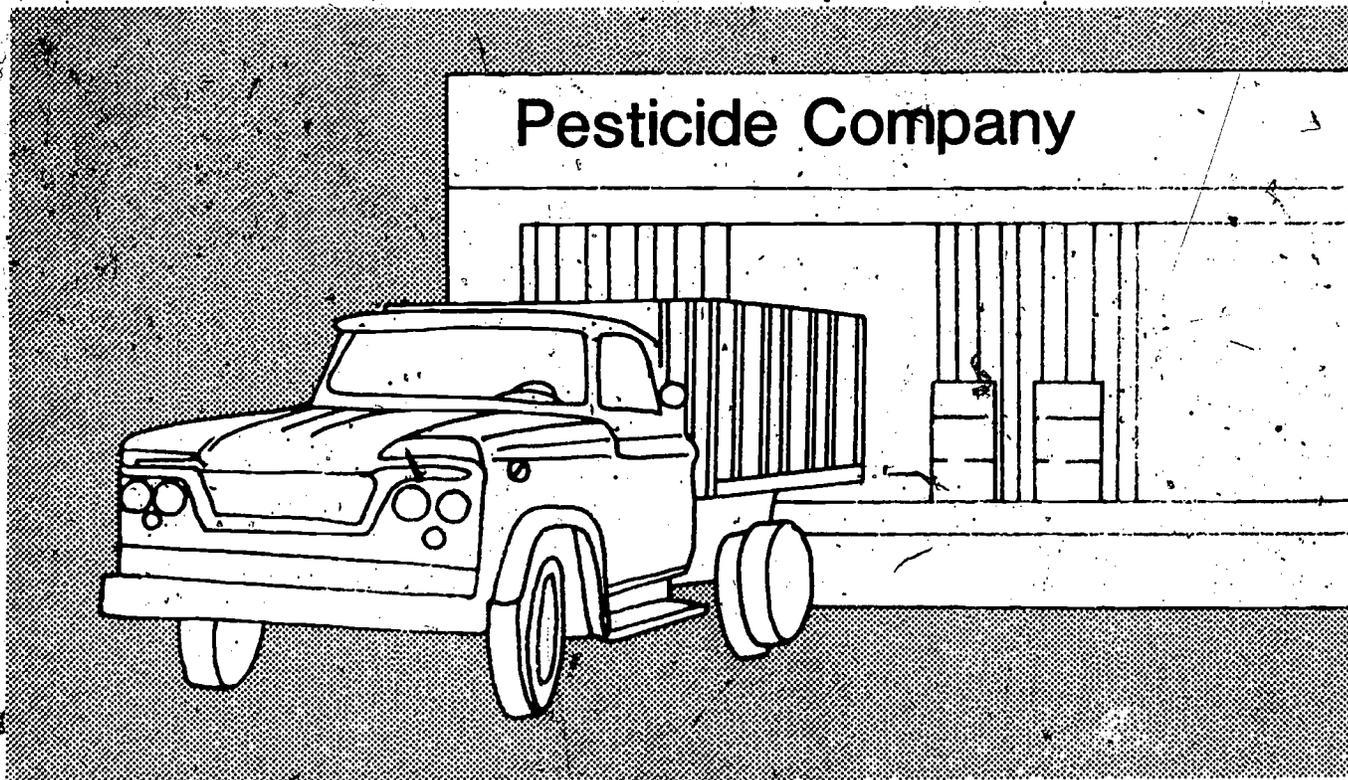


Long Rubber or Neoprene Gloves



Rubber or Neoprene Boots

# Safest Method of Disposal of Highly Toxic Containers

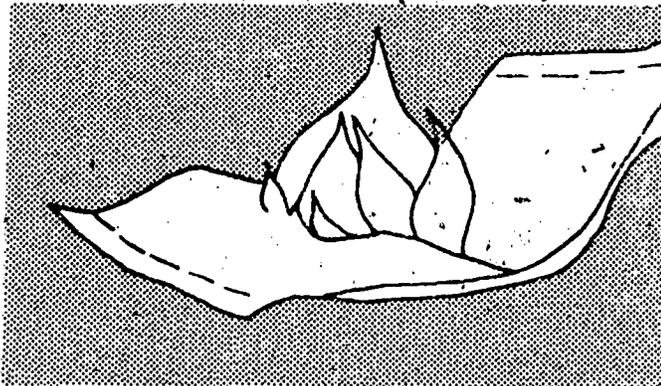
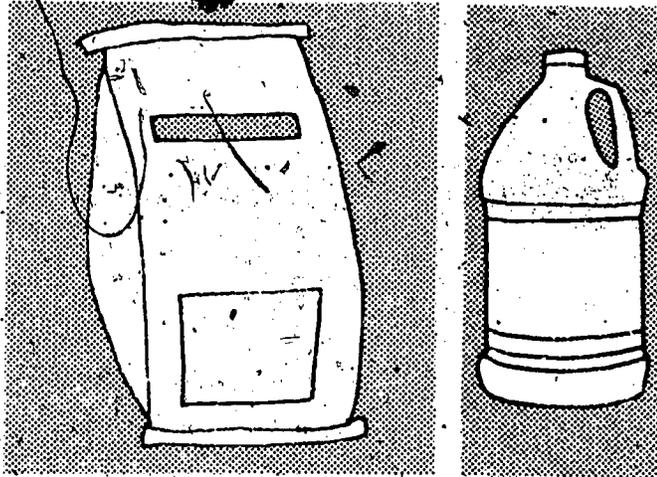


195

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## Other Methods of Disposal of Highly Toxic Containers

### Burnable

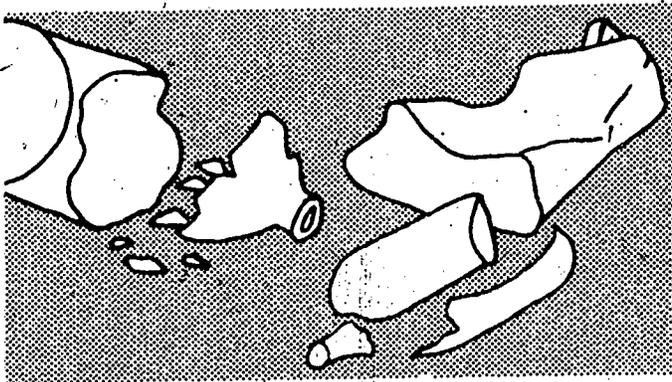
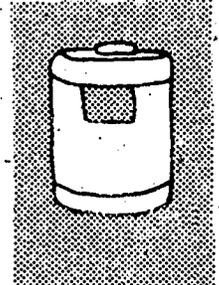
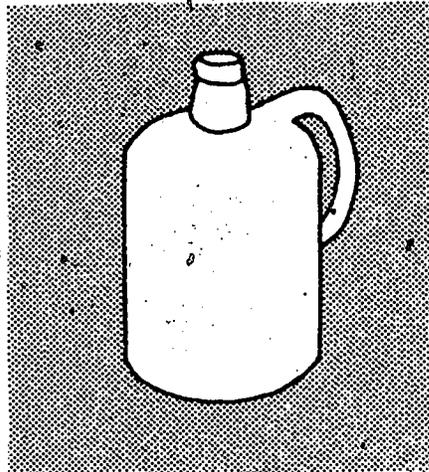
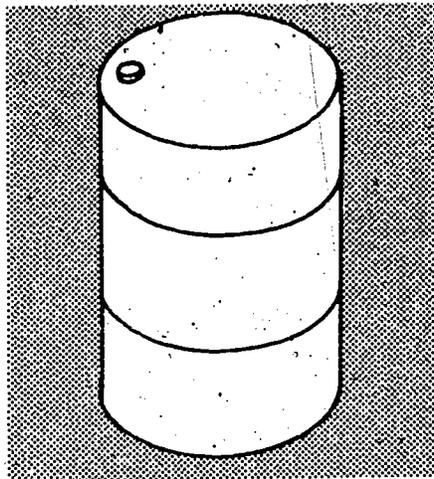


### Burning

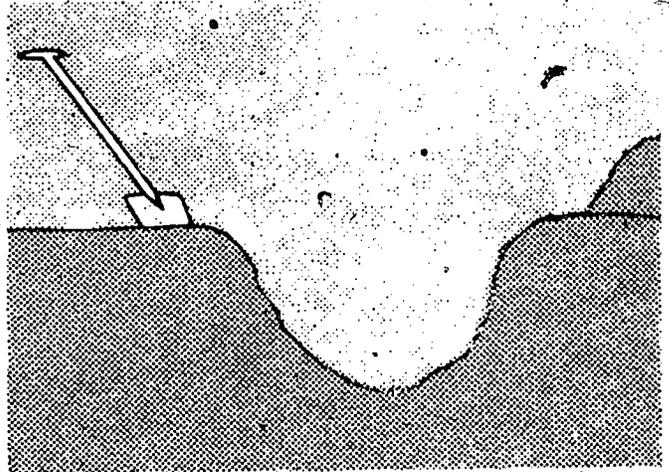
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# Other Methods of Disposal of Highly Toxic Containers

Nonburnable



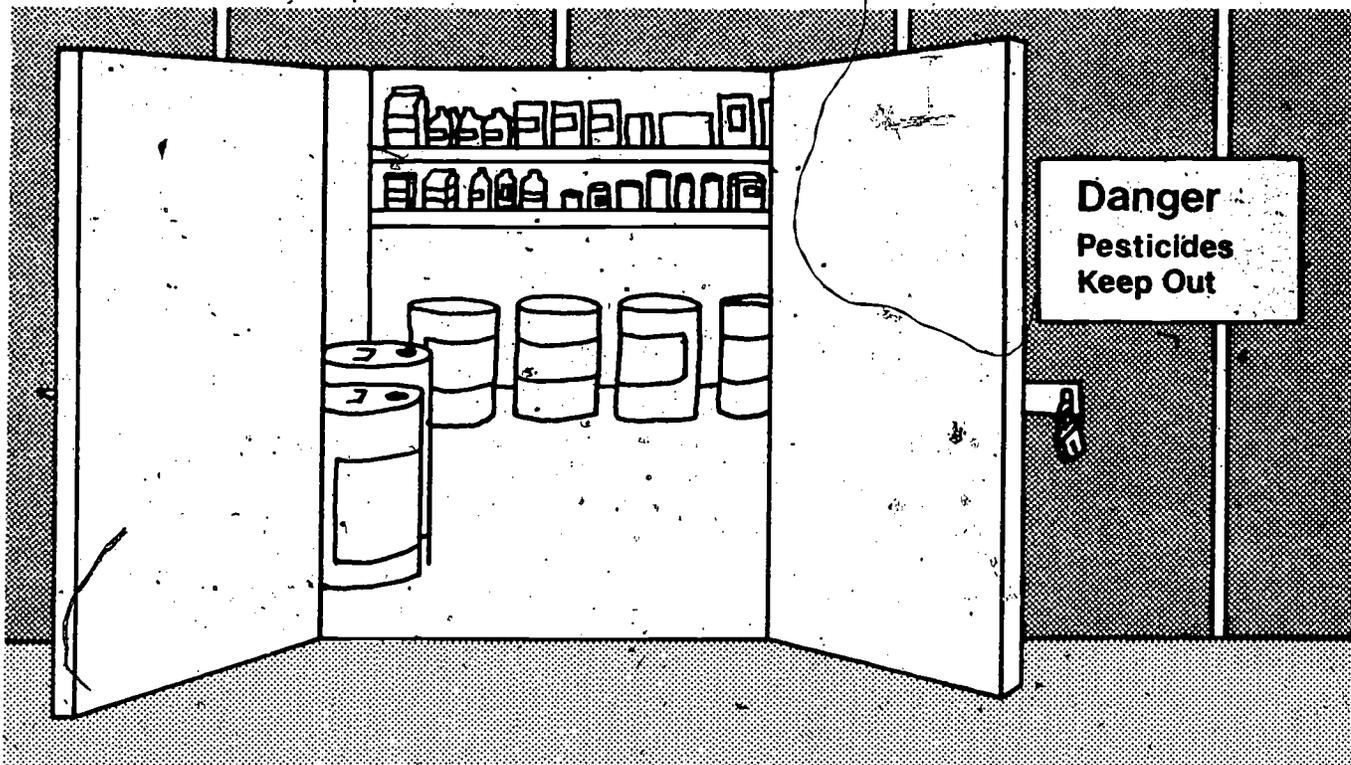
Break, Crush, or Cut Apart



Then Bury

197

# Recommended Storage of Pesticides



## Key Concepts

1. Store in separate building, room or enclosure.
2. Sacks, cartons, and fiber boxes should be stored on shelf.
3. Keep locked.
4. Use signs on outside of area.
5. Store only pesticides in area.
6. Make sure area is dry and the temperature can be controlled.
7. Store only in original containers with label in front.

TRANSPARENCY GUIDE  
HANDLING PESTICIDES SAFELY AND PASSING CERTIFICATION TESTS

I. Transparency--KEY PESTICIDE INDICATORS

- A. Discuss the three signal words, and what each one means in terms of toxicity.
- B. Have students cite examples of products where they have seen these signal words.

II. Transparency--METHODS OF PESTICIDE POISONING

- A. Discuss pesticide poisoning by the three methods listed.
- B. Have students give examples of how any of these accidents could happen.

III. Transparency--RECOMMENDED PROTECTIVE CLOTHING AND EQUIPMENT

- A. Discuss each article of clothing and equipment.
- B. Have students identify instances where these precautions would be very beneficial.

IV. Transparencies--TYPES AND DISPOSAL OF CONTAINERS

- A. Discuss the three classifications of containers.
- B. Describe how to dispose of the containers.
- C. Discuss the Environmental Protection Agency's role in disposing of containers and waste.

V. Transparency--RECOMMENDED STORAGE OF PESTICIDES.

- A. Discuss why it is important to have good pesticide storage.
- B. Have students identify specific storage recommendations.
- C. Have students plan a pesticide storage area, and then describe to class.

## TEACHER'S KEY

### SAMPLE TEST QUESTIONS

#### HANDLING PESTICIDES SAFELY AND PASSING CERTIFICATION TESTS

True (+) - False (0)

- |          |     |  |
|----------|-----|--|
| <u>0</u> | 1.  | A pesticide is a type of rodenticide.  |
| <u>+</u> | 2.  | Downwind is the side towards which the prevailing wind is blowing.   |
| <u>+</u> | 3.  | A stomach poison is a pesticide which kills when swallowed.  |
| <u>0</u> | 4.  | A selective herbicide will kill or injure all plants in the application site.  |
| <u>0</u> | 5.  | A fumigant poison is one that is taken up by one part of the animal or plant, and then moves to another section.           |
| <u>0</u> | 6.  | One should wear their coveralls inside their boots when working with pesticides.   |
| <u>+</u> | 7.  | The storage area for pesticides should be dry, cool, and out of direct sunlight.   |
| <u>0</u> | 8.  | Most poisonings involving pesticides occur with adults.  |
| <u>+</u> | 9.  | Transporting pesticides safely requires extra care on your part.   |
| <u>+</u> | 10. | If a pesticide will do little harm to the applicator or the environment, it will be classified as a general use pesticide. |

Match the term in column 1 with activity in column 2.

- |          |     |              |    |   |
|----------|-----|--------------|----|---|
| <u>H</u> | 1.  | Insecticides | A. | Controls rats and mice                  |
| <u>G</u> | 2.  | Fungicides   | B. | Causes leaves to drop prematurely       |
| <u>E</u> | 3.  | Herbicides   | C. | Used to drive pests from a location     |
| <u>A</u> | 4.  | Rodenticides | D. | Causes plant tissue to dry out          |
| <u>F</u> | 5.  | Nematicide   | E. | Controls weeds                          |
| <u>B</u> | 6.  | Defoliants   | F. | Controls nematodes                      |
| <u>D</u> | 7.  | Disiccants   | G. | Control fungi that cause plant diseases |
| <u>I</u> | 8.  | Bactericides | H. | Controls insects and insect relatives   |
| <u>J</u> | 9.  | Miticides    | I. | Control bacterial diseases              |
| <u>C</u> | 10. | Repellants   | J. | Control mites                           |

Multiple Choice

- B 1. Which part of the body has the highest dermal exposure?
- A. Ear canal
  - B. Scrotal area
  - C. Scalp
  - D. Palm of hand
  - E. Ball of foot
- A 2. Which of the following chemicals is the most toxic according to the LD<sub>50</sub> value?
- A. LD<sub>50</sub> 5
  - B. LD<sub>50</sub> 10
  - C. LD<sub>50</sub> 50
  - D. LD<sub>50</sub> 75
  - E. None of the above
- C 3. When "WARNING" is on the label it indicates that the pesticide is
- A. Highly toxic
  - B. Slightly toxic
  - C. Moderately toxic
  - D. All of the above
  - E. None of the above
- E 4. Which of the following formulations is defined as wettable powders sold as thick liquids to make them easier to add water?
- A. Solutions
  - B. Wettable powders
  - C. Soluable powders
  - D. Granules
  - E. Flowables
- D 5. Which of the following is not a recommended clothing precaution?
- A. Boots
  - B. Gloves
  - C. Long sleeve shirt
  - D. Pants inside boots
  - E. Goggles
- A 6. At which age do most pesticide poisonings in Illinois occur?
- A. 0-3 years
  - B. 3-12 years
  - C. 13-25 years
  - D. 25-30 years
  - E. Over 30 years

B

7. Most accidental pesticide related deaths are caused by:

- A. Improper use
- B. Improper storage
- C. Improper disposal
- D. Improper interpretation of label
- E. None of the above

D

8. Containers are classified into disposal groups. Which of the following is not a disposal group.

- A. Burnable containers
- B. Nonburnable containers
- C. Burnable and nonburnable that contained highly toxic chemical
- D. Buriable containers
- E. None of the above

E

9. Which of the following is a good approved practice to follow when storing pesticides?

- A. Store in separate building or room
- B. Sacks, cartons, boxes, should be stored on a shelf
- C. Padlock door to storage area
- D. Put up warning signs
- E. All of the above

D

10. All labels on pesticide include all but:

- A. Classification
- B. Brand name
- C. Directions for use
- D. Directions for disposal of container
- E. Statement of practical treatment

#### Essay Question

1. List and explain some of the approved practices for storage of pesticides.

(Refer to VAS Unit 4045a)

2. Discuss how to dispose of each type of container, and precautions to follow when disposing of containers.

(Refer to VAS Unit 4045a)

## UNIT E: CROP SCIENCE

### PROBLEM AREA: MAINTAINING AND IMPROVING FORAGE CROPS AND PASTURES

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during the early fall.

The estimated instructional time for this problem area is 3 to 5 days depending on how far the teacher wishes to go in developing forage evaluation skills. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

Instructors are encouraged to conduct a local search to identify other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

#### CREDIT SOURCES:

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The teacher's guide, student worksheet, and test questions were developed by Al Zwilling, Department of Vocational and Technical Education, University of Illinois, and Chris Mowrer, former graduate student in Agricultural Education. Transparency masters and the transparency discussion guide were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Rural Core Curriculum Field Test Teachers, and reviewed by the following vocational agriculture teachers:

Clarence Benard - Enfield High School  
Clarence Tipton - Serena High School  
Carol Keiser - Carlinville High School

## TEACHER'S GUIDE

- I. Unit: Crop science
- II. Problem area: Maintaining and improving forage crops and pastures
- III. Objectives: At the close of this problem area students will be able to:
  1. Choose the proper species and varieties of forage plants adapted for their area.
  2. Identify the steps involved in establishing forage crops and improving pastures.
  3. Identify the management practices used to maintain forage crops.
  4. Estimate the economic value of an acre of forage.
- IV. Suggested interest approaches:
  1. Ask the following questions to stimulate interest:
    - a. "How many of you have pastures or hay crops on your home farm?"
    - b. What are your pasture stocking rates in terms of acres per animal?"
    - c. "Could this rate be improved?"
    - d. "What are the hay yields on your home farm?"
  2. Demonstrate the value of forages by comparing it to corn and soybeans.
- V. Anticipated problems and concerns of students:
  1. How can I tell if a pasture needs renovating?
  2. What species and varieties are best adapted for our area?
  3. What kind of fertilizer should I apply? When should I apply it?
  4. How should I prepare the seedbed?
  5. What are the best rates and methods of seeding?
  6. How should pastures be managed?
  7. When should hay crops be harvested?
  8. How can we control weeds in forages and pastures?

VI. Suggested learning activities and experiences:

1. Conduct an interest approach using one or more of the suggestions in Section IV.
2. Have students identify problems and concerns and then record them on the chalk board.
3. Have students read resource materials and find answers to their problems and concerns.
4. Have students complete worksheets, using VAS Unit 4014 during supervised study.
5. Display "Crop Varieties for Illinois" wall chart, and discuss the varieties adapted to the local area. Ask students to identify the varieties that they use.
6. Organize a field trip to:
  - a. Pastures and hay fields to point out specific management practices.
  - b. Observe a farmer seeding a forage crop.
  - c. Observe a farmer interseeding a pasture with a no-till seeder.
7. Have students identify samples of forage crops, by laying out the plants of different crops.
8. Show one or more of the slidefilms listed in Section IX.
9. Distribute and discuss "Approved Practices for Alfalfa."
10. Have each student prepare a short presentation on the advantages and disadvantages of a forage species.
11. Prepare samples of hay and other forages, then have students evaluate the samples for quality. Refer to Core I materials for quality standards. Ask students to explain their rating of selected samples. Have students bring in a sample flake of hay, corn silage, and forage seeds.
12. Have students complete the Competency Inventory to check their skills.

VII. Application procedures:

1. Students who become involved in forage production after high school can apply management practices and use skills learned in this problem area.
2. Students who have forages should apply their knowledge and skills to their S.O.E. project.

3. Skills acquired in this problem area should be used in evaluating hay quality at a crops judging contest.

VIII. Evaluation:

1. Administer test using some or all of the sample questions included in this problem area.
2. Evaluate student worksheets.
3. Evaluate students forage plant collection.

IX. References and aids:

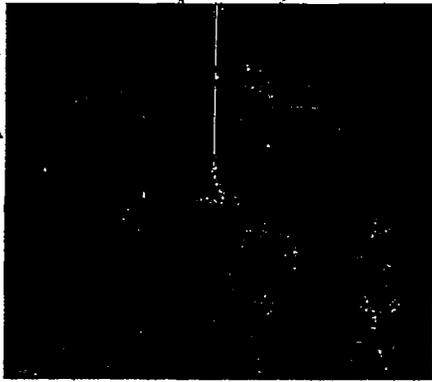
The following materials are available from Vocational Agriculture Service, University of Illinois:

1. VAS Unit 4014 "Improving Permanent Pastures."
2. VAS Unit 4032a "Producing High Alfalfa Yields."
3. VAS Bulletin "Approved Practices for Alfalfa."
4. VAS Slidefilm 748 "Efficient Alfalfa Production."
5. VAS Slidefilm 749 "Diseases of Alfalfa."
6. VAS Slidefilm 750 "Diseases of Red Clover."

Other materials:

1. Illinois Agronomy Handbook  
Circular 1186  
University of Illinois, College of Agriculture,  
Cooperative Extension Service  
Urbana, Illinois 61801
2. Crop Varieties for Illinois  
VAS Agriculture Releases.

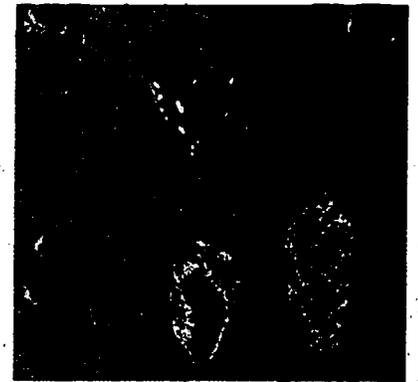
# ALFALFA DISEASES I



1. Common leaf spot



2. Yellow leaf blotch



3. *Leptosphaerulina* leaf spot



4. *Stemphylium* leaf spot; R, close up of lesion



5. Summer (*Cercospora*) black stem and leaf spot



6. Rust



7. Downy mildew. L, upper and lower leaf surfaces; R, infected shoot tip



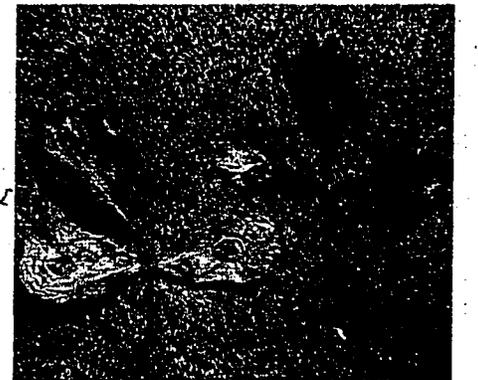
8. Alfalfa mosaic



Bacterial leaf



10. Spring (*Phoma* and *Ascochyta*) black stem (L) and leaf spot (R)



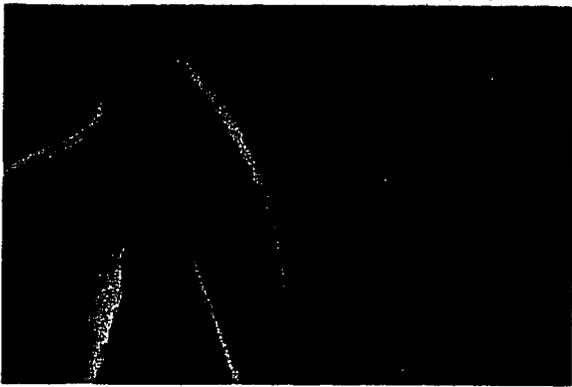
11. *Cercospora* leaf spot

## ALFALFA DISEASES I

- 1. Common Leaf Spot**, caused by the fungus *Pseudopeziza medicaginis*, occurs world-wide reducing both yield and hay quality by early and heavy defoliation. Seedling stands under a thick cover crop can be severely infected following extended periods of cool, moist or very humid weather. Numerous small (1 to 3 mm), circular, dark brown to black spots form on the leaflets. These lesions remain distinct and develop a slight yellow halo. A tiny, light brown, cup-shaped structure (apothecium) appears in the center of older spots on the upper leaf surface. Plants are rarely killed outright by Common Leaf Spot, but defoliation can seriously reduce plant vigor and predispose a plant to winter injury. The fungus survives in undecomposed leaves and leaf fragments on the soil surface.
- 2. Yellow Leaf Blotch**, caused by the fungus *Leptotrochila medicaginis* (synonym *Pseudopeziza jonesii*; imperfect stage, *Sporonema phacidioides*), occurs world-wide where stands are rank and tall. Leaf symptoms start as chlorotic flecks that often enlarge to form yellow-to-orange streaks between the leaf veins. Older lesions turn an orange-yellow or brown. Numerous dark specks (pycnidia) form in the centers of older lesions on the upper leaf surface. The withered leaves may remain attached for some time. The fungus survives in undecomposed leaves on the soil surface.
- 3. Leptosphaerulina Leaf Spot**, also called lepto leaf spot, halo spot, pepper spot and brown leaf spot, is most severe on young leaves, petiole and other above ground parts of recently cut stands. The disease is most prevalent in cool, moist weather. The causal fungus, *Leptosphaerulina briosiana* (synonyms *Pseudopezia* or *Pleosphaerulina briosiana*), produces small, reddish-brown to black spots ("pepper spots") that may enlarge to form oval-to-round tan spots with a darker brown border often surrounded by a yellowish area. Infected leaves and petioles die and often cling to the stem for some time. The fungus overwinters in leaves on the soil surface.
- 4. Stemphylium Leaf Spot**, also called target spot, is caused by the fungus *Stemphylium botryosum* (perfect stage, *Pleospora herbarum*). The disease is often most severe in lush dense stands following warm wet weather when harvesting is delayed. Lesions on the leaflets are oval-to-elongate, dark brown spots with lighter centers that enlarge and form concentric light and dark brown zones. A single large lesion can cause a leaflet to turn yellow and drop prematurely. Older leaf and stem lesions are covered by a sootlike mold due to growth of the *Stemphylium* fungus. Black, girdling lesions may develop on the peduncles, petioles and stems causing the foliage beyond to wilt, wither and die. The fungus overwinters on old infected stems or on seed.
- 5. Summer (Cercospora) Black Stem and Leaf Spot**, also called Cercospora leaf spot and Cercospora black stem, is caused by the fungus *Cercospora medicaginis*. The disease is common after the first cutting during warm, moist weather. Leaf lesions begin as small brown spots that enlarge to form roughly round, reddish- to smoky-brown lesions, 2 to 6 mm in diameter, with a yellow halo. If severe, leaflets are killed causing early defoliation. Stem and petiole lesions are elliptical to elongate and reddish- to chocolate-brown. These lesions may expand to girdle and kill the stems, petioles and peduncles resulting in further defoliation and loss of seed. The fungus overwinters in crop residue and may be seed-borne.
- 6. Rust**, caused by the fungus *Uromyces striatus*, is a late-season disease that occurs world-wide. The uredial pustules are reddish-brown and dusty, forming on the lower leaf surface, petioles and stems. When severe, rusted leaves may turn yellow and fall prematurely. The near absence of the alternate hosts (*Euphorbia* spp.) in the USA makes the black telial stage, which forms at the season's end, nonfunctional in the disease cycle. The fungus survives in southern states in the uredial stage in living plants. The urediospores are wind-borne northward as the season progresses.
- 7. Downy Mildew**, caused by the fungus *Peronospora trifoliorum*, appears mainly in the spring and fall during cool, moist or humid weather. Symptoms disappear during warm-to-hot, dry weather. Young leaflets, especially at the shoot tips of rapidly growing plants, are often dwarfed, twisted or curled downward with light green-to-yellow blotches. A pale violet, downy growth may be visible on the underleaf surface, especially during cool, moist or very humid weather. Systemically infected plants may be stunted and yellow. Fall-infected seedlings commonly winter-kill. The fungus overwinters as thick-walled spores (oospores) in crop residue and as mycelium in systemically infected crown buds and shoots.
- 8. Alfalfa Mosaic** is caused by a virus of many strains transmitted to seed through pollen and ovules from infected plants and by aphids after feeding on infected plants. Typically, a yellow or light green interveinal mottling and yellow streaks parallel to the leaf veins appear in young developing leaves during cool weather. Infected leaves or entire plants often become distorted and stunted. Mosaic-infected plants may die within several weeks to several years. Symptom expression is often masked in hot weather; many infected plants may never show symptoms. The virus is seed-borne and also overseasons in living alfalfa and other plants (some 220 species in 73 genera).
- 9. Bacterial Leaf Spot**, caused by the bacterium *Xanthomonas alfalfae*, may occur world-wide following warm-to-hot, moist weather. Small, round-to-irregular, water-soaked leaf spots expand up to 3 mm in diameter, become irregular and brown or black, often with a lighter center that may often be due to dried bacterial exudate on the surface. Infected leaves usually wither and drop prematurely. Stem lesions are "greasy" before enlarging and turning light-to-dark brown. Infected seedlings are often stunted or killed. The bacterium overseasons in crop residue and in soil.
- 10. Spring Black Stem**, or *Asochyta* leaf spot, is similar to Summer (Cercospora) Black Stem (5), but disease development is favored by cool, moist weather in spring and fall. Usually the first cutting is most damaged. The causal fungus, *Phoma medicaginis* var. *medicaginis* (synonym *Asochyta imperfecta*), primarily, infects the stems, but attacks all above ground plant parts. Dark green, water-soaked, girdling lesions develop in the stems and petioles, turning dark brown to black with age. The lesions may enlarge and merge until most of the lower parts of stems are blackened. Young shoots may be girdled, turn yellow-to-brown, and die. Numerous small, irregular, dark brown or black spots form on the lower leaves. The lesions enlarge and may merge to cover most of the leaflet. If severe, the leaves turn yellow, wither, and drop prematurely. A crown and root rot may also develop. The fungus overseasons in diseased plant tissue and may be seed-borne.
- 11. Cercospora Leaf Spot** is a minor foliar disease in warm, moist weather caused by the fungus *Cercospora zebrina*. The fungus is closely related to the one that incites Summer Black Stem (5); however, *C. zebrina* also attacks various clovers. The brown leaf lesions are oval to irregular in shape, expanding into dark, target-shaped spots surrounded by a yellow halo. Older lesions may appear ash-gray due to sporulation of the fungus on the diseased tissue. The fungus overwinters in plant residue and may also be seed-borne.

For chemical control suggestions, a listing of resistant varieties, and other control measures, consult the Extension Plant Pathologist at your land-grant university or your county extension office.

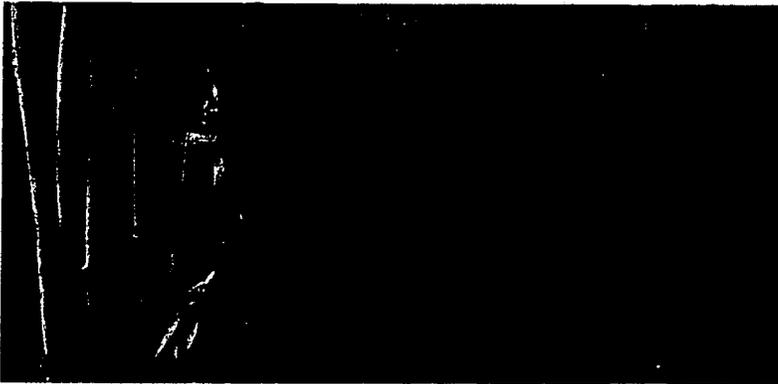
# ALFALFA DISEASES II



1. Bacterial wilt



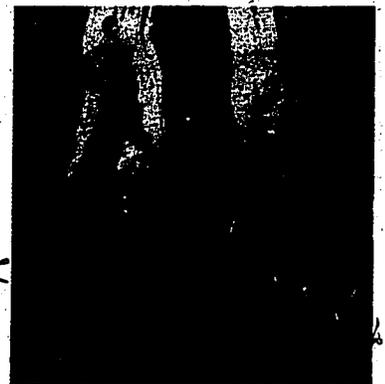
2. Phytophthora root rot. L, dead and dying plants; R, typical root symptoms



3. Anthracnose. L, external and R, internal symptoms



4. Fusarium crown rot



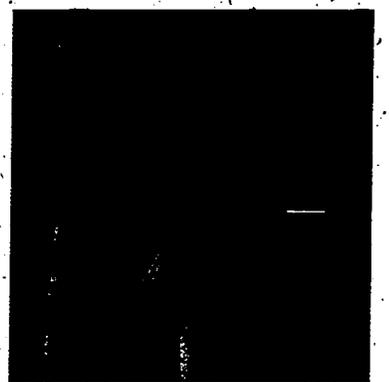
5. Mycoleptodiscus crown rot



6. Sclerotinia crown and stem rot



7. Fusarium wilt



8. Rhizoctonia stem canker



9. Violet root rot



10. Crown wart



11. Dodder

## ALFALFA DISEASES II

- Bacterial Wilt**, caused by the bacterium *Corynebacterium insidiosum*, is a major disease that occurs worldwide, especially in poorly drained wet areas. The bacterium is easily spread in the field by mowing and tillage equipment, surface water, and animal life in the soil. Symptoms first appear as the dying of scattered plants throughout a field, usually starting in the second or third year after seeding. Severely infected plants are stunted to dwarfed, bunched, and yellow-green to bleached. Such plants are more susceptible to winter-kill. Under moisture stress, young succulent growth wilts and dies. A cut through a diseased tap root or crown reveals a yellow-to-brown discoloration in the vascular cylinder. The bacterium overseasons in crop debris in the soil and infects plants through a variety of wounds.
- Phytophthora Root Rot** is a serious, worldwide, soil-borne disease caused by the fungus *Phytophthora megasperma*. Like Bacterial Wilt (1), it occurs primarily in low-lying, poorly drained soils following periods of excessive rainfall or flood irrigation. Losses are most severe to seedling stands. Infected plants are stunted; the leaves turn yellow or reddish, wilt, and die. Regrowth is often slow and greatly reduced after a cutting. The tap roots and rootlets are rotted with yellow-to-brown lesions that later turn black. There is usually a sharp line between rotted and healthy tissue and the decay may occur at various depths in the soil. The fungus probably overseasons as thick-walled, dormant spores (oospores) or as mycelium in crop debris.
- Anthracnose**, caused by the fungus *Colletotrichum trifolii*, occurs in the southern half of the USA during warm, moist or humid weather. Infected shoots wilt and die, turn straw-colored to white, and are scattered through a field. Newly killed shoot tips often have a "shepherd's crook" appearance. Lesions on the lower parts of these shoots are oval to diamond-shaped with a straw-colored center and a brown border. Black fruiting structures (acervuli) form in the centers of older lesions and on crop debris. The fungus may grow downward from infected shoots into the crown tissue which appears bluish-black. Diseased crowns produce weak, less vigorous shoots or entire plants are killed thinning out the stand. The fungus overseasons in living and dead plants, on machinery, and in the soil.
- Fusarium Crown Rot and root rot**, like Fusarium Wilt (7), is a widespread, soil-borne disease caused by several species of *Fusarium*. These fungi enter through a variety of wounds caused by machinery, cold temperatures, nematodes, insects and other animals. Infected plants are usually stunted with bleached, yellow leaves that wilt under a moisture stress. Light brown-to-black streaks develop in the vascular tissue of diseased plants. Leaves on these plants often curl slightly and wither. The disease progresses slowly, rarely killing a plant in a single growing season. The stand is gradually thinned from year to year. Seedlings may wilt, wither, and die (postemergence damping-off), especially during warm, wet weather. These fungi survive as chlamydospores in soil or plant debris.
- Mycoleptodiscus Crown Rot**, caused by the fungus *Mycoleptodiscus terrestris*, is only found in the USA and is most severe in warm, humid weather. The fungus causes damping-off of seedlings, but is more prevalent as a black rot of the lateral roots that later spreads into the tap root and crown. Infected crowns have numerous wilted and dead stems. Small brown leaf spots and reddish-brown stem lesions are occasionally seen. As with Sclerotinia Crown and Stem Rot (6), fungal mycelium and numerous, small, round to spindle-shaped black sclerotia may be found in decayed crown tissue. The fungus probably overwinters as sclerotia in crop residue and soil.
- Sclerotinia Crown and Stem Rot**, caused by the fungus *Sclerotinia trifoliorum* (synonym *S. sclerotiorum*), is a cool, wet weather disease that infects plants of all ages. Small, more or less circular patches of dying and dead seedling plants are common. On older plants, infected leaves and stems become yellow and finally collapse. A white, cottony mass of fungus mycelium grows over dead plants of the soil surface in wet weather. Dark brown to black sclerotia later form in the fluffy growth. Affected plants may die with the fungus invading the crown area. The crown turns soft and grayish-green, causing the shoots to wilt and turn yellow. The fungus overseasons as dormant, hard, round-to-irregular sclerotia, up to 8 to 20 mm in diameter, in soil and crop debris.
- Fusarium Wilt**, normally caused by the soil-borne fungus *Fusarium oxysporum* f. sp. *medicaginis* occurs in irregular areas in a field. Scattered plants within these areas wilt, sometimes starting on one side, with the leaves turning light green to yellow. Affected plants are commonly stunted or dwarfed and die slowly over a period of several weeks or months during warm-to-hot weather. Dark or reddish-brown streaks within the vascular cylinder are visible in a tap root that has been split or cut across. The fungus, like those cause Fusarium Crown Rot (4), survives in soil for years as chlamydospores or as mycelium in living or dead plants.
- Rhizoctonia Stem Canker or blight** is caused by the cosmopolitan soil fungus *Rhizoctonia solani*. Scattered, round to irregular areas of affected plants are evident in a field. Elliptical to circular, somewhat sunken, tan to reddish- or dark-brown lesions (cankers) form on the lower stems, crown and tap root. If severe, stems and roots are girdled causing the leaves and shoots to turn yellow, wilt and die. Seedlings are killed before or after emergence. In hot, humid weather the leaves and shoots, especially on lush plants in thick stands may appear water-soaked. Affected parts soon wilt, wither and die. The fungus survives for years in the soil as minute, irregular, dark brown-to-black sclerotia or as a saprophyte in plant debris.
- Violet Root Rot**, caused by the fungus *Rhizoctonia crocorum* (sexual stage, *Helicobasidium purpureum*), is usually of minor importance. The disease is most prevalent in older stands after midsummer, killing plants in enlarging, circular to irregular patches. The shoots turn yellow, then brown, wither, and die. Infected roots decay, turn brown to dark violet, and are covered with a thick, bright violet-to-cinnamon, feltlike mat of hyphae. The fungus survives as deep violet-brown, velvety sclerotia in soil and as a saprophyte in plant debris.
- Crown Wart**, a common disease in excessively wet fields, mostly in the western USA, is caused by the fungus *Physothermum (Urophlyctis) alfalfae*. Irregularly shaped white galls, up to 5 cm in diameter, form on the crown at or slightly below the soil surface. Older galls turn gray-to-brown as they dry and decay. The fungus survives as resting spores in gall tissue and in the soil.
- Dodder**, also known as strangleweed, goldthread and lovevine, is caused by several species of *Cuscuta*. Dodder is a slender, twining, orange-to-yellow, annual vine that is parasitic on a wide range of plants. It occurs in tangled, yellowish patches that enlarge up to an acre or more in diameter if left uncontrolled. This "leafless" seed plant entwines alfalfa stems, grows over the tops of plants and mats them down, slowly reducing their vigor. Infected areas are difficult to harvest. Dodder seed can remain dormant in soil up to 20 years.

\*For chemical control suggestions, a listing of resistant varieties, and other control measures, consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

Photo credits: F. I. Frosheiser (1L, 3L, 7, 8), W. G. Willis (1R, 5, 11), University of Illinois (2L, 6R), University of Wisconsin (2R, 9R, 10), A. S. Williams (3R, 9L), F. L. Lukezic (4, 6L), and G. W. Simone (6C).

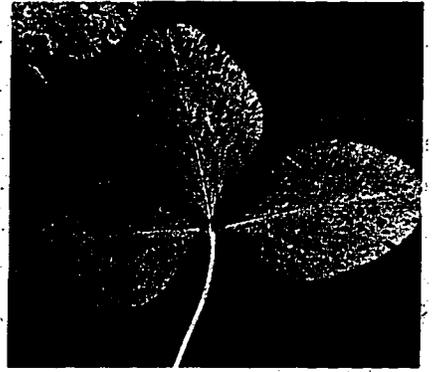
# CLOVER DISEASES I



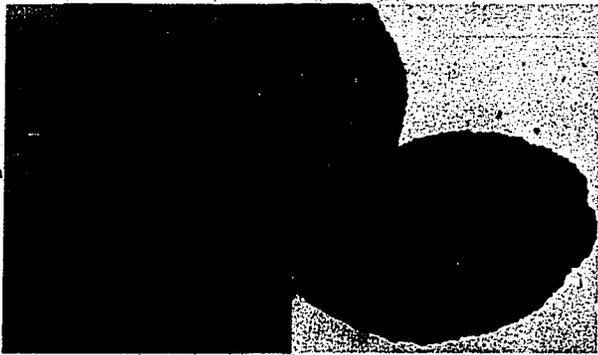
1. *Stemphylium* leaf spot or Target spot



2. Common or *Pseudopeziza* leaf spot



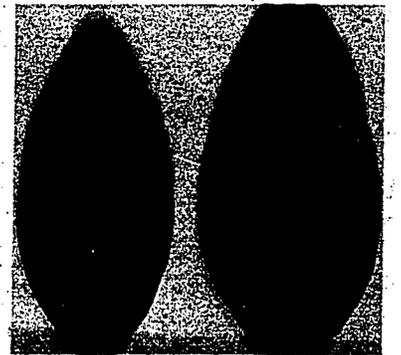
3. Sooty blotch



4. *Cercospora* leaf spot



5. Bacterial blight or bacterial leaf spot



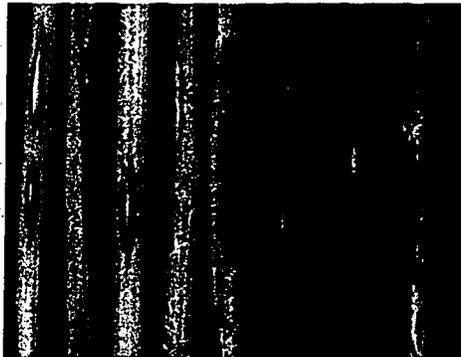
6. Powdery mildew



7. Red clover vein (mosaic)



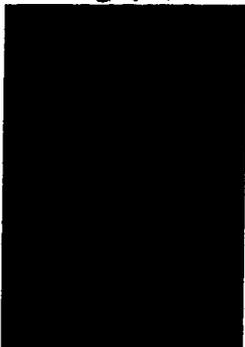
8. Alfalfa mosaic



9. Northern anthracnose



10. Root rot



11. Root and crown rots



12. *Fusarium* root rot or Common root rot



13. Internal breakdown



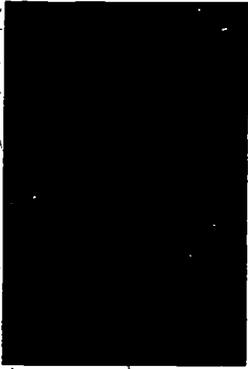
14. Dodder

## CLOVER DISEASES I

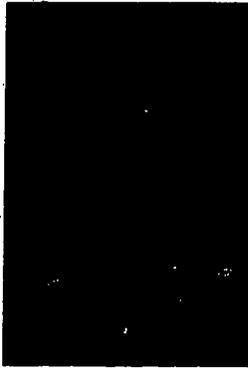
1. **Stemphylium leaf spot or Target spot**, caused by the fungi *Stemphylium sarcinaeforme* and *S. botryosum*, is a common warm, wet weather disease of red clover. Losses are greatest in dense stands in late summer and autumn. Small dark brown spots on the leaflets, later enlarge and develop into oval-to-round, target-like spots with alternate light and dark brown rings. Entire older leaves become wrinkled and dark brown with a sooty appearance. Such leaves usually remain attached to the plant. Elongated, sunken brown lesions with light centers may occasionally form on the stems, petioles and pods. The causal fungi overwinter in infected plant residue.
2. **Common or Pseudopeziza leaf spot of red clover**, caused by the fungus *Pseudopeziza trifolii*, is closely related to those causing common leaf spot and yellow leaf blotch of alfalfa. Infections are widespread during cool, wet weather. Very small, angular to round, dark spots—olive to reddish-brown, purple or black—develop on both leaf surfaces. Occasionally, small elongated dark streaks may occur on the petioles. Severely infected leaves may become yellow. The fungus overwinters in crop debris.
3. **Sooty blotch**, sometimes called black blotch, is a widely distributed disease of red clover caused by the fungus *Cymadothea trifolii*. Olive-green dots appear on the lower leaf surface, enlarge, become thicker and darker, and eventually resemble velvety, black, elevated cushions. In the fall, the black areas have a shiny surface. If infection is severe, the entire leaf turns yellow-to-brown, dies, and drops early. The fungus overwinters in plant residue.
4. **Cercospora leaf spot**, sometimes called summer black stem, is a widespread disease of red clover during warm, moist weather in summer and early autumn. It is caused by the fungus *Cercospora zebrina*. Leaf spots are angular, deep brown and more or less delimited by the veins. Older spots may develop ash-gray centers. Sunken, dark brown lesions on the stems and petioles may enlarge and merge to form extensive dark areas on the stems. The disease is spread by planting infected seed. The fungus also overwinters in crop debris.
5. **Bacterial blight or bacterial leaf spot**, caused by *Pseudomonas syringae*, is a minor disease of red clover. During cool, wet weather at any time during the growing season angular, dark brown-to-black blotches may form on the leaflets, petioles, stipules, stems, and flower pedicels. During wet weather, a milky-white bacterial exudate may form on diseased areas. The exudate dries to form a thin, crusty film that shines in the light. Infected leaves may become tattered and torn as the wind tears away the dead areas. The bacterium overwinters in infected residue and is spread by splashing rain and equipment.
6. **Powdery mildew** occurs wherever red clover is grown. It is most severe during long periods of dry weather when nights are cool and days are warm. The disease, caused by the fungus *Erysiphe polygoni*, can reduce both yield and hay quality, especially late in the growing season. A dusty, white to pale gray mildew grows in patches on the leaves. Infected leaves may turn yellow and wither prematurely. The mildew fungus overwinters as black specks (cleistothecia) scattered on diseased plant residue. It is spread by air currents.
7. **Red clover vein mosaic** is caused by a virus and is transmitted from plant-to-plant by the pea aphid (*Macrosiphum pisi*) and other aphids as they feed. The first symptom is a faint yellowing of the leaf veins. The chlorosis gradually intensifies until the veins and adjacent tissue may become a whitish-yellow. Symptoms are most conspicuous in young leaves during cool weather. Symptoms become "masked" or disappear during hot weather. Yields are reduced and affected plants are weakened and more susceptible to root rot fungi, winter injury, and drought. In time, clover stands thus become thin and unproductive.
8. **Alfalfa mosaic** is a virus-caused disease, transmitted from diseased alfalfa, red clover, or other legume plants to healthy plants by various species of aphids. A systemic light and dark green or yellow mottling is the most common symptom. Other symptoms may include vein yellowing, leaf crinkling and distortion, and yellow streaks or blotches on and between the veins. Legumes, especially garden peas and beans, growing near clover or alfalfa fields, commonly serve as reservoirs for mosaic viruses—alfalfa, red clover vein, bean yellow, and pea common. The viruses overwinter in a wide range of perennial host plants.
9. **Northern anthracnose**, caused by the fungus *Kabatella caulivora*, is a serious disease of red clover in cool, wet weather. Elongated, dark brown to black, sunken, girdling lesions on the leaf petioles and stems cause the shoot tips and flower heads to droop (like a shepherd's crook) or collapse. The lesions are later light colored with dark margins. The leaves on affected plants wilt, appear scorched as if by fire, become very brittle, and hang on for some time. The anthracnose fungus may be carried on or within the seed; it also overwinters in plant residue.
10. **Root rot** may be caused by one of several soil-borne fungi. Fungus growth is found in the crown-root area and within ruptured or otherwise injured tissues. Irregular, brown-to-black decayed areas may develop or the whole crown and upper taproot may disintegrate. Root rot is most conspicuous in early spring. This disease complex causes a greater loss than all other diseases of red clover combined.
11. **Root and crown rots** affect all types of clover. This disease, caused by a complex of soil-borne fungi, acting singly or together, may cause a 50 percent loss of red clover plants during the first year. Diseased plants are generally yellow to bleached, stunted, and often wilt during hot dry weather. Such plants gradually decline in vigor; finally wither and die.
12. **Fusarium root rot or Common root rot**, is caused by several species of the fungus *Fusarium*. Like other crown and root rots, infection usually occurs to plants weakened by winter injury, prolonged drouth, low or unbalanced fertility, insect or nematode injury, improper management, mechanical injuries, or other diseases. Affected plants appear unthrifty, stunted, yellowish and wilt during hot, dry weather. Plants may be killed at any stage of growth but stand loss is greatest during the second year. A spongy or soft, light brown, reddish brown, or dark brown internal and external decay develops in the larger roots. The smaller feeder roots are also decayed, and appear "pruned off." The causal fungi are common soil inhabitants and are generally distributed wherever red clover is grown.
13. **Internal breakdown** is common in winter-injured crown and root tissue of red clover and other clovers. Crown buds are damaged or killed. This tissue is later invaded by fungi and bacteria resulting in serious crown and root rot losses. The control is to grow well-adapted species and varieties in a well-drained, fertile soil. Avoid overgrazing and overcutting in the fall, rank growth, and excessive rates of fertilizer (especially nitrogen).
14. **Dodder (*Cuscuta* spp.)** is a slender, twining, parasitic vine that occurs in tangled, yellowish-orange patches that "pull down" clover plants. Dodder infects a wide range of crop plants, being especially common and damaging to clovers and alfalfa. Dodder seed is very difficult to separate from clover seed.

For chemical control suggestions, a listing of resistant varieties, and other control measures, consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

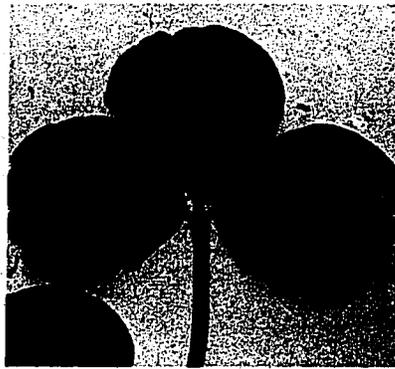
# CLOVER DISEASES II



1. *Cercospora* leaf spot



2. Common or *Pseudopeziza* leaf spot



3. *Ascocyta* leaf spot



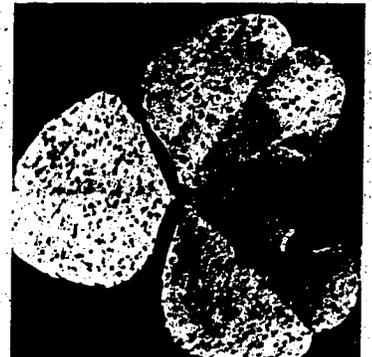
4. Slime molds



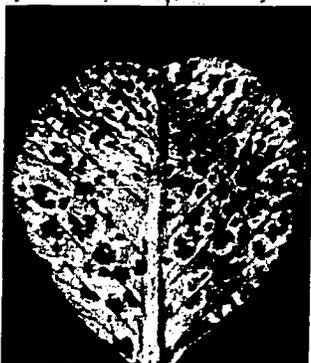
5. *Stagonospora* leaf spot



6. Rust



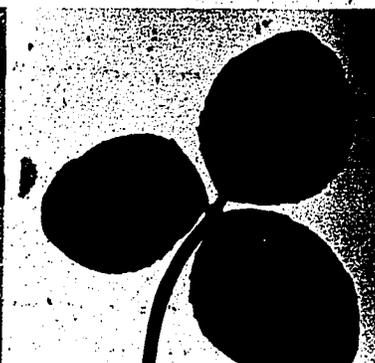
7. *Pseudoplea* leaf spot



8. Sooty blotch or black blotch



9. Northern anthracnose or clover scorch



10. Peanut mottle



11. Clover phyllody



12. Root rot of weetclover



13. *Fusarium* wilt of sweetclover



14. Crown rot of sweetclover

## CLOVER DISEASES II

1. **Cercospora leaf spot**, more commonly called summer black stem, is a widespread, warm, moist weather disease caused by the fungus *Cercospora zebrina*. Damage to white (Ladino) clover pastures may be severe during late summer in the southern half of the United States. On Ladino the lesions are angular to rectangular, dark brown, and more or less delimited by the veins. The centers of older fruiting lesions is gray-to-black. Lesions on the stems, petioles, and flower heads are reddish brown to dark brown and somewhat sunken. Severely infected seed are shriveled and discolored. The fungus also persists overwinter, in old stems.
2. **Common or Pseudopeziza leaf spot** of Ladino clover is caused by *Pseudopeziza trifolii*, a fungus that attacks other perennial clovers as well. Infections occur during cool wet weather. Small, round to angular, dark reddish brown-to-black spots with lighter centers develop on both leaf surfaces. Severe infection may cause the leaves to drop early reducing both the yield and hay quality. The fungus overwinters in crop debris.
3. **Ascochyta leaf spot**, also called spring black stem, is caused by the fungus *Phoma trifolii*. Dark brown-to-black spots, irregular in size and shape, develop on or along the leaf veins and on the petioles following cold wet weather. Some lesions may develop gray-tan centers. Black, enlarging lesions form on the stems. Young shoots may be girdled and killed. Leaf and stem infections together may result in defoliation. The causal fungus is seed-borne and also overwinters in crop residue.
4. **Slime-molds** cause an unimportant disease. During wet weather one of a number of these primitive, soil-borne fungi creep (flow) up and over low-lying vegetation or other objects and soon form their powdery, bluish, white to creamy yellow, or black fruiting bodies. Some of the more common species include *Physarum cinereum*, *Mucilago spongiosa*, and *Fuligo septica*. Although unsightly, these fungi do no harm except to keep light off the foliage in areas up to about three feet in diameter. The growth can easily be rubbed off to expose the healthy or yellowed clover tissue underneath. Slime molds usually disappear following a good rain.
5. **Stagonospora leaf spot** is widely distributed on white clover, including Ladino, in warm, wet areas. The causal fungus, *Stagonospora meliloti* (perfect stage *Leptosphaeria pratensis*), also infects red and alsike clovers, alfalfa, sweetclover, and other legumes. Small, round to irregular spots with a pale, almost white center and light to dark brown border form in the leaves. Occasionally, older lesions develop faint concentric zones. Dark specks in older spots are fungus fruiting bodies (pycnidia). The fungus overwinters in infected crop residue.
6. **Rust** occurs wherever clovers are grown but usually causes little damage. The rust fungus, *Uromyces trifolii*, has several stages. The aecial stage appears in spring as swollen, light yellow to orange-yellow pustules on the stems, petioles, and leaves that may cause distortion. Later in the season, small, oval, reddish brown, dusty pustules (uredial stage) develop on the leaves, petioles, and stems. When severe, especially in late summer and autumn, rusted leaves may turn yellow and drop early. Late in the season the pustules become dark brown to black (telial stage). The rust fungus overwinters on clovers in the southern United States and is blown northward each summer on southerly winds.
7. **Pseudopeziza leaf spot**, also called pepper spot, is widely distributed on clovers, being most common during cool, moist weather. Numerous, small, sunken black spots form on both leaf surfaces and on petioles. Later, the spots turn gray with a reddish brown margin. The disease may cause leaf curling and yellowing or browning on white and Ladino clovers. Like other leaf diseases, *Pseudopeziza* leaf spot is found mostly on lower leaves under dense growth. The causal fungus, *Pseudopeziza trifolii*, overwinters in crop residue.
8. **Sooty blotch or black blotch** occurs generally on white, alsike, and other clovers. Small, angular to irregular, velvety or shiny black spots, most numerous on the lower leaf surface, may cause infected leaves to wither, become brown, and drop prematurely. The sooty blotch fungus, *Cymadothea trifolii*, overseasons in crop residue.
9. **Northern anthracnose or clover scorch** is caused by the fungus *Kabatella caulivora*. It is most common on red, crimson, alsike, and white sweet clovers during cool, wet weather in the northern half of the United States. Elongated, sunken, medium brown-to-black, girdling lesions, with light centers, form on the stems and petioles and result in a dark brown scorching of the foliage. Leaves and flower heads commonly droop to form a "shepherd's-crook." The anthracnose fungus is seed-borne and also overwinters in plant residue.
10. **Peanut mottle** is a viral disease that occurs in about the southern half of the United States. Numerous legumes, including clovers, peanuts, and soybeans are infected. Diseased plants are often stunted, lack vigor, and are more susceptible to winter injury, drought, and other diseases. Leaves on affected plants are irregularly mottled with a yellow and light and dark green mosaic. Yellowish patches and line patterns commonly develop. The virus is spread by various aphids as they feed and is seed-borne at a low frequency. Peanut mottle cannot be distinguished from other viral diseases in the field. Laboratory tests are required for positive identification.
11. **Clover phyllody**, caused by one or more mycoplasma-like organisms, and transmitted by several genera and species of leafhoppers is a striking but unimportant disease. The most characteristic symptom is a transformation of certain flower parts (calyx lobes) into miniature, simple or trifoliate leaf-like structures borne on the ends of pedicel-like organs. Individual flower pedicels, calyx lobes, and ovaries may be three times their normal size. The other flower parts (keel and wings) remain white but dwarfed or even absent. New shoot growth is prolific, spindly, and stunted with smaller than normal yellowish leaves. In later stages the leaves may be slightly deformed and darker green.
12. **Root rot of sweetclover** may be caused by numerous soil-borne fungi including species of *Phytophthora*. The tops of affected plants are somewhat stunted, later wilt, become bleached to brown, and die from a spongy, soft, yellowish brown-to-black rot of the crown and taproot following excessive rain or overirrigation. The disease is most common and severe in poorly drained soils subject to periodic flooding or saturation. *Phytophthora* and other root-rotting fungi enter all types of wounds.
13. **Fusarium wilt of sweetclover** results in a wilting, yellowing and browning, and slow dying of scattered plants in irregularly shaped areas of fields that are infested with the *Fusarium oxysporum* fungus. The water-conducting tissue (xylem) inside the stems, crown, and roots shows a dark discoloration due to fungus invasion and root-tissue response. The fungus may survive in soil or plant refuse for five years or more in the absence of sweetclover and other host plants.
14. **Crown rot of sweetclover** may be caused by several soil-borne fungi that persist in soil and crop debris. Infections occur through a wide variety of wounds. Plants weakened by adverse temperatures, insect or nematode feeding, virus diseases, drought, improper management, other mechanical injuries, low soil fertility, or other unfavorable soil conditions are most susceptible. Crown rot can be found in most plants over a year old. Decayed tissue varies in color from yellowish brown to dark brown or black, often interspersed with healthy tissue. Crown rot often progresses slowly over several years, gradually killing plants and thinning out the stand. The relative prevalence and severity of these crown and root-rotting fungi vary greatly with the type and variety of clover, age of the plant, season of the year, locality, soil type, and management conditions.

For cultural control suggestions, and a listing of resistant varieties, consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

214

## COMPETENCY INVENTORY

### MAINTAINING AND IMPROVING FORAGE CROPS AND PASTURES

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

Competency	Circle One					
1. Choose proper species of forage	1	2	3	4	5	
2. Choose proper varieties of forages	1	2	3	4	5	
3. List the steps involved in establishing a forage crop	1	2	3	4	5	
4. List the management practices used in forage production	1	2	3	4	5	
5. Estimate the economic value of a forage	1	2	3	4	5	
6. Select high quality seed	1	2	3	4	5	
7. Determine seeding rates	1	2	3	4	5	
8. Evaluate old forage stand	1	2	3	4	5	
9. Operate forage equipment	1	2	3	4	5	
10. Calibrate fertilizer spreader	1	2	3	4	5	
11. Make fertilizer recommendations	1	2	3	4	5	
12. Calibrate pesticide applicator	1	2	3	4	5	
13. Outline steps in forage improvement	1	2	3	4	5	
14.						
15.						
16.						
17. Identify safety practices						6 7
18. Identify insect damage						6 7
19. Identify disease damage						6 7
20. Recognize bloat problems						6 7
21. Recognize the affects of overgrazing, undergrazing and clipping						6 7

These are competencies outlined in the National Ag Occupations Competency Study, for entry level positions in agricultural production.

Name \_\_\_\_\_

Date \_\_\_\_\_

## STUDENT WORKSHEET #1

### IMPROVING PERMANENT PASTURES (For use with VAS Unit 4014)

1. Much of the \_\_\_\_\_ pasture land of the state has been made unproductive by the \_\_\_\_\_ of forage as pasture, hay, or silage, and by little or no \_\_\_\_\_ of fertility to the soil.
2. Extremely \_\_\_\_\_ seasons have made matters worse by killing many of the better pasture grasses and legumes. They have been replaced by \_\_\_\_\_ and undesirable grasses. The thinned less vigorous stands are not holding the soil as well, and \_\_\_\_\_ is taking place.
3. Overgrazing is one of the chief causes of low \_\_\_\_\_, thin stands, and weed growth. Continued close grazing diminishes root \_\_\_\_\_.
4. Poor land may often be used more \_\_\_\_\_ for pastures than other crops, but good pastures cannot be produced on \_\_\_\_\_ soils.
5. The soil must be \_\_\_\_\_ thoroughly to determine the exact amount of fertilizer needed.
6. \_\_\_\_\_ should be applied whenever the test indicates that the soil is acidic. Where a large portion of the pasture land has become lime \_\_\_\_\_, application of limestone is the most important single soil treatment practice.

7. Apply limestone at least \_\_\_\_\_ months in advance of seeding clover. The best time is in the \_\_\_\_\_, but it can be done during the winter and \_\_\_\_\_ spring.
8. If the sod is to be plowed in preparing the seedbed, apply one-half of the limestone \_\_\_\_\_ plowing and one-half \_\_\_\_\_ plowing.

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9. It may be necessary to seed immediately after liming. If so, an additional \_\_\_\_\_ to \_\_\_\_\_ pounds of \_\_\_\_\_ ground limestone per acre should be drilled in with the seed. This will help insure a good stand of \_\_\_\_\_.
10. The \_\_\_\_\_ and organic-matter requirements of the soil are not likely to need further attention when \_\_\_\_\_ pasture plants are grown in \_\_\_\_\_ with non legume plants. But if \_\_\_\_\_ plants are not used extensively, \_\_\_\_\_ fertilizer of some sort should be applied.
11. Apply \_\_\_\_\_ to soils testing \_\_\_\_\_ or \_\_\_\_\_ in available phosphorous to aid in securing a \_\_\_\_\_ of legumes or grasses and to improve the \_\_\_\_\_ of the forage crop produced from the seeding.
12. Where potassium is needed apply \_\_\_\_\_ of potash in the amount indicated by the \_\_\_\_\_. Usually \_\_\_\_\_ to \_\_\_\_\_ pounds per acre is applied, and this is repeated about every \_\_\_\_\_ years if the soil is naturally deficient in potassium.

13. \_\_\_\_\_ makes a better seedbed and usually gives the best results on level to moderately sloping land. If the sod is thin and there is little top growth, the \_\_\_\_\_ or field \_\_\_\_\_ will do a satisfactory job. Whether you plow or disk, be sure to work sloping land on the \_\_\_\_\_.
14. A \_\_\_\_\_ carefully prepared seedbed pays off by helping to insure a better \_\_\_\_\_. A good seedbed is \_\_\_\_\_ to prepare when renovating pastures, so use plenty of \_\_\_\_\_.
15. It is seldom advisable to seed land intended for \_\_\_\_\_ pastures to a \_\_\_\_\_ kind of plant.
16. The improved pasture should not be \_\_\_\_\_ until well into the summer so that new seedlings may become well \_\_\_\_\_.
17. \_\_\_\_\_ the grazing enough in the following years to maintain a fair \_\_\_\_\_ cover on the field throughout the year. If supplementary pasture or another permanent pasture is available, a system of \_\_\_\_\_ grazing may be practiced.
18. Keep cattle off the \_\_\_\_\_ in the spring until the grass has made a growth of \_\_\_\_\_ to \_\_\_\_\_ inches and then do not allow them to graze too \_\_\_\_\_.
19. Livestock should always be removed \_\_\_\_\_ in the fall to allow the pasture to \_\_\_\_\_ and to store food \_\_\_\_\_ for the following year.

20. The application of \_\_\_\_\_ is one of the best means of weed control. Generally, grasses will \_\_\_\_\_ when they have favorable soil conditions. \_\_\_\_\_ weeds at the proper time is another good means of control. In general, this should be done when the weeds are starting to \_\_\_\_\_ and before the \_\_\_\_\_ has formed.

21. What three objectives should the job of preparing the seedbed accomplish? (Refer to VAS Unit 4014 on page 4)

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1)

2)

3)

22. What are the advantages of using a mixture of several kinds of plants, especially grasses and legumes? (Refer to VAS 4014, Unit on page 5)

STUDENT WORKSHEET #2

IDENTIFYING THE PRESENT CONDITION OF A PASTURE

Visit a farm, or use a field on your home farm to study. Answer the following questions:

1. What is the approximate number of acres in the field? \_\_\_\_\_
2. What is the most predominant vegetation? \_\_\_\_\_  
\_\_\_\_\_
3. What are the minor forms of vegetation? \_\_\_\_\_  
\_\_\_\_\_
4. What is the present condition of the field? \_\_\_\_\_  
\_\_\_\_\_
5. Can you foresee any possible bloat problems with this field? \_\_\_\_\_  
Why? \_\_\_\_\_  
\_\_\_\_\_
6. Are there any signs of overgrazing, undergrazing, or clipping too short? \_\_\_\_\_
7. Are there any problems with weeds? \_\_\_\_\_  
What kind of weeds? \_\_\_\_\_  
How would you control these weeds? \_\_\_\_\_
8. In your estimation has the pasture been properly cared for? \_\_\_\_\_  
Why or why not? \_\_\_\_\_  
\_\_\_\_\_
9. Does the farmer follow a fertilization program on his pasture? \_\_\_\_\_  
Why or why not? \_\_\_\_\_  
\_\_\_\_\_
10. If this was your pasture, what would you recommend doing, not only this year, but for the next five years? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

JOB SHEET #1

COLLECTING FORAGE PLANTS

OBJECTIVES:

1. To be able to give the characteristics of listed forage plants.
2. To be able to identify forage crops from examples.

MATERIALS:

1. 4 pages of the collection sheet
2. Scissors
3. Tape

PROCEDURES:

1. Take scissors and cut a portion of stem with leaves of forage crops.
2. Put into newspaper and press.
3. Mount to collection sheets.
4. Describe the plant.
  - A. Height
  - B. Color of leaves and bloom
  - C. Shape of leaves
  - D. Type of plant--Annual, Biennial Perennial
  - E. Any distinguishing characteristics

APPLICATION:

Practice identifying the forage crops listed on sheets.

Identify how this would be beneficial to a student's S.O.E. program

PLANT

DESCRIPTION

SAMPLE

Alfalfa

Alsike Clover

Kentucky  
Bluegrass

222

III-E-2-16

PLANT

DESCRIPTION

SAMPLE

Ladino Clover

Orchard  
Grass

Perennial  
Rye Grass

PLANT

DESCRIPTION

SAMPLE

Red Clover

Reed  
Canary Grass

Smooth  
Brome Grass

224

III-E-2-18

PLANT

DESCRIPTION

SAMPLE

Tall Fescue

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Timothy

225

III-E-2-19

TEACHER'S KEY

STUDENT WORKSHEET #1

IMPROVING PERMANENT PASTURES  
(For use with VAS Unit 4014)

1. Much of the PERMANENT pasture land of the state has been made unproductive by the REMOVAL of forage as pasture, hay, or silage, and by little or no RETURN of fertility to the soil.
2. Extremely DRY seasons have made matters worse by killing many of the better pasture grasses and legumes. They have been replaced by WEEDS and undesirable grasses. The thinned less vigorous stands are not holding the soil as well, and EROSION is taking place.
3. Overgrazing is one of the chief causes of low PRODUCTIVITY, thin stands, and weed growth. Continued close grazing diminishes root RESERVES.
4. Poor land may often be used more ECONOMICALLY for pastures than other crops, but good pastures cannot be produced on POOR soils.
5. The soil must be TESTED thoroughly to determine the exact amount of fertilizer needed.
6. LIMESTONE should be applied whenever the test indicates that the soil is acidic. Where a large portion of the pasture land has become lime DEFICIENT, application of limestone is the most important single soil treatment practice.

7. Apply limestone at least 6 months in advance of seeding clover. The best time is in the FALL, but it can be done during the winter and EARLY spring.
8. If the sod is to be plowed in preparing the seedbed, apply one-half of the limestone BEFORE plowing and one-half AFTER plowing.
9. It may be necessary to seed immediately after liming. If so, an additional 400 to 500 pounds of FINELY ground limestone per acre should be drilled in with the seed. This will help insure a good stand of LEGUMES.
10. The NITROGEN and organic-matter requirements of the soil are not likely to need further attention when LEGUME pasture plants are grown in COMBINATION with non legume plants. But if LEGUME plants are not used extensively, NITROGEN fertilizer of some sort should be applied.
11. Apply PHOSPHATE to soils testing LOW or SLIGHT in available phosphorous to aid in securing a STAND of legumes or grasses and to improve the QUALITY of the forage crop produced from the seeding.
12. Where potassium is needed apply MURIATE of potash in the amount indicated by the SOIL TESTS. Usually, 100 to 150 pounds per acre is applied, and this is repeated about every THREE years if the soil is naturally deficient in potassium.

13. PLOWING makes a better seedbed and usually gives the best results on level to moderately sloping land. If the sod is thin and there is little top growth, the DISK or field CULTIVATOR will do a satisfactory job. Whether you plow or disk, be sure to work sloping land on the CONTOUR.
14. A FIRM carefully prepared seedbed pays off by helping to insure a better STAND. A good seedbed is DIFFICULT to prepare when renovating pastures, so use plenty of SEED.
15. It is seldom advisable to seed land intended for PERMANENT pastures to a SINGLE kind of plant.
16. The improved pasture should not be GRAZED until well into the summer so that new seedlings may become well ESTABLISHED.
17. LIMIT the grazing enough in the following years to maintain a fair TOP-GROWTH cover on the field throughout the year. If supplementary pasture or another permanent pasture is available, a system of ALTERNATE grazing may be practiced.
18. Keep cattle off the PASTURE in the spring until the grass has made a growth of 5 to 6 inches and then do not allow them to graze too CLOSELY.
19. Livestock should always be removed EARLY in the fall to allow the pasture to RECOVER and to store food RESERVES for the following year.

20. The application of FERTILIZERS is one of the best means of weed control. Generally grasses will DOMINATE when they have favorable soil conditions. MOWING weeds at the proper time is another good means of control. In general, this should be done when the weeds are starting to BLOOM and before the SEED has formed.

21. What three things should the job of preparing the seedbed accomplish?

(Refer to VAS 4014 Unit on page 4)

1)

2)

3)

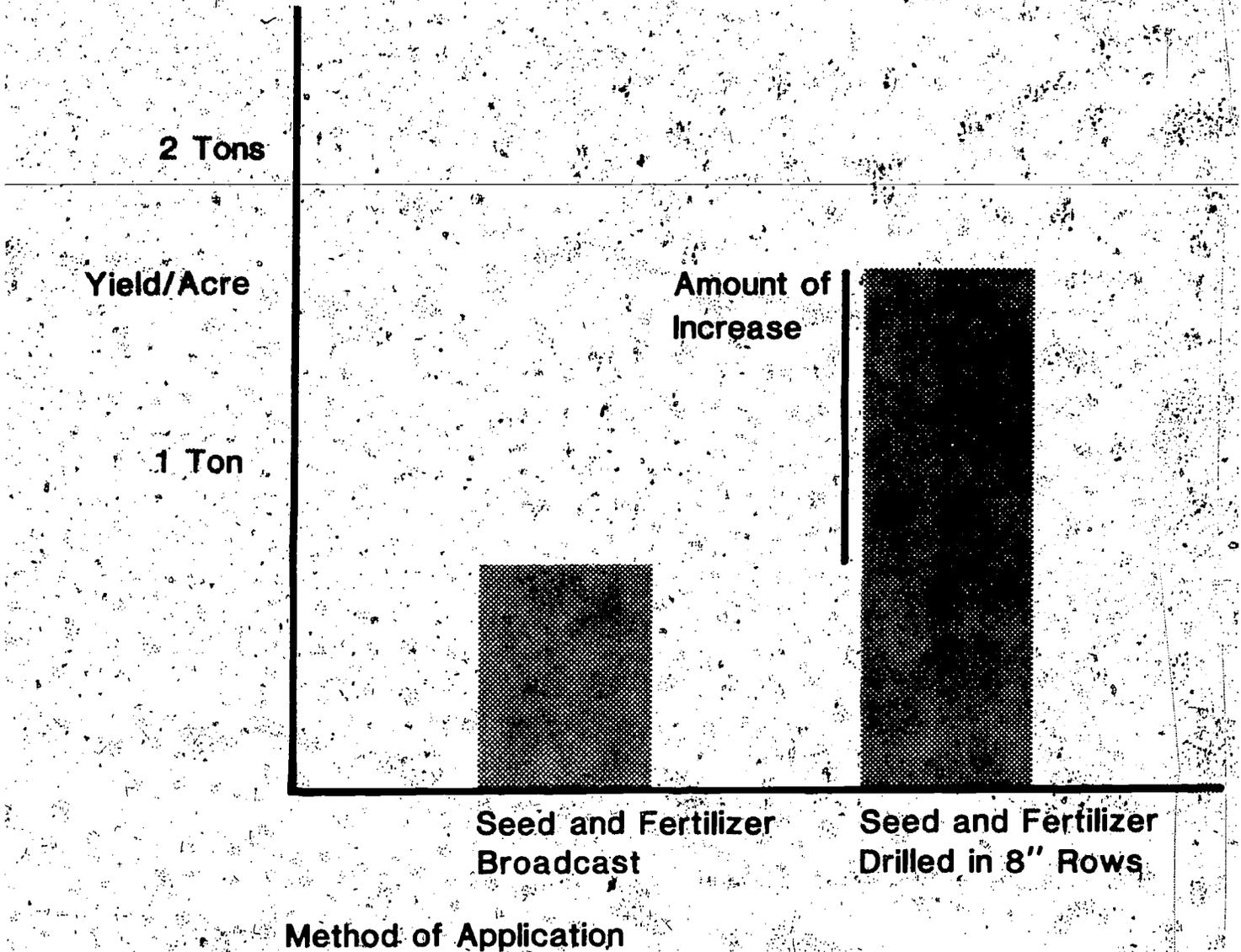
22. What are the advantages of a mixture of several kinds of plants, especially grasses and legumes? (Refer to VAS Unit 4014 on page 5)

229

# Optimum Planting Depths for Small-Seeded Legumes and Grasses (In Inches)

Soil Conditions	Alfalfa and Bromegrass		All Others	
	Early	Late	Early	Late
Sandy Soils and Other Soils with Low Moisture	1.0	1 1/2	1/2	1.0
Medium-Textured Soils	1/2	1.0	1/2	3/4
Fine-Textured Soils with Adequate Moisture	1/2	3/4	1/4	1/2

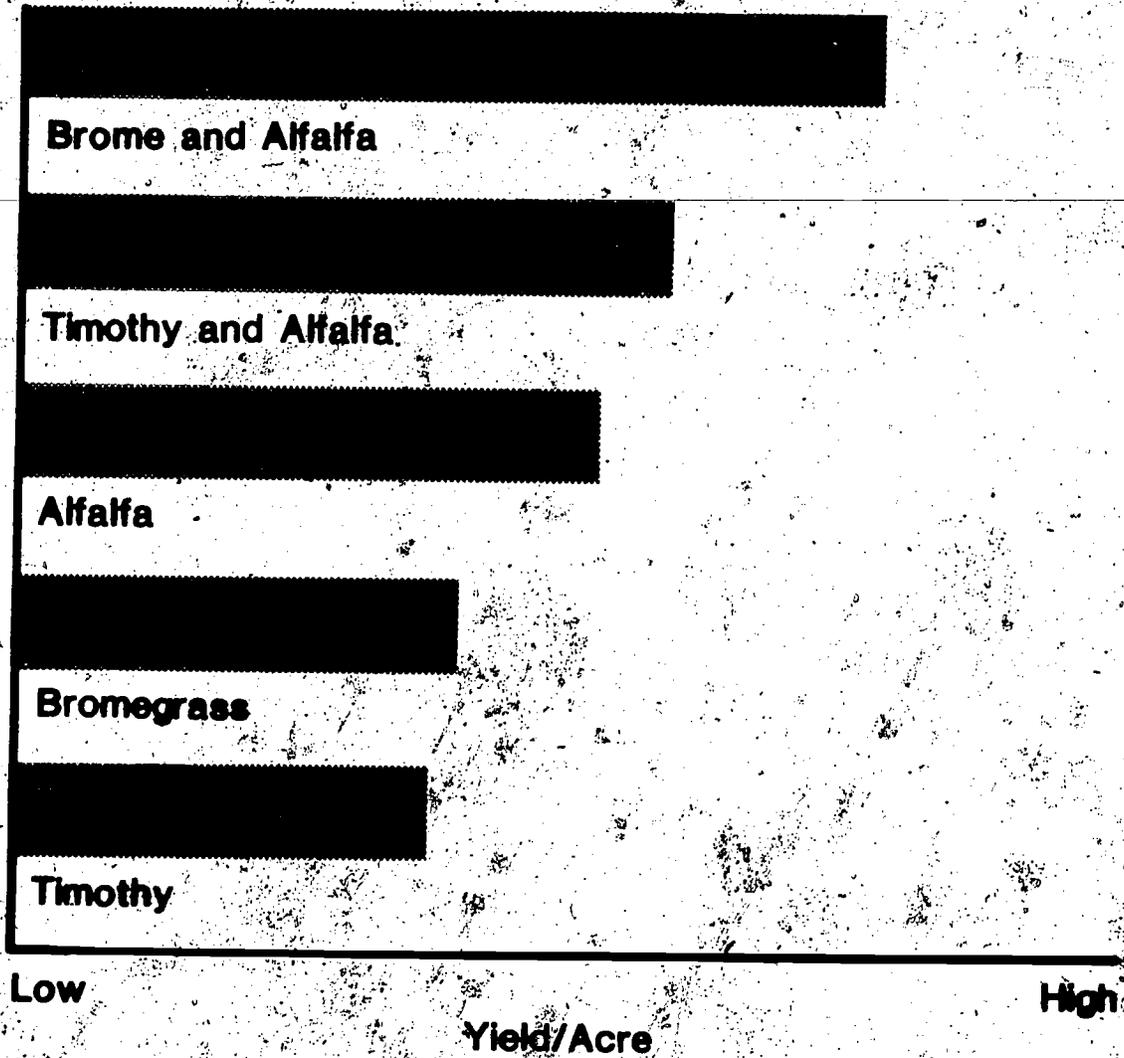
# Drilling Compared to Broadcasting of Tons of Hay Produced Per Acre\*



\* Original source of information: Our Soils and Their Management (3rd edition 1970) by Roy L. Donahue.

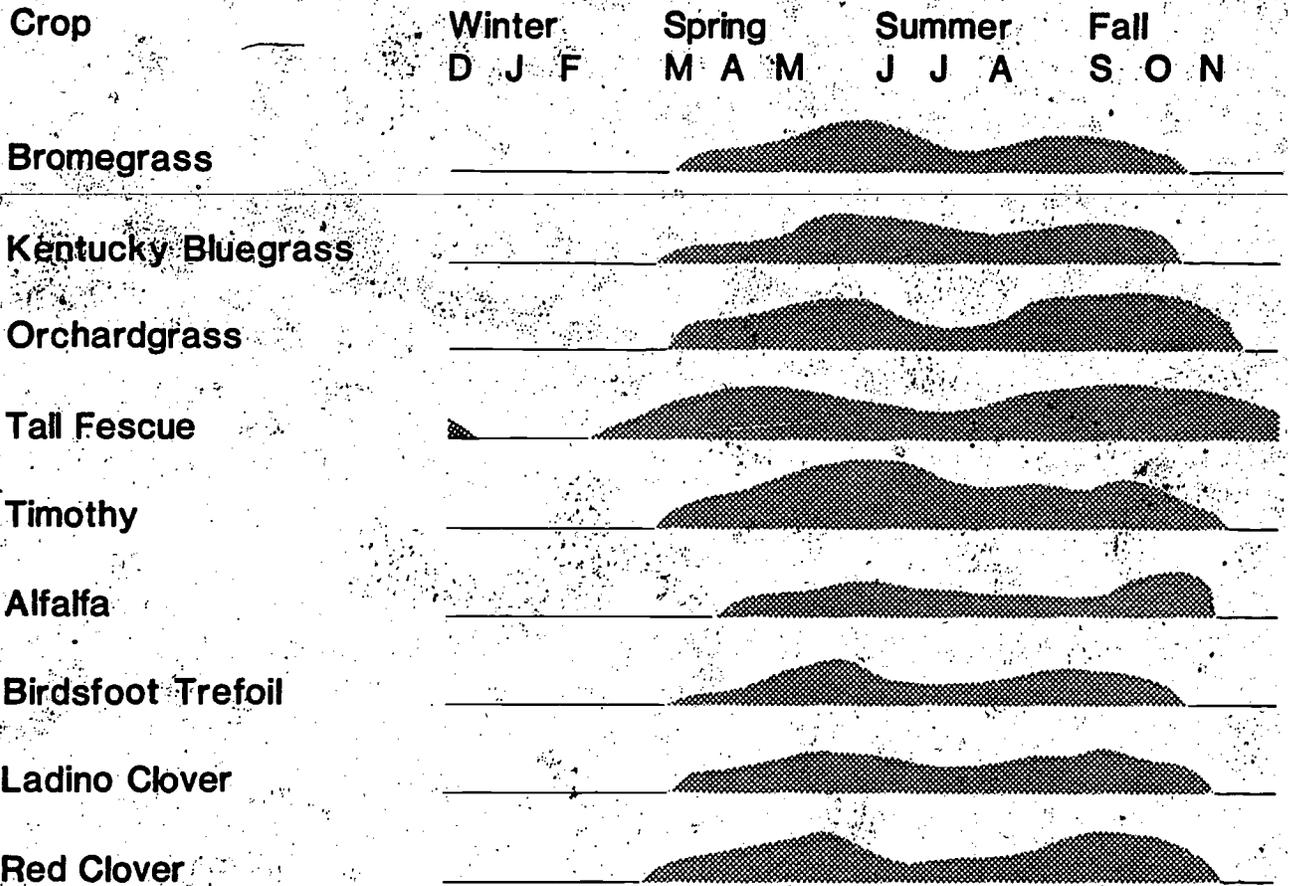
# Mixtures Give Higher Yields\*

Forage  
crops



\*Original source of information: Crop Production (1974),  
by Richard J. Delort, Louis J. Grueb and Henry L. Ahlgren.

# Seasonal Availability of Forages

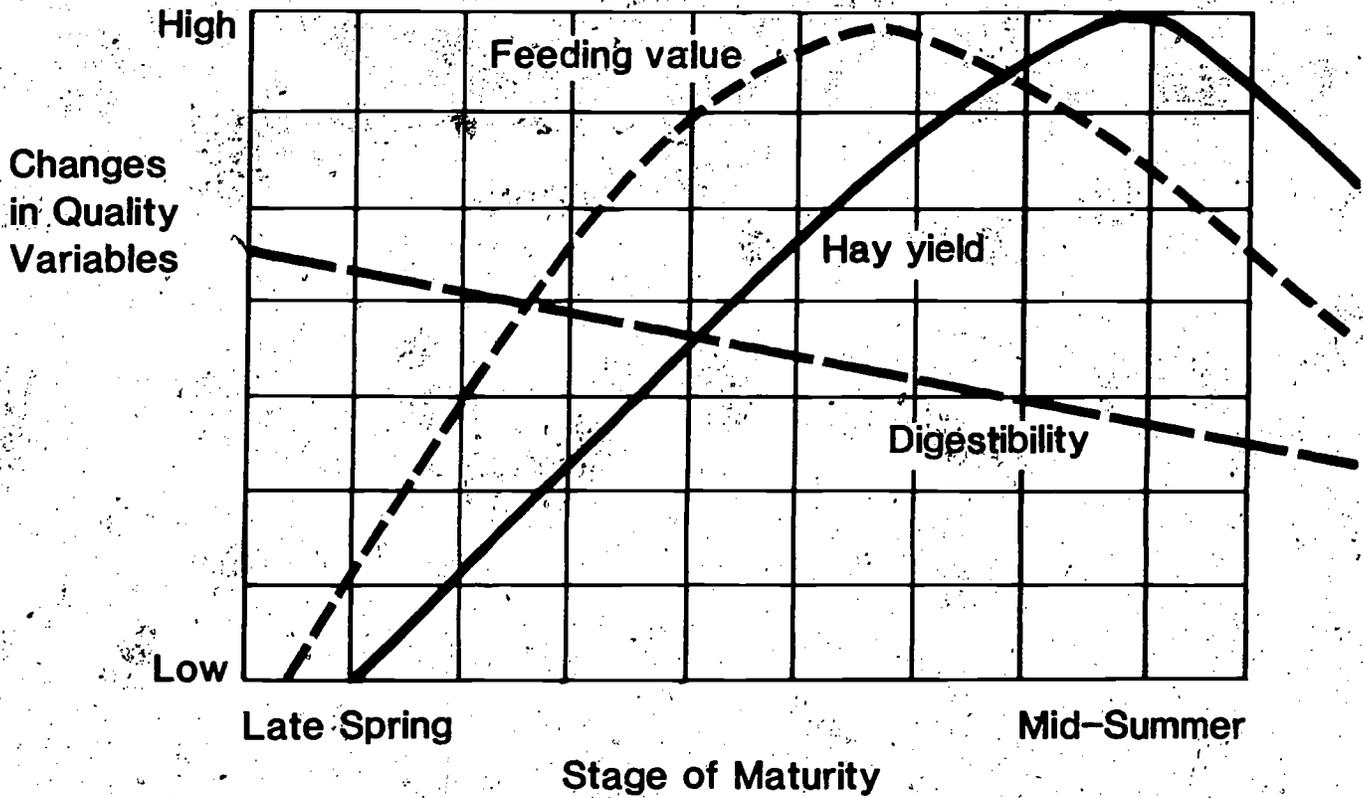


233

# Effects of Stage of Maturity on Quality and Yield of Hay\*

Maximum feeding value comes earlier than top yield

Digestibility declines as plant matures



\* Original source of data: University of Minnesota.

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# Testing for Moisture Content of Hay



Juice can easily be squeezed from stems, 45%



Hard to squeeze juice from stems, 35%



Slightly tough, 25%



Safe for baling, 18-23%



Usually safe for storage, 15-18%

## TRANSPARENCY DISCUSSION GUIDE

### MAINTAINING AND IMPROVING FORAGE CROPS AND PASTURES

1. Transparency--OPTIMUM PLANTING DEPTHS for SMALL-SEEDED LEGUMES and GRASSES
  - A. Discuss which legumes and grasses are small seeded.
  - B. Question students as to why the type of soil should affect the planting depth.
2. Transparency--DRILLING COMPARED TO BROADCASTING
  - A. Have students describe each of the two methods of planting.
  - B. List the reasons why drilling is better than broadcasting.
  - C. Show students the economic significance between the two different methods.
3. Transparency--MIXTURES GIVE HIGHER YIELDS
  - A. Explain the reasons for mixtures.
  - B. Discuss how they can be beneficial to farmers.
4. Transparency--SEASONAL AVAILABILITY OF FORAGES
  - A. Have students pick out the peak time of production for the plants listed.
  - B. Have students select mixtures that would work together well for different purposes. For example, which would make the best pasture, which would make the best hay, or silage.
5. Transparency--EFFECTS OF MATURITY ON QUALITY AND YIELD OF HAY
  - A. Compare each of the variables on chart.
  - B. Have students select the point at which they think hay should be harvested, and have them describe why.
6. Transparency--TESTING FOR MOISTURE CONTENT OF HAY
  - A. Go through each of the stages and describe the characteristics.
  - B. Discuss the difference between safe for baling and safe for storing.

TEACHER'S KEY

SAMPLE TEST QUESTIONS

MAINTAINING AND IMPROVING FORAGE CROPS AND PASTURES

TRUE (+) FALSE (o)

- + 1. Overgrazing is one of the chief causes of low productivity.
- o 2. Continued close grazing increases root food reserves.
- + 3. Soils should be tested to determine the amount of fertilizer needed.
- o 4. Limestone should be applied within 6 months after seeding legumes.
- + 5. If legumes are included in the pasture seed mix, little or no nitrogen fertilizer will be required.
- o 6. It is usually advised to seed land intended for permanent pastures to a single kind of plant.
- + 7. Alfalfa is the highest yielding perennial forage crop suited to Illinois.
- + 8. Red Clover is the most important hay and pasture legume in Illinois.
- + 9. Where potassium is needed apply muriate of potash.
- + 10. Plowing makes a better seedbed than disking.

MULTIPLE CHOICE (Make appropriate choice of A, B, C, D)

- D 1. Which additive should be applied when the soil test indicates that the soil is acidic?
- A. Nitrogen  
B. Phosphorous  
C. Potassium  
D. Limestone
- C 2. The best time to apply limestone is:
- A. Spring  
B. Summer  
C. Fall  
D. Winter

- C 3. If the sod is to be plowed in preparing the seedbed, when should limestone be applied?
- A. Before plowing
  - B. After plowing
  - C. Half before plowing, half after plowing
  - D. 6 months before plowing
- A 4. The purpose of legumes in a pasture mix is to supply:
- A. Nitrogen
  - B. Phosphorous
  - C. Potassium
  - D. Limestone
- 
- B 5. Which of the following tillage methods usually makes a better seedbed?
- A. Disking
  - B. Plowing
  - C. Field cultivating
  - D. None of the above
- D 6. Which of the following practices is not a cause of low productivity of pastures?
- A. Overgrazing
  - B. Undergrazing
  - C. Grazing too late in the fall
  - D. Rotational or alternate grazing
- B 7. How much growth should grass make in the spring before grazing is allowed?
- A. 1-2 inches
  - B. 5-6 inches
  - C. 10-12 inches
  - D. 1-2 feet
- C 8. Which of the following is not a common method of weed control in pastures?
- A. Fertilizing
  - B. Mowing
  - C. Burning
  - D. Herbicides

COMPLETION (Write the appropriate word or words to complete the statements.)

1. The two basic methods of seeding are BAND and BROADCAST seeding.
2. The one that usually gives the best yields is BAND seeding.
3. Forage crop seeds are small and should be seeded no deeper than 1/4 to 1/2 inches.

DISCUSSION (Briefly answer the following questions.)

1. Identify some management practices which could be used to reduce bloat problems caused by pasturing legumes.
  - A. Balanced soil fertility
  - B. Including grasses with legumes
  - C. Maintaining animals at good nutritional levels
  - D. Using bloat inhibiting feed additives
  
2. Briefly discuss one major pasture or forage crop problem found in the community area and suggest some possible solutions to this problem.

## UNIT F: SOIL SCIENCE AND CONSERVATION OF NATURAL RESOURCES

### PROBLEM AREA: CONSERVING SOIL AND WATER RESOURCES

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in vocational agriculture programs. The recommended time for teaching this problem area is during late fall or early spring. These are good times for this problem area because much of the soil is lost over winter and spring with the heavy rainfall.

The estimated instructional time for this problem area is 5 to 7 days depending on how far the teacher wishes to go in developing learning activities that will help improve soil and water conservation. If the students are to be involved in laboratory exercises, the instructional time will need to be increased to allow for the completion of the exercises.

Instructors are encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt these materials to their local situation.

#### CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466, with the Illinois State Board of Education Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, student worksheet, transparency discussion guide, and test questions were developed by Jerry Pepple and Al Zwilling, Department of Vocational and Technical Education, University of Illinois. Transparency masters and sample test questions were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Rural Core Curriculum Field Test Teachers. This problem area was reviewed by the following vocational agriculture teachers:

Floyd Wahrley -	Kewanee High School
Darrell Scherer -	West Richland High School, Noble
Steve Hendrix -	Sullivan High School
Don Prather -	Clinton High School

## TEACHER'S GUIDE

- I. Unit: Soil science and conservation of natural resources
- II. Problem area: Conserving soil and water resources
- III. Objectives: At the close of this problem area students will be able to:
  1. Define terms that pertain to soil management techniques.
  2. Name the two basic kinds of erosion and control measures for each.
  3. Describe the different kinds of cropping systems which aid in soil and water conservation.
  4. List the mangement practices that aid in erosion control.
  5. List the mangement practices that aid in preserving water resources.
- IV. Suggested interest approaches:
  1. Lead a discussion on soil erosion by asking students to identify any erosion problems in the community.
  2. Invite a soil conservationist to class to discuss erosion problems and management techniques.
  3. Show a film or slide set on erosion and control techniques.
  4. Take a field trip to observe areas subjected to erosion.
- V. Anticipated problems and concerns of students:
  1. What is soil erosion?
  2. How does soil erosion affect us?
  3. What factors affect erosion?
  4. How can soil erosion be minimized?
  5. Why is water conservation important?
  6. What are some methods for conserving soil moisture?
  7. What common terms are used in soil management techniques?
  8. How can we prevent water pollution?
  9. What standards of water quality have been designated by federal, state and local agencies?

10. What is the universal soil loss equation? How does it work?

VI. Suggested learning activities and experiences:

1. Provide students with the opportunity to perform or observe one or more of the following activities:
  - a. Plant ground cover plants.
  - b. Stop rill and gully erosion.
  - c. Build retaining walls.
  - d. Make a terrace in a landscape planting.
  - e. Sod a steep area in the landscape.
  - f. Apply a mulching material to an unprotected soil area.
  - g. Seed a cover crop.
  - h. Determine the slope of the land using a transit or hand level and target rod.
  - i. Determine the extent of soil erosion in different parts of the school site.
2. Have students identify their problems and concerns and list on chalkboard or overhead transparency.
3. Distribute the Competency Inventory included with this problem area, to assess the present level of students' competencies.
4. Have students read VAS Unit 4060, "Soil Erosion... The Silent Enemy of the Soil," and record tentative answers to the problems and concerns. Handout Worksheet 2, "Soil Erosion" and have students complete assignment. Discuss their answers in class.
5. Have each student complete Worksheet #1, "Soil Management Techniques" using five examples in the community where erosion control is needed.
6. Divide the class into small groups (3-4 students each) for a brainstorming session. Ask the students to list all the pro's and con's they can think of for implementing soil conservation practices. Have each group present their ideas to the group, and record the pro's and con's on the chalkboard or transparency. After all the ideas have been listed, follow-up with a group discussion of each pro and con. Allow class members to justify their ideas, and have the group decide and make judgments of a final list of pro's and con's.
7. Distribute VAS Unit 4054b as reference and have students practice using the universal soil loss equation on selected field locations.

8. Divide the students into two groups. The one group will gather information on conventional till practices, the other on the minimum till system. Allow each group to present their pro's to their system. The instructor should act as a judge or moderator. After the positive presentation allow each group to present what they feel are the negative points of the opposing system. Points should be awarded for each positive point made, and points deducted for speaking out of turn, and unsportsmanlike conduct.
9. Conduct any or all of the demonstrations included with this problem area.
10. Have students construct a sample farm on a bench or table. Use soil, sod, twigs and other materials to represent crops, waterways and timber areas. Illustrate as many conservation practices as possible.
11. Use transparencies included with this problem area to show the different types of erosion, and how they can be prevented with management techniques.
12. Show slide set on water conservation and discuss those methods which are used or needed in the local community.
13. Show VAS Filmstrip SG 723A "Soil Erosion...The Silent Enemy of the Soil-Our Precious Resource."
14. Identify problems and concerns relating to conservation tillage systems. Distribute VAS Unit 4058 and conduct supervised study to answer identified problems and concerns. Lead class discussion to identify final solutions and approved practices for conservation tillage.
15. Visit county Soil Conservation Service to identify teaching resources and other instructional aids available from USDA.

#### VII. Application procedures:

1. As the students develop an awareness of soil erosion problems and the management practices of soil and water conservation, they should be encouraged to implement them on their home farms.
2. Students who conduct soil and water conservation practices should use these as improvement projects with their S.O.E.P.'s.

#### VIII. Evaluation:

1. Construct and administer a pencil and paper using the Sample Test Questions as possible test items.
2. Collect and grade Worksheet #1 and #2.

3. Evaluate students' performance on the brainstorming activity, and comparison of conventional and minimum tillage activity.
4. Have students complete Competency Inventory to check progress of students toward the desired competencies.

IX. References and aids:

Available from Vocational Agriculture Service, University of Illinois.

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1. Subject-Matter Units:

- U4021; "Grass Waterways"
- U4058, "Using Conservation Tillage Systems"
- U4060, "Soil Erosion - The Silent Enemy of the Soil - Our Precious Resource."
- U4054b, "Determining Soil Loss With the Universal Soil Loss Formula"

2. Slidefilms:

- SG723a "Soil Erosion - The Silent Enemy of the Soil - Our Precious Resource."
- MF724 "Meet the Speck: The Erosion Crisis"
- SG722 "Agriculture: Soil Erosion and Water Quality"

214

# COMPETENCY INVENTORY

## CONSERVING SOIL AND WATER RESOURCES

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

Competency

Circle One

1. Gather field data for farm plans and conservation practices.	1	2	3	4	5
2. Layout and inspect routine conservation practice.	1	2	3	4	5
3. Use taping and surveying equipment.	1	2	3	4	5
4. Assist landowners in planting trees, grass seed, sod, or stolons.	1	2	3	4	5
5. Make cross sections and profiles.	1	2	3	4	5
6. Transpose notes from aerial photograph.	1	2	3	4	5
7. Make simple rough tracings of farm maps.	1	2	3	4	5
8. Color land use capability maps.	1	2	3	4	5
9. Help prepare and maintain records.	1	2	3	4	5
10. Measure and compute water flow.	1	2	3	4	5
11. Remove obstructions from ditches and streams.	1	2	3	4	5
12. Recommend approved practices for conserving soil and water resources.	1	2	3	4	5
13.	1	2	3	4	5
14.	1	2	3	4	5
15.					
16. Identify the different types of erosion.					

These competencies outlined in the National Ag Occupations Competency Study, are for entry level positions in agricultural production.

Name \_\_\_\_\_

Date \_\_\_\_\_

## STUDENT WORKSHEET 1

### SOIL MANAGEMENT TECHNIQUES

1. Survey your community and locate five examples where there is a need for erosion control. Consider the following items when making this survey.
  - a. Topography - How much slope does the land have?
  - b. Vegetative cover - Is the soil covered with plants most of the time? Is the soil covered or protected during the winter months?
  - c. Soil structure - Is the soil compacted and of poor structure thereby preventing rainfall from soaking in?
  - d. Extent of top soil - Is there any evidence of sheet erosion? (Considerable gravel or pebbles on the soil surface, light colored, heavy soil)
  - e. Drainage - Does the soil drain rapidly or slowly? Is it subjected to flooding?
  - f. Tillage operations - Is the soil often cultivated or tilled to keep the soil loose?
2. Prepare a short report and present it to the class. Include suggested approved practices which could be implemented to help stabilize the identified conservation problems.
3. Identify some general benefits to society from the improved soil and water conservation practices.

STUDENT WORKSHEET 2  
SOIL AND WATER CONSERVATION

(References, VAS Unit 4060 and VAS Slidefilm SG723A)

1. How does man's use of soil as a resource affect society as a whole?

2. In 1934, a national survey was conducted by the Soil Erosion Service and it was found that about \_\_\_\_\_ areas had lost its top soil and another \_\_\_\_\_ acres had been severely eroded.

3. In 1977, the SCS identified \_\_\_\_\_ acres as prime farmland. During the same year, about \_\_\_\_\_ acres of prime farmland was lost to housing, airports, lakes, reservoirs, etc.

4. Draw a "pie chart" which shows the percent of cropland by slope. (See page 4, VAS Unit 4060)

5. What factors could account for the general decrease in soil erosion in Illinois between 1930 and 1970.

217

6. What factors could account for the general increase in soil erosion in Illinois between 1970 and 1980.

7. Today, about \_\_\_\_\_ tons of soil are lost annually through erosion in Illinois, and about \_\_\_\_\_ tons of this loss are due to agricultural practices.

8. For every bushel of corn produced in Illinois, the state loses \_\_\_\_\_ bushels of soil.

9. When soil erosion rates exceed \_\_\_\_\_ tons per acre per year, it is lost faster than it can be replenished.

10. What soil factors are considered when placing land in one of the eight land classes.

11. In Illinois, most of the crop land erosion comes from class land.

12. In Illinois, the land capability class with the highest average erosion rate in tons per acre per year is class \_\_\_\_\_, the class with the lowest is class \_\_\_\_\_.

13. What are two soil erosion processes which result in lower soil productivity?

14. The erosion process involves what three distinct steps?

15. What are three ways soil is moved by wind?

16. How does surface roughness affect runoff and soil loss?
  17. What is meant by "conservation tillage system"?
  18. What are some examples of conservation tillage methods used in Illinois?
- 

19. What conservation methods are currently being used in your local county or area?

20. What conservation methods are needed or could be started which would reduce soil and/or water erosion in your local county or area?

21. What are some barriers which keep individuals from practicing soil and water management?

22. What are two "short term" primary benefits to society of soil conservation?

23. What are two "long term" benefits to society of soil conservation?

24. What is the long term goal of the "State Water Quality Plan" in Illinois?

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25. What factors are considered in establishing a T-value for land?

## STUDENT JOB SHEET

### ESTIMATING THE AMOUNT OF SURFACE RESIDUE

#### OBJECTIVE:

1. To develop the ability to estimate the percentage of surface residue on a field.
2. To understand the relationships between surface residue and soil erosion.
- ~~3. To identify approved tillage practices which can be used to increase the percentage of surface residue.~~

#### MATERIALS:

1. 70 feet of 1/8- or 3/16-inch nylon rope.
2. Clipboard, paper, and pencil to record results.

#### PROCEDURE:

1. Tie 100 knots, 6 inches apart on the rope.
2. Tie a stake to each end of the rope.
3. Stretch the rope diagonally. (about 45 degrees) across the crop rows.
4. Adjust the final angle of the rope so that both stakes are placed in a crop row.
5. Stand over the rope and walk toward the other end, count the knots that intersect a piece of crop residue which is large enough to intercept a raindrop (do not count stones or rocks). Ignore small pieces of residue that will decay easily.
6. The number of knots that intersect a piece of crop residue equals the percent of soil surface covered.
7. Record this percentage and then make at least three more checks over randomly selected areas in the field.
8. Calculate the average over the total number of areas checked. This average percentage equals the amount of residue on the surface.

QUESTIONS:

1. What would be a definition of conservation tillage? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. How can conservation tillage help reduce erosion? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. How does soil roughness affect erosion? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
4. Does this field have adequate surface residue? \_\_\_\_\_  
Why? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CONCLUSIONS:

Identify some tillage methods which could be employed to improve the surface residue.

Identify major barriers which causes resistance to adopting approved conservation tillage practices.

## STUDENT JOB SHEET

### SPLASH EROSION

#### OBJECTIVE:

1. To understand the relationship between raindrops and soil erosion.
2. To compare the effects of plant cover on reducing soil erosion caused by raindrops.
3. To understand the effects of slope and soil erosion caused by raindrops.

#### MATERIALS:

1. 4 - 1" x 2" x 12" boards sharpened on one end.
2. 4 - 3/8" x 4" x 8" plywood boards painted white.

#### PROCEDURE:

1. Fasten the painted plywood pieces to the wooden laths.



2. Select locations for soil splash erosion experiments, such as:
  - a. level, grass sodded area
  - b. sloping, grass sodded area
  - c. level, bare soil area
  - d. sloping, bare soil area
3. Drive boards into ground until bottom of plywood is about  $\frac{1}{4}$ " above ground surface.
4. Keep stakes in place until it rains or, if possible, set up a sprinkler system to simulate at least a  $\frac{1}{4}$ " rain.
5. Have students examine the boards for evidence of soil splash erosion.
6. Promote class discussion on the relationship between rainfall, soil cover, cropping systems, slope of land, soil type, etc.

**OBJECTIVES:**

Complete the following form.

<u>STAKE NUMBER</u>	<u>LOCATION CHARACTERISTICS</u>	<u>RESULTS</u>

**QUESTIONS:**

1. Which stake location showed the most erosion or soil movement?

\_\_\_\_\_

\_\_\_\_\_

2. What types of tillage practices could be used at each location where erosion was evident to reduce the soil loss?

\_\_\_\_\_

\_\_\_\_\_

3. Are there other locations around the local community where splash or sheet erosion is taking place? What conservation practices could reduce the erosion?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. What effects would this type of erosion has on streams, lakes, ponds, etc.

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5. Calculate the average soil loss using the universal soil loss equation for one or more of the staked areas.

- 
6. Are these areas within soil loss tolerance limits?

**CONCLUSIONS:**

Identify some approved soil and water conservation practices which could be used on your S.O.E.P. or on your home farm to reduce soil erosion and water pollution.

## SUGGESTED DEMONSTRATION EROSION CONTROL PRACTICES

### OBJECTIVES

1. To understand how grasses, shrubs, ground cover, and trees break the force of rainfall with their leaves and stems and hold the top soil in place with their roots.
2. To demonstrate the effect of vegetative cover on reducing soil loss by erosion.

### MATERIALS REQUIRED:

1. Two seed flats made waterproof by lining with plastic film, tin, or tar paper.
2. Two half-gallon sprinkling cans.
3. Two half-gallon, wide mouthed jars or other suitable containers.
4. One four foot piece of 1" x 3" lumber.

### PROCEDURE:

1. Cut a 1" to 1½" V notch at the center of one of the end boards of each seed flat. Fit each notch with a tin spout to draw runoff water into a container.
2. Cut a piece of sod to fit one of the flats. Trim the grass to a height of one inch.
3. Fill the other box with soil from the same area from which the sod was taken. The soil in this flat should have no vegetative cover.
4. Set the flats on a table so that the spouts extend over the edge. Place the 1" x 3" piece of lumber under the other end of the flats to provide slope.
5. Place the empty containers on stools beneath the spouts.
6. Fill the two sprinklers with water and pour the water on both boxes at the same time from a height of about one foot. Pour steadily and at the same rate for both boxes.

#### I. Summarizing the demonstration

The water flowing over the sod will be reasonably clear. It will take longer for the flow to start and it will continue to flow for a longer period of time.

There should be more water in the jar or container under the flat of bare soil than is in the container under the flat of sod.

This demonstration illustrates one of the most fundamental principles of soil and water conservation, that of the protection which grass gives soil against the pounding of raindrops and the movement of running water. The grass breaks the force of the raindrops so that the soil is not pounded and broken apart by the drop impact. The grass roots open up channels to let water get into the soil and the grass stems slow down the speed of the running water so that the soil is not disturbed.

## II. Using good fertility programs

By replenishing the organic matter content of soils with soil conditioning materials such as manure and peat moss, and by replenishing the nutrient level with lime and fertilizer, plants with large root systems and luxuriant top growth can be produced which are highly effective in reducing soil erosion.

## III. Using contour cultivation practices

The value of contouring in preventing soil erosion on steep areas in the landscape can be shown by using the materials in the previous demonstrations and modifying the procedure to include contouring rather than vegetative cover or mulches.

TEACHER'S KEY  
STUDENT WORKSHEET 2

SOIL AND WATER CONSERVATION

(References, VAS Unit 4060 and VAS Slidefilm SG723A)

1. How does man's use of soil as a resource affect society as a whole?

Whole civilizations have developed and prospered because of productive soils, only to decline and disappear as a result of misuse and destruction of their fertile soil base.

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2. In 1934, a national survey was conducted by the Soil Erosion Service and it was found that about 50 million acres had lost its top soil and another 280 million acres had been severely eroded.
3. In 1977, the SCS identified 346 million acres as prime farmland. During the same year, about 1 million acres of prime farmland was lost to housing, airports, lakes, reservoirs, etc.
4. Draw a "pie chart" which shows the percent of cropland by slope.  
(See page 4, VAS Unit 4060)

5. What factors could account for the general decrease in soil erosion in Illinois between 1930 and 1970.
- More crop residue to control runoff.
  - Earlier planting.
  - Use of minimum tillage.

6. What factors could account for the general increase in soil erosion in Illinois between 1970 and 1980.
  - a. Increasing raw crop acreage.
  - b. Decline in hay, pasture, woodland acreage.
  - c. Specialized farms.
  - d. Removing fences and windbreaks.
  - e. Reduced contour tillage.
  - f. Elimination of terraces.
7. Today, about 180 million tons of soil are lost annually through erosion in Illinois, and about 158 million tons of this loss are due to agricultural practices.
8. For every bushel of corn produced in Illinois, the state loses 1½ bushels of soil.
9. When soil erosion rates exceed 5 tons per acre per year, it is lost faster than it can be replenished.
10. What soil factors are considered when placing land in one of the eight land classes.
  - a. Crop production restrictions.
  - b. Risk of erosion.
  - c. Slope.
  - d. Soil properties.
11. In Illinois, most of the crop land erosion comes from class II e land.
12. In Illinois, the land capability class with the highest average erosion rate in tons per acre per year is class VI e, the class with the lowest is class I.
13. What are two soil erosion processes which result in lower soil productivity?
  - a. Chemical erosion.
  - b. Physical erosion.
14. The erosion process involves what three distinct steps?
  - a. Loosening of soil particles.
  - b. Moving of soil particles.
  - c. Deposition of soil particles.
15. What are three ways soil is moved by wind?
  - a. Saltation
  - b. Suspension
  - c. Surface creep

16. How does surface roughness affect runoff and soil loss?

Less tillage, permitting greater soil surface roughness and soil cover, means significantly less rainfall runoff and soil erosion.

17. What is meant by "conservation tillage system"?

It is any tillage system that would increase the amount of soil residue left on the surface or increase the roughness of the soil surface.

18. What are some examples of conservation tillage methods used in Illinois?

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- a. No-till planting
- b. Strip rotary tillage
- c. Till planting
- d. Fall or spring chiseling
- e. Disking
- f. Terraces
- g. Grass waterways
- h. Contour farming
- i. Contour strip cropping

19. What conservation methods are currently being used in your local county or area?

20. What conservation methods are needed or could be started which would reduce soil and/or water erosion in your local county or area?

21. What are some barriers which keep individuals from practicing soil and water management?

- a. Economic conditions
- b. Short term responsibilities
- c. Tradition of methods
- d. Lack of awareness of problem

22. What are two "short term" primary benefits to society of soil conservation?

- a. Reduced sedimentation damage
- b. Fewer pollution problems

23. What are two "long term" benefits to society of soil conservation?

- a. Retaining productive potential of land
- b. Maintaining prosperous agricultural base for nation

24. What is the long term goal of the "State Water Quality Plan" in Illinois?

A step-by-step reduction of soil erosion to a limit of 1 to 5 tons per acre per year on all Illinois land by the year 2000.

25. What factors are considered in establishing a P-value for land?

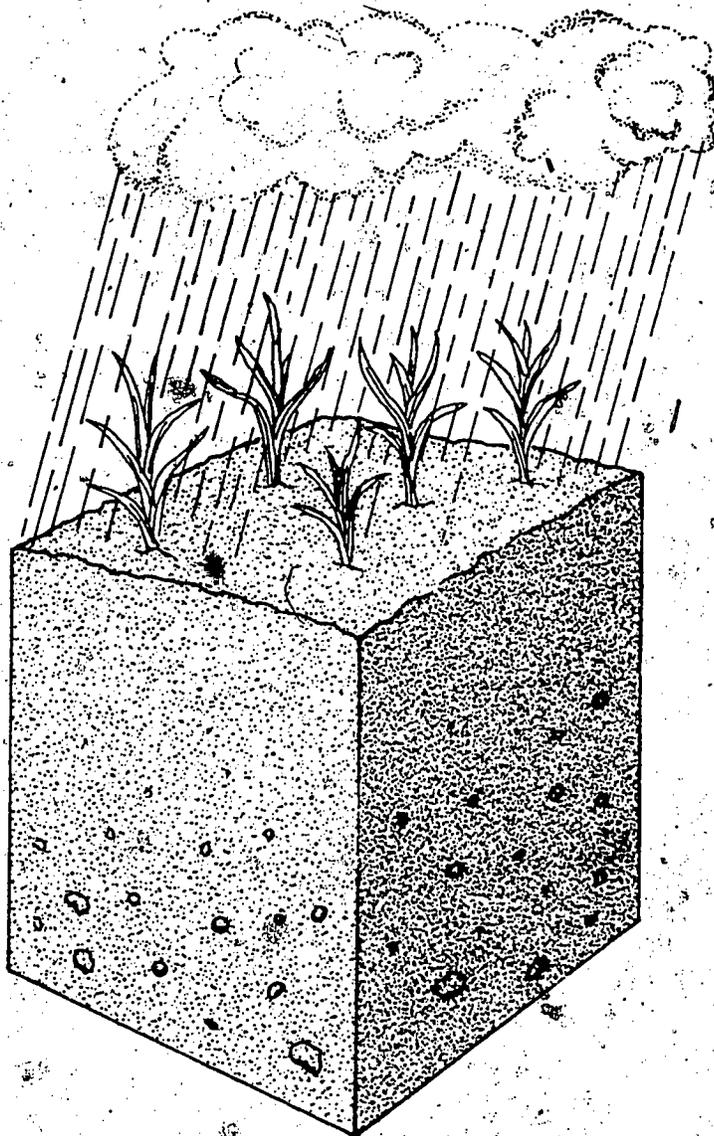
- a. Physical characteristics
- b. Economic factors

# **FUNCTIONS OF SOIL WATER**

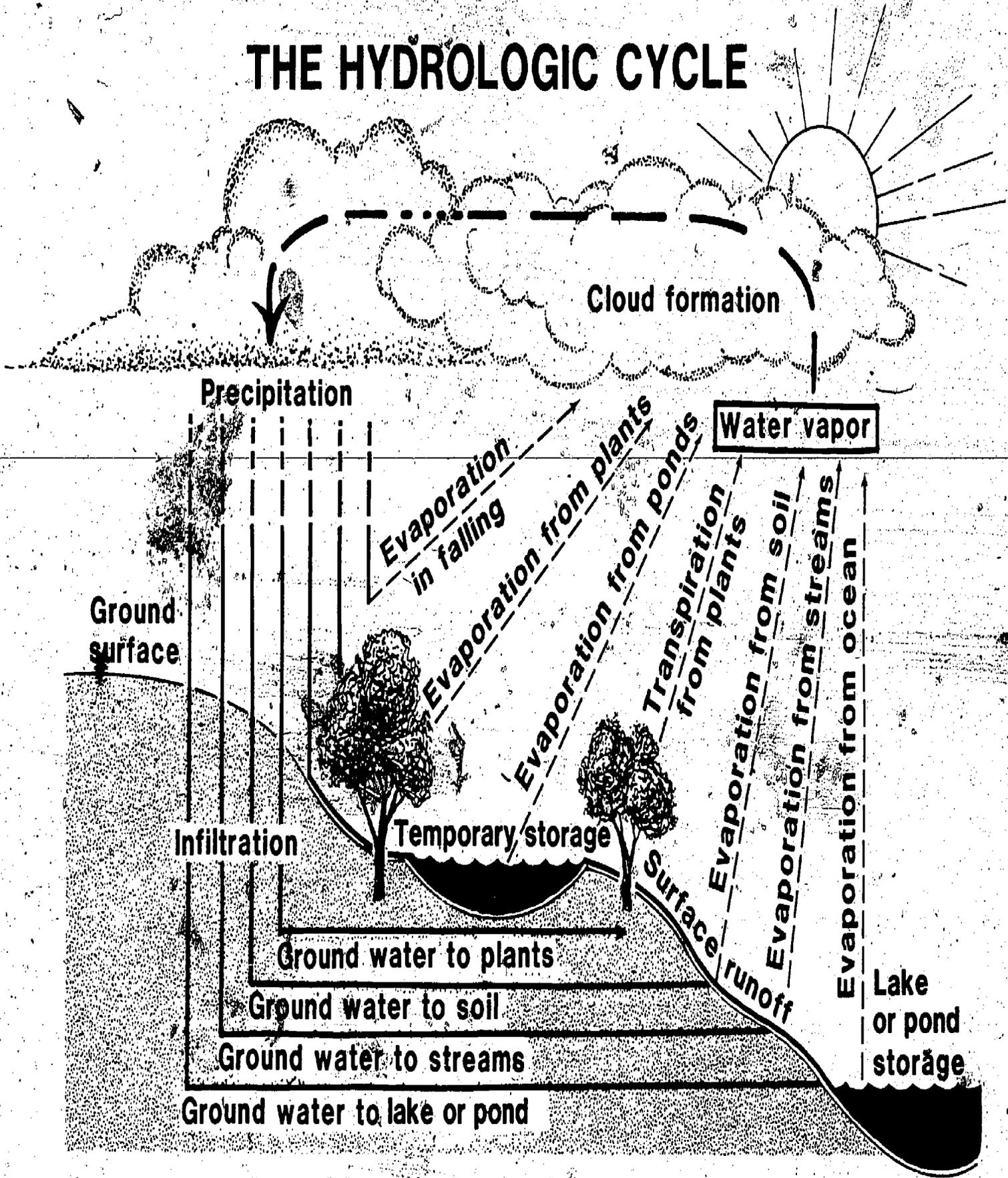
- 1. Essential for plant growth**
- 2. Necessary for soil formation**

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- 3. Makes nutrients available**
- 4. Influences the physical condition of soil**



# THE HYDROLOGIC CYCLE



The water cycle endlessly repeats itself, as the sun draws water from the earth and the water returns to the earth in the form of rain or snow.

# WAYS SOILS LOSE WATER

**Transpiration**

**Evaporation**

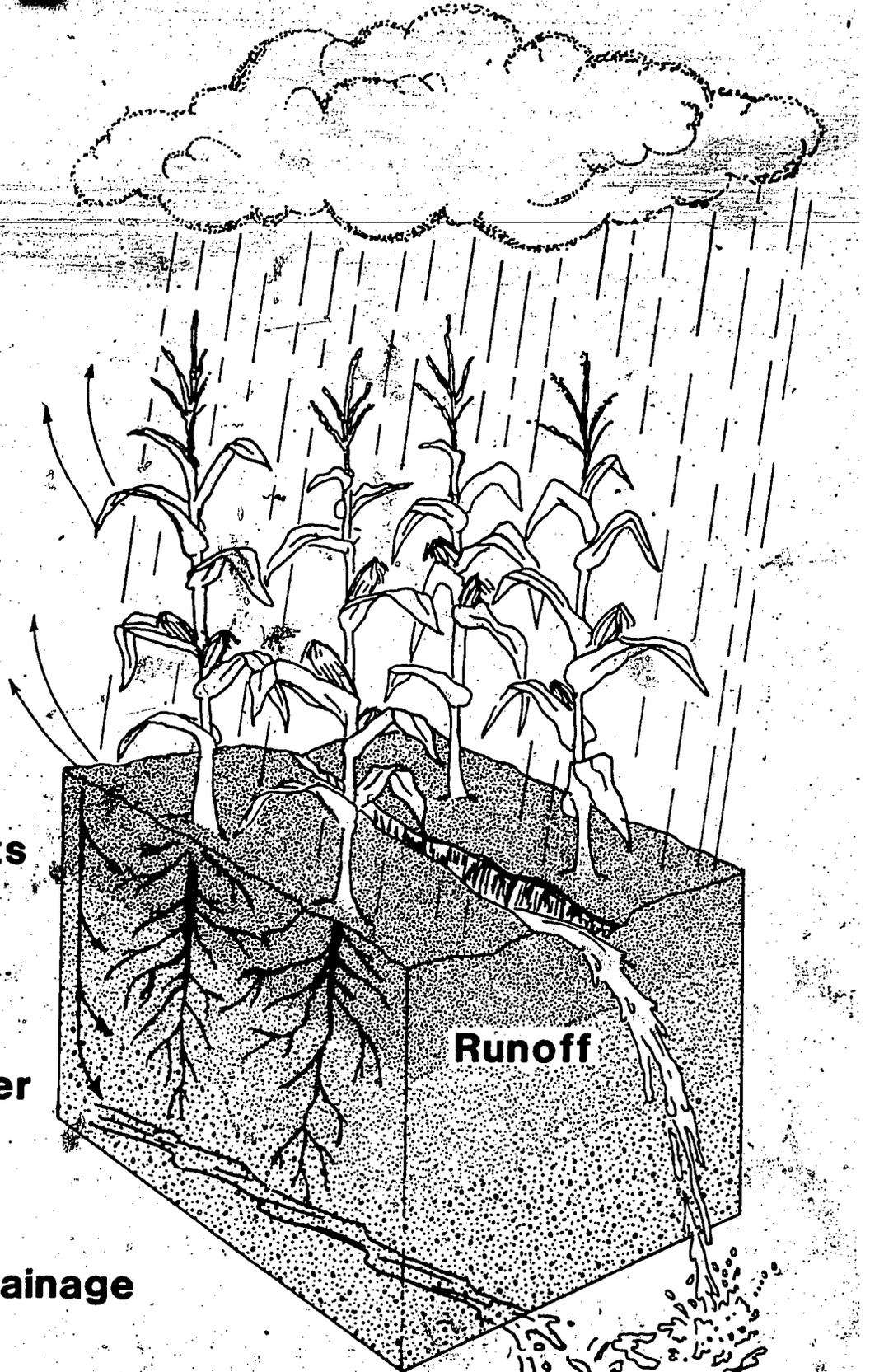
**Used by plants**

**Held in soil**

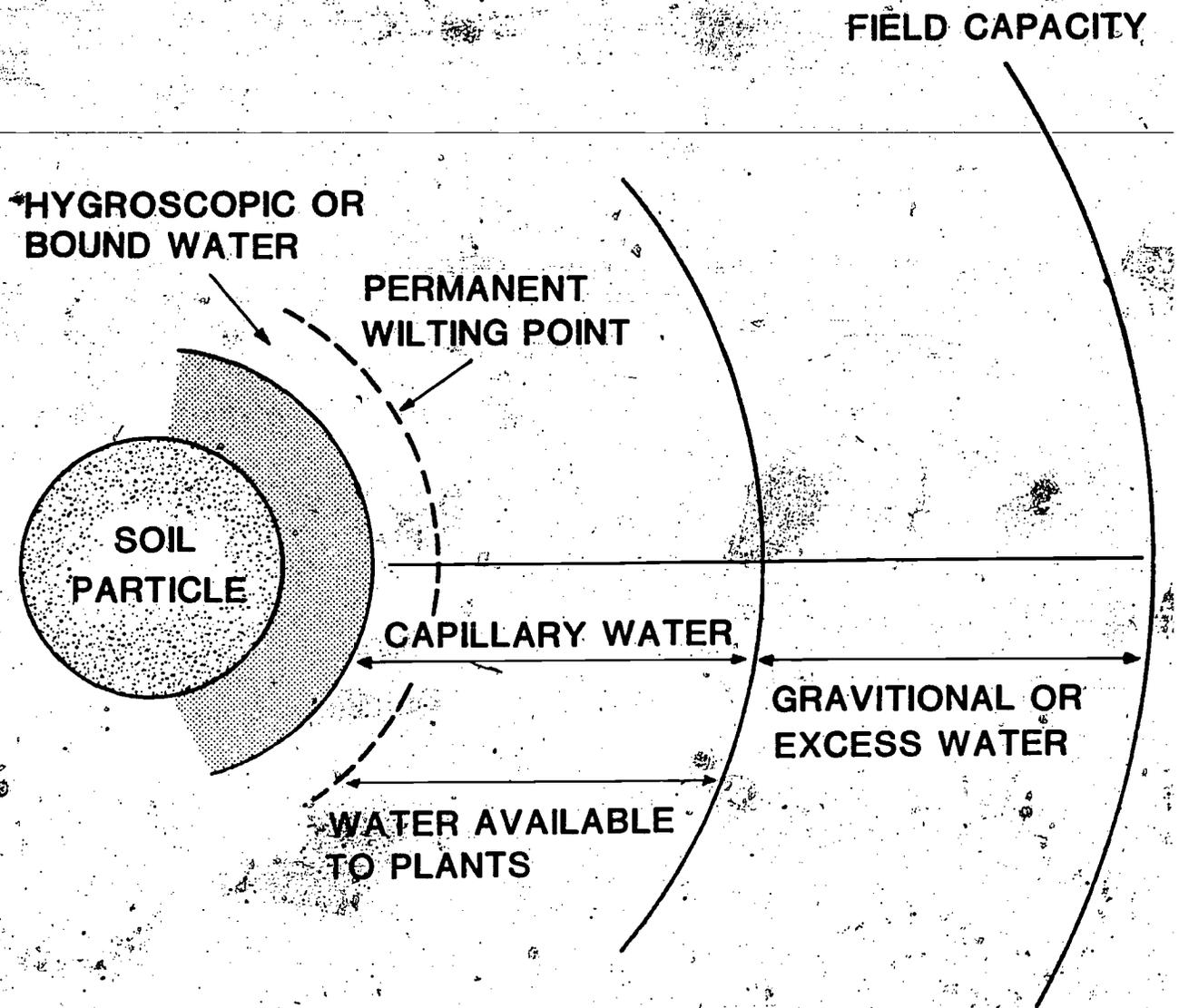
**Percolation**

**Drainage water**

**Subsurface drainage**

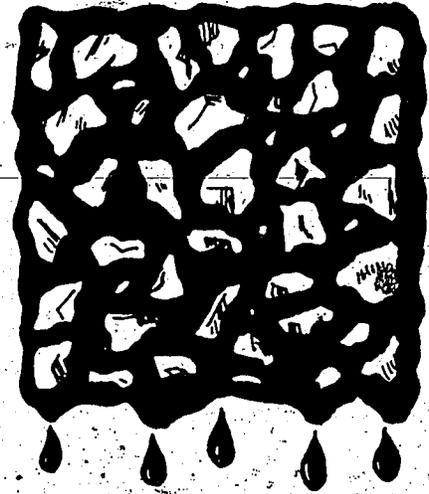


# CLASSIFICATION OF SOIL WATER



# EXAMPLES OF THE THREE MOST IMPORTANT SOIL MOISTURE CONDITIONS

**SATURATION**



**FIELD CAPACITY**

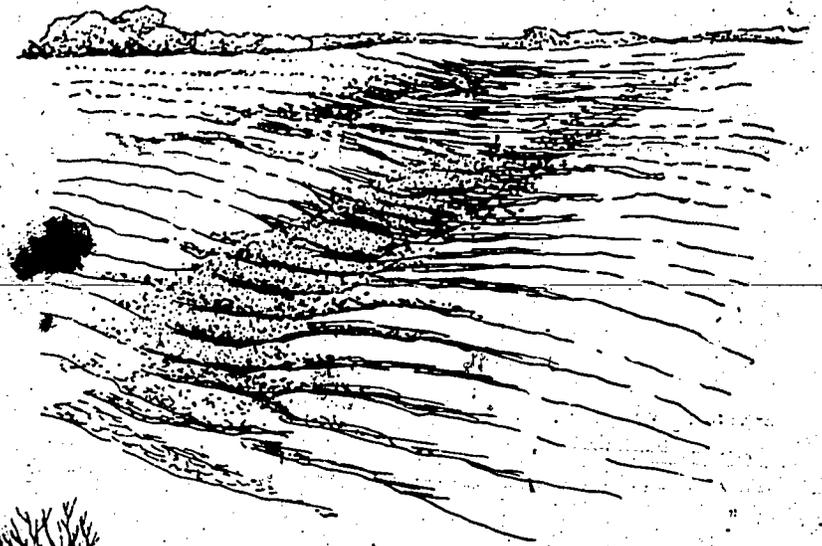


**WILTING POINT**



# EROSION CAUSED BY RUNNING WATER

**SHEET EROSION**



**GULLY EROSION**

**RILL EROSION**



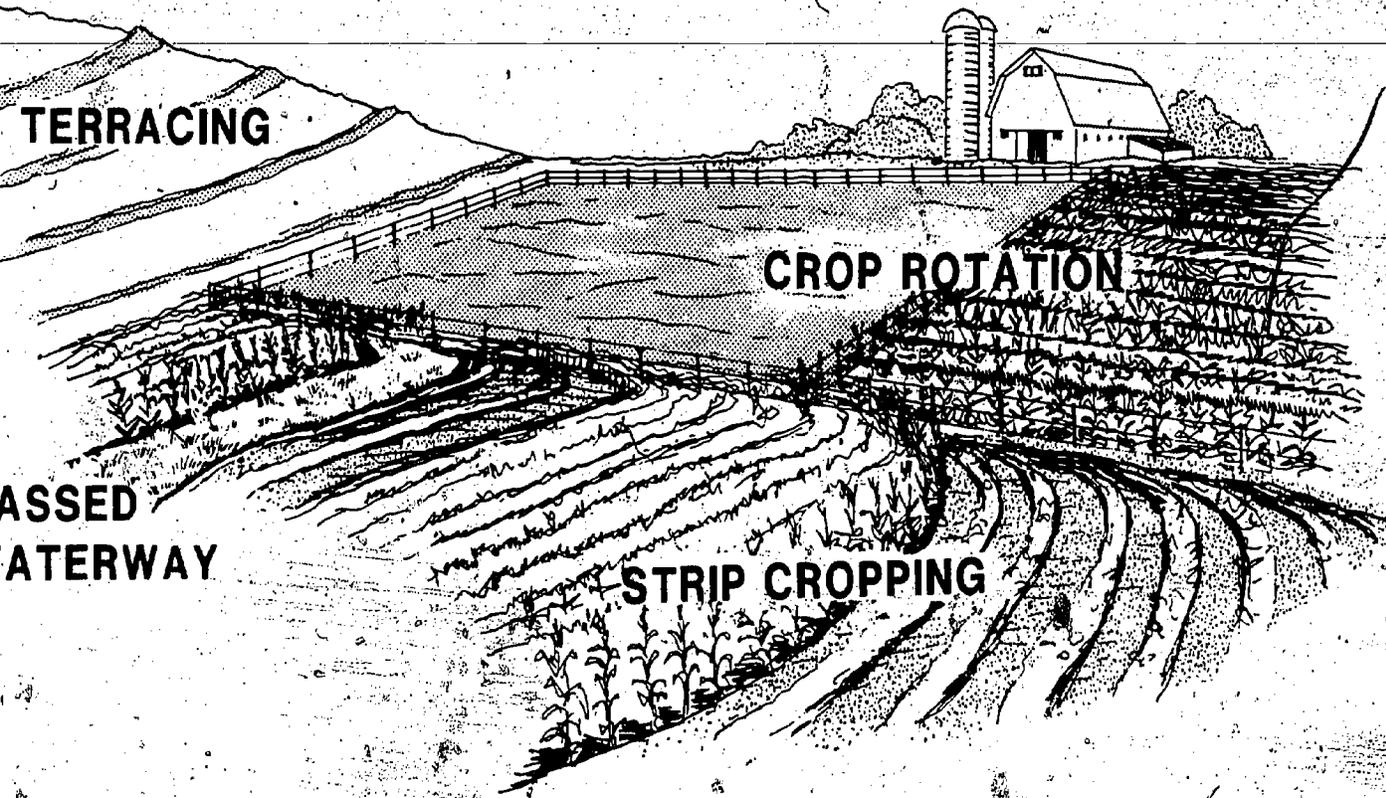
# SOIL DETACHMENT BY RAINDROPS

**A raindrop may splash soil as far as 5 feet.**

**One inch of rain may remove one inch of soil per acre (150 tons).**



# METHODS TO CONTROL SOIL AND WATER EROSION



TERRACING

CROP ROTATION

GRASSED  
WATERWAY

STRIP CROPPING

270

271

III-F-1-34

# FACTORS WHICH EFFECT EROSION CONTROL METHODS

1. Effect on the land
2. Effect on the community
3. Effect on farming practices
4. Cost
5. Benefits
6. Time to implement



# WATER EROSION CONTROL MEASURES

## MECHANICAL

**Terracing**

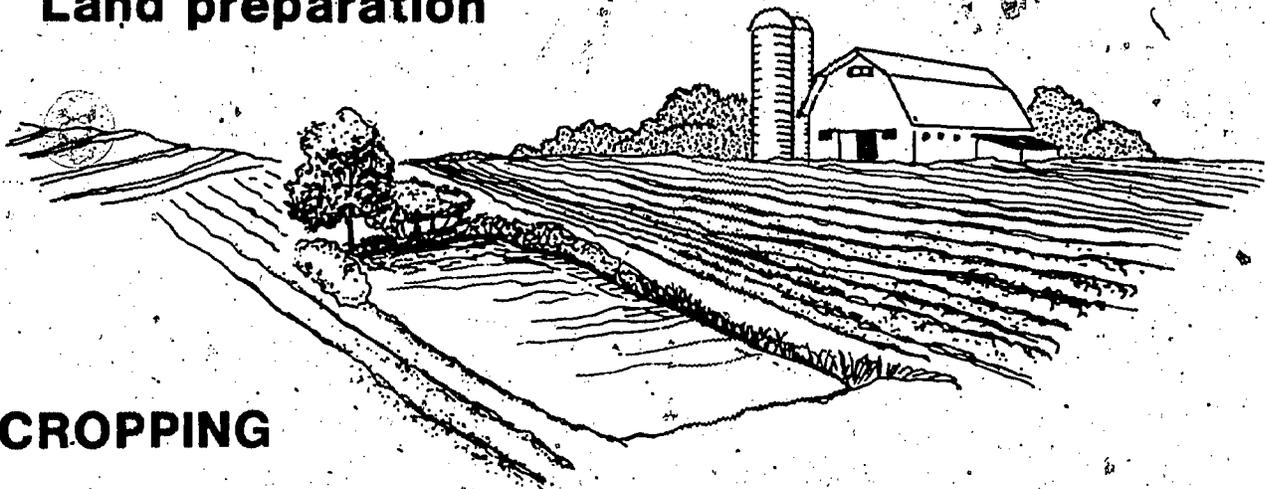
**Diversions**

**Grassed waterways**

**Construction of ponds and dams**

**Drainage systems (tiling)**

**Land preparation**



## CROPPING

**Contour planting**

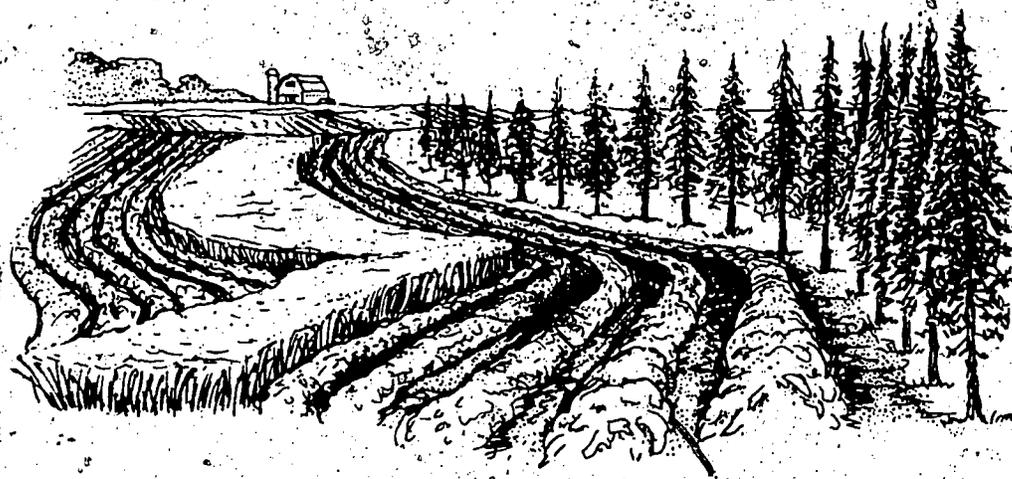
**Strip cropping**

**Conservation tillage**

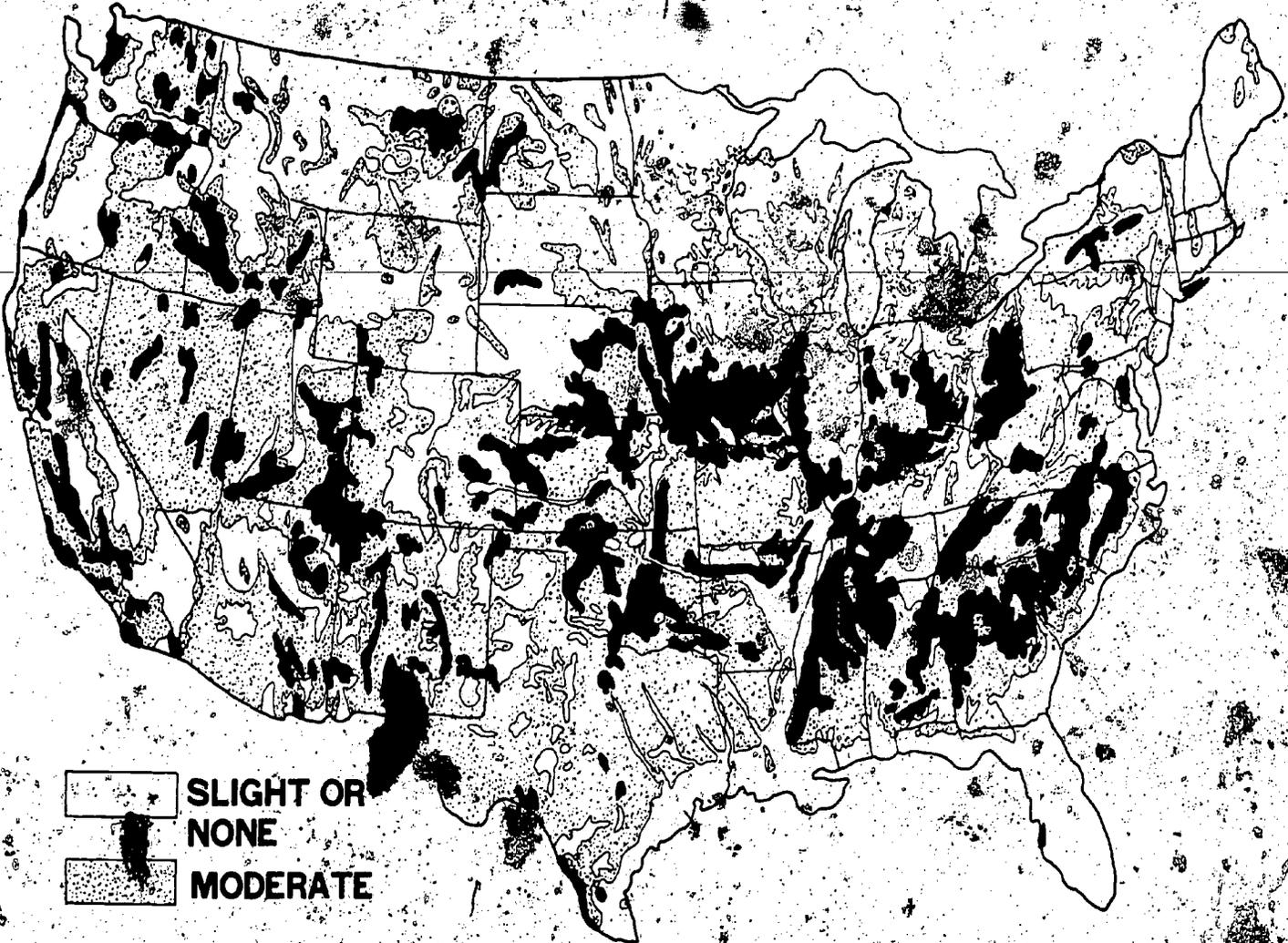


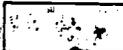
# WIND EROSION CONTROL MEASURES

1. Strip cropping
2. Prevention of burning
3. Prevention of grazing
4. Moisture conservation
5. Emergency cover crops
6. Emergency tillage operations
7. Windbreak tree planting



# GENERALIZED SOIL EROSION MAP OF THE UNITED STATES



-  SLIGHT OR NONE
-  MODERATE
-  SEVERE

III-F-1-38

275

276

# AVERAGE SLOPE RANGE and SLOPE LIMITATION





## TRANSPARENCY DISCUSSION GUIDE

### SOIL AND WATER MANAGEMENT

#### I. Transparency -- FUNCTIONS OF SOIL WATER

- A. Point out the importance of water to continued growth of Illinois agriculture.
- B. Point out that it takes about 1000 pounds of water to produce one pound of corn.
- C. Discuss the fact that corn planted at normal populations on a 40-acre field will use about 18,600,000 gallons of water per year.
- D. Corn planted at a population 14,000 plants per acre will use about 8,750 gallons of water per day per acre.
- E. Point out the importance of water in carrying essential nutrients to plants and in forming soil from parent material.

#### II. Transparencies -- THE HYDROLOGIC CYCLE and WAYS SOILS LOSE WATER

- A. Discuss the general phases of the hydrologic cycle.
  - 1. Precipitation phase
    - a. rain, snow, sleet, hail
    - b. A one inch rain on 160 acres is equivalent to about:
      - i. 4,360,000 gallons, or
      - ii. 36,300 tons of water.
    - c. To transport this 36,300 tons of water, you would need over 100 railroad tankcars, the equivalent of 4 trains, each over a mile in length.
  - 2. Infiltration phase
    - a. Makes water available to plants.
    - b. Water is stored for later use by plants, man, etc.
    - c. Water can move to underground streams and eventually to rivers and the ocean.
    - d. It's the rate water enters the soil.
  - 3. Surface runoff phase
    - a. Surface water causes most of the soil erosion in Illinois.
    - c. Moves to temporary storage in lakes, ponds, reservoirs, etc. and other water sheds.

4. Evaporation phase.

- a. Occurs when falling as precipitation, and from plants, ponds, soil, ocean, etc.
- b. To evaporate enough water to provide a one inch rain over 160 acres requires about one million horsepower of energy.

5. Condensation phase

- a. Changing from vapor to mist and moisture droplets which fall as precipitation.
- b. It takes the same amount of energy to condense the moisture as it originally took to evaporate it.

B. Use transparency on soil water to emphasize that nature is not a 100% efficient.

1. Point out how water is "lost".
2. Identify and discuss some good management practices which could increase available water to plants during critical dry periods.

II. Transparencies -- CLASSIFICATION OF SOIL WATER and EXAMPLES OF THE THREE MOST IMPORTANT SOIL MOISTURE CONDITIONS.

A. Saturation -

1. Occurs when the large (non-capillary) pores are filled with water.
2. Occurs immediately following major rainfall.
3. Point out that the small capillary pores fill first and from top down in soil profile.
4. Then the non-capillary pores start to fill from bottom of soil profile and fills toward the surface.

B. Field Capacity -

1. The water left in the soil when the non-capillary pores are empty and the capillary pores are filled.
2. Usually occurs 24-48 hours after major rain fall.
3. The large (non-capillary) pores will drain with gravity.
4. The small (capillary) pores will not drain with gravity.

C. Wilting Point -

1. It's the point where plants can no longer get water from soil.
2. The bound water is strongly attached to the solid soil particles such as clay, silt, etc.

D. Point out to students that the only soil water which is available to plants is the water between field capacity and wilting point.

- E. Discuss how soil structure, organic matter, soil texture, etc. can influence this available water and the importance of good soil tilth in maintaining the water holding capacity of the soil.

### III. Transparency -- EROSION CAUSED BY RUNNING WATER

#### A. Sheet erosion

1. Removal of a thin, fairly uniform layer of surface soil.
2. Most common type of erosion.
3. Most serious type of erosion because it can go unnoticed for a long time.

#### B. Gully erosion

1. Most noticeable type of erosion.
2. Most are found near the bottom of a slope.
3. Causes severe damage to soil and its productivity.
4. Reduces field efficiency and damages equipment.

#### C. Rill erosion

1. Noticeable as small ditches between rows of corn and other crops.
2. Not as severe as gully erosion.
3. As small streams increase in size, they carry more soil away.

### IV. Transparency -- SOIL DETACHMENT BY RAINDROPS

A. Until recently, agriculturalists tried to control erosion by concentrating on runoff.

B. Originally it was thought that the raindrops just caused surface sealing which caused more runoff.

C. Now it is known that the force of the raindrop impact dislodges the soil particles, then the running water can move the soil.

D. It has been estimated that during a hard rain storm, as much as 100 tons of soil may be bouncing up and down on each acre.

### V. Transparency -- METHODS TO CONTROL SOIL AND WATER EROSION

A. Point out that gullies, rills, and sheet erosion can be treated and controlled through various conservation techniques.

B. On moderate slopes, erosion can be controlled by planting crops on contour, terracing, or by strip cropping.

C. Strip cropping is more effective on longer slopes.

- D. Terracing is the most effective soil conservation practice.
- E. Waterways can divert water around gullies and spread the flow over a grassed area.

VI. Transparency -- FACTORS WHICH EFFECT EROSION CONTROL METHODS

A. Economic factors such as low livestock prices have eliminated much pasture and forage crop acreage, therefore;

1. land stays in row crops.
2. unwilling to invest in long term expensive practices.
3. looking for short term profit.
4. not willing to purchase different equipment.

B. Short term responsibilities have increased the soil erosion problem by:

1. high cash rent on one-year leases discourages long-term conservation involvement.
2. absentee landlords do not see erosion problem, but want to maximize returns.
3. life estates contribute by deferring ultimate responsibility to someone else.

C. Traditions of farming practices have increased erosion by:

1. planting straight rows.
2. clean tillage.
3. resistance to change.

VII. Transparency -- WATER EROSION CONTROL MEASURES

A. Point out that a good conservation plan is a combination of many techniques and practices. There is no one answer or solution to controlling erosion.

B. Erosion involves these steps:

1. loosening of soil particles
2. moving of soil particles
3. deposition of soil particles

C. Use this transparency to promote class discussion on local conservation practices being used.

D. Have class identify other erosion control practices which could be listed under these two measures.

VIII. Transparency -- WIND EROSION CONTROL MEASURES

A. Point out that wind erosion is not as serious as water erosion in Illinois.

B. Wind erosion causes:

1. air pollution
2. highway safety hazards
3. drainage ditches to fill-up with soil
4. loss of top soil

C. Discuss primary factors contributing to wind erosion:

1. frequent, high-velocity winds
2. dry, residue-free soil surface

D. Point out the methods of soil movement.

1. Saltation

- a. Occurs with medium sized particles.
- b. Occurs at what is known as threshold velocity.
- c. Small particles don't lift off the ground because the velocity between the top and bottom of the particle is almost equal.
- d. Large particles have too much density to be easily lifted off the surface.
- e. Use airplane wing design to help explain the lifting technique involved.

2. Suspension

- a. Small particles become dislodged due to surface creep or saltation and are light enough to remain airborne.
- b. Particles can be carried long distances by this means.

3. Surface creep

- a. Large particles are too heavy for saltation or suspension.
- b. Moved along the surface by impact of particles moving in saltation.

E. Discuss the steps people can take to protect the soil from direct assault by wind or rain.

IX. Transparency -- GENERALIZED SOIL MAP OF UNITED STATES

- A. Crops are grown on a little more than 400 million acres in U.S.
- B. About 50 million acres has lost its topsoil.
- C. Another 280 million acres are severely eroded and cannot be used for cropland.
- D. In areas receiving 30 inches or more of rain annually, most erosion is caused by water.

E. In areas receiving between 20 and 30 inches of rain annually, most erosion is due to both water and wind.

F. In area receiving less than 20 inches of rain annually, most erosion is caused by wind.

X: **Transparencies -- AVERAGE SLOPE RANGE and DRAINAGE NEEDS**

A. Slope influences:

1. height of water table
2. amount of water that enters and passes through the soil.

B. About 60 percent of Illinois has an average slope of less than 4 percent.

C. Color of soil is a reflection of moisture status during soil development.

D. Discuss the average slope and drainage needs in your county or local area.

E. Identify conservation techniques being used locally to counter the soil limitation factors.

TEACHER'S KEY

SAMPLE TEST QUESTIONS

SOIL AND WATER EROSION

TRUE (+) or FALSE (-)

T 1. In a short term sense, our soil is not a renewable natural resource.

T 2. By 1934, almost 50 million acres had already lost its topsoil due to erosion.

T 3. Illinois currently has about 21 million acres in row crops.

F 4. Recent surveys have indicated that excessive erosion is occurring on only 10% of Illinois crop land.

F 5. Most of the cropland erosion and resulting sediment in Illinois comes from steep slopes on Class VIII land.

F 6. Most of the erosion and sediment in every county of Illinois comes from woodland.

T 7. Erosion will always occur, regardless of the control practices adopted by farmers.

F 8. Surface residue on soil prevents water from entering the soil, thus, increasing runoff and erosion.

T 9. Both absentee and absentee landlords have both contributed to Illinois soil erosion problem.

T 10. Federal income tax credits are available to farmers for costs associated with construction and maintenance of certain soil erosion control practices.

MULTIPLE CHOICE (Choose the most correct answer)

B 1. The percent of the American labor force directly engaged in producing agricultural products is about:

- A. 2%
- B. 5%
- C. 10%
- D. 20%

B 2. A national soil erosion control policy was first established in

- A. 1890
- B. 1933
- C. 1948
- D. 1977

C 3. The corn belt accounts for about 81 \_\_\_\_\_ acres of prime farmland in the United States.

- A. hundred
- B. thousand
- C. million
- D. billion

A 4. Approximately \_\_\_\_\_ tons of soil are lost annually through erosion in Illinois.

- A. 180 million
- B. 180 thousand
- C. 18 million
- D. 18 thousand

D 5. One acre inch of top soil weighs about \_\_\_\_\_ tons.

- A. 16
- B. 56
- C. 100
- D. 160

A 6. Level and nearly level land has a \_\_\_\_\_ percent slope.

- A. 0-2
- B. 2-6
- C. 6-12
- D. 12-20

C 7. Erosion began to increase after the early to mid-1970's because

- A. grain prices began to decline.
- B. of a continued decline in world food demand.
- C. farmers began increasing their acreage of row crops.
- D. farmers began increasing their acreage of hay and pasture.

D 8. Soils and land having limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitate, or water supply would have a Land Capability Class of \_\_\_\_\_

- A. I
- B. IV
- C. VI
- D. VIII

B 9. Approximately 3% of the total sheet erosion comes from \_\_\_\_\_ land.

- A. crop
- B. forest
- C. pasture
- D. prairie

C 10. Between the years of 1983 and 1988 the erosion on all farmland must not exceed \_\_\_\_\_ tons of soil loss per acre per year.

- A. 80 to 100
- B. 40 to 60
- C. 4 to 20
- D. 1 to 5

MATCHING (Select the term in Column B that fits the description in Column A)

Column A	Column B
<u>H</u> 1. A sheet of water collecting on the soil surface and flowing downhill.	A. Chemical erosion
<u>D</u> 2. Soil loss tolerance value limit in tons per acre per year.	B. Clay
<u>J</u> 3. Deep channels that join together as they form down a slope.	C. Gullies
<u>F</u> 4. Depositing of loosened soil, final step in erosion process.	D. T-value
<u>A</u> 5. Removal of nutrients from the land.	E. Soil texture
<u>L</u> 6. Normal, natural erosion from land not disturbed by man.	F. Sediment
<u>B</u> 7. Smallest of soil particles.	G. Soil structure
<u>G</u> 8. Arrangement of individual soil particles.	H. Runoff
<u>C</u> 9. Deep channels that cannot be smoothed out by ordinary tillage method.	I. Soil surface
<u>E</u> 10. The size of the individual soil particles.	J. Rill
	K. Sand
	L. Geologic erosion

COMPLETION (complete the statement with the proper word or phrase)

1. Illinois has been nicknamed The Prairie State because of its nearly level, dark soils.
2. The early white settlers of North America were primarily from western Europe.
3. The best land available for farming purposes is referred to as prime farmland.
4. Ten tons of soil lost per acre per year means one inch of top soil is lost every 16 years.



TEACHER'S KEY

SAMPLE TEST QUESTIONS

USING CONSERVATION TILLAGE SYSTEMS

TRUE (+) - FALSE (0)

- 0 1. The total cost factor demonstrates that the conventional moldboard plow system is always higher in cost per acre than conservation tillage.
- 0 2. Yields with conservation tillage are slightly higher when compared to those in a conventional moldboard plow system.
- + 3. Herbicide "carry-over" potential is greater in conservation tillage systems because of the higher herbicide rates used and because of less dilution of the herbicide in the plow layer with chisel plows.
- + 4. Clean plow down for disease control has been a standard practice since man started cultivating crops.
- 0 5. European corn borer is the primary soil insect pest of corn in Illinois.
- + 6. Cutworm outbreaks in corn are more frequent in conservation tillage than in conventional tillage.
- + 7. Conservation tillage systems reduce erosion by leaving a mulch of crop residues and by producing a rough soil surface.
- + 8. No-tillage systems reduce soil erosion and evaporation; water runoff is high, but about the same as for the fall moldboard system.
- + 9. Conservation tillage systems are well adapted to large scale farming.
- + 10. Insecticides and herbicides are more effective in a conventional tillage system than in a conservation tillage system.

MULTIPLE CHOICE (Make appropriate choice of A, B, C, or D)

- C 1. The primary concern of conservation tillage:
- A. Reduction of fuel costs
  - B. Reduction of work
  - C. Reduce soil loss
  - D. Increase yields
- B 2. According to a 1975 survey listed in the 1977-78 Illinois Agronomy Handbook, the following percentage of corn ground was moldboard plowed:
- A. 60 percent
  - B. 70 percent
  - C. 80 percent
  - D. 90 percent

- D 3. Conservation tillage system(s) used in Illinois:
- A. Disk system
  - B. Strip cropping
  - C. Chisel plow system
  - D. Both A and C
- D 4. Limitations of no-tillage:
- A. High herbicide rates are often needed
  - B. Some insect problems are increased
  - C. Lower soil temperatures
  - D. All of above
- D 5. It is estimated that during a heavy rainstorm as many as the following number tons of soil may be bouncing up and down per acre:
- A. 5
  - B. 20
  - C. 70
  - D. 100
- D 6. Soil losses as indicated by simulated rainfall tests at the University of Illinois, show that on fall plowing nearly \_\_\_\_\_ pounds of soil per acre was removed by run off water from the initial 1.25 inches of rain:
- A. 100
  - B. 300
  - C. 700
  - D. 1000
- A 7. Corn planting should be delayed until temperatures reach the following degrees farenheit:
- A. 50
  - B. 55
  - C. 60.
  - D. 65
- C 8. According to a 1975 survey listed in the 1977-78 Illinois Agronomy Handbook, the greatest reason for farmers not changing to conservation tillage was:
- A. Takes too much time
  - B. Fear of yield decrease.
  - C. Fear of weed problems
  - D. Machinery change
- C 9. To control vegetation growing in the seed bed, no-till systems require a knockdown herbicide such as:
- A. DDT
  - B. 2,4-D
  - C. Paraquat
  - D. Lasso

D 10. The following are important methods of disease control in cultivated crops:

- A. Clean plow down and crop rotations
- B. Resistant varieties and chemical protectants
- G. A good soil mulch and leave a rough soil surface
- D. Both A and B

MATCHING (Select the answer that fits the situation best.)

- |          |     |   |    |   |
|----------|-----|---|----|---|
| <u>J</u> | 1.  | A minimum tillage system                  | A. | Disadvantage of conservation tillage      |
| <u>E</u> | 2.  | An important part of conventional tillage | B. | Cutworm                                   |
| <u>G</u> | 3.  | Primary soil insect pest                  | C. | Surface germinating weed                  |
| <u>I</u> | 4.  | Marestail                                 | D. | Reduces "running room" for water          |
| <u>C</u> | 5.  | Crabgrass                                 | E. | Moldboard plowing and disking             |
| <u>A</u> | 6.  | Lower soil temperatures                   | F. | No plow system                            |
| <u>H</u> | 7.  | Soil crusting and compaction              | G. | Corn rootworm                             |
| <u>K</u> | 8.  | Crop rotation                             | H. | Disadvantage of conventional tillage      |
| <u>D</u> | 9.  | Terraces                                  | I. | Weed not controlled by paraquat           |
| <u>L</u> | 10. | Soils with pH above 7.4                   | J. | Ridge planting                            |
|          |     |   | K. | Helps to reduce disease risks             |
|          |     |   | L. | Tend to have atrazine carry over problems |

COMPLETION (Write appropriate information or words to complete statements.)

1. Direct damage from soil erosion depends on soil properties.
2. Sediment from eroded fields increases water pollution and reduces the storage capacity of lakes and reservoirs.
3. Moldboard plowing produces an unprotected residue-free soil surface.
4. Soil blowing is especially hazardous on sandy soils.
5. Soil erosion after soybeans is greater than after corn.
6. Soil temperatures become lower as the amount of residue on the surface increases.
7. When using a conservation tillage system, seeding rates can be increased by ten percent to offset the reduction in stand.
8. Phosphorous and potassium fertilizers and limestone are concentrated near the surface when soils are not moldboard plowed.
9. Corn rootworm damage is primarily confined to corn following corn.
10. Strip cropping provides season long vegetative cover on half or more of a slope and also divides a slope into shorter lengths.

**ESSAY QUESTIONS**

1. List and discuss three important advantages and three limitations of the chisel plow system.

(Refer to VAS Unit 4058)

(See Pg. 3)

2. In what ways does a conservation tillage system differ from conventional tillage? Elaborate on each difference.

(Refer to VAS Unit 4058)

(See Pg. 1)

## UNIT F: SOIL SCIENCE AND CONSERVATION OF NATURAL RESOURCES

### PROBLEM AREA: CONSERVING WILDLIFE RESOURCES

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed to be used with juniors, or third-year students enrolled in a vocational agriculture program. The recommended time for teaching this problem area is during the mid-fall or mid-spring. The estimated time for teaching this problem area is 5 to 10 days depending on what subject matter the instructor wishes to cover and the number of field trips that are arranged. The materials in this problem area were selected and written with the following assumptions:

1. There have been wide reductions in areas which are suitable for wildlife habitat in the past few years in Illinois.
2. This reduction of wildlife habitat has deemed it necessary that we successfully manage those areas that we have left and try to develop suitable new areas.
3. Students will have the opportunity to observe a wildlife area that has significant habitat.
4. Students will have available copies of "Making Land Produce Useful Wildlife," and "These Precious Few." (See Credit Sources for method of obtaining these booklets.)

The instructor is encouraged to conduct a local search for other supplementary materials. The items in this problem area are for reference or modification as the teacher adapts these materials to his/her local situation.

#### CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research, and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teachers guide, information sheets, worksheets, and transparency discussion guide were developed by Joe House, Princeville High School, and Jerry Pepple, Department of Vocational and Technical Education, University of Illinois. The worksheets and sample test questions were developed to correspond with or are a part of the following booklets. "Making Land Produce Useful Wildlife" Farmers Bulletin #2035 (For Sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 001-000-00021-7. This booklet may possibly be obtained by contacting the local Soil Conservation Service Office. The transparencies were developed by Vocational Agriculture Service, University of Illinois.

The second booklet, "These Precious Few" can be obtained by writing, Natural Heritage Conservation Education Kit, Illinois State Board of Education, 100 North First Street, Springfield, Illinois 62777 or by contacting Vocational Agriculture Service, College of Agriculture, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801.

These materials were reviewed by the following vocational agriculture teachers:

Joe House	-	Princeville High School
Floyd Wohrley	-	Kewanee High School
Darrell Scherer	-	West Richland High School
Steve Hendrix	-	Sullivan High School
Don Prather	-	Clinton High School

## TEACHER'S GUIDE

- I. Unit: Soil science and conservation of natural resources.
- II. Problem area: Conserving wildlife resources
- III. Objectives: At the close of this problem area students will:
  1. Understand why wildlife management is important and necessary.
  2. Be able to list several endangered wildlife species in Illinois.
  3. Identify approved management practices for the development of different types of wildlife areas.
  4. Recommend useful farming practices which protect the development of wildlife habitat.
  5. Explain essential practices necessary for managing several popular game species in Illinois.
- IV. Suggested interest approaches:
  1. Lead a discussion by asking students what type of wildlife they could expect to find in one mile of shrub fence row. (Answer and discussion information on page 22 of "Making Land Produce Useful Wildlife.")
  2. Promote class interest by developing a bulletin board on the types of wildlife found in the area.
  3. Use buzz groups to develop ideas on why we need wildlife.
  4. Take class on a field trip to an area abundant in wildlife and have students identify wildlife species.
  5. Show slides of wildlife found in local area and discuss their habitat.
- V. Anticipated problems and concerns of students:
  1. What types of wildlife are found in this area?
  2. Why do we need wildlife?
  3. What are the benefits of wildlife?
  4. What problems confront wildlife in Illinois and which species are in the greatest danger?
  5. What practices are beneficial to wildlife?

6. How should different areas (ex. wetlands, ditchbanks, ponds, etc.) be managed to produce wildlife?
7. Can wildlife be produced in public areas?
8. How can I successfully produce game animals in my area?

VI. Suggested learning activities and experiences:

1. Have students read and discuss pages 1-4 of "Making Land Produce Useful Wildlife" and have students fill in the blanks of student worksheet #1, Benefits and Requirements of Wildlife.
2. Have students read and discuss "These Previous Few" and do student worksheet #2, Endangered and Threatened Species, and worksheet #3, History of Wildlife Habitat in Illinois.
3. Have students read and discuss pages 4-5 of "Making Land Produce Useful Wildlife", and distribute and fill in the blanks on student worksheet #4, Managing Land to Meet Wildlife Requirements.
4. In a class field trip or as an outside assignment have students do the job sheet on wildlife management. Teacher may substitute some other type project if this activity does not fit the particular area.
5. Have students read and discuss pages 6-29 of "Making Land Produce Useful Wildlife". Distribute and have students fill in the blanks of student worksheets #5 and #6. (Note: The teacher may wish to break the reading assignment down into segments that correspond to each of the worksheets.)
6. Ask game warden to talk to the class on hunting regulations and how these are needed to protect and manage wildlife.
7. Have students read and discuss information sheet on "Managing Areas for Popular Illinois Game Species". Distribute and have students fill in the blanks on student worksheet #7.
8. At the close of the Wildlife Management problem area, have students discuss useful practices that they have learned and give ideas for implementing these plans in their area.
9. Identify possible job and career opportunities in wildlife management areas for students on a part-time or full-time basis.
10. Ask students to bring in local newspaper articles on wildlife issues and develop a bulletin board with the pro and con arguments.

11. Develop class discussion on the importance of wildlife and if the general public is more concerned or less concerned about preserving our natural wildlife areas today than they were a few years ago.
12. Have class locate and bring to school examples of popular wildlife magazines. Examine the magazines to determine the magazines' audience, their main advertisers and philosophy toward wildlife management.
13. Have students write letters to their legislators to express their feelings on current wildlife and natural resource issues.
14. Have class develop and conduct a local BOAC program on wildlife management and submit the BOAC Application for an FFA state award.
15. Encourage each student to develop an FFA Foundation program in an area of wildlife management, natural resources, etc.

VII. Application procedures:

1. Have students develop a proposal for an FFA Foundation program in wildlife management.
2. Have students design and complete wildlife management project for BOAC program in the local community.

VIII. Evaluation:

1. Prepare and administer a pencil and paper test using the Sample Test Questions as possible test items.
2. Collect and grade worksheets.
3. Collect and grade Wildlife Management Project.
4. Have students explain current practices that they conduct around the home or farm and possible practices they could use to increase wildlife.

IX. References and aids:

1. Making Land Produce Useful Wildlife, USDA, Farmer Bulletin No. 2035, U. S. Government Printing Office, Washington, D.C.; or contact local Soil Conservation Service Office.
2. These Precious Few, Booklet, and Workbook, Illinois Department of Conservation.
3. More Wildlife for Recreation, U.S. Department of Agriculture, Soil Conservation Service.

4. Our Natural Resources, P.E. McMill, 4th edition, The Interstate Publishers and Printers.
5. The Farmer and Wildlife, Wildlife Management Institute, Wire Building, Washington, D.C. 20005.

COMPEJENCY INVENTORY  
CONSERVING WILDLIFE RESOURCES

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

Competency

Circle One

1. Operate equipment and maintain facilities for plant life projects as assigned.	1	2	3	4	5
2. Collect and record information on wildlife in a specific area.	1	2	3	4	5
3. Capture and mark wild animals.	1	2	3	4	5
4. Aid in construction, maintenance and repair of buildings.	1	2	3	4	5
5. Gather samples of water, food, and soil.	1	2	3	4	5
6. Conduct simple analytical tests.	1	2	3	4	5
7. Transport game animals.	1	2	3	4	5
8. Use radio tracking methods.	1	2	3	4	5
9. Assist in development of controlled wildlife areas.	1	2	3	4	5
10. Assist with wildlife education.	1	2	3	4	5
11. Locate and establish boundaries for game land and game preserves.	1	2	3	4	5
12. Assist in the enforcement of game laws during peak periods of hunter activity.	1	2	3	4	5
13.	1	2	3	4	5
14.	1	2	3	4	5
15.	1	2	3	4	5
16. Identify the endangered species of wildlife					6 7
17.					6 7

These are competencies outlined in the National Ag Occupations Competency Study for entry level positions in agricultural production.

Name \_\_\_\_\_

Date \_\_\_\_\_

III-F-2-7

## INFORMATION SHEET

### MANAGEMENT OF POPULAR ILLINOIS GAME SPECIES

**RING-NECKED PHEASANTS** - A favorable land use pattern for pheasants consists of (1) 65-80 percent of the area in cultivated crops such as corn, soybeans, and wheat; (2) 15-30 percent in hay and rotation pastures; (3) 5-10 percent in brush and woods; and (4) 3 percent or more of the total area in brushy fence rows, odd areas, and permanently protected herbaceous cover. The pheasants' greatest need in most places is for undisturbed nesting cover and good winter cover near food supplies.

Land management practices most important in improving living conditions for pheasants are:

1. Establish and maintain grasses and grass-legume stands on drainage ditchbanks, field borders, grassed waterways, roadsides, in odd areas, pond areas and snow traps. Use herbicides rather than mowing to control weeds or woody plants. If mowing is necessary, delay it until after small grain harvest.
2. Establish farmstead shelterbelts with snow traps.
3. Maintain cattail-covered marshes and sloughs.
4. Establish or maintain woody cover in hedgerows, odd areas and pond areas.

Generally, the daily range does not exceed one-half mile. The seasonal range does not usually exceed one mile. Egg laying starts during the last half of April. Most hens renest if they lose their first nest. The average clutch size is 11 eggs, laid in a two-week period. Broods begin hatching in late May or early June depending upon spring weather conditions. About 10 chicks hatch from the 11 eggs. Of these, about six or seven birds survive until fall.

Pheasants nest in grass more than any other cover. One-fourth to one-half of the nests are located in hay fields. Eighty percent of the nests in meadows or grain fields are found in the outer 100 feet. From 2/3 to 9/10 of nesting losses are due to mowing machines.

Pheasants find most of their foods in farm-crop fields. Cultivated grains make up 81 percent of the total annual food and nearly one-half of this is corn. The most common weed seeds taken were foxtail, common ragweed, and wild buckwheat. These three form 78 percent of the weed seeds taken and six percent of the total annual food. Other food species of importance are wheat, barley, oats, rose hips, dogwood fruits, wild cherries, nannyberries, and highbush cranberries. Pheasants appear to eat about one and one-fourth pounds of corn per bird per week.

**BOBWHITE QUAIL** - The bobwhite is one of the smallest (6 to 7 oz.), yet one of our most important game birds. An ideal land use pattern for bobwhite would be an area with 30 to 40 percent in grassland, 40 to 60

percent in cropland, 5 to 20 percent in brushy cover and 5 to 40 percent in woodland. The greater the interspersion of these types, the better the area for bobwhites.

Land management practices of benefit to the bobwhite quail are:

1. Crop rotations and good fertilization programs increase the amount and quality of quail foods produced.
2. Contour strip cropping provides interspersion of cover types.
3. Grass or grass-legume stands on drainage ditch banks and field borders provide nesting and roosting cover.
4. Woody cover in hedgerows, odd areas and pond areas provide travel and escape cover.
5. Improved pastures and regulating grazing within the carrying capacity of the land increase nesting and roosting cover.
6. Control of fire and grazing in woodlots, in residues of crop fields, and along roadsides increases food and several kinds of cover.
7. Shrubby or herbaceous borders around woodlots provide roof and escape cover.
8. Protected pond areas provide vitally needed water, cover and sometimes food during drouth periods.

The daily movements of the bobwhite are relatively restricted, 1/8 to 1/4 mile is the daily range. The annual range rarely exceeds one mile. Egg laying generally starts in late April and early May. Egg laying requires two to three weeks. The average clutch size is 14, but varies from 7 to 30 or more eggs. The incubation period is 23 days. Three-fourths of the nests are generally located within 50 feet of roads, paths, or similar openings. The total loss for the 16 weeks of growing up is generally 25-40 percent.

Quail need two primary kinds of cover: Herbaceous and woody. Mixed grass and clover are preferred to alfalfa. The mixed stands are less dense. Grass-legume stands in rotations, along ditches and field boundaries are of benefit.

The bobwhite is essentially a seed eating bird; therefore, croplands are important to the quail. Winter grains have good aftermath growth of weed seeds the summer after harvest. Grain fields and corn fields provide weed seeds nutritious to quail as well as waste grains. Where corn is grown for grain, it may make up 60 percent of the bobwhite's fall and winter food. Wheat, rye, soybeans, cowpeas, ragweed, bristle grass, common and Korean lespedeza, beggarweed, sunflower seeds, oak acorns, partridge pea, switch grass, grain sorghum and vetch are all important foods for the bobwhite wherever they are found.

COTTONTAIL RABBITS - The cottontail rabbit is the most popular small game animal in the United States. They thrive on agricultural lands where cropland, grassland and woodland are about equally represented and well distributed. Some animals lend themselves naturally to management. The cottontail appears to be one of these.

Land management practice of benefit to cottontail rabbits are:

1. Establish and maintain grass or grass-legume stands on drainage ditch banks and field borders.
2. Establish or maintain woody cover in hedgerows, fencerows, odd areas and pond areas. "Living brush piles" - small thicket like plantings of multiflora rose are ideal.
3. Do not graze or burn farm woodlots. Pile brush in woodland borders.
4. Establish farmstead and field windbreaks, or Christmas tree plantations - the combination of evergreens and grasses is very attractive.
5. Maintain cattail covered marshes and sloughs.

The annual range of cottontails seldom exceeds 20 acres. The cottontails occupy relatively small areas and food and cover must be in comparatively close proximity.

The gestation period of the cottontail rabbit is approximately one month and a female may have as many as three to five litters during the breeding season. Four or five young per litter is average. They may be born any time of the year between February and September. The nest is a cup-shaped cavity on top of the ground, lined with grass and fur. Some preferred cover types for nesting are bluegrass, broomsedge, orchard grass, fescue, Korean lespedeza and clover. The majority of the nests are found within 150 feet of a field's edge.

Less than 15 to 25 percent of the rabbits live longer than one year.

Protected nesting cover and winter cover are primary limiting factors for this species in the midwest agricultural areas. Brush piles and hollow logs left in protected woodlots, rock piles, small conifer clumps, and shrub thickets provide both winter and escape cover.

In most areas food is not a problem. It would be easier to list the food plants the animal will not eat than those it will eat. Apple, blackberry, dewberry, birch, maple, willow, basswood, dogwood, rose, sumac, clovers, grasses, wheat, alfalfa, and soybeans are all favored foods.

TREE SQUIRRELS - The squirrel is generally considered the number two game mammal in the United States, ranking second only to the cottontail rabbit. The fox squirrel is largely an inhabitant of mature open hardwood

woodlots, while the gray squirrel lives primarily in large relatively unbroken hardwood forests. In many areas both species may be found in the same tract of woods, though normally one predominates.

Land management practices most important to tree squirrels are:

1. Control of fire and grazing in woodlots.
2. Managing woodlots and forests according to accepted forest management principles; practicing selective cutting; and leaving two or three good den trees per acre.
3. Establish and maintaining farm shelterbelts, field windbreaks, and hedgerows. The daily cruising radius of fox squirrels seldom exceeds 300 yards, seasonal ranges may cover 10 acres, while the annual range is about 40 acres.

The gestation period of squirrels is approximately six weeks. There are usually two peak periods of births: In late winter (February and March) and in summer (late July and August). Litters average two or three young.

Nests are of two types: den trees and leaf nests. Den trees are the most important affording the best protection throughout the year. There are two types of den: those used for reproduction, shelter or escape and those used for escape only. The latter consists of tree cavities that are deep or too shallow or have entrances that are too large or are too damp. Contrary to popular belief, good den trees are not always abundant, particularly in more extensive forests.

The food and cover for tree squirrels is almost synonymous. The staple diet consists of mostly nut and acorns, and in the case of the fox squirrel, corn. Favored foods are hickory nuts, oak acorn, walnuts, butternuts, beachnuts, pine seeds, maple seeds, and hazelnuts. Trees in the woodland border or in woodland openings are generally better food producers because they receive more sunlight.

MOURNING DOVES - The mourning dove, America's most important game bird, is the only native game bird that raises more than one brood a year. The dove is a distinct product of farmland and nests in every state except Alaska and Hawaii.

Land management practices most helpful to mourning doves are:

1. Establishment of farmstead shelterbelts, windbreaks and Christmas tree plantations for nesting sites.
2. Development of ponds and pits of dugouts for watering areas.
3. Establish or maintain woody cover in hedgerows, odd areas, and pond area.
4. Establish or maintain a border of coniferous trees around woodlots.

Generally two eggs are laid, two days apart. The eggs are hatched in two weeks and two weeks later the young leave the nest and the process begins again. Nesting takes place from April through August. The majority of the nests are in trees or shrubs. Red pine and Norway spruce are early season preferences, while elms, box elder and soft maple are used more in the summer.

Three to six row field windbreaks or farmstead windbreaks near small grain and mixed farming are more valuable as nesting sites than single rows located in pasture lands.

Seeds compose 98 percent of the mourning dove's diet. Agricultural crops in the form of waste grains and weed seeds compose the major source of food. At least 300 plant foods are utilized. Some of the major species are: corn, wheat, bristlegrass, crabgrass, ragweed, pokeweed, buckwheat, turkey mullein, fiddleneck, hemp, croton, wild beans, timothy, and Korean lespedeza.

WHITE TAILED DEER - The white-tailed deer is the most popular, and abundant big game animal in the United States. While the white-tail is generally thought to be a product of forested lands it often maintains higher densities and productivity where cropland, grassland and second growth woodlands are well distributed. Intensive farming areas, however, may limit deer populations because of the lack of suitable cover and the crop damage experienced by farmers.

Land management practices of benefit to deer are:

1. Protection of woodlands from grazing and uncontrolled fires.
2. Reseeding and renovation of pastures.
3. Grazing pastures within carrying capacities.
4. Fertilizing and liming of pastures.
5. Clear cutting of small areas in larger woodlands.
6. Plant field windbreaks and hedgerows as well as woody cover in odd area and around ponds or other areas to provide resting sites and travel lanes.
7. Pond and pit construction will provide desired watering places.

Deer herd control (adequate harvest) is essential in order to achieve successful land management of this species.

Contrary to popular belief white-tailed deer do not travel far. Almost 80 percent will travel less than six miles during one year.

Fawns are born in late May or June, with fawns representing 30 to 40 percent of the herd by hunting season. Less than one-tenth of the deer population exceeds an age of 5½ years.

SOURCE: More Wildlife for Recreation  
U.S. Department of Agriculture  
Soil Conservation Service

305

STUDENT WORKSHEET #1

BENEFITS AND REQUIREMENTS OF WILDLIFE

(Reference, Making Land Produce Useful Wildlife, Introduction - page 4)

1. What is a biologic balance? \_\_\_\_\_

\_\_\_\_\_

2. What three general types of wildlife can be found on a well managed area?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

3. List three benefits of wildlife.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. What are the three basic requirements of wildlife?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

5. What must an area have in order to support wildlife?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

6. What are the three essentials to good wildlife cover?

1. \_\_\_\_\_

\_\_\_\_\_

2.

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3.

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7. What are the three sources of water for wildlife?

1.

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2.

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3.

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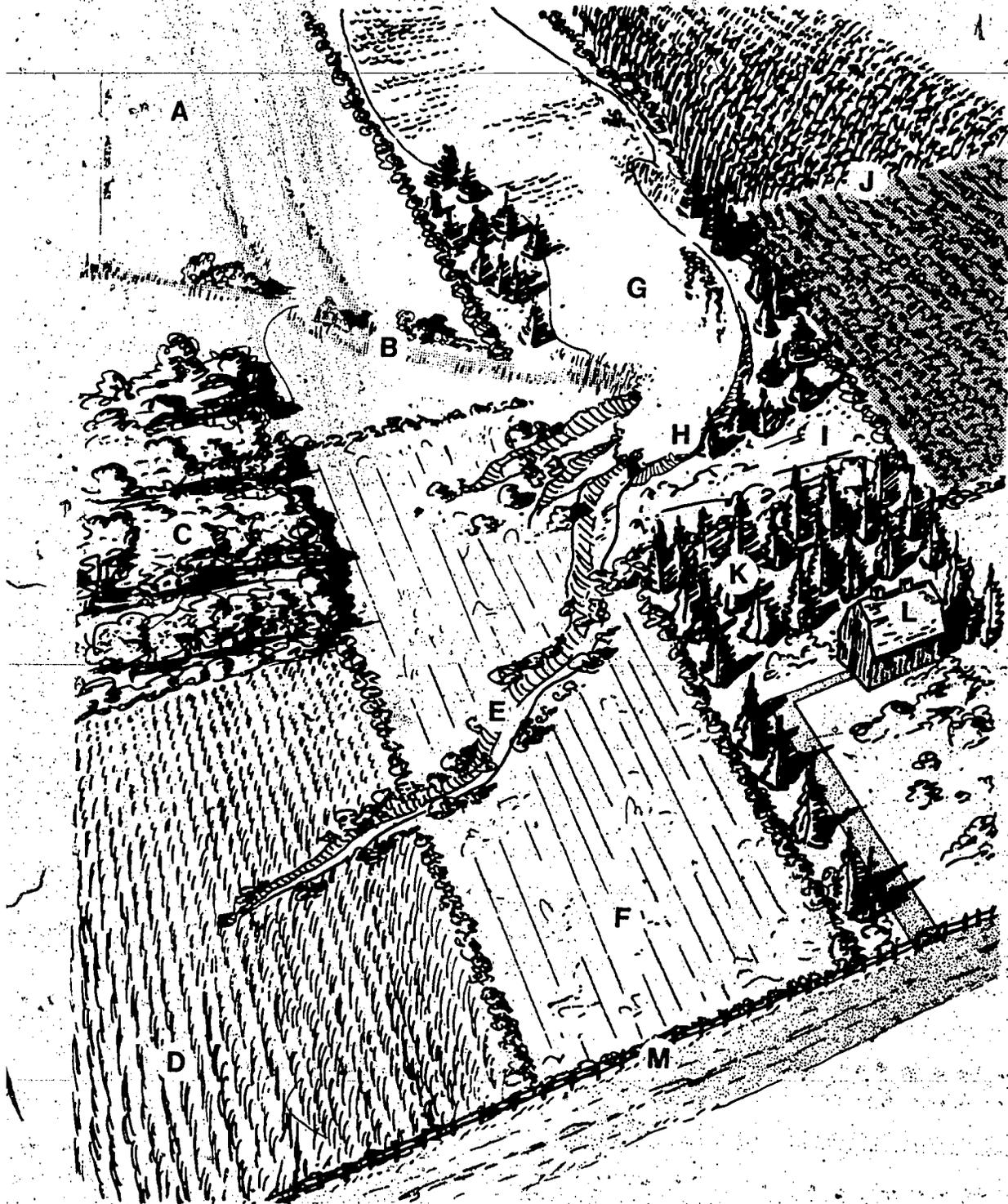
307

STUDENT WORKSHEET #2

ENDANGERED AND THREATENED SPECIES

(Reference, These Precious Few)

Use the land area in the drawing to identify the endangered animals species which might be found in the numbered areas. Assume this land is located in your area of the state (Northern, Central, or Southern).



III-F-2-17

A. Permanent pasture  
(grass and legume)

G. Pond  
(conservation water shed)

B. Grass watering  
(tall fescue, etc.)

H. Pond shoreline  
(aquatic plants)

C. Woodlot  
(native hard woods)

I. Weed patch  
(tall weeds, vines, black-  
berries, sunflowers, etc.)

D. Wheat  
(under seeded with legume)

J. Row Crop  
(cultivated corn + soybeans)

E. Drainage ditch  
(bushes and shrubs, dogwood,  
crabapples, etc.)

K. Wind break  
(tall pine trees, oak,  
hickory, etc.)

F. Hay and forage  
(tall grass vegetation)

L. Barn  
(generally unused)

M. Roadside  
(herbaceous growth, honey-  
suckle, autumn olive, etc.)

303

STUDENT WORKSHEET #3

HISTORY OF WILDLIFE HABITAT IN ILLINOIS

(Reference, These Precious Few, pages 3-4, 14-15, and 28-29)

1. In 1800, Illinois had about \_\_\_\_\_ acres of forestland; now less than \_\_\_\_\_ acres remain.

2. Most of Illinois forest land is upland composed of \_\_\_\_\_ and \_\_\_\_\_.

3. List the three United States Forest Regions in Illinois.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. In early times more than \_\_\_\_\_ of Illinois was prairie.

5. List the three types of prairie originally found in Illinois.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

6. Melting glaciers left behind \_\_\_\_\_ acres of lakes, rivers, and wetlands in Illinois.

7. List the two main reasons why wetlands have been lost.

1. \_\_\_\_\_

2. \_\_\_\_\_

8. Today fewer than \_\_\_\_\_ acres of wetlands remain in Illinois.

9. List five types of areas that are classified as wetlands.

1. \_\_\_\_\_

2.

3.

4.

5.


311

III-F-2-20

## STUDENT WORKSHEET #4

### MANAGING LAND TO MEET WILDLIFE REQUIREMENTS

State whether each of the following practices is helpful (place a plus + beside the statement), or harmful (place a minus - beside the statement.)

(Reference, Making Land Produce Useful Wildlife, pages 4-5)

#### CROPLAND

- 1. Liming and fertilizing
- 2. Clean fall plowing
- 3. Strip cropping
- 4. Leaving small amounts of grain/unharvested next to good cover
- 5. Planting cover crops
- 6. Burning of ditch banks, fence

#### PASTURELAND

- 1. Building ponds for livestock
- 2. Uncontrolled burning
- 3. Overgrazing
- 4. Complete clean mowing early in the season
- 5. Liming and fertilizing

#### RANGELAND

- 1. Reseeding
- 2. Partial brush removal
- 3. Construction of walkways in marshy range
- 4. Complete brush removal
- 5. Proper grazing and salting

#### WOODLAND

- 1. Leaving den trees when cutting hardwood timber

- 2. Grazing den tree areas
  - 3. Uncontrolled burning
  - 4. Cutting trees out of woodland borders to increase shrub growth
  - 5. Piling brush near the edge of the woods.
-

STUDENT WORKSHEET #5

MANAGEMENT OF PONDS FOR WILDLIFE

(Reference, Making Land Produce Useful Wildlife, pages 14-29)

1. List five purposes for which ponds are constructed.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

2. Where should ponds be located?

- \_\_\_\_\_
- \_\_\_\_\_

3. List four reasons for fencing livestock off of ponds.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

4. What type of plants should be planted around a pond?

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

5. What is a good fish combination for Illinois ponds?

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

6. When and how should small ponds be fished?

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7. How should bluegills be managed?

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8. List three characteristics of fertile water.

1. 

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2. 

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3. 

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9. How can pond winterkill be controlled?

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STUDENT WORKSHEET #6

MANAGEMENT OF FENCE ROWS, WILDLIFE BORDERS,  
WINDBREAKS, AND STREAMBANKS

(Reference, Making Land Produce Useful Wildlife, pages 20-29)

1. What is the main advantage of shrubby fence rows?

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2. What problems can occur with multiflora rose?

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3. List six shrubs that could be used for shrub fences besides multiflora rose.

1. _____	4. _____
2. _____	5. _____
3. _____	6. _____

4. What can you do if you don't want to grow shrubs in your fence row?

---

---

5. List two benefits and uses of wildlife borders.

1. _____
2. _____

6. List the two types of wildlife borders.

1. _____
2. _____

7. List three tall and three short shrubs useful in wildlife borders and explain how they should be arranged.

TALL

SHORT

1. _____	1. _____
----------	----------

2. \_\_\_\_\_ 2. \_\_\_\_\_  
3. \_\_\_\_\_ 3. \_\_\_\_\_

Arrangement: \_\_\_\_\_  
\_\_\_\_\_

8. What is the general purpose of windbreaks?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

9. List two benefits of windbreaks to wildlife.

1. \_\_\_\_\_  
2. \_\_\_\_\_

10. Shrub hardwood windbreaks usually consist of \_\_\_\_\_ rows.  
In four row windbreaks, the outer two rows are \_\_\_\_\_  
and the inner two rows are \_\_\_\_\_.

11. List five shrubs and five hardwood trees that are useful in windbreaks.

Shrubs:

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_  
4. \_\_\_\_\_  
5. \_\_\_\_\_

Hardwood trees

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_  
4. \_\_\_\_\_  
5. \_\_\_\_\_

(both shrub and trees depend on your locality)

12. List three benefits of well managed stream banks.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

13. List four factors to consider when deciding on the treatment of streambanks.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

14. List three shrubs and three conifers that can help produce wildlife and help in the management of stream banks.

SHRUBS

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

CONIFERS

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

STUDENT WORKSHEET #7

MANAGEMENT OF POPULAR ILLINOIS GAME SPECIES

(Reference Information Sheet)

1. A favorable land use pattern for pheasants would consist of:

- \_\_\_\_\_ % of the area in cultivated crops,
- \_\_\_\_\_ % of the area in hay and rotation pasture,
- \_\_\_\_\_ % of the area in brush and woods,
- \_\_\_\_\_ % of the area in brushy fence rows and their permanent cover.

2. The seasonal range of pheasants generally does not exceed \_\_\_\_\_ miles.

3. Pheasants generally nest in \_\_\_\_\_ in the outer \_\_\_\_\_ feet.

4. Most pheasant losses are due to \_\_\_\_\_.

5. List five common food sources for pheasants:

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_

Others: barley, oats, rose hips, dogwood, wild cherry, nannyberries, highbush cranberries

6. The ideal land use pattern for bobwhite quail would be:

- \_\_\_\_\_ % grassland
- \_\_\_\_\_ % cropland
- \_\_\_\_\_ % brushy cover
- \_\_\_\_\_ % woodlands

7. The annual range of bobwhite quail rarely exceeds \_\_\_\_\_ mile.

8. The bobwhite quail start laying eggs in \_\_\_\_\_  
\_\_\_\_\_ eggs are generally laid and are incubated in \_\_\_\_\_  
days.

9. Generally \_\_\_\_\_ % of quail are lost during the 16-week growing up period.

10. Quail require \_\_\_\_\_ and \_\_\_\_\_ cover.

11. List five common seed sources for quail feed:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

12. \_\_\_\_\_ and \_\_\_\_\_ should be about equally represented and well distributed for cottontail rabbits.

13. The annual range of cottontails seldom exceeds \_\_\_\_\_ acres.

14. Less than \_\_\_\_\_ percent of rabbits live more than one year.

15. Protected \_\_\_\_\_ and \_\_\_\_\_ are the primary limiting factors for the cottontail rabbit in the midwest agricultural areas.

16. List five food sources for rabbits:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

17. Where are fox and gray squirrel generally found?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

18. The annual range of squirrels is about \_\_\_\_\_ acres.

19. List the two types of squirrel nest and the two types of dens.

1. \_\_\_\_\_ 1. \_\_\_\_\_  
2. \_\_\_\_\_ 2. \_\_\_\_\_

20. The two main foods of squirrels are \_\_\_\_\_ and \_\_\_\_\_

21. The mourning dove nests from \_\_\_\_\_ to \_\_\_\_\_  
and generally lay \_\_\_\_\_ eggs which hatch \_\_\_\_\_ weeks  
later.

22. \_\_\_\_\_ compose 98% of the mourning doves diet.

23. List five common seed sources for the mourning doves diet:

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_  
4. \_\_\_\_\_  
5. \_\_\_\_\_

24. The most popular and abundant big game species in Illinois is the \_\_\_\_\_

25. List the two limitations of white tail deer in extensive farming areas.

1. \_\_\_\_\_  
2. \_\_\_\_\_

26. Most deer travel less than \_\_\_\_\_ miles in a year.



## STUDENT JOB SHEET

### WILDLIFE MANAGEMENT INVENTORY

#### OBJECTIVES:

1. To understand the relationship between farming techniques and wildlife management.
2. To recognize and map wildlife sites.
3. To compare and contrast two or more farm sites for approved wildlife management practices.

#### MATERIALS:

1. Plant identification booklet.
2. Soil map of area.
3. Wildlife identification booklet.
4. Two comparable field sites.

#### PROCEDURE:

1. Diagram the field site. If possible, obtain aerial photo from local SCS office to help identify field locations.
2. Mark the major natural features of the area such as roads, ditches, waterways, wooded areas, buildings, wet spots, ponds, fences, cropland, etc.
3. Identify potential areas which can provide food and/or shelter for wildlife. Make note of types of ground cover such as grasses (short or tall), shrubs, herbaceous plants, woody plants.
4. Record any noticeable signs of wildlife such as, visible contact, hearing, tracks, droppings, feeding areas, nesting spots, etc.
5. Use symbols to represent items on your map. Use a different symbol for each type of vegetation and animal specie.

## WILDLIFE SURVEY FORM

### I. Sketch, or diagram, of wildlife area.

### II. Survey observations.

Consider the following points about each area.

- A. What are the physical characteristics of the area? (specific plants, topography, animal species, etc.)
- B. How valuable is the area to wildlife? To people?
- C. How could the characteristics of the area be changed or improved for wildlife?
- D. What are some options or recommendations for using this land area? (cropland, nature preserve, public hunting, housing division, public park, etc.)
- E. Try to establish the cause for any differences in wildlife numbers between the sites. (different farming practices, drainage, etc.)

TEACHER'S KEY

STUDENT WORKSHEET #1

BENEFITS AND REQUIREMENTS OF WILDLIFE

(Reference: Making Land Produce Useful Wildlife, Introduction - page 4)

1. What is a biologic balance? It is a community of living things in an area which has an abundance of helpful kinds of plants and animals and a low number of the harmful kind.

2. What three general types of wildlife can be found on a well managed area?

1. Millions of beneficial insects
2. More than 400 beneficial birds
3. More than 1,000 beneficial small mammals

3. List three benefits of wildlife.

1. Ecological (Control harmful insects and rodents)
2. Economic (Fur bearing mammals provide recreation and cash)
3. Esthetic Value (The beauty of seeing wildlife in native habitat)

4. What are the three basic requirements of wildlife?

1. Food
2. Cover
3. Water

5. What must an area have in order to support wildlife?

A plentiful supply of good food close to cover that furnishes protection from enemies and weather. And it must be available during all seasons.

6. What are the three essentials to good wildlife cover?

1. Grass, weeds, stubble, and other low growing plants for nesting and roosting.

2. Dense or thorny plants and shrubs for protection from predators  
for loafing, and for nesting.

3. Clumps of evergreens or other tall dense cover for winter protec-  
tion.

7. What are the three sources of water for wildlife?

1. Surface water

2. Food

3. Dew

325

TEACHER'S KEY  
STUDENT WORKSHEET #3

HISTORY OF WILDLIFE HABITAT IN ILLINOIS

(Reference, These Precious Few, pages 3-4, 14-15, and 28-29)

1. In 1800, Illinois had about 14 million acres of forestland, now less than 3.2 million acres remain.

2. Most of Illinois forest land is upland composed of oak, hickory, mixed hardwoods, and scrub hardwoods.

3. List the three United States Forest Regions in Illinois.

1. Eastern Deciduous

2. Southeastern Coastal Plain

3. Northern Coniferous

4. In early times more than two thirds of Illinois was prairie.

5. List the three types of prairie originally found in Illinois.

1. Tall grass

2. Sand

3. Hill

6. Melting glaciers left behind 1.4 million acres of lakes, rivers, and wetlands in Illinois.

7. List the two main reasons why wetlands have been lost.

1. To make room for farmland

2. Commerical development

8. Today fewer than 500,000 acres of wetlands remain in Illinois.

9. List five types of areas that are classified as wetlands.

1. Seasonally flooded basins or flats.

2. Wet meadows
  3. Shallow or deep marshes
  4. Swamps
  5. Bogs
-

TEACHER'S KEY

STUDENT WORKSHEET #4

MANAGING LAND TO MEET WILDLIFE REQUIREMENTS

State whether each of the following practices is helpful (place a plus + beside the statement), or harmful (place a minus - beside the statement.)

(Reference, Making Land Produce Useful Wildlife, pages 4-5)

CROPLAND

- + 1. Liming and fertilizing
- 2. Clean fall plowing
- + 3. Strip cropping
- + 4. Leaving small amounts of grain unharvested next to good cover
- + 5. Planting cover crops
- 6. Burning of ditch banks, fence rows

PASTURELAND

- + 1. Building ponds for livestock
- 2. Uncontrolled burning
- 3. Overgrazing
- 4. Complete clean mowing early in the season
- + 5. Liming and fertilizing

RANGELAND

- + 1. Reseeding
- + 2. Partial brush removal
- + 3. Construction of walkways in marshy range
- 4. Complete brush removal
- + 5. Proper grazing and salting

WOODLAND

- + 1. Leaving den trees when cutting hardwood timber

- 2. Grazing den tree areas
  - 3. Uncontrolled burning
  - + 4. Cutting trees out of woodland borders to increase shrub growth
  - + 5. Piling brush near the edge of the woods.
-

TEACHER'S KEY

STUDENT WORKSHEET #5

MANAGEMENT OF PONDS FOR WILDLIFE

(Reference, Making Land Produce Useful Wildlife, pages 14-29)

1. List five purposes for which ponds are constructed.

1. Soil erosion and flood control
2. Water storage for livestock, irrigation, orchard spraying, etc.
3. Fish production
4. Drinking water for wildlife
5. Resting, feeding, and breeding places for ducks

2. Where should ponds be located?

Ponds must be located on relatively tight subsoils or they must be sealed with clay.

3. List four reasons for fencing livestock off of ponds.

1. Help prevent the spread of livestock diseases
2. To protect the fill, spillway, and pond banks from trampling
3. To provide a filter strip of grass to remove silt from water entering the pond
4. To allow you to make planting for upland game, if needed

4. What type of plants should be planted around a pond?

Some type of thorny shrub should be used to establish a fence. All raw areas above the waterline should be seeded to adapted grasses and shallow rooted legumes. Keep woody plants back 25 feet if pond is used for fish production. If muskrats and ducks are being produced provide loafing areas in shallows, planted in cattails, arrowhead, bulrushes, or burreeds.

5. What is a good fish combination for Illinois ponds?

Largemouth black bass, bluegills, and red-eared sunfish make a very good combination. Channel catfish may be stocked alone or with the above.

6. When and how should small ponds be fished?

Most farm ponds are not fished heavily enough. Fishing should begin as soon as both bass and sunfish have spawned for the first time.

Fish lightly the first 2-3 months and heavily thereafter. It is not good management to throw back any fish caught on hook or line except undersized bass.

7. How should bluegills be managed?

Bluegills should never be returned to the water, regardless of size.

Generally three-fourths of your total pounds of fish are bluegills.

A harvest of 3-4 pounds of bluegill for every pound of bass should be taken.

8. List three characteristics of fertile water.

1. Shades out submerged weeds.

2. It is greenish and opaque.

3. Sunlight does not enter the water to any great depth.

9. How can pond winterkill be controlled?

You should remove the snow from part of the pond surface and lower the water a few inches below the ice to admit air.

TEACHER'S KEY

STUDENT WORKSHEET #6

MANAGEMENT OF FENCE ROWS, WILDLIFE BORDERS,  
WINDBREAKS, AND STREAMBANKS

(Reference, Making Land Produce Useful Wildlife, pages 20-29)

1. What is the main advantage of shrubby fence rows?  
Shrubby fence rows have been shown to harbor fewer harmful and many more beneficial kinds of wildlife than do grassy fence rows.
2. What problems can occur with multiflora rose?  
It may spread into pastures and abandoned farmlands where it is unsirable.
3. List six shrubs that could be used for shrub fences besides multiflora rose. (students should have six of the following thirteen listed)
  1. Red Cedar Bush, honeysuckle
  2. Gray dogwood, Russan olive
  3. American hazelnut, pyrocantha
  4. Elder, choke cherry, trifoliata
  5. Silky cornel, buffaloberry,
  6. Highbush cranberry, autumn olive
4. What can you do if you don't want to grow shrubs in your fence row?  
You can improve them for wildlife by planting them in sericea lespedeza or sweetclover.
5. List two benefits and uses of wildlife borders.
  1. Used to control erosion
  2. To make use of narrow strips of land in which crops are hard to grow.
6. List the two types of wildlife borders.
  1. Grass and legume borders
  2. Shrub or shrub and conifer borders.
7. List three tall and three short shrubs useful in wildlife borders and explain how they should be arranged.

TALL Student should have three SHORT  
of the following five

- |                                    |                       |
|------------------------------------|-----------------------|
| 1. <u>Wild plum, Autumn olive,</u> | 1. <u>Honeysuckle</u> |
| 2. <u>Thornapple, Nannyberry,</u>  | 2. <u>Dogwood</u>     |
| 3. <u>Highbush cranberry</u>       | 3. <u>Hazelnut</u>    |

Arrangement: Plant four rows four feet apart. Plant the taller shrubs (two rows) next to the woods and the lower shrubs in the outer two rows.

8. What is the general purpose of windbreaks?

Field windbreaks are planted in crop fields to help control wind erosion and lessen the drying effect of wind on the soil. They conserve snow moisture needed in low rainfall and light soil areas.

9. List two benefits of windbreaks to wildlife.

- They create homes for insect-eating birds close to cropland
- They provide cover and travel lanes for game.

10. Shrub hardwood windbreaks usually consist of 4 to 12 rows. In four row windbreaks, the outer two rows are shrubs, conifers and the inner two rows are hardwood trees.

11. List five shrubs and five hardwood trees that are useful in windbreaks.

Shrubs  
Should have 5 of these 12

- Bush honeysuckle, wild plum
- Amur, multiflora rose,
- Autumn olive, desert willow
- Russian olive, chokecherry,

Hardwood trees  
Should have five of these 11

- American elder, boxelder, green ash,
- soft maple, black locust, Chinese elm,
- mulberry, catalpa,
- apricot, cottonwood,

5. Buffalo berry, juniper  
Pyrocantha, squawbush

5. willow

(both shrub and trees depend on your locality)

12. List three benefits of well managed stream banks.

1. Control bank cutting

2. Protect valuable adjoining property

3. Reduce the silt load in streams

13. List four factors to consider when deciding on the treatment of streambanks.

1. Size of the watershed draining into the stream

2. Expected runoff and flood peaks

3. Expected ice and debris load to be carried by the stream

4. The causes of meandering and erosion

14. List three shrubs and three conifers that can help produce wildlife and help in the management of stream banks.

#### SHRUBS

1. Red-osier dogwood

Other - Nannyberry, High-bush cranberry

2. Silky cornel

3. Russian-olive

#### CONIFERS

1. White pine

Others - Rocky Mountain juniper  
Norway spruce

2. Yellow pine

3. Northern white cedar

TEACHER'S KEY  
STUDENT WORKSHEET #7

MANAGEMENT OF POPULAR ILLINOIS GAME SPECIES

(Reference, Information Sheet)

1. A favorable land use pattern for pheasants would consist of:  
65-80 % of the area in cultivated crops,  
15-30 % of the area in hay and rotation pasture,  
5-10 % of the area in brush and woods,  
3 % of the area in brushy fence rows and other permanent cover.
2. The seasonal range of pheasants generally does not exceed 1 mile(s).
3. Pheasants generally nest in grass in the outer 100 feet.
4. Most pheasant losses are due to mowing.
5. List five common food sources for pheasants:
  1. Corn
  2. Foxtail
  3. Common Ragweed
  4. Wild Buckwheat
  5. WheatOthers: barley, oats, rose hips, dogwood, wild cherry, nannyberries, highbush cranberries
6. The ideal land use pattern for bobwhite quail would be:  
30-40 % grassland  
40-60 % cropland  
5-20 % brushy cover  
5-40 % woodlands
7. The annual range of bobwhite quail rarely exceeds 1 mile(s).
8. The bobwhite quail start laying eggs in late April or early May.  
7-30 eggs are generally laid and are incubated in 23 days.

9. Generally 25-40 % of quail are lost during the 16-week growing up period.

10. Quail require herbaceous and woody cover.

11. List five common seed sources for quail feed:

- |                    |   |
|--------------------|---|
| 1. <u>Corn</u>     | Others: ragweed, bristle grass, lespedeza, beggarweed, sunflower, oakacorns, partridge pea, switch grass, grain sorghum, vetch. |
| 2. <u>Wheat</u>    |   |
| 3. <u>Rye</u>      |   |
| 4. <u>Soybeans</u> |   |
| 5. <u>Cowpeas</u>  |   |

12. Cropland, grassland, and woodland should be about equally represented and well distributed for cottontail rabbits.

13. The annual range of cottontails seldom exceeds 20 acres.

14. Less than 15-25 percent of rabbits live more than one year.

15. Protected nesting cover and winter cover are the primary limiting factors for the cottontail rabbit in the midwest agricultural areas.

16. List five food sources for rabbits:

- |                      |   |
|----------------------|---|
| 1. <u>Apple</u>      | Others: Willow, basswood, dogwood, rose, sumac, clovers, grasses, wheat, alfalfa, soybeans. |
| 2. <u>Blackberry</u> |   |
| 3. <u>Dewberry</u>   |   |
| 4. <u>Birch</u>      |   |
| 5. <u>Maple</u>      |   |

17. Where are fox and gray squirrel generally found?

The fox squirrel is largely an inhabitant of mature open hardwood woodlots, while the gray squirrel lives mostly in unbroken hardwood forests.

18. The annual range of squirrels is about 40 acres.

19. List the two types of squirrel nest and the two types of dens.

1. Den trees

1. Those for reproduction, shelter and escape

2. Leaf nests

2. Those for escape only

20. The two main foods of squirrels are nuts and acorns

21. The morning dove nests from April to August and generally lay 2 eggs which hatch 2 weeks later.

22. Seeds compose 98% of the mourning doves diet.

23. List five common seed sources for the mourning doves diet:

1. Corn

Others: Pokeweed, buckwheat, turkey mullein, fiddle-neck, hemp, croton, wild beans, timothy, lespedeza.

2. Wheat

3. Bristle grass

4. Crabgrass

5. Ragweed

24. The most popular and abundant big game species in Illinois is the White-tailed deer

25. List the two limitations of white tail deer in extensive farming areas:

1. Lack of suitable cover

2. Crop damage

26. Most deer travel less than six miles in a year.

# Benefits of Wildlife

Food  
Pleasure (aesthetic value)  
Environmental Balance

---

Clothing  
Cash Income  
Hunting  
Pest Control



III-F-2-47

# Wildlife Land Areas

Wetlands  
Ditchbanks  
Odd Areas  
Ponds

Fence Rows and Hedges  
Wildlife Borders  
Windbreaks  
Streambanks

---



# Wetland Habitats

Seasonally Flooded Basins

Wet Meadows

Shallow and Deep Marshes

Swamps

Bogs

Ponds and Lakes

Open Waterways

Streams and Rivers



III-F-2-49

# Requirements of Wildlife

## 1. Food in all seasons

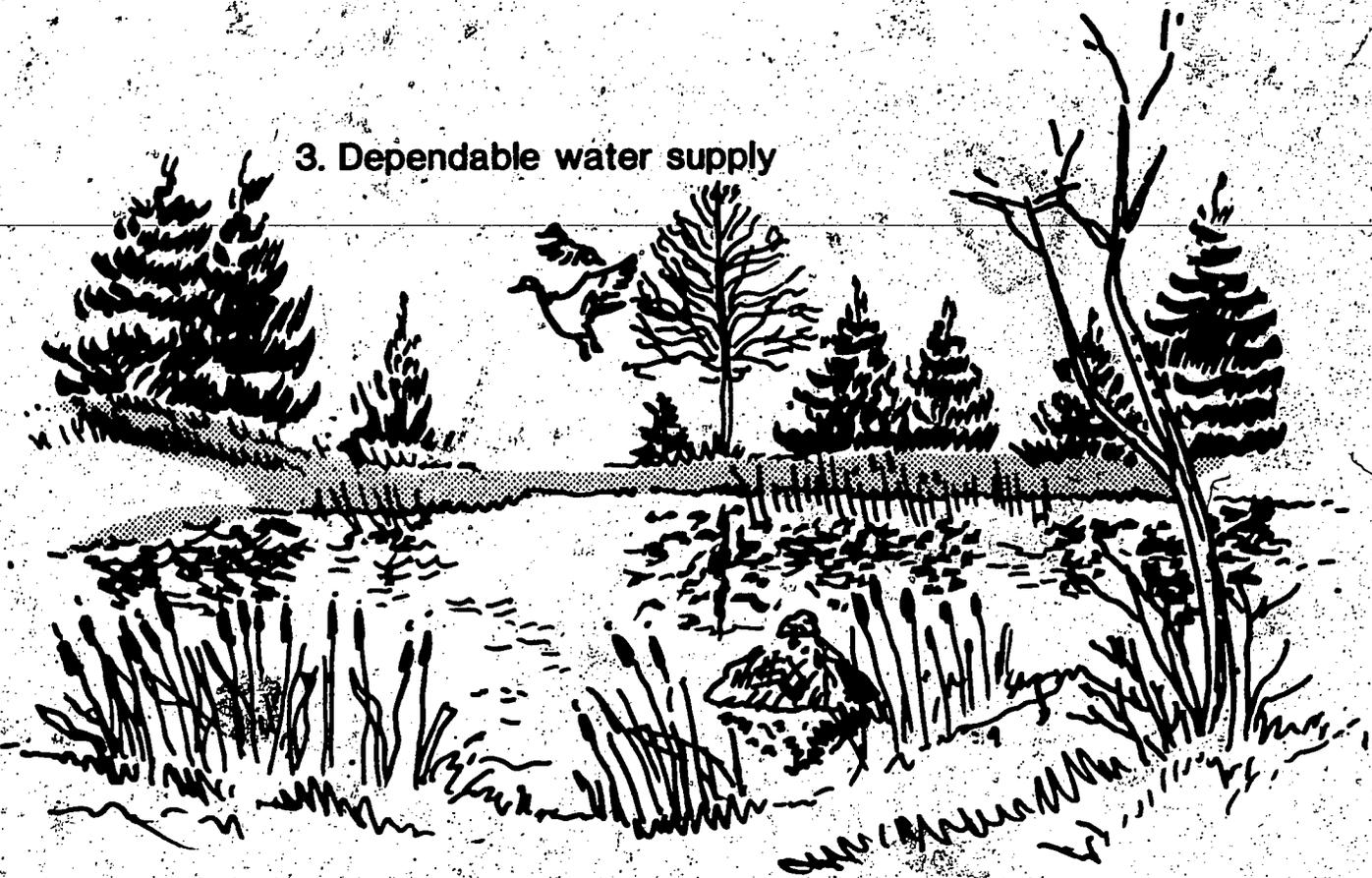


## 2. Shelter for nesting, escape, and loafing



III-F-2-50

3. Dependable water supply



4. Space to live naturally



III-F-2-51

## TRANSPARENCY DISCUSSION GUIDE

### CONSERVING WILDLIFE RESOURCES

#### I. Transparency--BENEFITS OF WILDLIFE

- A. Ask students to identify possible benefits of wildlife.
- B. Discuss and classify the benefits as personal or society.
- C. Briefly review the public's attitude toward wildlife and natural resources.
- D. Use this transparency when discussing worksheet 1.

#### II. Transparency--WILDLIFE LAND AREAS

- A. Use this transparency to start students thinking about the different types of wildlife habitat areas found in the local community.
- B. Point out the type of animal and/or plant wildlife commonly found in each land area.
- C. Point out the approved management practices which could be adapted to promote wildlife in each area.

#### III. Transparency--WETLAND HABITATS

- A. Point out the importance of wetland areas to Illinois' history.
- B. Use a map of Illinois to identify where some of the wetland areas are located in Illinois.
- C. Have students identify wildlife species common to Illinois wetlands.
- D. Have class discuss some ideas on how the state's wetlands could be protected and improved.

#### IV. Transparency--REQUIREMENTS OF WILDLIFE

- A. Point out the major survival requirements of all living things, then relate this list to Illinois wildlife.
- B. Ask students to identify local farming practices which aid or hinder wildlife growth.

- C. Have class develop a list of approved practices which could improve the four requirements identified on the transparency.
  - D. Discuss the farmers conflict between farming efficiency and wildlife management.
  - E. Have class identify projects the FFA chapter could conduct to improve the local wildlife populations.
-

TEACHER'S KEY  
MANAGING WILDLIFE  
SAMPLE TEST QUESTIONS

Short answer and essay

1. List the three requirements for wildlife.

1. Food      2. Cover      3. Water

~~2. What are the three essentials to good cover for wildlife?~~

1. Plentiful supply of good food  
2. Close to cover for nesting and roosting  
3. Cover that furnishes protection

3. List three sources of water for wildlife.

1. Surface water  
2. Food  
3. Dew

4. What three factors are necessary in order for a marsh to be productive for furbearers or waterfowl?

1. A dependable water supply  
2. Water level control facilities  
3. Vegetation for feeding, nesting and resting

5. What animals will benefit from good ditchbank management?

- Fur bearers, gamebirds, mammals, and songbirds

6. List three odd areas that can be used for wildlife areas.

1. Eroded areas in crop fields      Others: Sand blowouts, large gullies, abandoned roads, fence rows, gravel pits.  
2. Bare knobs  
3. Sinkholes

7. List two reasons why ponds should be fenced.

1. Prevent the spread of livestock diseases  
2. To protect the fill, spillway and pond banks from trampling.

8. How can winterkill be reduced?

Remove the snow from part of the surface ice, or lower water level to admit air under the ice

9. List five good shrubs for fencerows.

1. Multiflora rose

Others: Cornel, cranberry, honeysuckle

2. Hazelnut

3. Red Cedar

4. Elder

5. Gray dogwood

10. List three plants that make good wildlife borders.

1. Wild plum

Others: Nannyberry, cranberry honeysuckle, dogwood, hazelnut

2. Autumn olive

3. Thornapple

11. List three good shrubs for windbreaks.

1. Honeysuckle

Others: Autumn olive, wild plum, chokecherry, willow, buffalo berry

2. Privet

3. Amur

12. List three factors that should be considered before you start treatment of any streambank.

1. Size of watershed

Causes of meandering and erosion

2. Expected runoff

3. Expected ice and debris load

13. List the three types of prairies originally found in Illinois.

1. Tall grass

2. Sand

3. Hill

14. List three types of areas that are classified as wetlands.

1. Seasonally flooded basins      Others: Swamps, Bogs
2. Wet meadows
3. Shallow or deep meadows

15. List three animals commonly found in Illinois forests, open fields, and wetlands which were identified during class discussion.

Forests

Open Fields

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Wetlands

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

16. List three factors that should be considered when deciding on trees and shrubs for wildlife habitat areas.

1. Soil
2. Moisture
3. Nutrients      Sunlight

17. List three advantages of having wildlife in your backyard.

1. Entertaining
2. Learning experience for children
3. Increase value of land

18. List two food sources for each of the following. (See information sheet)

Pheasants

Bobwhite quail

Rabbits

1. \_\_\_\_\_
2. \_\_\_\_\_

1. \_\_\_\_\_
2. \_\_\_\_\_

1. \_\_\_\_\_
2. \_\_\_\_\_

Squirrels

Deer

1. \_\_\_\_\_

1. \_\_\_\_\_

2. \_\_\_\_\_

2. \_\_\_\_\_

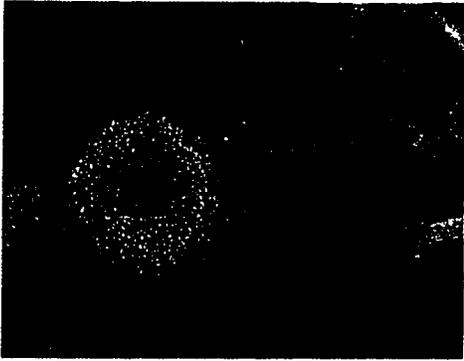
True or False

- T 1. In order to support wildlife a farm or ranch must have a plentiful supply of good food close to cover that furnishes protection.
- T 2. Most kinds of wildlife need several kinds of cover.
- 
- T 3. Cropping systems should include grass-legume meadows.
- T 4. Liming and fertilizing is a good wildlife management practice.
- T 5. Strip cropping is a helpful wildlife practice.
- T 6. Mowing of headlands, roadsides and watercourses should be delayed until after nesting season.
- F 7. One-half to three fourths acre of grain should be left standing next to good cover.
- F 8. Lands should be fall plowed to increase wildlife production.
- F 9. Ditches and fence rows should be burned to provide good plant growth for wildlife in the spring.
- T 10. Land should not be overgrazed.
- T 11. Brush should be piled near the edge of woodlands.
- F 12. Den trees should be cut down when they get old.
- T 13. Sometimes wildlife lands should be burned.
- T 14. Herbicides may be a useful means of controlling unwanted plant growth on wildlife areas.
- T 15. Water should be managed on wildlife areas.
- F 16. At least three fourths of an odd area should be left in a good ground cover consisting of grasses and legumes.
- T 17. A living fence of multiflora rose or other thorny shrub is good for keeping livestock out of odd areas.
- T 18. Ponds will not hold water unless they are located on clay or on tight subsoils.
- T 19. Largemouth bass, bluegills and sunfish make a good combination for warm water ponds.

- T 20. Never return bluegills to water.
- T 21. Fertile waters shade out submerged weeds.
- T 22. A major cause of winter kill in ponds is from snowfall blocking out the sunlight from the water surface.
- T 23. Wildlife borders are used to control erosion and to make use of narrow strips of land in which farm grain crops are hard to grow.
- T 24. Field windbreaks are planted in crop fields to help control wind erosion and to lessen the drying effect of wind on the soil.
- 
- T 25. Field windbreaks help conserve soil moisture in low rainfall and light soil areas.
- T 26. Illinois had about 14 million acres of forestland at one time.
- F 27. Over two-thirds of Illinois was originally forestland.
- F 28. Glaciers left behind about 1/2 million acres of lakes, rivers, and wetlands.
- T 29. One of the main reasons wetlands have been lost is to make room for farmland.
- T 30. One of the main trees found in upland forest stands is oak.
- F 31. There are two main stages in the development of backyard wildlife habitats.
- T 32. The local agriculture county agent can be helpful in developing wildlife habitat for the backyard.
- F 33. About 60 percent of pheasant habitat should be brush and woods.
- F 34. Most pheasants nest in shrubs near the outer 50 feet of fields.
- T 35. Around forty percent of quail habitat should be grasslands.
- T 36. Quail and pheasant rarely range much further than one mile.
- F 37. Generally only 25 to 40 percent of quail are left after the first 16 weeks of growing up.
- T 38. Cotton tail rabbits require about equal amounts of cropland, grassland, and woodland for habitat.
- F 39. Cottontail range areas rarely exceed twenty acres in one year.
- F 40. Less than 15 to 25 percent of rabbits live more than six months.

- F 41. The annual range of squirrels is about 10 acres.
- F 42. Seeds compose 50 percent of the mourning doves diet.
- F 43. The fox is the most abundant big game animal in Illinois.
- T 44. White tail deer travel about six miles annually.
- T 45. White-tail deer can cause crop damage on intensive farming areas.

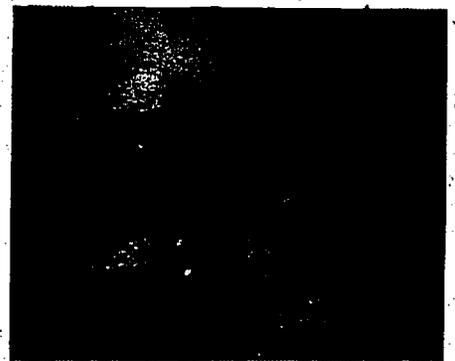
# APPLE DISEASES I



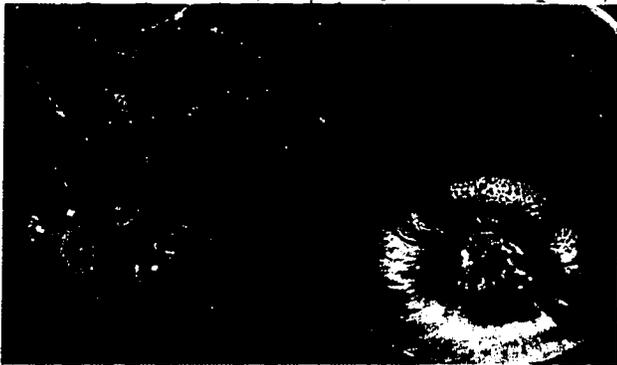
1. Northwestern anthracnose or bull's-eye rot



2. Bitter rot



3. Botrytis rot



4. Black rot or frog-eye leaf spot



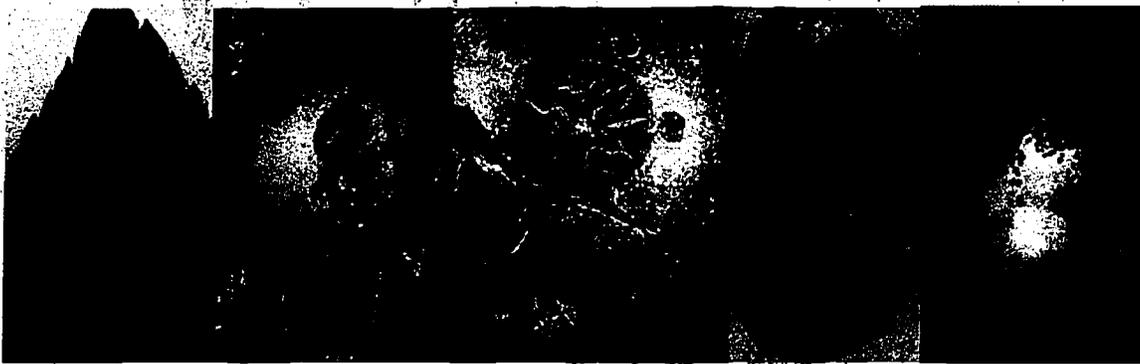
5. Sooty blotch and flyspeck



6. Soft rot or blue mold rot



7. Internal breakdown



8. Apple scab



9. Soft scald



10. Cedar-apple rust



11. Quince rust



11. Nectria canker

## APPLE DISEASES I

- 1. Northwestern anthracnose or bull's-eye rot**, caused by the fungus *Neofabraea malicorticis*, is a rot primarily of stored fruit and a branch canker disease found mostly in northern areas (chiefly the Pacific Northwest) with a heavy autumn rainfall. The centers of the concave fruit lesions are light brown with a dark brown margin. Later, two or more concentric rings, alternating tan and brown, give a bull's-eye appearance to the rot. Enlarging, elliptical, dark sunken cankers with concentric rings, form in the younger branches. The causal fungus, which can only invade injured tissue, overseasons in cankered limbs and fruit.
- 2. Bitter rot** is a fairly firm rot that starts as a small, circular, light brown spot which enlarges rapidly, darkens, and eventually turns almost black. Characteristic of this rot is the saucer-shaped depression in the center and later the concentric rings of tan fungus fruiting structures that form inside the spot. The bitter rot fungus, *Glomerella cingulata*, attacks a wide range of woody plants during warm moist weather in the southern two-thirds of the United States. The source of most infections are mummified fruit and broken limbs.
- 3. Botrytis rot** is fairly common on injured mature fruit. The causal fungus, *Botrytis cinerea*, attacks a wide range of plants in cool damp weather. Characteristic of this disease is (1) a small, quarter- to half-inch, somewhat sunken, shallow dry rot at the blossom end of the fruit, (2) a moldy core rot, and (3) a tan-to-medium brown rot covered by a dense, tan-to-gray mold that forms under damp conditions. The fungus overseasons in plant debris.
- 4. Black rot or frog-eye leaf spot** is caused by the fungus *Phylospora obtusa*, which infects the leaves, fruits and wood. Small purple specks on the leaves enlarge to form round to angular spots with a dark margin and brown or yellowish-brown centers (called frog-eyes). Twig, limb and trunk cankers are slightly sunken and reddish brown. Some cankers enlarge each year until they cover several feet. The canker margins are lobed. Diseased fruit develop a brown-to-black rot containing alternating light and dark bands. Such fruit often shrivel into black "mummies" that hang in a tree overwinter. The black rot fungus overwinters in mummified fruit and dead wood.
- 5. Sooty blotch and flyspeck** normally occur together on the same fruit. Sooty blotch is caused by the fungus *Gloeodes pomigena*; flyspeck by the fungus *Microthyriella rubi*. Sooty blotch gives a superficial smudgy appearance to affected fruit due to large numbers of minute, black fungus structures (pycnidia) connected by thread-like hyphae. Flyspeck consists of shiny, black dots in groups of 10 to 50 that resemble true flyspecks. Both fungi are superficial and can be removed by vigorous rubbings. They overwinter on the twigs of many woody plants.
- 6. Soft rot or blue mold rot** is the most common storage rot. This soft to watery, tan-to-brown or gray rot is most prevalent in fruit with a bruised or broken skin handled roughly at harvest time and later. When humidity is high, gray-to-bright blue cushion-like structures form on the surface of the rot. The primary cause of soft rot is the fungus *Penicillium expansum*.
- 7. Internal breakdown** characterizes the gradual transition from the normal to the senescent fruit; the end of normal storage life. The fruit flesh becomes off-white to yellow, then brown and mealy. In advanced stages, the skin is also discolored and the flesh slowly softens. Large apples, late picking, delayed cooling, and high storage temperatures are primary factors that lead to early breakdown. It commonly follows water core and freezing and may be associated with a very low calcium and/or phosphorus status in the tree.
- 8. Apple scab** occurs wherever apples and crabapples are grown. Scab infects primarily the leaves and fruit. Velvety, green-to-brown spots, that blacken with age, appear on the leaf. Infection causes the leaves to drop early greatly weakening the tree. Fruit infections resemble leaf infections when young; later, becoming brownish-black and corky. Early fruit infections give the fruits a scabby, knotty, misshapen appearance. Such fruit commonly crack and drop early. Small, rough, black, circular, lesions may develop on stored fruit. The scab fungus, *Venturia inaequalis*, overwinters in dead leaves on the ground.
- 9. Soft scald** is a physiological or noninfectious disease that attacks fruit picked when immature and stored under unfavorable conditions. The degrees of scald are classified as common scald, soft scald, and soggy breakdown. Common scald first appears as a diffuse browning of the skin, which is most pronounced on light colored varieties. Usually a sharp line exists between affected and normal fruit tissue. Soft scald is characterized by irregular, burn-like brown areas with definitely outlined edges. The flesh beneath these areas is often soft and discolored to a slight depth. In advanced stages, a deep brown flesh rot develops that may extend to three-fourths of the fruit. Sometimes the brown areas in the flesh remain small and firm; at other times large, soft and watery (soggy breakdown). Apple varieties differ markedly in the scald symptoms they express.
- 10. Cedar-apple rust**, caused by the fungus *Gymnosporangium juniper-virginianae*, commonly occurs on leaves and fruit, and occasionally the twigs. Leaf infections appear as pale yellow spots on the upper surface which enlarge, turn orange and exude an orange exudate in the center. Later, black fruiting bodies (pycnia) appear within the spot. On the underleaf surface, a number of orange-yellow, tube-like structures (aecia) form in each spot. When severe, leaves may turn yellow and drop early. Fruit lesions appear usually near the calyx end. They resemble leaf lesions, but are much larger. Aecia sometimes appear on the fruit. The rust fungus overseasons on red cedars and other *Juniper* species where brown to reddish brown galls are formed that produce gelatinous masses of yellow to bright orange spore-horns during spring rains.  
  
Two other rust fungi attack apples: hawthorn rust (*Gymnosporangium globosum*) and quince rust (*G. clavipes*). Hawthorn rust may infect apple foliage and fruit, producing symptoms similar to those of cedar-apple rust. Quince rust infects apple fruit but not the leaves. Fruit lesions are somewhat similar to those of cedar-apple rust except that they are usually larger, dark green, and commonly produce deep, crater-like depressions. Both the hawthorn and quince rust fungi overseason on *Juniperus* species. The quince rust fungus produces somewhat swollen, spindle-shaped swellings on juniper twigs, branches, and trunks that are covered with orange gelatinous masses during and following spring rains.
- 11. Nectria canker**, caused by the fungus *Nectria galligena*, attacks a wide range of woody plants especially in northern areas with a maritime climate. Slowly enlarging, sunken or flattened areas of bark, usually centered around the base of a dead side shoot or wound, form on the twigs and branches. The girdling cankers slowly enlarge, becoming conspicuous and somewhat targetlike with the bark later sloughing off to expose concentric rings of callus. Small, bright red fungus fruiting bodies (perithecia), that later blacken, are clustered on the bark or wood at the margin of older cankers in autumn. When twigs and branches are encircled, the parts beyond the canker wilt and die.  
  
Nectria twig blight, caused by a closely related fungus (*N. cinnabarinata*), is cosmopolitan on hundreds of woody plants. It mostly occurs on dead wood but may be weakly parasitic. It produces small, sunken cankers that girdle and kill infected twigs. In mid to late summer, bright-pink or coral-red globular structures (sporodochia) form in the dead bark. Later, the pustules turn chocolate-brown. Both *Nectria* fungi overwinter in dead wood.

For chemical and cultural control suggestions consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

# APPLE DISEASES II



1. Papery bark canker



2. Botryosphaeria (Bot) rot



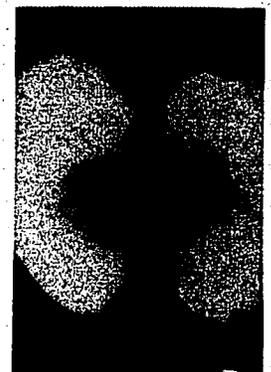
3. Bitter pit or Jonathan spot



4. Powdery mildew



5. Phytophthora collar rot



6. Water core



7. Fire blight



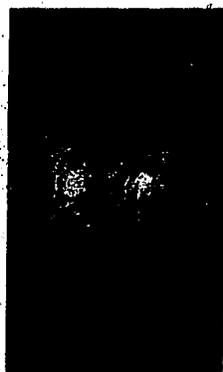
8. Brown rot



Apple mosaic



10. Trunk twisting and flattening



11. Russet-ring



12. Leaf pucker



13. 2,4-D injury



14. Brown heart or core

## APPLE DISEASES II

- 1. Papery bark canker, commonly called silver leaf,** is caused by the fungus *Stereum purpureum*. The fungus infects a wide variety of woody plants, including pome and stone fruits, in the northern states, being most prevalent following severe winters. The first symptom is usually the appearance of dull lead to silvery leaves on infected branches. Death of infected branches or the entire tree may occur within a year or two after the appearance of the silvered leaves. The fungus enters through wounds and produces a dark brown decay first of the heartwood, later killing the sapwood. The outer bark becomes "papery," splits, and sloughs off. Stunting of growth is often apparent before the tree dies. The characteristic, small ( $\frac{1}{2}$  to about an inch in diameter), round, leathery, flattened to somewhat shelf-shaped sporophores of the causal fungus can often be found on limbs and trunks of dead trees. The upper surface of the fruiting body is velvety and buff or grayish in color; the spore-bearing under surface is purplish.
- 2. Botryosphaeria (Bot) rot,** caused by the fungus *Botryosphaeria dothidea* (*B. ribis*), infects a wide range of woody plants. Young twig, limb, and trunk cankers appear as blisters filled with liquid. The liquid spreads over the wood surface when the blisters rupture. Enlarging, sunken, dark colored cankers are soon evident. Dark, spore-producing structures (stromata) form on the canker surface. The following spring the canker may cork off and become inactive or may continue to grow. Mechanical injury or environmental stress (freeze injury, drought) predispose wood to infection. Fruit infections start as small, reddish-brown spots surrounding a lenticel. The fungus advances through the fruit forming a soft rot. The skin color fades to a light brown and then a deeper brown. Completely rotted fruits may often have syrupy beads of exudate on their surface. Fruit rot commonly starts to develop in storage. The fungus overwinters on living and dead limbs.
- 3. Bitter pit or Jonathan spot** is a noninfectious disease that is most common in years when the fruit crop is light. Slightly sunken, circular, dark green spots with some internal browning form on the skin of the fruit. Later the spots may become deep red or light green; finally gray or black. As the fruit matures, the pits become more sunken with a definite brown corkiness of the flesh that may extend  $\frac{1}{4}$  inch into the fruit. Bitter pit seems to be related to a fluctuating soil moisture supply associated with calcium nutrition, and is increased by abundant rainfall shortly before harvest. The disease is most severe on fruit picked immaturely; it increases in storage.
- 4. Powdery mildew,** caused by the fungus, *Podosphaeria leucotricha*, overwinters mostly in terminal buds. A whitish, powdery to felt-like growth covers infected buds, blossoms, leaves, twigs, and fruit. The leaves are often stunted, narrower than normal, folded lengthwise, and become stiff and brittle with age. Twig growth is stunted and may have a witches'-broom appearance. Infected fruit commonly have a fine network of russetting, may be severely russeted, and sometimes are dwarfed. This disease is most common on certain cultivars in southern apple-growing areas.
- 5. Phytophthora collar rot,** caused by the soil-borne fungus *Phytophthora cactorum*, infects a wide range of plants. Disease incidence has increased as dwarfing rootstocks (especially Malling-Merton or MM) have replaced seedling rootstocks. The fungus attacks the lower 30 inches of apple trunks, usually between the soil line and the crown roots. Infected bark becomes brown, somewhat depressed, and is often slimy when wet. A brown to reddish-brown discoloration of the wood and a gummy exudate under the dead bark is typical. The enlarging, definitely outlined cankers, girdle the lower trunk and/or roots and often result in death of the entire tree. A general lack of vigor, poor shoot growth, and formation of sparse leaves in summer, or reddish leaves in early autumn, is commonly the first indication of the disease. The *Phytophthora* fungus attacks the fruit of susceptible apple cultivars producing a firm, brownish rot. The disease is more common in heavy, poorly drained soils.
- 6. Water core** is a noninfectious disease that occurs both in the orchard and in storage. The fruit must be cut open to observe the symptoms which arise in the core as a clear, "glassy" translucence that soon spreads to the surrounding flesh. Water core is most common in large, mature fruits from sun-exposed portions of the tree. Fruits with low calcium or high potassium and magnesium are most susceptible to water core.
- 7. Fire blight** is an extremely destructive disease caused by the bacterium *Erwinia amylovora*. Infected blossoms become water-soaked in appearance and soon wilt, turning brown to dark brown. Infected shoots wilt from the tip, often forming a "shepherd's-crook," and soon turn dark brown (as if scorched by fire). The disease may progress into the shoot from its base, blighting the lower tissues and girdling the parts beyond. In young trees, the bacteria may girdle the trunk and kill the tree. The bark of invaded branches and scaffold limbs is darker than normal with the wood beneath turning brown. Later the margins become sunken and often cracked, forming a definite canker. During wet, humid weather, blighted tissues exude a milky, sticky ooze that soon turns brown.
- 8. Brown rot** is caused by two closely related species of fungi, *Monilinia fructicola* and *M. laxa*. The disease is usually a minor problem in the United States, but is much more important in Great Britain and continental Europe. In the U.S., the fungi infect apple fruits injured by insects, hail, birds, or other means. Mature apples develop soft, light brown spots that enlarge rapidly in warm weather. Entire fruits may be destroyed within a day or two. Ash-gray tufts of mold develop on the surface of rotted fruits in damp weather. These fungi are much more destructive to stone fruit trees where the blossoms, twigs and fruit are infected.
- 9. Apple mosaic** is the most familiar viral disease of apple. The leaves on some twigs develop white-to-light yellow flecks, spots and blotches and bands along the veins. Occasionally, mosaic may appear as light and dark green areas in the leaves. Severely infected leaves turn brown and drop early. Tree vigor and yield may be reduced. The virus is transmitted by budding, grafting and by root grafts between adjacent trees.
- 10. Trunk twisting and flattening,** believed by some to be caused by a virus, results in twisting and flattening of the trunk. Infected trees are generally weak and vigor declines by the sixth year.
- 11. Russet-ring** is a viral disease that is fairly common in certain years. Affected Golden Delicious fruits develop narrow, irregularly closed rings to a solid circle of russet up to 1 to 2 inches in diameter. Yellow Newton apples develop elaborate networks of ring russetting, usually covering much of the fruit surface. Extensive, superficial, purple-to-brown blotches, without russetting, form on Stayman and Jubilee fruits. Some cultivars are symptomless carriers (see also Leaf pucker below).
- 12. Leaf pucker** may be part of a virus complex with russet-ring and fruit blotch. Foliage symptoms appear on the first-formed leaves in early spring. Leaves on the fruit spurs appear dwarfed and puckered and sometimes show yellowish-green flecking. Symptoms are masked on leaves formed during hot weather. Fruit symptoms vary depending on the variety, tree, and orchard and are described under Russet-ring. The severity of leaf pucker and fruit russetting varies from season to season, depending largely on temperature. In cool summers severe russetting occurs; when summers are warm, no fruit symptoms occur and only the first-formed leaves develop puckering and flecking.
- 13. 2,4-D injury** appears as a curling, twisting, and distortion of the leaves. Often there is a fern-leaf effect instead of normal foliage. Fortunately, unless the dose (from spray drift, other air-borne particles and sprayer contamination) is too large, the plants gradually return to normal.
- 14. Brown heart or core** is a noninfectious disease that develops in storages that are excessively cold (below 36° F.). The core is dark brown. Symptoms are not evident until the fruit are cut in half.

For chemical control suggestions, a listing of resistant varieties, and other control measures, consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

Photo credits: University of Wisconsin (1L), British Ministry of Agriculture (1R, 5C, 6, 12, 13), University of Illinois (2, 3, 7L, 8L, 10, 11), BASF (4, 8R, 9), University of Missouri (5L), unknown (5R, 7R, 14), USDA and Clemson University (7 far L), S. V. Beer (7 far R).

The Illinois Vocational Agriculture Service provides equal opportunities in programs and employment.

## UNIT G: HORTICULTURE

### PROBLEM AREA: GROWING SMALL FRUITS

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh-grade or third-year students in a horticultural or agricultural occupations program. The recommended time for teaching this problem area is during the spring semester.

The estimated instructional time for this problem area is 3 to 5 days, depending on how far the teacher wishes to go in developing skills on growing small fruits and brambles. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be 3 days or less. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt this problem area to their local situation.

#### CREDIT SOURCES:

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The teacher's guide, student information sheets, student worksheets, transparency discussion guide, and sample test questions were developed by Marcia Watman-Lauchner and Susan Osborne, and the competency sheet was developed by Al Zwilling, Department of Vocational and Technical Education, University of Illinois. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers, and reviewed by the following vocational agriculture teachers:

Allen Hornbrook - Paris High School  
Harold Lindley - Morton High School  
Frank Dry - Nashville High School

## TEACHER'S GUIDE

- I. Unit: Horticulture
  - II. Problem area: Growing small fruits
  - III. Objectives: At the close of this problem area students will be able to:
- 

1. Recognize small fruit varieties grown in Illinois
2. Prepare a site for growing small fruits and brambles
3. Plant and maintain strawberries, grapes, blueberries, blackberries and raspberries
4. Identify, prevent, and control insects, diseases and weeds affecting small fruits and brambles
5. Identify and utilize approved training methods and pruning practices on strawberries, grapes, blueberries, and brambles
6. Harvest small fruits and brambles.

### IV. Suggested interest approaches:

1. Ask the students what small fruits they like and if they have ever grown them at home.
2. Bring in samples of small fruits for students to identify and taste.
3. Bring in a sample plant or illustration of each small fruit type to be discussed in class, and ask students to identify them.

### V. Anticipated problems and concerns of students:

#### A. Strawberries

1. How do I choose a variety to plant?
2. What is the best site for strawberries?
3. When and how do I plant strawberries?
4. Do strawberries need full sun?
5. How much water do strawberries need?
6. Do strawberries need organic matter?
7. What type of fertilizer do strawberries need?

8. Why should I mulch strawberry plants?
  9. How do you prevent and control insects, diseases and weeds from damaging your strawberry crop?
  10. Why do I remove strawberry flowers the first year?
  11. Why do strawberries need a training system?
- 

#### B. Grapes

1. What is the difference between American and European grapes?
2. Why are some grapes seedless?
3. What is the best site for growing grapes?
4. What is the training system for grapes?
5. Why are grapes grown on a trellis?
6. How much water and fertilizer do grapes need?
7. How do you prevent and control insects, diseases and weeds affecting your vineyards?
8. When and how are grapes harvested?
9. How are raisins made?

#### C. Blueberries

1. Do blueberries require a certain pH?
2. How can the soil be adjusted for an acid pH?
3. What type of drainage do blueberries need?
4. Why are mulches so important for blueberries?
5. How do I plant blueberries?
6. When and how should blueberries be pruned?
7. How do you prevent and control birds, insects, diseases and other pests from damaging your blueberry crop?
8. When and how are blueberries harvested?

D. Brambles: Raspberries and Blackberries

1. Are there thornless bramble plants?
2. What is the difference between a raspberry and a blackberry?
3. Why should raspberries and blackberries be grown 1000 feet from each other?

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4. Why is it important to avoid an area previously grown with solanaceous crops (ex. tomatoes, potatoes, tobacco)?
5. How much organic matter do brambles need?
6. How much water do brambles need?
7. Should brambles be mulched?
8. How do you prevent and control insects, diseases and weeds affecting brambles?
9. Are there training systems for brambles?
10. How and when are brambles pruned?
11. How and when are brambles harvested?

VI. Suggested learning activities and experiences:

1. Have a student who grows small fruits at home report on the scope, care and maintenance of these fruits.
2. Provide students with information on spacings of fruits, yield per plant, and number of plants needed for a family of five. Have students extrapolate to their own family size and approximate what size area would be needed for each small fruit crop.
3. Conduct a brainstorming session with students on the factors to consider when selecting a location to grow small fruits and brambles. Have students study their own home landscape, choose a location to grow small fruits, and/or brambles and list the reasons for selecting the location.
4. Have students complete Student Worksheet 1 - Selecting and Preparing a Site for Small Fruits and Brambles Using VAS Units 5026 and 5027 as references.
5. Bring in samples of different types of soil. Give students the pH level and nutrient content of each soil sample. Ask students if the soil is adequate for the growth of various small fruits and brambles. If not, ask the students how they would prepare the soil.

6. Have students bring in a soil sample from a location at their home that may be a potential site for small fruit. Send the soil to a soil testing station (consult your county extension advisor for locations) and have tests done for pH and nutrient levels. Discuss the results with the class and prepare recommendations.
7. Have students complete Student Worksheet 2 - My Home Small Fruit Planting. Students can draw a rough outline or complete the project on regular landscaping paper.
8. Provide students with lists of Illinois cultivars and certified nurseries. Have each student send away for one catalog, making sure that most of the nurseries will be used. Once this information is returned, provide students with the table on page 5 of Circular 935, Growing Small Fruits in the Home Garden. Using these references, students should complete Worksheet 3 - Comparison of Small Fruit Varieties. Each student should choose two different varieties of each fruit that will be grown in their chosen location at home.
9. If this problem area is taught during the fall semester, take students on a field trip to a Pick-Your-Own raspberry farm. If taught in spring, take students to a Pick-Your-Own strawberry farm. Arrange for the owner or manager to speak with the students about the planning and maintenance of a commercial small fruit business. Students should be allowed to pick and purchase some fruit.
10. Arrange for a commercial small fruit grower to talk to students about starting and managing a commercial small fruit operation.
11. Distribute the Fruit or Vegetable Production Record Book to students that want to work on a problem. Growing small fruits takes more than one, maybe two seasons for a successful fruit crop. The Problem For Use With Fruit or Vegetable Production Record Book can help the student with the factors that should be considered. The problem is for a vegetable garden, so adaptations will need to be made.
12. Purchase a lot of 100 strawberry plants. Have students practice the planting and spacing of these plants. Upon completion of this exercise, the students can take their plants home to add to their S.O.E.P., using My Plant Diary or the Fruit and Vegetable Production Record Book. Remaining plants can be set on the school grounds or in the greenhouse and used as a teaching aid in future years.
13. Use the transparencies and transparency discussion guide included in this problem area along with actual plant material to demonstrate the proper method of planting and maintaining small fruits and brambles.

14. Have students construct models of the various small fruit and bramble training systems.
  15. Demonstrate pruning, training and renovation techniques for small fruits and brambles. Allow students to practice these techniques. Have students complete Student Worksheet 4 - Pruning and Training Brambles using VAS Unit 4048 as a reference.
- 
16. Have students complete Student Worksheet 5 - Planting, Culture and Harvest of Small Fruits and Brambles using VAS Units 5026 and 5027 as references.
  17. Demonstrate the proper way to transplant small fruits.
  18. Provide samples of various mulches commonly used with small fruits. Compare the characteristics, quality and price of each type of mulch.
  19. Discuss the importance of watering and irrigating small fruits and brambles.
  20. Show students pictures or bring in actual samples of small fruits and brambles damaged by insects, disease or excessive weeds. Using Circular 1145, Home Fruit Pest Control, have students plan a pest prevention/control schedule.
  21. Have specimens or pictures of the most common weeds in small fruit sites. Conduct an identification test on these weeds.
  22. Make a display of the equipment used for applying chemicals for commercial and home use. Demonstrate how to use and calibrate (if necessary) the applicators. Prepare a safety demonstration for use of this equipment.
  23. Provide empty containers of fungicides, insecticides, and grass and broadleaf herbicides. Discuss the proper use of these chemicals.
  24. Bring in small fruit samples at various stages of development. Have students taste the fruit. Ask students why they selected the various pieces of fruit they ate. Discuss when and how small fruits should be harvested. Show students commercial mechanical harvesters by means of audio-visuals or a field trip.
  25. Use the Competency Inventory to discuss entry level requirements for work in the small fruit and brambles field. Have students complete the competency sheet at the end of the unit, so they can assess their progress.

VII. Application procedures:

1. The skills learned in this problem area can be utilized in the home garden.
2. The skills learned in this problem area can be used by students who plan to work in a fruit nursery or garden center.

VIII. Evaluation:

1. Collect and grade student worksheets.
2. Construct and administer written test upon completion of the problem area, utilizing sample test questions included with this problem area.
3. Evaluate students on planning a small fruit garden, consider factors such as site selection, hardiness and vigor of chosen cultivars, selected training systems, et cetera.
4. Check student progress through use of the Competency Inventory.

IX. References and aids:

1. Vocational Agriculture Service, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801
  - a. VAS Unit 4048: Pruning and Training Bramble Fruits and Highbush Blueberries
  - b. VAS Unit 5026: Growing Raspberries and Blackberries in the Midwest
  - c. VAS Unit 5027: Growing Strawberries
  - d. Fruit or Vegetable Production Record Book
  - e. Problem for Use with Fruit or Vegetable Production Record Book
2. Cooperative Extension Service, College of Agriculture, University of Illinois, Urbana, Illinois 61801
  - a. Circular 935: Growing Small Fruits in the Home Garden
  - b. Circular 1144: Controlling Weeds in Home Fruit Plantings
  - c. Circular 1145: Home Fruit Pest Control
3. All About Growing Fruits and Berries, Ortho Books, Midwest/Northeast Edition. Chevron Chemical Company, 575 Market Street, San Francisco, CA 94105. This publication is available at most garden centers.

4. Competency inventory
  5. Selected information sheets
  6. Selected student worksheets
  7. Selected transparencies
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# COMPETENCY INVENTORY

## GROWING SMALL FRUITS

1. Student has no knowledge of competency.
  2. Student has read about competency.
  3. Student has seen competency performed.
  4. Student has performed competency.
- 
5. Student has performed competency without supervision.
  6. Student does possess skill.
  7. Student does not possess skill.

### Competency

### Circle One

1. Prepare the soil for planting small fruits	1	2	3	4	5		
2. Prepare the site for planting small fruits	1	2	3	4	5		
3. Plant sets according to plans	1	2	3	4	5		
4. Water newly planted sets	1	2	3	4	5		
5. Take soil samples	1	2	3	4	5		
6. Apply fertilizer	1	2	3	4	5		
7. Apply insecticides and fungicides	1	2	3	4	5		
8. Prune small fruits	1	2	3	4	5		
9. Provide small fruits with winter protection	1	2	3	4	5		
10. Control unwanted vegetation with herbicides	1	2	3	4	5		
11.							
12.							
13. Select appropriate varieties of small fruits						6	7
14. Select appropriate planting sites						6	7
15. Select an appropriate system for training each fruit						6	7
16. Determine the optimum time to harvest crop						6	7
17. Determine most appropriate method of harvesting						6	7
18. Identify outlets for fruit products to be marketed						6	7

These competencies outlined in the National Ag Occupations Competency Study are for entry level positions in agricultural/horticultural production.

Name \_\_\_\_\_

Date \_\_\_\_\_

INFORMATION SHEET 1  
 SMALL FRUIT VARIETIES SUGGESTED  
 FOR THE GEOGRAPHICAL REGIONS OF ILLINOIS

Crop	Southern IL	Central IL	Northern IL
Strawberries	Earliglow	Earliglow	Earliglow
	Sunrise	Sunrise	Sunrise
	Surecrop	Honeoye	Honeoye
	Redchief	Surecrop	Surecrop
	Raritan	Redchief	Redchief
	Cardinal	Raritan	Guardian Raritan Sparkle
Red Raspberry	Heritage	Heritage	Latham
	September	September	Heritage
	Fallred	Fallred	September
Black Raspberry	Bristol	Bristol	Bristol
	Allen	Allen	Allen
		Jewel (trial)	Jewel (trial)
Purple Raspberry	Clyde Brandywine	Clyde Brandywine	Clyde Brandywine
Grapes (American)	Fredonia	Fredonia	Fredonia
	Buffalo	Niagara	Concord
	Niagara	Concord	
	Steuben	Delaware	
	Concord		
	Catawba Delaware		
Grapes (French Hybrid: trial)	Vignoles	Vignoles	none
	Foch	Foch	
	Baco Noir	Baco Noir	
	Seyval	Seyval	
	DeChaunac	DeChaunac	
Thornless Blackberries	Dirksen	Dirksen	none
	Black Satin	Black Satin	
	Hull	Hull	
Blueberries	Collins	Collins	Collins
	Bluecrop	Bluecrop	Bluecrop
	Blueray	Blueray	Blueray
	Jersey	Jersey	Jersey
	Berkeley	Berkeley	Berkeley
	Herbert	Herbert	Herbert
	Coville	Coville	Coville
Lateblue	Lateblue	Lateblue	

<sup>1</sup> Varieties are listed from the earliest to latest ripening order.

INFORMATION SHEET 2  
SELECTED SOURCES OF SMALL FRUIT PLANTS

General Nurseries

They offer strawberries, blackberries, raspberries, grapes, blueberries, currants, and gooseberries, in addition to ornamentals and tree fruits.

AHRENS NURSERY, Rt. 1, Huntsburg, IN 47542  
BOATMAN'S NURSERY & SEED CO., Bainbridge, OH 45612  
BOUNTIFUL RIDGE NURSERIES, INC., Princess Anne, MD 21853  
BURGESS SEED AND PLANT CO., Galesburg, MI 49053  
BURPEE SEED CO., Clinton, IA 52732  
EMLONG NURSERIES, INC., Stevensville, MI 49127  
FARMER SEED AND NURSERY CO., Fairbault, MN 55021  
EARL FERRS NURSERY, Hampton, IA 50441  
FRENCH NURSERY CO., Clyde, OH 43410  
GURNEY SEED AND NURSERY CO., Yankton, SD 57078  
HILLEMAYER NURSERIES, Lexington, KY 40500  
IDEAL FRUIT FARM AND NURSERY, Stilwell, OK 74960  
INTER-STATE NURSERIES, INC., Hamburg, IA 51640  
KELLY BROS. NURSERIES, Dansville, NY 14437  
KRIDER NURSERIES, INC., Middlebury, IN 46549  
J.E. MILLER NURSERIES, 5060 West Lake Road, Canandaigua, NY 14424  
MONROE NURSERY CO., Monroe, MI 48161  
NEOSHO NURSERIES, Neosho, MO 64850  
NEW YORK STATE FRUIT TESTING COOPERATIVE ASSN., Geneva, NY 14456  
OZARK NURSERY, Tahlequah, OK 74464

<sup>1</sup>This is a partial list of nurseries and seed companies that offer small fruit for sale. Interested persons should obtain catalogs from several nurseries before choosing. The nurseries listed under the small fruit type offer a wide selection of cultivars for that crop. For cultivar recommendations, consult your county extension adviser in Agriculture or write to the Department of Horticulture, 124 Mumford Hall, 1301 West Gregory, Urbana, Illinois 61801.

Selected Sources of Small Fruit Plants (cont'd.)

SCARFF'S NURSERY, INC., New Carlisle, OH 45344

STARK BROS. NURSERIES AND ORCHARDS CO., Louisiana, MO 63353

STERN'S NURSERIES, Geneva, NY 14456

TENNESSEE NURSERY CO., INC., Cleveland, TN 36311

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BLUEBERRIES

J. HERBERT ALEXANDER, Middleboro, MA 02346

A. G. AMMON NURSERY, Box 488F, Chatworth, NJ 08019

BLUEBERRY HILLS, Rt. 5, Rogers, AR 72756

D.A. BYRD, Lacota, MI 49063

FINCH'S BLUEBERRY NURSERY, Bailey, NC 27807

GALLETA BROS. BLUEBERRY FARMS, Hammonton, NJ 08037

HARTMANN'S PLANTATION, Grand Junction, MI 49056

KEEFE BLUEBERRY PLANTATION, Grand Junction, MI 49056

MICHIGAN BLUEBERRY GROWER'S ASSN., Grand Junction, MI 49056

THOMAS AND PATRICK O'BRIEN, RR 2, BOX 147B, South Haven, MI 49090

RIVER VIEW NURSERY, McMinnville, TN 37110

BLACKBERRIES AND RASPBERRIES<sup>2</sup>

DALE BASHAM NURSERY, Alma, AR 72921

BOUNTIFUL RIDGE NURSERIES, INC., Princess Anne, MD 21853

CONGDON AND WELLER NURSERY, Mile Block Road, North Collins, NY 14111

RAYNER BROS., INC., Salisbury, MD 21801

THEODORE STEGMAIER NURSERY, Rt. 4, Cumberland, MD 21502

CURRENTS AND GOOSEBERRIES

FOSTER NURSERY CO., INC., Fredonia, NY 14063

SOUTHMEADOW FRUIT GARDENS, 2363 Tilbury Place, Birmingham, MI 48009

ELDERBERRIES

NEW YORK STATE FRUIT TESTING COOPERATIVE ASSN., Geneva, NY 14456

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<sup>2</sup>Raspberry plants should be designated as "essentially virus-free." Such plants are definitely superior.

Selected Sources of Small Fruit Plants (cont'd.)

GRAPES

BOORDY VINEYARD, Box 38, Ridderwood, MD 21139

CHALET DU LAC VINEYARDS AND NURSERY, Rt. 1, Box 9F, Altus, AR  
72821 (Hybrids)

FOSTER NURSERY CO., INC., 69 Orchard Street, Fredonia, NY 14063

JOHNSTON VINEYARDS, 4320 North Barnes, Oklahoma City, OK 73112

SOUTHEAST NURSERIES, Box 321-A, Raleigh, NC 27609

SOUTHMEADOW FRUIT GARDENS, 2363 Tilbury Place, Birmingham, MI 48009

STRAWBERRIES<sup>3</sup>

AHRENS NURSERY, Rt. 1, Huntingburg, IN 47542

W.F. ALLEN CO., PO Box 1577, Salisbury, MD 21801

JAMES W. BRITTINGHAM, 2538 Ocean City Boulevard, Salisbury, MD 21801

E.J. BRYAN, Washburn, WI 54891

BUNTING'S NURSERIES, INC., Shelbyville, DE 19975

CHAPMAN BERRY FARM, East Leory, MI 49051

THE CONNOR CO., INC. PO Box 534, Augusta, AR 72006

LEWIS STRAWBERRY NURSERY, Rocky Point, NC 28457

MULLINS BERRY FARMS, 410 Brookfield Avenue, Chattanooga, TN 37411

NEW JERSEY SMALL FRUITS COUNCIL, INC., PO Box 185, Hammonton, NJ  
08037

NOURSE FARMS, INC., Box 485, South Deerfield, MA 01373

RAYNER BROTHER, INC., Salisbury, MD 21801

<sup>3</sup>Strawberry plants should be designated as "essentially virus-free." Such plants are definitely superior.

STUDENT WORKSHEET #1

SELECTING AND PREPARING A SITE  
FOR SMALL FRUITS AND BRAMBLES

References - VAS Unit 5026 - Growing Raspberries and Blackberries in the Midwest  
VAS Unit 5027 - Growing Strawberries

1. What is the difference between blackberries and raspberries and what is the term that refers to both plants?

2. Do brambles prefer full shade, partial shade or full sunlight?

3. Name 3 major factors to consider when selecting a site to grow brambles.

A.

B.

C.

4. Brambles should be planted in soil that is \_\_\_\_\_ and high in \_\_\_\_\_.

5. Why should brambles not be planted in areas where solenaceous crops (potatoes, tomatoes, peppers, tobacco) have previously been grown?

6. Why should raspberries and blackberries never be planted together, and how far apart should they be planted?

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7. How far in advance should you begin preparing the site selected for growing brambles?

8. What should the soil pH be for growing brambles?

9. What type of soil is the best for growing strawberries, and why is drainage important?

10. Why should strawberries not be planted in areas where solenaceous crops (potatoes, peppers, tomatoes and corn) have previously been grown?

11. Name 2 reasons why a site with a gentle slope is suitable for strawberries.

12. Name 4 reasons for fumigating the soil prior to planting strawberries.

A.

B.

C.

D.

13. What should the soil pH be for growing strawberries?

14. Should you apply lime directly on established strawberries to raise the pH? Why or why not?

15. Describe a 4-step recommended rotation to precede strawberry establishment.

A.

B.

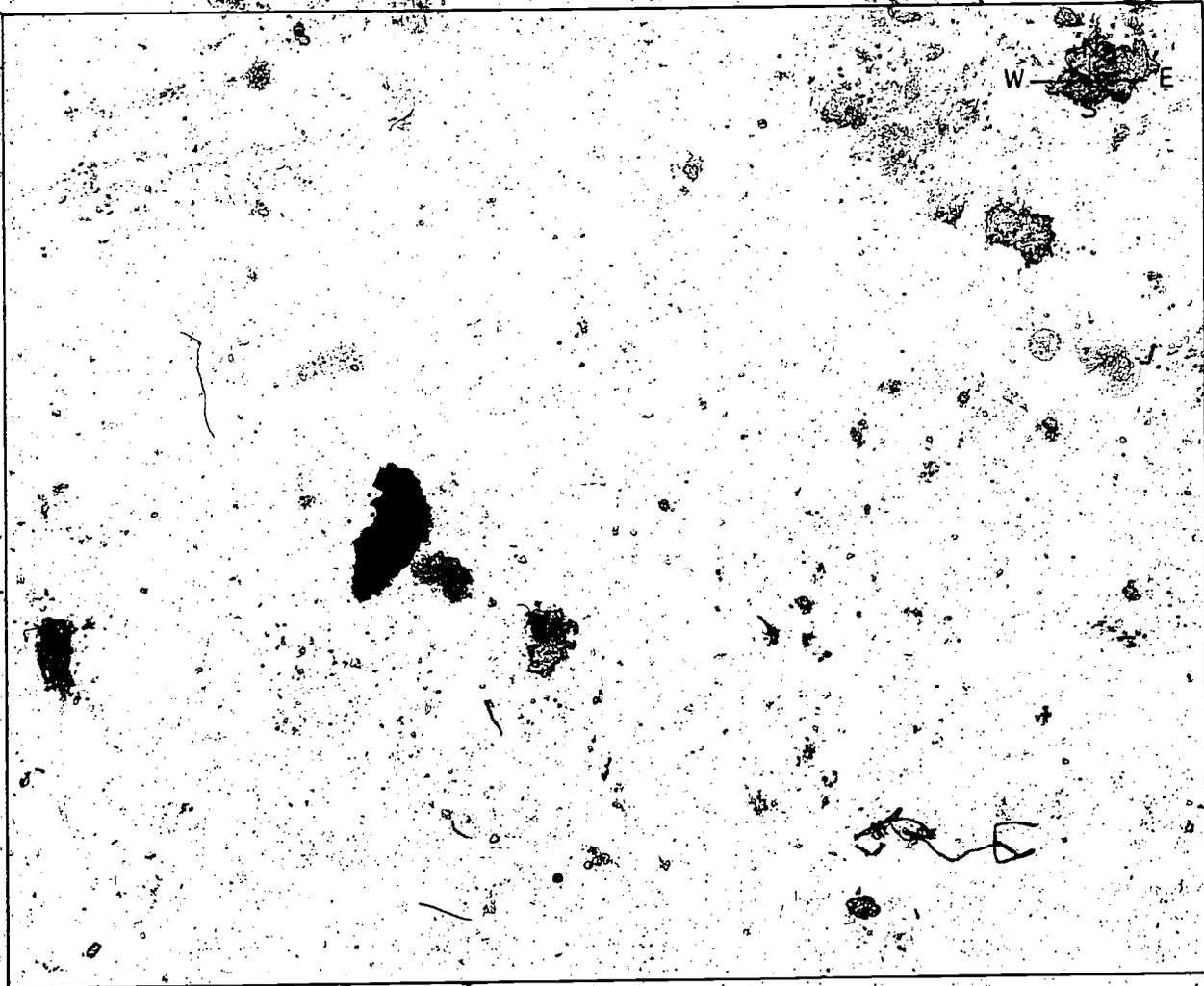
C.

D.

STUDENT WORKSHEET #2

MY HOME SMALL FRUIT PLANTING

INSTRUCTIONS: Draw a basic outline of your home grounds. Allow  $\frac{1}{4}$  inch for every 1 foot. Show the placement of your home, existing trees, shrubs, perennial flowers, sidewalks, patios and driveways. Select two different types of small fruits and indicate where you would plant them.



371

COMPARISON OF SMALL FRUIT VARIETIES

Fruit Type (List two different varieties for each)	Planting Distance		Time Interval from Planting to Fruiting	Approx. Life of Plants	Height of Mature Plant
	Between Rows	Between Plants			
Strawberry					
Raspberry					
Blackberry					
Blueberry					
Grape					

III-G-1-21

STUDENT WORKSHEET #3 - Continued

III-G-1-22

Fruit Type (List two different varieties for each)	Estimated Annual Yield Per Plant	Suggested No. of Plants for Family of Five	Cost of Plants	Quality Characteristics	Size and Durability of Fruit	Plant Hardiness
Strawberry 1. 2.						
Raspberry 1. 2.						
Blackberry 1. 2.						
Blueberry 1. 2.						
Grape 1. 2.						

STUDENT WORKSHEET #4

PRUNING AND TRAINING BRAMBLES

Reference - VAS Unit 4048 - Pruning and Training Bramble Fruits and High-bush Blueberries

1. Name 3 tools used for pruning brambles and the major purpose of each.

A.

B.

C.

2. How should pruning tools be cared for after their use?

3. How often and when are red and yellow raspberries pruned each year?

4. How often and when are black and purple raspberries and erect blackberries pruned each year?

5. How often and when are semi-erect and trailing blackberries pruned each year?

6. How often and when should raspberry blueberry plants be pruned each year?

7. When is the best time to spring-prune brambles?

8. When is the best time to remove fruited canes from bramble plants? Why?

9. What should be done with the fruited canes pruned from the plant?

10. How many canes should remain on a red or yellow raspberry plant growing on the hill and other training systems after spring pruning?

377

11. When pruning everbearing varieties of red and yellow raspberries should the shoots that bear fruit in the fall be removed after harvest? Why or why not?

12. How many canes should remain on black or purple raspberries or erect blackberries after spring pruning, and what should be done with the lateral branches?

13. How should black or purple raspberries and erect blackberries be pruned during the summer?

14. After spring pruning how many canes should remain on semi-erect and trailing blackberries?

15. Name 3 different training systems for brambles.

16. Name 3 advantages of using some type of training system when growing brambles.

A.

B.

C.

17. Which bramble training systems are the most practical for a large scale planting of brambles?

18. Which bramble training system does not require the tying of canes?

19. What is the most common system of training brambles and which type of wire trellis is used?

20. Which bramble training system is most useful in home garden plots? Why?

STUDENT WORKSHEET #5

PLANTING, CULTURE, AND HARVESTING  
OF SMALL FRUITS AND BRAMBLES

Reference - VAS Unit 5026 - Growing Raspberries and Blackberries in the  
Midwest  
VAS Unit 5027 - Growing Strawberries

1. When can brambles be planted?
2. What type of fertilizer should be used when planting brambles?
3. Name the three basic types of training systems for brambles.
  - A.
  - B.
  - C.
4. When should strawberries be planted?
5. How deep should strawberries be planted?
6. What type of fertilizer should be used when planting strawberries?

7. Name the four basic types of training systems for strawberries.

A.

B.

C.

D.

8. How much water do strawberries and brambles require weekly?

9. How can weeds in brambles be controlled?

10. Name 2 reasons for mulching a strawberry planting.

11. Why are flower trusses removed from newly-set strawberries the first year they are planted?

12. What is the accepted practice for strawberry frost protection?

331

13. When are bramble fruits ready for harvesting and what is the best time of day to pick them?

14. When are strawberries ready for harvesting and what is the best time of day to pick them?

15. Why should the caps be left on when picking strawberries?

## TEACHER'S KEY - STUDENT WORKSHEET #1

### SELECTING AND PREPARING A SITE FOR SMALL FRUITS AND BRAMBLES

- References - VAS Unit 5026 - Growing Raspberries and Blackberries in the Midwest  
VAS Unit 5027 - Growing Strawberries

1. What is the difference between blackberries and raspberries and what is the term that refers to both plants?

Raspberries and blackberries are known as brambles. Plants with ripe fruit that slips easily from the receptacle are known as raspberries. Plants with ripe fruit that does not slip easily from the receptacle are known as blackberries.

2. Do brambles prefer full shade, partial shade or full sunlight?

Brambles prefer full sunlight.

3. Name 3 major factors to consider when selecting a site to grow brambles.

- A. soil type
- B. air circulation, and
- C. previous crop history

4. Brambles should be planted in soil that is well-drained and high in organic matter.

5. Why should brambles not be planted in areas where solenaceous crops (potatoes, tomatoes, peppers, tobacco) have previously been grown?

Brambles should not be planted where solenaceous crops have previously been grown because these crops are hosts to diseases that infect brambles. Some of these disease organisms can live in the soil for many years away from the solenaceous host plant.

6. Why should raspberries and blackberries never be planted together, and how far apart should they be planted?

Raspberries and blackberries should be planted 600 to 1000 feet apart to lessen the chance of virus spreading between the plants.

7. How far in advance should you begin preparing the site selected for growing brambles?

You should begin preparing the soil site at least one year prior to planting brambles.

8. What should the soil pH be for growing brambles?

The soil pH should be in the range of 5.5 to 7.5 for growing brambles.

9. What type of soil is the best for growing strawberries, and why is drainage important?

Strawberries grow best on a loam or sandy loam soil. A well-drained soil is important because standing water can kill strawberry plants in a short period of time.

10. Why should strawberries not be planted in areas where solenaceous crops (potatoes, peppers, tomatoes and corn) have previously been grown?

Strawberries should not be planted where solenaceous crops have previously been grown due to the chance of verticillium wilt carry-over to the new strawberry planting. If strawberries are planted after corn, root aphids may be present and injure the strawberry roots.

11. Name 2 reasons why a site with a gentle slope is suitable for strawberries.

A site with a gentle slope is suitable for growing strawberries because

- 1) it allows surface water to drain quickly and
- 2) cold air will drain away to a lower level.

12. Name 4 reasons for fumigating the soil prior to planting strawberries.

- A. to control root diseases, soil insects and weeds
- B. to prevent plant losses
- C. to produce higher yields, and
- D. to reduce labor costs for weeding.

13. What should the soil pH be for growing strawberries?

The soil pH should be in the range of 6.0 and 6.5 for growing strawberries.

14. Should you apply lime directly on established strawberries to raise the pH? Why or why not?

Lime should not be applied directly to established strawberry plants because the calcium in lime can cause reduced plant growth and berry size.

15. Describe a 4-step recommended rotation to precede strawberry establishment.

Step A. plow the site in fall and sow rye or clover

Step B. plow the site in spring and raise cultivated vegetables or row crops (other than corn or those that carry verticillium wilt)

Step C. plow again in the fall and sow rye or clover, and

Step D. plow the cover crop under in the spring and plant strawberries.

TEACHER'S KEY - STUDENT WORKSHEET #4

PRUNING AND TRAINING BRAMBLES

Reference - VAS Unit 4048 - Pruning and Training Bramble Fruits and High-bush Blueberries

1. Name 3 tools used for pruning brambles and the major purpose of each.
  - A. hand pruning shears - to cut back laterals and summer topping
  - B. long-handled or lopping shears - to remove canes at ground level
  - C. bramble hook - to remove canes at ground level
2. How should pruning tools be cared for after their use?

Pruning tools should be cleaned and their cutting surfaces wiped with an oily cloth to prevent rust. Cutting surfaces must be kept sharp.

3. How often and when are red and yellow raspberries pruned each year?

Red and yellow raspberries are pruned twice yearly, once in early spring and again after fruiting.

4. How often and when are black and purple raspberries and erect blackberries pruned each year?

Black and purple raspberries and erect blackberries are pruned three times yearly, once in early spring, during the summer, and after fruiting.

5. How often and when are semi-erect and trailing blackberries pruned each year?

Semi-erect and trailing blackberries are pruned twice yearly, once in early spring and after fruiting.

6. How often and when are highbush blueberry plants pruned each year?

After the end of the third year in the field, highbush blueberry plants are pruned once a year during the dormant season (early spring is preferred).

7. When is the best time to spring prune brambles?

Spring pruning should be done in early spring before the buds begin to swell, but after danger of severe cold is past.

8. When is the best time to remove fruited canes from bramble plants? Why?

Fruited canes can be removed any time after harvest. Cutting the canes off immediately after harvest is the best time, because it facilitates new growth and reduces possible infestation of diseases and insects.

9. What should be done with the fruited canes pruned from the plant?

They should be removed from the planting site and burned.

10. How many canes should remain on a red or yellow raspberry plant growing in the hill and other training systems after spring pruning?

5-8 canes should be left per stake in the hill system.

Canes should be spaced 4-8 inches apart in the horizontal or vertical trellis training systems.

11. When pruning everbearing varieties of red and yellow raspberries should the shoots that bear fruit in the fall be removed after harvest? Why or why not?

The shoots of everbearing varieties should not be removed after harvest, because these shoots will bear fruit again the next spring.

12. How many canes should remain on black or purple raspberries or erect blackberries after spring pruning, and what should be done with the lateral branches?

Four to five canes should be left per plant and the lateral branches should be thinned out and shortened.

13. How should black or purple raspberries and erect blackberries be pruned during the summer?

New shoots of black raspberries are pinched back 3-4 inches when they reach 24 inches in height. Purple raspberries and erect blackberries are pinched when they reach 30-36 inches in height. Shoots of both plants are allowed to grow an additional 6-8 inches more before pinching if grown with supports.

14. After spring pruning how many canes should remain on semi-erect and trailing blackberries?

The best 4-8 canes are left on semi-erect varieties, and 8-16 canes are left on trailing varieties of blackberries.

15. Name 3 different training systems for brambles.

The staked-hill system, vertical-type wire trellis and horizontal-type wire trellis are three training systems used for brambles.

16. Name 3 advantages of using some type of training system when growing brambles.
- A. facilitates harvesting and other cultural practices
  - B. prevents crop losses due to breakage of canes by wind, cultivation, and picking, and
  - C. keeps the fruit on the canes cleaner.

17. Which bramble training systems are the most practical for a large scale planting of brambles?

Wire trellising systems are the most practical for large scale plantings of brambles.

18. Which bramble training system does not require the tying of canes?

The horizontal-type wire trellis system does not require the tying of canes.

19. What is the most common system of training brambles and which type of wire trellis is used?

The hedgerow system is the most common system of training brambles and the horizontal-type wire trellis is used.

20. Which bramble training system is most useful in home garden plots? Why?

The staked-hill system for training brambles is the most useful for home garden plots because a small power cultivator can be used, very little hand hoeing is needed, and the fruit is easy to pick.

TEACHER'S KEY - STUDENT WORKSHEET #5

PLANTING, CULTURE, AND HARVESTING  
SMALL FRUITS AND BRAMBLES

Reference - VAS Unit 5026 - Growing Raspberries and Blackberries in the Midwest  
VAS Unit 5027 - Growing Strawberries

1. When can brambles be planted?

Brambles can be planted as soon as the soil can be prepared in the spring.

2. What type of fertilizer should be used when planting brambles?

A starter solution containing a 10-52-17 or 10-50-10 fertilizer should be used when planting brambles.

3. Name the three basic types of training systems for brambles.

- A. vertical wire trellis system
- B. horizontal wire trellis system
- C. the staked hill system

4. When should strawberries be planted?

Strawberries should be planted in early spring so the plants can become established before hot weather.

5. How deep should strawberries be planted?

Strawberries should be planted so that 1/3 of the crown is buried.

6. What type of fertilizer should be used when planting strawberries?

A starter solution containing a 10-50-10 fertilizer should be used when planting strawberries.

7. Name the four basic types of training systems for strawberries.

- A. hill system
- B. broadcast system
- C. matted - row system
- D. spaced matted - row system

8. How much water do strawberries and brambles require weekly?

Strawberries and brambles require 1 to 1½ inches of water weekly.

9. How can weeds in brambles be controlled?

Weeds in brambles can be controlled with mulches of black plastic, straw or sawdust.

10. Name 2 reasons for mulching a strawberry planting.

Mulching a strawberry planting helps avoid damage to roots from alternate freezing and thawing of the soil and may prevent excessive drying of the plants.

11. Why are flower trusses removed from newly-set strawberries the first year they are planted?

Removing flower trusses from newly-set strawberry plants during the first year they are planted promotes the formation of runners for a better established planting.

12. What is the accepted practice for strawberry frost protection?

The accepted practice in strawberry frost protection is to turn on the water when temperatures drop to 34°F at plant level in the field, run it continuously, and turn it off only when all the ice on the plant has melted.

13. When are bramble fruits ready for harvesting and what is the best time of day to pick them?

Bramble fruits are ready for harvesting when sweet and firm. They should be picked in the early morning.

14. When are strawberries ready for harvesting and what is the best time of day to pick them?

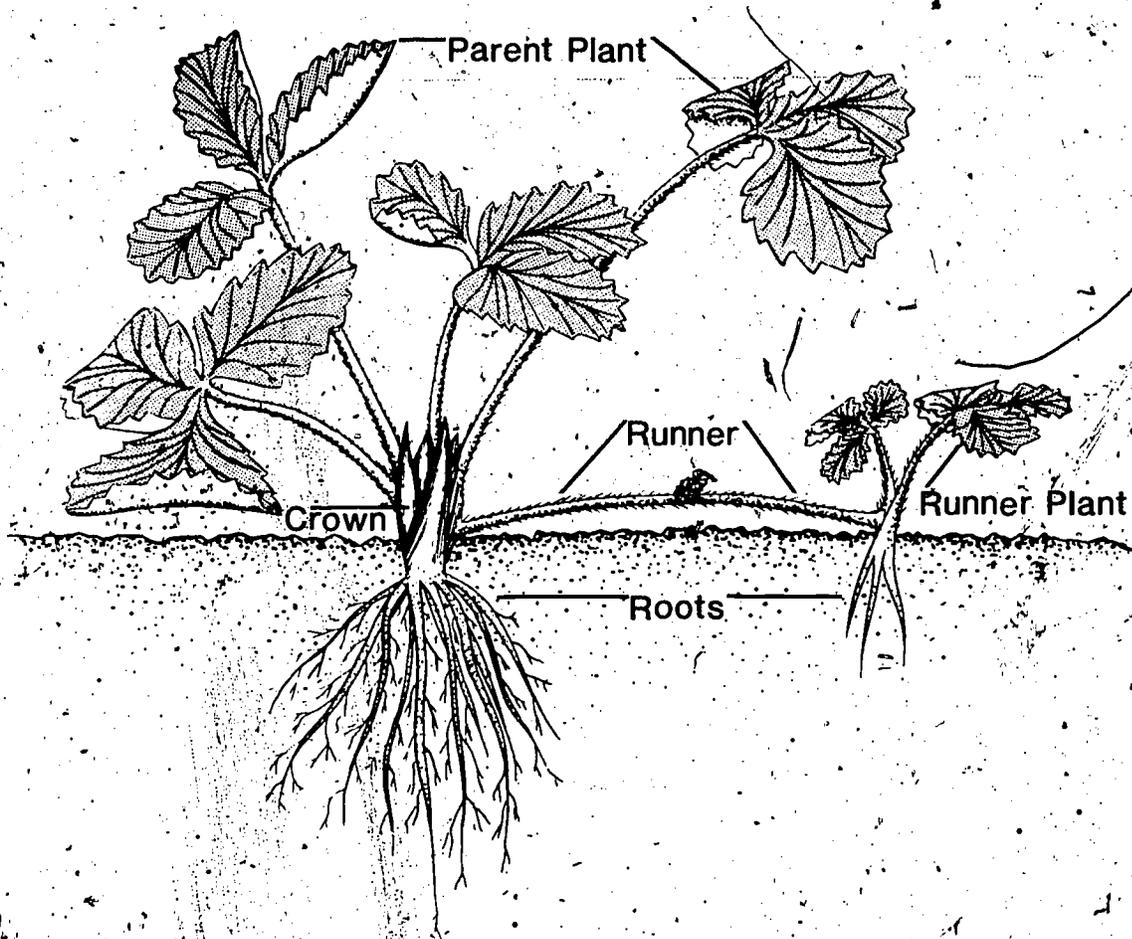
Strawberries are ready for harvesting when they are approximately three-fourths red. They should be picked in early morning when the berries are still cool.

15. Why should the caps be left on when picking strawberries?

The caps should be left on when picking strawberries to prevent the fruit from shrivelling.

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# Parts of the Strawberry Plant



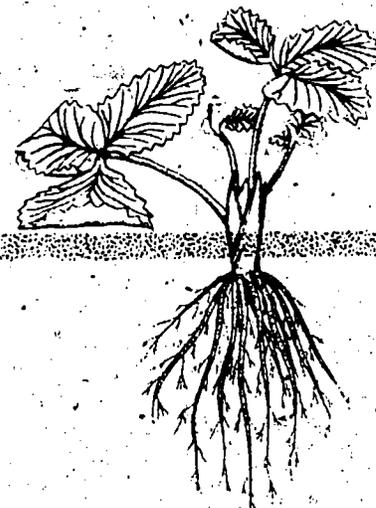
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# Planting Strawberries Correctly



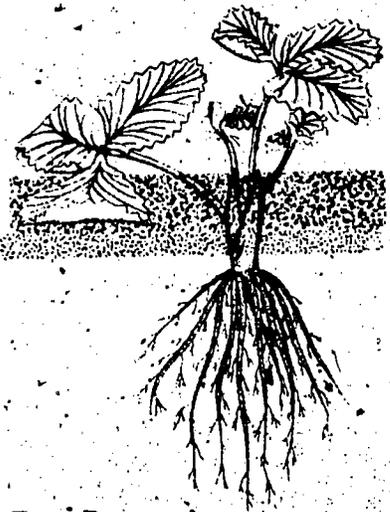
Too Shallow

Crown of plant set too shallow.



Correct

Plant set so crown is even with ground surface after the soil has been firmed around the roots.



Too Deep

Crown of plant set too deep.

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## Removing Strawberry Plant Flowers

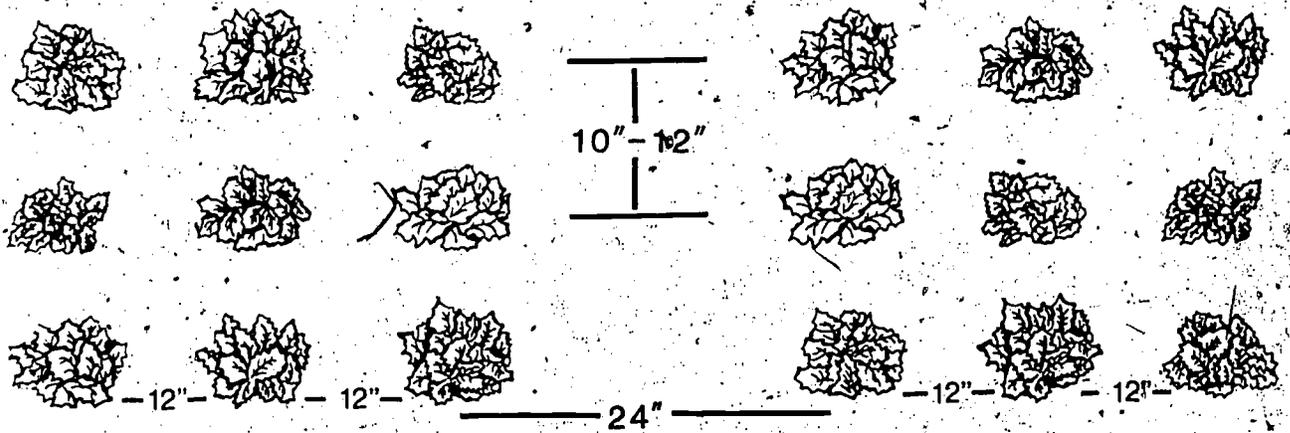


Flower stems of newly set strawberry plants are removed during the first season as they appear in order to:

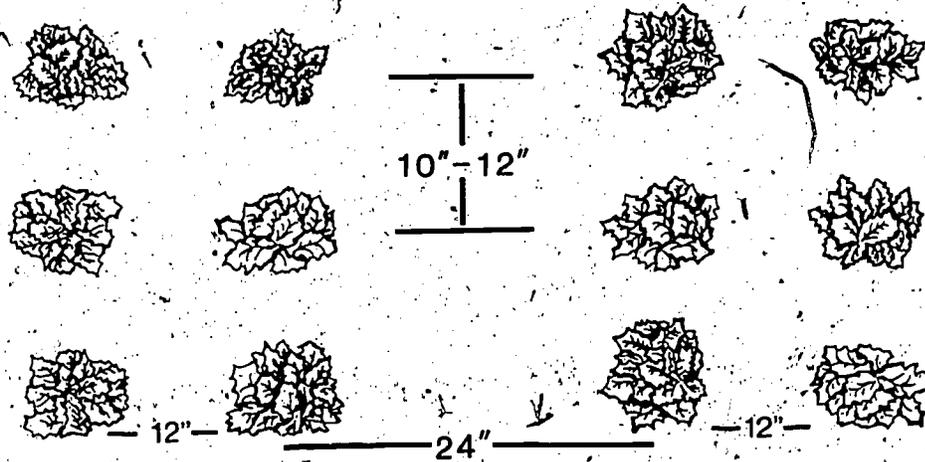
1. Strengthen the plant
2. Encourage vigorous growth
3. Increase the number of runner plants which produce the most fruit the following year

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# The Hill System For Training Strawberries



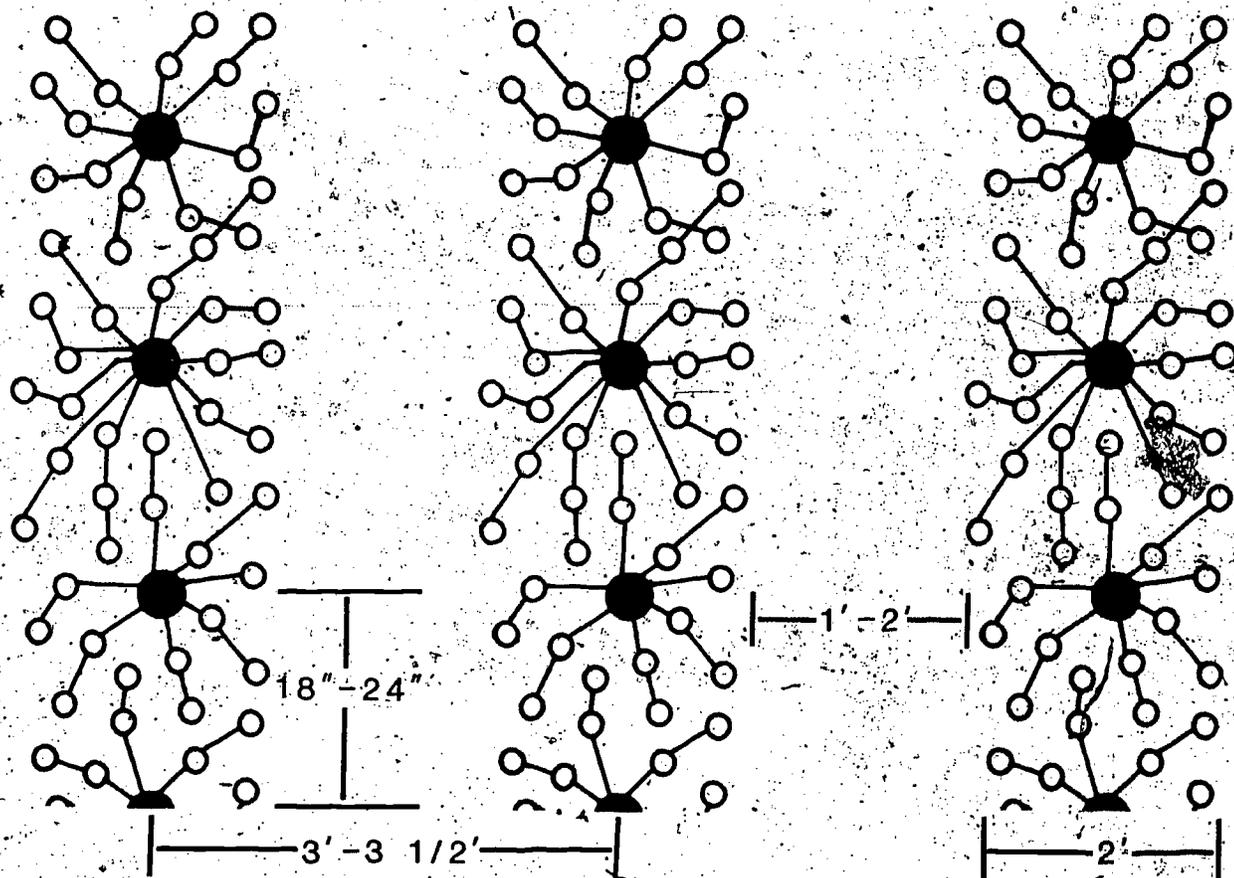
Triple Row Hill System



Double Row Hill System

Plants are spaced 12 in. apart in double or triple rows. A 24 in. aisle is left between each group of rows. Runner plants are removed as they appear.

# The Spaced Matted-Row System For Training Strawberries

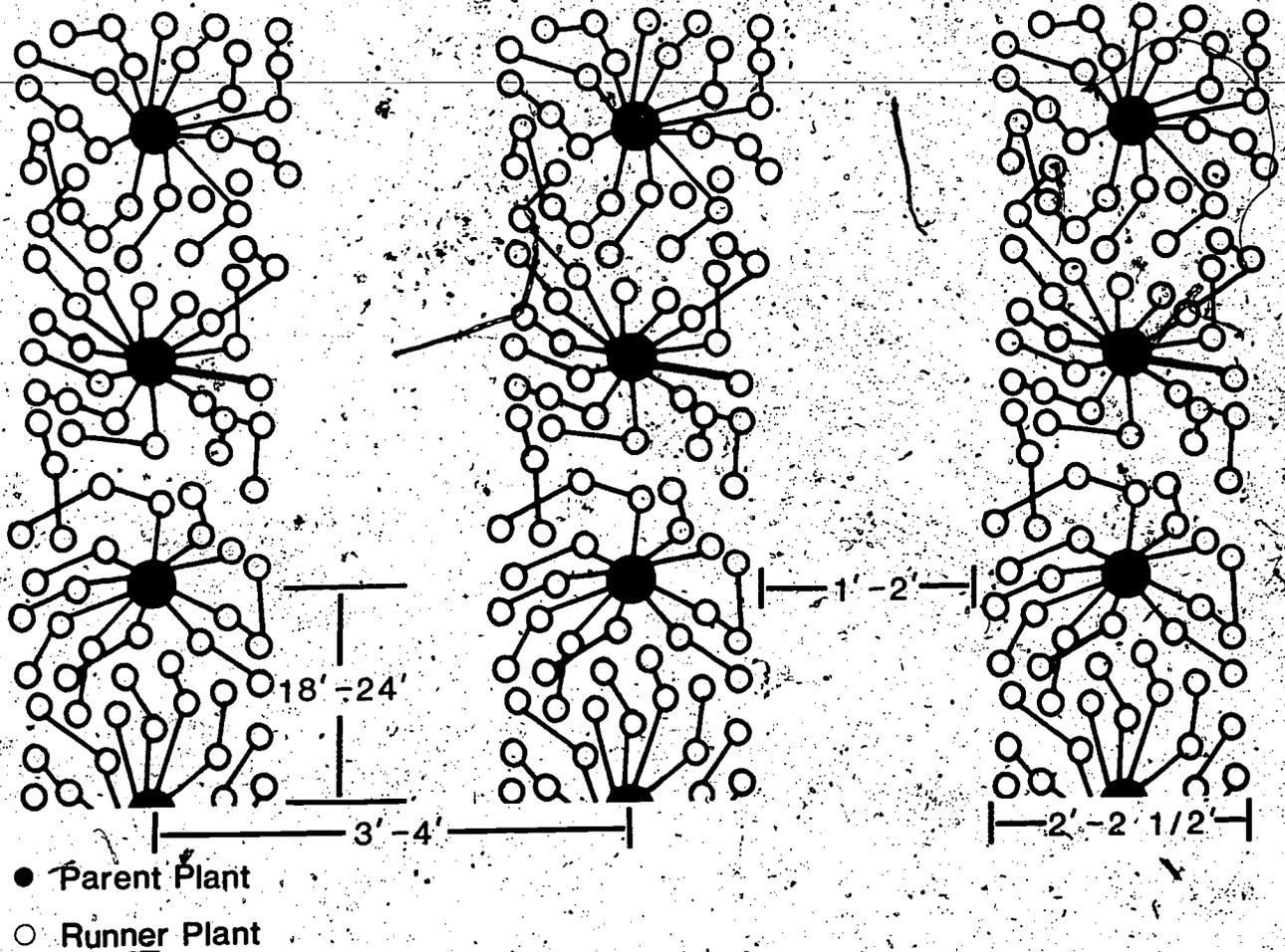


- Parent Plant
- Runner Plant

Plants are spaced 18-24 in. apart in single rows. A 3-3 1/2 ft. aisle is left between each row. Runner plants are arranged by hand at 6 in. intervals until desired spacing is obtained. Final rows are 2 ft. wide.

III-G-1-43

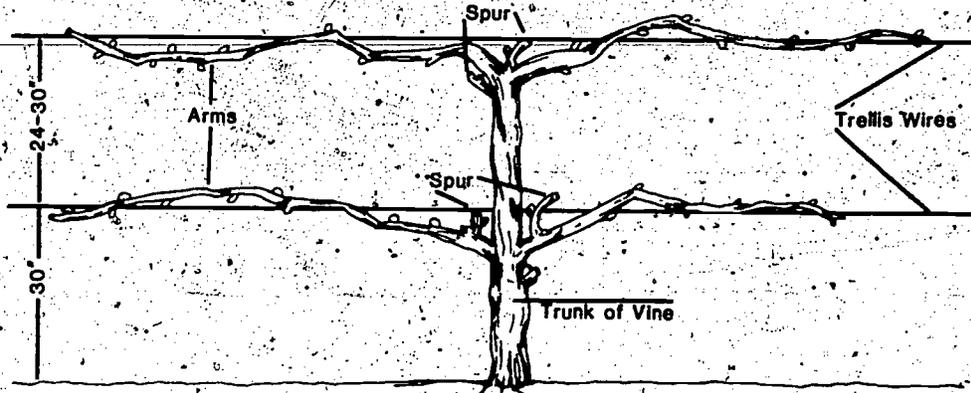
# The Matted-Row System for Training Strawberries



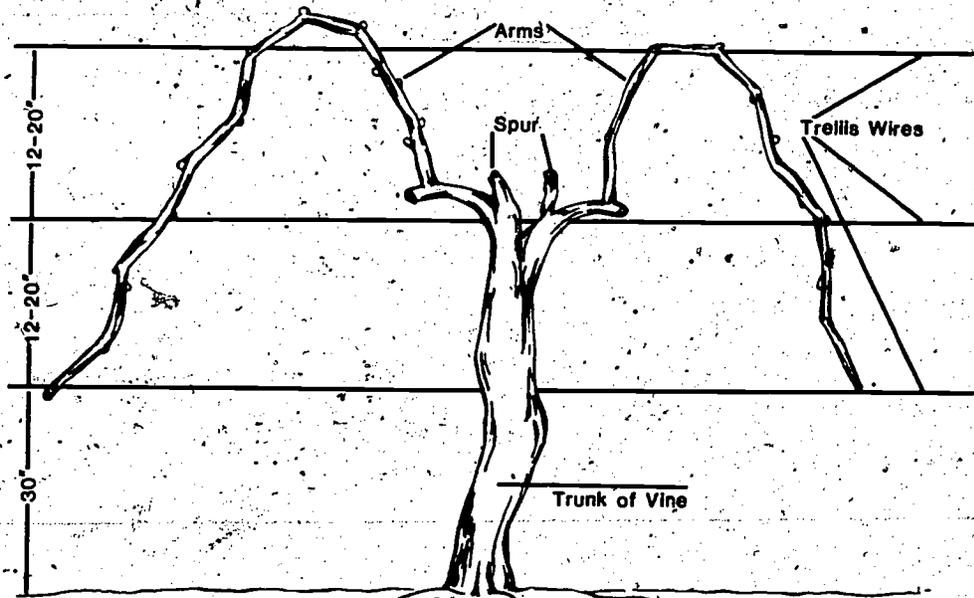
Plants are spaced 18-30 in. apart in single rows. A 3-4 ft. aisle is left between each row. Runner plants are allowed to grow naturally until a 2 ft. wide row is obtained.

# Grapevine Training System

## Four-Arm Kniffin Training System

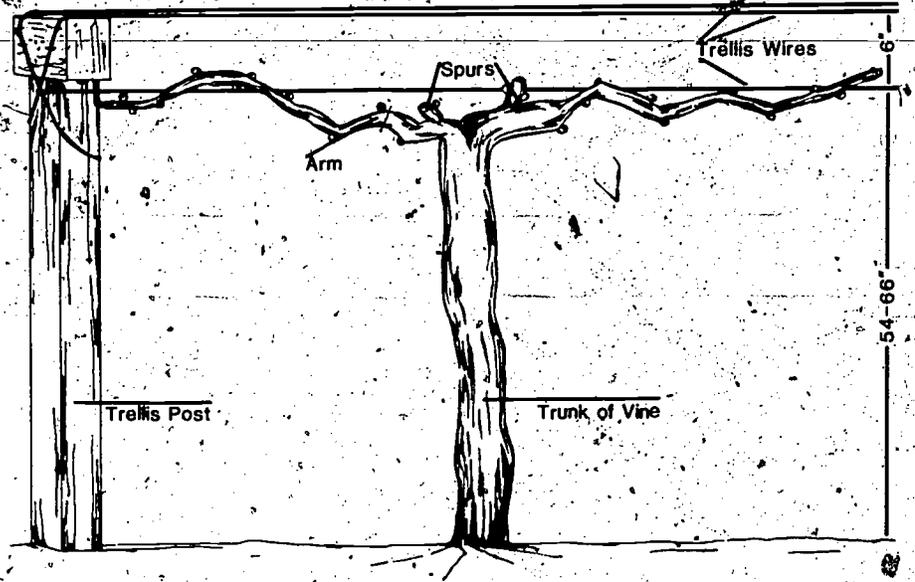


## Umbrella Kniffin Training System

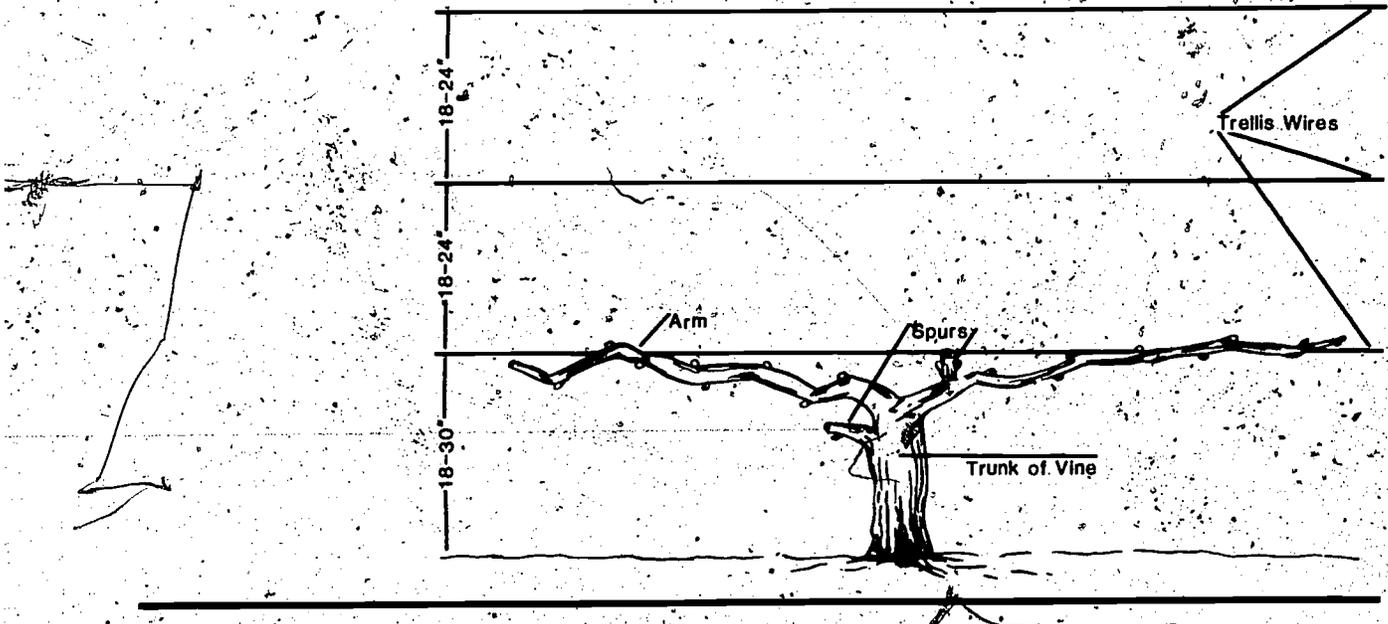


# Grapevine Training Systems

## Munson System



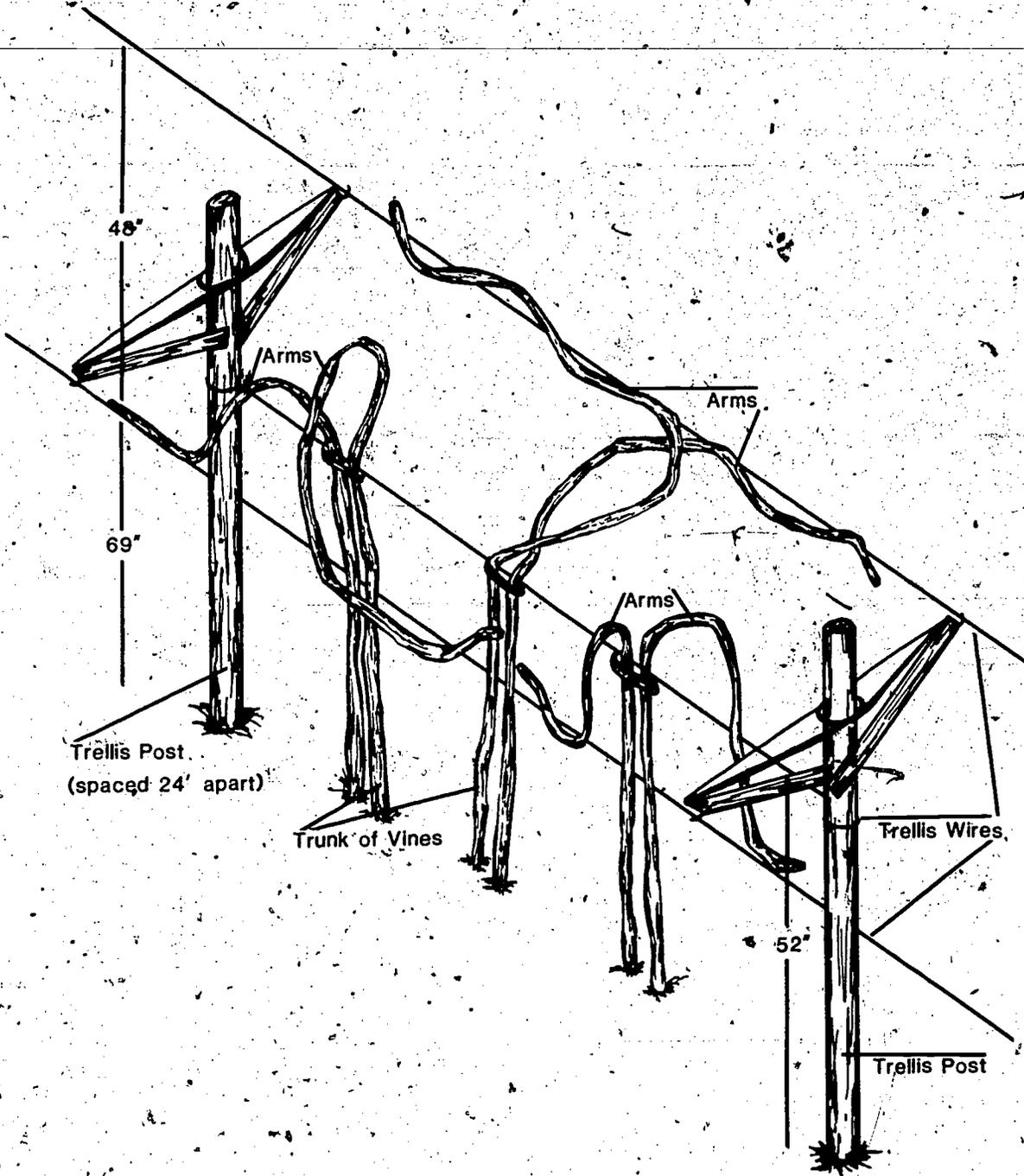
## Keuka High Renewal Training System



III-G-1-46

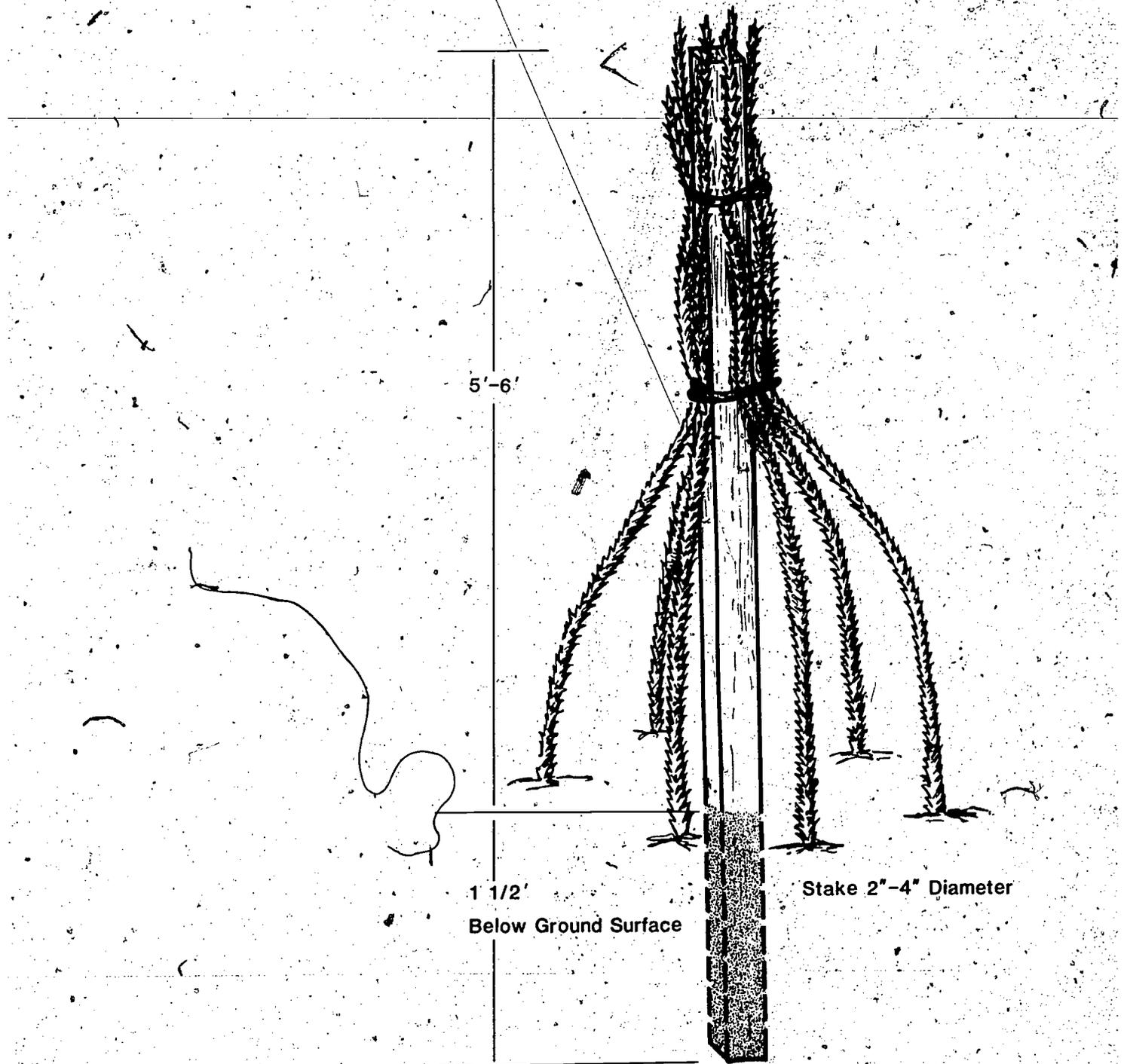
# Grapevine Training System

## Geneva Double Curtain System

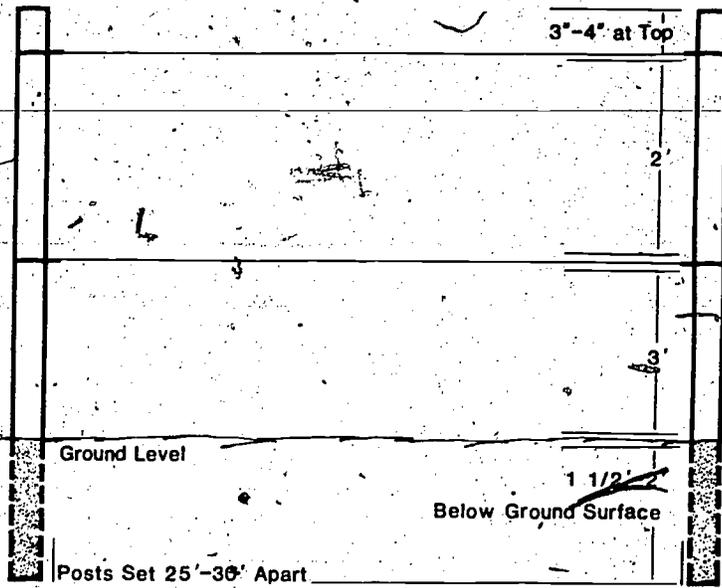


III-G-1-47

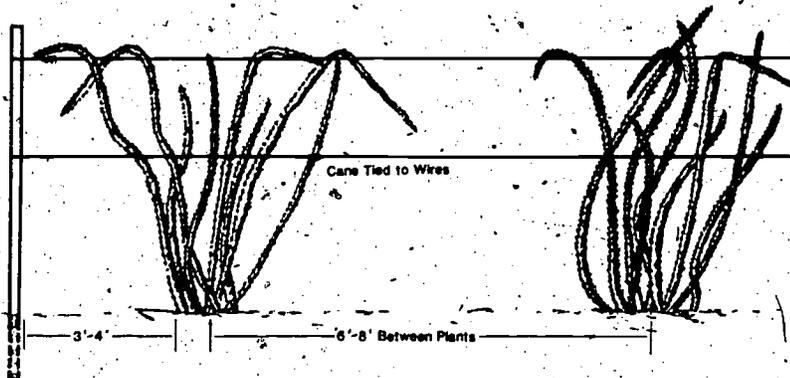
# The Hill System For Training Brambles



# Vertical Type Wire System For Training Brambles

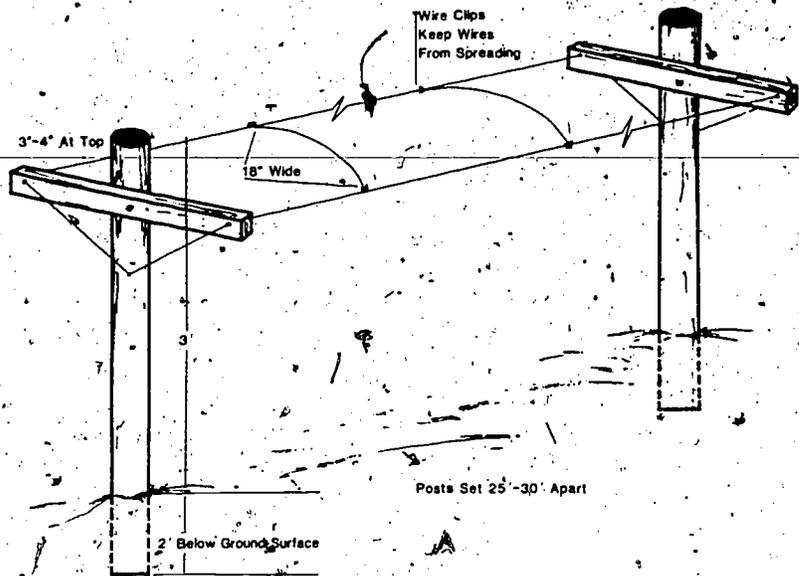


# Trailing Blackberries on Vertical Trellis

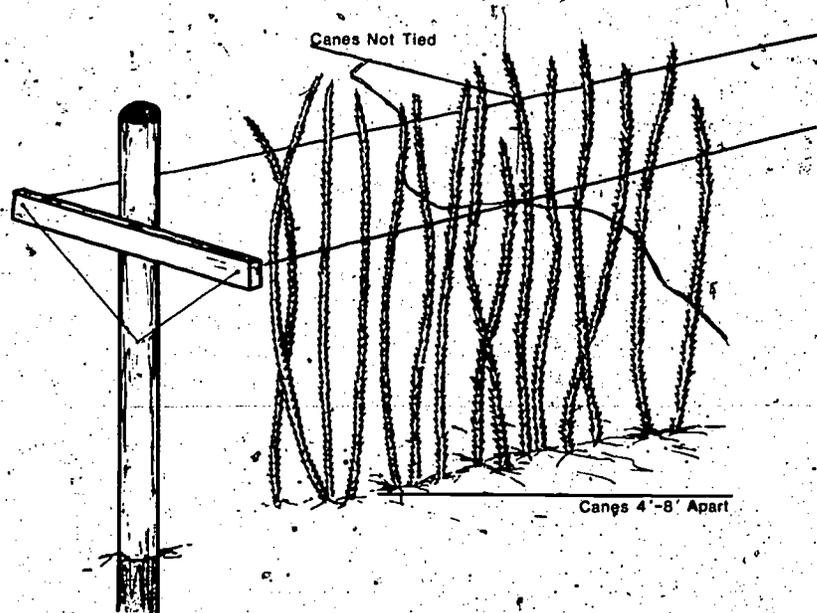


III-G-1-49

# Horizontal Type Wire System For Training Brambles



# Red Raspberries on Horizontal Trellis



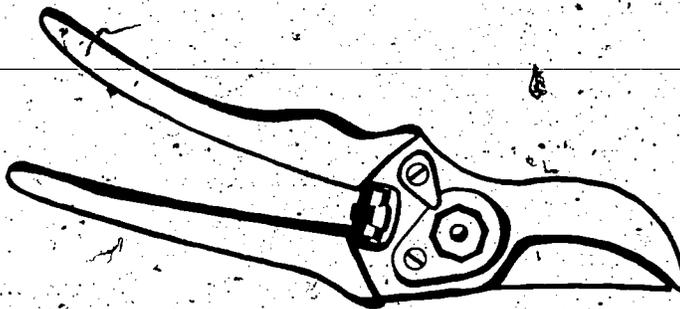
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## Tools Used For Pruning Brambles

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### Hand Pruning Shears

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### Long Handled or Lopping Shears

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### Bramble Hook

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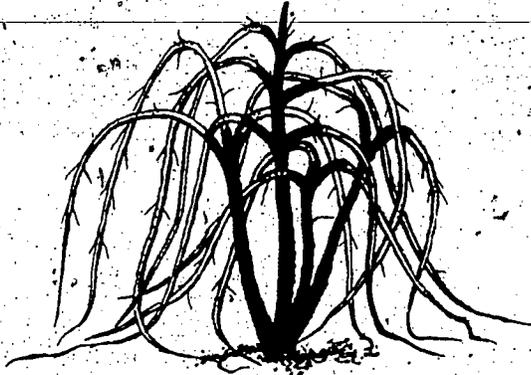
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# Pruning Raspberries

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## Black and Purple Raspberry

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Before Pruning (shaded areas show part of plant that remains after pruning)



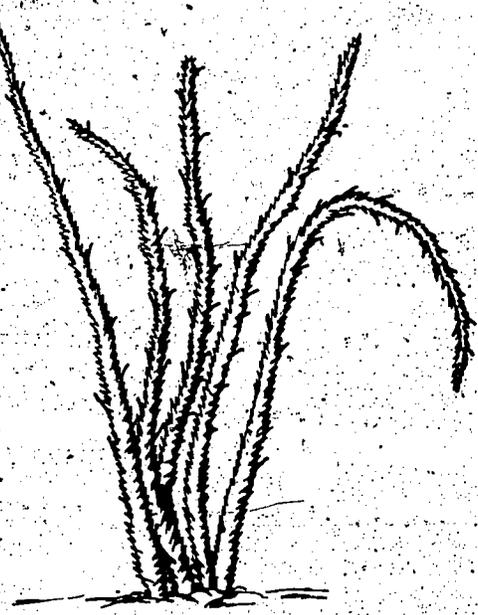
After Pruning

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## Red Raspberry



Before Thinning and Pruning (shaded areas show part of plant that remains after thinning and pruning)



After Thinning and Pruning

## TRANSPARENCY DISCUSSION GUIDE

### GROWING SMALL FRUITS

#### I. Transparency -- PARTS OF THE STRAWBERRY PLANT

- A. Identify each part of the strawberry plant. Discuss the importance of knowing these parts when planting, training and harvesting strawberries.

#### II. Transparency -- PLANTING STRAWBERRIES CORRECTLY

- A. Planting strawberries the proper depth is critical. The crown should be set so it is even with the soil surface after the soil has been firmed around the roots.
- B. If the plant is set too deep crown rot can occur. If the plant is set too shallow the roots may dry out.

#### III. Transparency -- REMOVING STRAWBERRY PLANT FLOWERS

- A. Removing the flowers of newly set strawberry plants increases the number of runner plants which bear the most fruit the following year.

#### IV. Transparency -- THE HILL SYSTEM FOR TRAINING STRAWBERRIES

- A. No runners are allowed to grow
- B. Recommended for use with irrigation and intensive cultivation
- C. Not recommended if danger of white grubs, drought, or severe winters
- D. Most often system used in home garden

#### V. Transparency -- SPACED MATTED ROW SYSTEM FOR TRAINING STRAWBERRIES

- A. Runners allowed to grow are arranged by hand at 6 inch intervals until desired spacing is obtained.
- B. Final rows are two feet wide.
- C. Recommended for use with irrigation and moderate cultivation

#### VI. Transparency -- MATTED ROW SYSTEM FOR TRAINING STRAWBERRIES

- A. Runners allowed to grow until desired row width is obtained, then additional runners are removed. Rows are normally 2 feet wide.

III-G-1-53

- B. Used where danger from severe drought, winters and white grubs exist
- C. Smaller yields and fruit size than with other systems due to crowding of individual plants
- D. Production costs per acre less than with other systems due to less weed control, no runner placement
- E. Better adapted to machine cultivation
- F. Major system used by Illinois commercial strawberry producers

## VII. Transparency -- GRAPEVINE TRAINING SYSTEMS

### A. FOUR-ARM KNIFFIN

1. most popular system for bunch grapes
2. trellis consists of 2 wires
3. requires little summer tying

### B. UMBRELLA KNIFFIN

1. trellis consists of 2 or 3 wires
2. provides good yield and excellent quality fruit

### C. MUNSON SYSTEM

1. used mostly in home plantings, very little in commercial plantings
2. trellis consists of 3 wires strung in the shape of a V
3. suitable for humid climates

### D. KEUKA HIGH SYSTEM

1. suitable to varieties which produce upright shoots
2. not suitable for varieties with a drooping growth habit or requiring long cane pruning
3. should not be pruned to short canes

### E. GENEVA DOUBLE CURTAIN

1. developed for vigorous vines
2. shoots and leaves receive more exposure to the sun

3. trellis space per vine is double that of other systems
4. used in areas of high humidity and low light intensity
5. positioning of shoots away from trellis posts allows for mechanical harvesting

VIII. Transparency -- THE HILL SYSTEM FOR TRAINING BRAMBLES

- A. Single stake 2-4" diameter used for support
- B. 5-8 fruiting canes tied to the stake in one or two places after pruning
- C. Plants usually set 6 feet apart
- D. Little hand hoeing needed, fruit easy to pick
- E. Most useful for home garden

IV. Transparency -- VERTICAL TYPE WIRE SYSTEM FOR TRAINING BRAMBLES

- A. Used with linear system
- B. Allows better weed, disease and insect control.
- C. Plants maintained in narrow row
- D. Canes tied to wires
- E. Most useful with red or yellow raspberries and trailing blackberries

X. Transparency -- HORIZONTAL TYPE WIRE SYSTEM FOR TRAINING BRAMBLES

- A. Used with hedgerow system (most common training system)
- B. End posts are braced or anchored
- C. Wire clips are used to prevent canes from spreading trellis wire apart
- D. Plants form a solid row approximately 18 inches wide
- E. No tying of canes

XI. Transparency -- TOOLS USED FOR PRUNING BRAMBLES

- A. Hand Pruning Shears - used to cut back lateral growth and terminal shoots (summer topping)

- B. Lopping Shears - used to remove entire canes at ground level in thinning or removing fruited canes
- C. Bramble Hook - serves same purpose as lopping shears; must be careful not to pull cane out of the crown when using the hook

## XII. Transparency -- PRUNING RASPBERRIES

### A. Red Raspberry

1. Pruned twice yearly - in early spring and after fruiting in fall
2. Spring pruning - leave canes largest in diameter and length, 5-8 canes per stake in hill system, 4-8 inches apart in other systems; canes left should be headed back 5-6 feet or 3-4 feet if no support is provided
3. New shoots of red and yellow raspberries should NOT be summer topped.
4. Pruning after fruiting - remove fruited canes any time after harvest; burn the removed canes
5. Everbearing varieties are pruned the same as single crop varieties. However, shoots that fruit in the fall should NOT be removed after the fall harvest. These shoots will bear fruit the next spring.

### B. Black and Purple Raspberry

1. Pruned three times yearly - in early spring, during summer, and after fruiting
2. Early spring dormant pruning - remove all but 4 to 5 of most vigorous canes per plant; lateral branches are shortened to 8-10 inches of growth or 8-12 buds per lateral; weak ( $\frac{1}{4}$  inch diameter or less) or dead laterals removed
3. Summer pruning - new shoots are pinched back 3-4 inches from growing tip; this is done at weekly intervals as canes reach proper height for topping (24 inches high for black raspberries, 30-36 inches high for purple raspberries and erect blackberries)
4. Pruning after fruiting - remove fruited canes any time after harvest; burn the removed canes

TEACHER'S KEY

SAMPLE TEST QUESTIONS  
GROWING SMALL FRUITS

MULTIPLE CHOICE:

- B 1. The most popular training system for bunch grapes is
- trellis
  - 4-arm kniffen
  - Keuka high
  - Geneva double curtain
- 
- C 2. When planting strawberries the crown should be set
- completely above the ground
  - completely below the ground
  - so that 1/3 of it is buried and it is even with the ground surface after the soil has been firmed around the roots
  - none of the above
- D 3. The matted row system for training strawberries is the major system used by Illinois commercial strawberry producers because
- it is better adapted to machine cultivation
  - less weed control is needed
  - there is no runner placement so fruit size and yields may be smaller
  - all of the above
- C 4. The three major training systems for growing brambles are the
- 4-arm kniffen, munson, and umbrella kniffen
  - hill, spaced matted row, and vertical trellis
  - staked hill, vertical wire trellis and horizontal wire trellis
  - staked hill, horizontal trellis and umbrella trellis
- B 5. The vertical-type wire trellis system for growing brambles
- requires no tying of canes
  - allows better weed, disease and insect control
  - is the most useful for home garden plots
  - utilize wire clips to prevent bramble canes from spreading the trellis wires apart

TRUE OR FALSE:

- True 1. Grapes may be trained on an arbor, a trellis, fence or other suitable structure.
- True 2. The soil pH for strawberries should be 5.5 - 6.5 for optimum production.

- True 3. The first-year blossoms should be removed off of newly-set strawberry plants.
- True 4. Irrigation can be used for frost control of strawberries in early spring.
- False 5. Strawberry patches do not need to be renovated to improve fruit production.
- True 6. Blueberries need a pH of 4.8 - 5.2 for optimum growth.
- False 7. Blackberries and raspberries can be interplanted.
- True 8. Pruning tools should be cleaned and their cutting surfaces wiped with an oily cloth after each use.
- False 9. The staked hill training system is the most practical for large scale plantings of brambles.
- False 10. Brambles should be planted on sites where solenaceous crops (potatoes, tomatoes, tobacco) have been grown because these crops rid the soil of insects and disease affecting brambles.

**SHORT ANSWER:**

1. What is the difference between blackberries and raspberries and what is the term that refers to both plants?

Blackberries and raspberries are known as brambles. Plants with ripe fruit that slips easily from the receptacle are known as raspberries. Plants with ripe fruit that does not slip easily from the receptacle are known as blackberries.

2. Name 3 major factors to consider when selecting a site to grow brambles

1. soil type
2. air circulation
3. previous crop history

3. Why is irrigation important for a small fruit planting?

Small fruits have shallow root systems and require large quantities of water (1-1½ inches per week). Irrigation is essential for producing larger, high quality fruit. In some cases, such as with strawberries, irrigation can be used as a method of frost protection.

4. Name 4 factors to consider when selecting which small fruit varieties to plant?

1. adaptability to regional conditions

2. season of maturation
  3. disease resistance
  4. fruit size and yield
  5. When is the best time of day for harvesting small fruits?
- 

The best time of day for harvesting small fruits is in the early morning after the dew has evaporated and when the fruit is still cool.

## UNIT G: HORTICULTURE

### PROBLEM AREA: GROWING TREE FRUITS

#### SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in a horticultural or agricultural occupations program. The recommended time for teaching this problem area is during the fall of the year.

The estimated instructional time for this problem area is 6-8 days, depending on how far the teacher wishes to go in developing skills on growing tree fruits. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be five days or less. If the students are to be involved in other activities, the instructional time will need to be increased.

The materials and information available for studying tree fruits grown in Illinois are vast. Therefore, the list of references and aids in the back of this problem area is lengthier than most. In addition, the instructor is encouraged to conduct a local search to locate other supplementary materials. Instructors should examine all materials in terms of their local situation and modify the materials as necessary.

Before teaching this unit instructors should review the Cooperative Extension Circulars mentioned in the Reference and Aids section. These circulars provide information regarding fruit tree varieties suitable for Illinois, fertilization procedures, pollination, maintenance schedules, et cetera. Although this unit emphasizes apples, the publications discuss a variety of tree fruits. When planning daily lessons, instructors should emphasize those tree fruits which are predominant in their local area.

#### CREDIT SOURCES:

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The teacher's guide, information sheet, student worksheets and sample test questions were developed by Marcia Watman-Lauchner, Department of Vocational and Technical Education. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers. This problem area was reviewed by the following vocational agriculture teachers:

Allen Hornbrook	-	Paris High School
Harold Lindley	-	Morton High School
Frank Dry	-	Nashville High School

III-G-2-1

## TEACHERS' GUIDE

J. Unit: Horticulture

II. Problem area: Growing tree fruits

III. Objectives: At the close of this problem area students will be able to:

1. Select and prepare a site for growing tree fruits.
2. Plant and properly space fruit trees for sufficient pollination.
3. Incorporate fruit trees into the home landscape.
4. Identify insects, pests, weeds, and diseases affecting tree fruits.
5. Maintain a year round insect, pest, weed and disease prevention/control schedule for fruit trees.
6. Maintain a fertilization schedule for fruit trees.
7. Prune fruit trees properly.
8. Harvest fruit.

IV. Suggested interest approaches:

1. Bring in several varieties of apples, peaches and/or other tree fruits and have students taste the different varieties.
2. Ask the students if they have any fruit trees in their home landscape. If so, ask them to tell the class about the variety and maintenance practices they are using.
3. Bring in several varieties of apples of different sizes and colors. Ask the students why there are so many different varieties, what makes each variety different, and how would they decide which variety to plant.

V. Anticipated problems and concerns of students:

1. How do I decide where to plant tree fruits?
2. How should I prepare the site I selected for growing tree fruits?
3. How do I find out which varieties of each type of fruit are best suited to my geographical area?
4. What is the difference between semi-dwarf, dwarf, and standard?
5. What are the advantages and disadvantages of growing fruit trees from seed?

III-G-23

6. How do I transplant fruit trees that are balled and burlapped or container grown?
7. How far apart should I plant my fruit trees?
8. Do I need beehives around my fruit trees for pollination?
9. How many years must I wait for different fruit trees to bear fruit?
10. What do I use and how often do I fertilize fruit trees?
11. Do fruit trees need mulches?
12. What happens if I damage the trunk while trimming grass around the tree with a lawnmower?
13. How do I prune and train fruit trees to increase fruit production?
14. What type of animal damage occurs on fruit trees and how can it be prevented?
15. What insects and diseases are found on fruit trees?
16. When do you spray fruit trees for insects and diseases?
17. How are tree fruits harvested?

VI. Suggested learning activities and experiences:

1. Conduct a brainstorming session with students on the factors to consider when selecting and preparing a site for growing tree fruits. Assign each student a factor to research. For example, if previous land use is a factor to consider have a student research how certain previously grown crops have an effect on the planting of tree fruits.
2. Have students plan for the establishment of fruit trees on the school grounds. Information and prices can be obtained from a local nursery. Students should be cautious for hardy zone and maintenance requirements.
3. Determine the number of apple trees needed to plant an acre lot. Have students calculate the production costs of establishing a one acre fruit orchard. Include costs such as trees, fertilizer, mulching, and spraying.
4. Have students read Cooperative Extension Circular 998 - Tree Fruit and Nut Varieties For Illinois Home Orchards. Have students discuss and compare the differences between what is recommended and what is actually available from catalogs or local garden centers.

5. Have students contact the local county Cooperative Extension Service office and report back to the class on a particular type of fruit tree that is recommended for use in their geographical area and blends in well with their home landscape.
6. Take a field trip to a fruit tree orchard and have the grower speak to students on various aspects of fruit production and management, and the possibilities of future employment in such an area. If the class cannot visit an orchard have a commercial grower visit and discuss these topics in class.
7. Demonstrate the proper practices of planting, wrapping, training, fertilizing and controlling pests on fruit trees.
8. Have a resource person from the Cooperative Extension Service talk on home maintenance of fruit trees.
9. Demonstrate the proper tools and pruning techniques used with fruit trees. This can be done with the audio-visuals selected for this problem area if an on-site demonstration is not possible.
10. After reading VAS Subject Matter Unit 4043, have students complete Student Worksheet I-Pruning Fruit Trees. Review the concepts with them once they have finished.
11. Show VAS Fruit Disease Sheets I and II on Apples. Discuss the prevention/controls available for these and other diseases. Have some of the chemicals available and demonstrate how to apply them. A follow-up discussion could include insect, weed, and animal pest prevention/controls. When discussing or demonstrating the use of chemicals, safety precautions should always be stressed.
12. Have students read Cooperative Extension Circular 1144 - Controlling Weeds in Home and Fruit Plantings, pages 3-6. Lead a discussion following this reading. Have students visit a local garden center, inquire about the most up-to-date weed control treatments, and report back to class on their findings. Each student could write a short report on one control/herbicide and discuss it with the class.
13. Have students discuss the information in the Cooperative Extension Circular 1145 - Home Fruit Pest Control. Particular attention should be focused on the safety factors involved when controlling pests with chemicals.
14. Have students make a chart, either for themselves or for the classroom, of apple trees and their pollinating varieties. Other tree fruits can be used in this exercise. Students will need to check the tree grower's catalogs for this information as specific varieties vary from one grower to another.

15. Bring in tree fruits at various stages of ripeness. Have students taste the fruit. Ask students how one would determine the proper time to harvest fruits.
16. Students really interested in the topic who have or plan to have apple or peach trees at home, should read Cooperative Extension Circular 1122 - Illinois Fruit Calendar. Make sure they read page 4 for instructions on how to properly use the calendar. If apple and/or peach trees are to be planted on the school grounds, each student should become familiar with the Illinois Fruit Calendar and be responsible in some way for the success of the tree(s).
17. Discuss with students how to use the Fruit and Vegetable Production Record Book or My Plant Diary for their SOEP's. Both publications are available from Vocational Agriculture Service.
18. Take the students on a field trip to a nearby tree fruit pick-your-own operation. Refer to the most updated version of the (1982) Directory of Pick-Your-Own Fruits and Vegetables in Illinois. The full address for receiving this directory is in the Reference and Aids section.
19. Use the competency inventory to discuss entry level requirements for work in the tree fruits area. Have students complete the Competency Inventory at the end of the unit, so they can assess their progress.

#### VII. Application procedures:

1. The information and materials in this problem area can be used by the student who has an S.O.E. program concerning tree fruits.
2. Students can apply knowledge learned as an employee in a nursery, orchard or local garden center.
3. The material in this problem area can be applied by the student for present or future home landscaping.

#### VIII. Evaluation:

1. Administer and evaluate worksheets completed by students.
2. Prepare, administer and grade a written test using the sample test questions enclosed in this problem area.
3. If feasible, evaluate students on the actual pruning of fruit trees.
4. Check student progress through use of the Competency Inventory.

#### IX. References and aids:

1. Vocational Agriculture Service, University of Illinois, 1401 S. Maryland Drive, Urbana, IL 61801.

- A. Subject Matter Unit 4043 - Pruning Fruit Trees
- B. Tree Fruit - Apple Disease Sheets I, II
- C. Fruit and Vegetable Production Record Book
- D. My Plant Diary

2. Cooperative Extension Service, College of Agriculture, University of Illinois, Urbana, IL 61801

- A. Circular 1013 - Growing Tree Fruits in the Home Garden
- B. Circular 1122 - Illinois Fruit Calendar
- C. Circular 998 - Tree Fruit and Nut Varieties for Illinois Home Orchards
- D. Circular 1144 - Controlling Weeds in Home Fruit Plantings
- E. Circular 1145 - Home Fruit Pest Control
- F. Fruit and Vegetable Calendar (minimal cost)

3. All About Growing Fruits and Berries, Ortho Books, Chevron Chemical Company, Ortho Division, 575 Market Street, San Francisco, California, 94105

This publication is available at most local garden centers and public libraries.

4. 1982 Directory of Pick-Your-Own Fruits and Vegetables in Illinois, Illinois Department of Agriculture, Division of Marketing, Agriculture Building, State Fairgrounds, Springfield, Illinois 62706 or contact your local Agricultural Extension Office.

## COMPETENCY INVENTORY

### GROWING TREE FRUITS

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

**Competency**

**Circle One**

1. Prepare the soil for planting fruit trees.	1	2	3	4	5		
2. Prepare the site for planting the trees.	1	2	3	4	5		
3. Plant trees in orchard according to plan.	1	2	3	4	5		
4. Water newly planted trees.	1	2	3	4	5		
5. Prune newly planted trees.	1	2	3	4	5		
6. Prune trees to establish scaffold branches.	1	2	3	4	5		
7. Take soil samples.	1	2	3	4	5		
8. Apply fertilizer.	1	2	3	4	5		
9. Apply insecticides and fungicides to trees.	1	2	3	4	5		
10. Thin fruit by use of chemicals.	1	2	3	4	5		
11.							
12.							
13.							
14. Select appropriate varieties of trees.						6	7
15. Select good planting sites.						6	7
16. Select an appropriate system of training for each fruit.						6	7
17. Assure adequate pollination.						6	7
18. Determine optimum time to harvest fruit crop.						6	7
19. Determine most appropriate method of harvesting.						6	7
20. Identify outlets for fruit products to be marketed.						6	7

These are competencies outlined in the National Ag Occupations Competency Study for entry level positions in agricultural/horticultural production.

Name \_\_\_\_\_

Date \_\_\_\_\_

INFORMATION SHEET I  
SOURCES OF TREE FRUIT PLANTS

This is only an example of the many growers. Exclusion does not imply inferior plant material. Do not hesitate to check with your local nursery/garden center first.

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Bountiful Ridge Nursery  
Princess Anne, MD 21853

Clyde Nursery  
Clyde, OH 43410

Cumberland Valley Nursery  
McMinnville, TN 37110

Emlong Nursery  
Stevensville, MI 49127

Haley Nursery  
Smithville, TN 37166

Hilltop Nursery  
Hartford, MI 49057

Inter-State Nursery  
Hamburg, IA 51640

Kelly Bros. Nursery  
Dansville, NY 14437

Miller Nurseries  
Canandaigua, NY 14424

Neosho Nursery  
Neosho, MO 64850

Stark Bros. Nursery  
Louisiana, MO 63353

Steelman Nursery  
Princeton, NJ 08540

Waynesboro Nursery  
Waynesboro, VA 22980

## STUDENT WORKSHEET I

### TERMS ASSOCIATED WITH TREE FRUITS

INSTRUCTIONS: Find the definitions of each term by looking these words up in various references including the dictionary or horticultural textbooks covering tree fruits.

---

1. DWARF -
2. SEMI-DWARF -
3. GENETIC DWARF -
4. SPUR -
5. HARDINESS ZONE -
6. MALLING/MERTON MALLING ROOTSTOCK -
7. THINNING THE FRUIT -
8. HERBICIDE -
9. INSECTICIDE -
10. FUNGICIDE -
11. CROTCH ANGLE -
12. SCAFFOLD -
13. HAND PRUNING SHEARS -
14. LOPPING SHEARS -
15. PRUNING SAW -
16. POLE PRUNER -

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III-G-2-13

## STUDENT WORKSHEET 2

### PRUNING FRUIT TREES

Reference - VAS Subject Matter Unit 4043 - Pruning Fruit Trees

1. What are the primary purposes of pruning fruit trees?

2. How does pruning increase the vigor of growth of a tree?

3. Why would pruning delay fruiting and lessen the yield of the tree?

4. What is a weak crotch angle? Draw a weak crotch angle.

421

STUDENT WORKSHEET 2 -- continued

5. What is the most desirable angle between the branches of fruit trees?

---

6. Why is it better to prune out some large upper branches?

7. How does pruning affect fruit quality and condition?

8. Name 3 ways that pruning helps control diseases and insects?

9. When is the best time of the year to prune fruit trees? Explain your answer.

## TEACHER'S KEY - STUDENT WORKSHEET 1

### TERMS ASSOCIATED WITH TREE FRUITS

1. DWARF - Made up of two distinct tree parts. A dwarfing rootstock is used to limit the tree growth up to 50% of the standard size. This is done by horticulturalists.

---

2. SEMI-DWARF - The tree grows from 60-75% of the standard size. This is done by horticulturalists.
3. GENETIC DWARF - The genetic make-up of the tree is the limiting factor in growth. This is a natural event.
4. SPUR - Where the fruit grows on an apple tree.
5. HARDINESS ZONE - Refers to the cold hardiness of plant and tree varieties. Some varieties may not grow in certain hardy zones. Illinois has two zones.
6. MALLING/MERTON, MALLING ROOTSTOCK - Dwarfing and semi-dwarfing rootstocks used in grafts to determine tree size. They are shorter than the standard tree.
7. THINNING THE FRUIT - Once the fruit crop is starting to grow; this is the removal of some fruits to allow for the best growth possible without crowding.
8. HERBICIDE - Chemical used in weed control.
9. INSECTICIDE - Chemical used in insect control.
10. FUNGICIDE - Chemical used in some disease control.
11. CROTCH ANGLE - The angle where branches fork or where a main limb joins the trunk. A strong crotch angle is an angle of 45 degrees or more.
12. SCAFFOLD - The main limbs branching from the trunk.
13. HAND PRUNING SHEARS - For pruning branches up to ½" in diameter.
14. LOPPING SHEARS - For pruning branches ½" to 1" in diameter.
15. PRUNING SAW - For pruning over 1" in diameter.
16. POLE PRUNER - For pruning up to 2" diameter wood, 12-16 feet above the ground.

## TEACHER'S KEY - STUDENT WORKSHEET 2.

### PRUNING FRUIT TREES

Reference - VAS Subject-Matter Unit 4043 - Pruning Fruit Trees

1. What are the primary purposes of pruning fruit trees?

Pruning fruit trees is done for the following reasons:

- A. To reduce total growth
- B. To increase vigor of growth
- C. To delay fruiting and lessen yield
- D. To avoid narrow angled branches and weak crotch angles
- E. To improve fruit quality and condition
- F. To aid in controlling diseases and insects.

2. How does pruning increase the vigor of growth of a tree?

Pruning a tree causes the remaining branches to grow larger. The lateral branches will also develop faster and grow longer.

3. Why would pruning delay fruiting and lessen the yield of the tree?

Any cultural practice which tends to maintain a vigorous shoot growth delays the formation of fruit buds. Pruning young trees either before or after they reach a fruit bearing stage also lowers fruit yields.

4. What is a weak crotch angle? Diagram a weak crotch angle.

A limb that branches from the trunk at a narrow angle forms a weak crotch angle.

5. What is the most desirable angle between the branches of fruit trees?

An angle of 40-60 degrees is the most desirable angle between the branches of fruit trees.

6. Why is it better to prune out some large upper branches?

It is better to prune out large upper branches which shade out and decrease fruit yields on the lower branches.

7. How does pruning affect fruit quality and condition?

Pruning can improve fruit quality and condition by letting in more light to give better color to the fruit. Pruning also removes limbs that may rub against fruit and damage it.

8. Name 3 ways that pruning helps control diseases and insect.

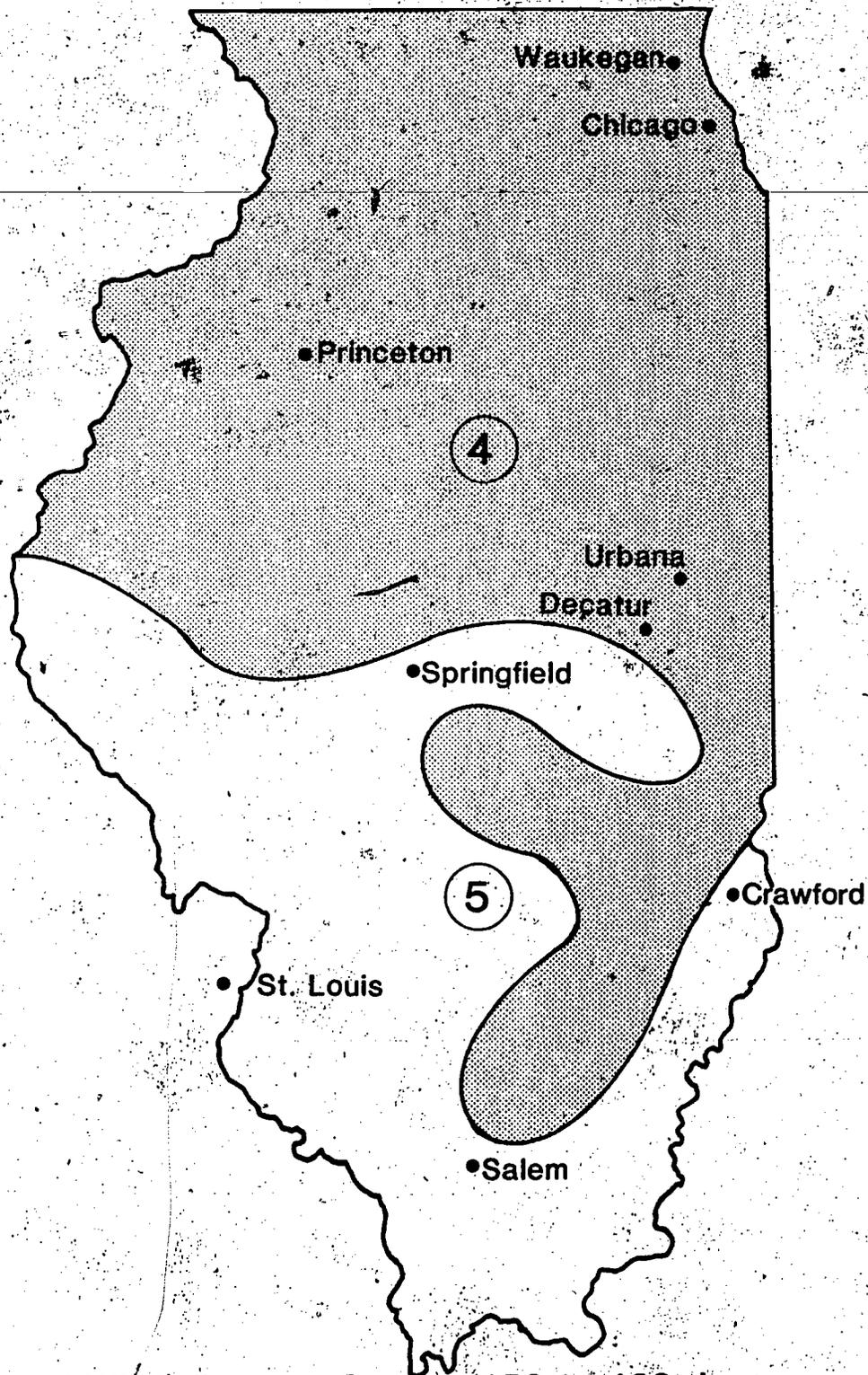
Pruning helps control diseases and insects by

1. allowing more complete coverage of the branches when spraying preventive pesticides
2. eliminating a harboring place for insects and disease in dead or dying wood
3. removing dead, weak and useless limbs, resulting in a stronger and more disease resistant tree.

9. When is the best time of year to prune fruit trees? Explain your answer.
- 

Pruning should be done during the dormant season. The open wounds caused by pruning are less susceptible to insects and disease at this time, thus causing less stress to the tree. In addition, when the leaves have dropped, the proper pruning cuts can be easily and readily determined.

# FRUIT CLIMATE ZONES FOR ILLINOIS

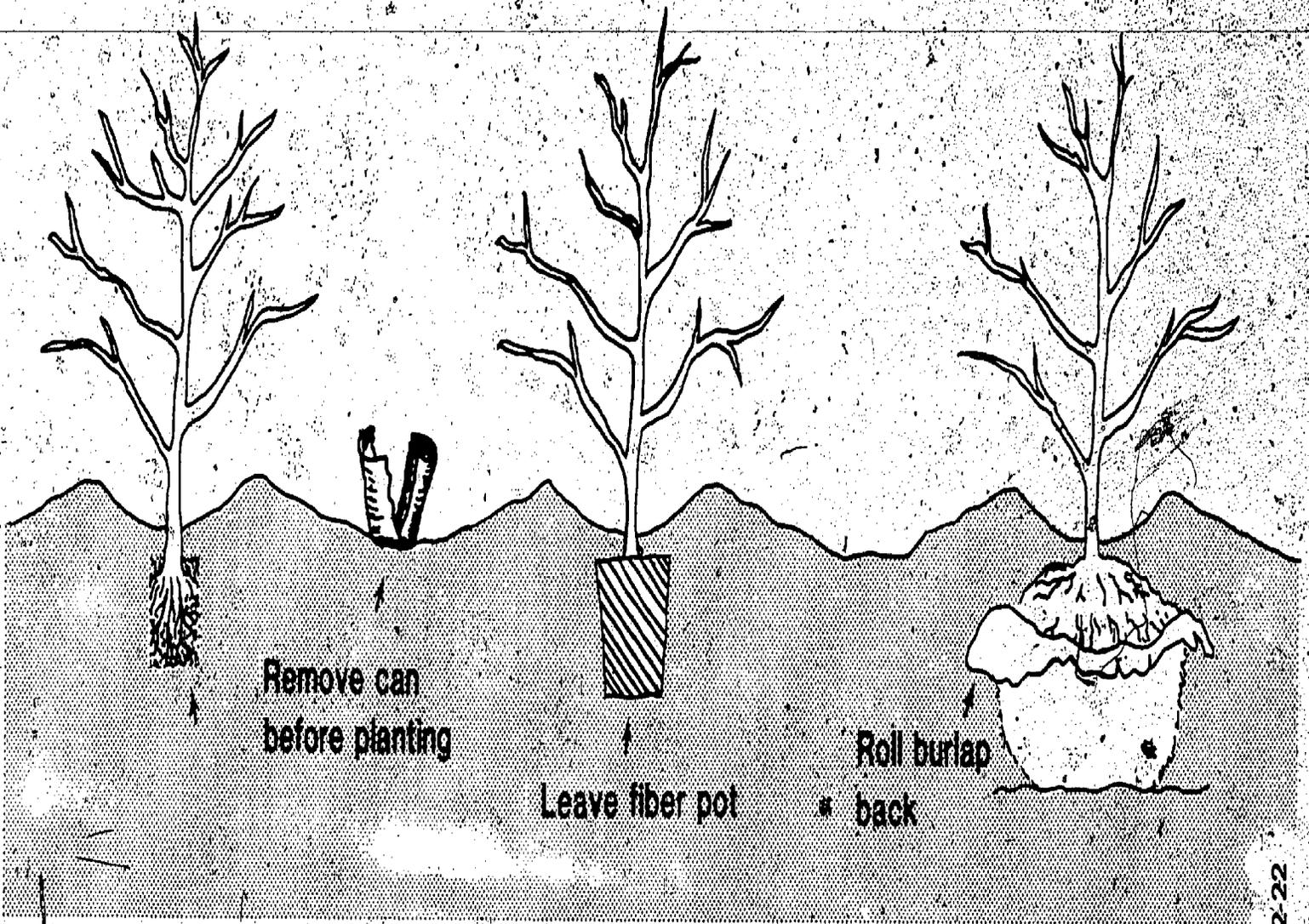


**ZONE 4**—Growing Season 150 to 180 days

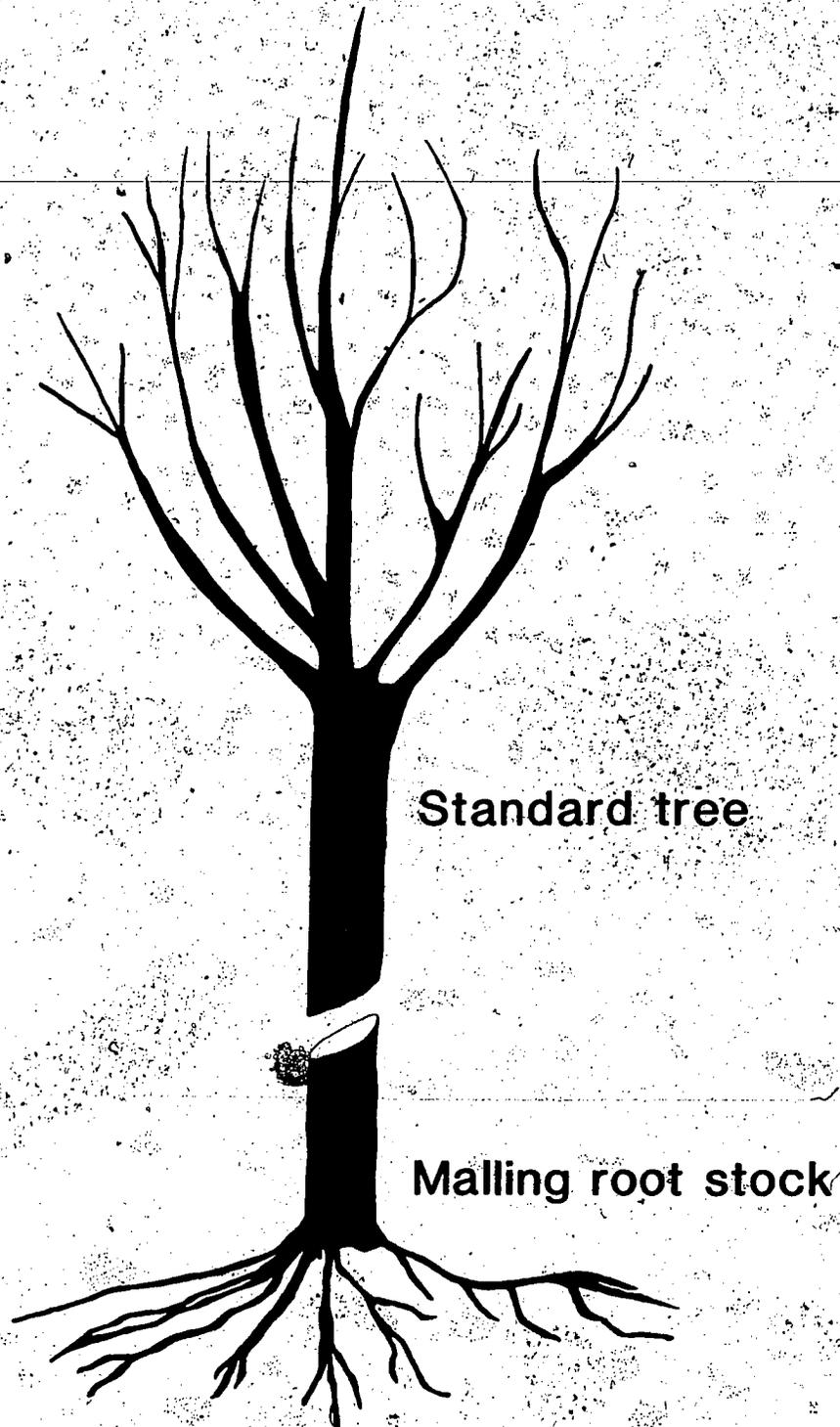
**ZONE 5**—Growing Season 180 to 210 days

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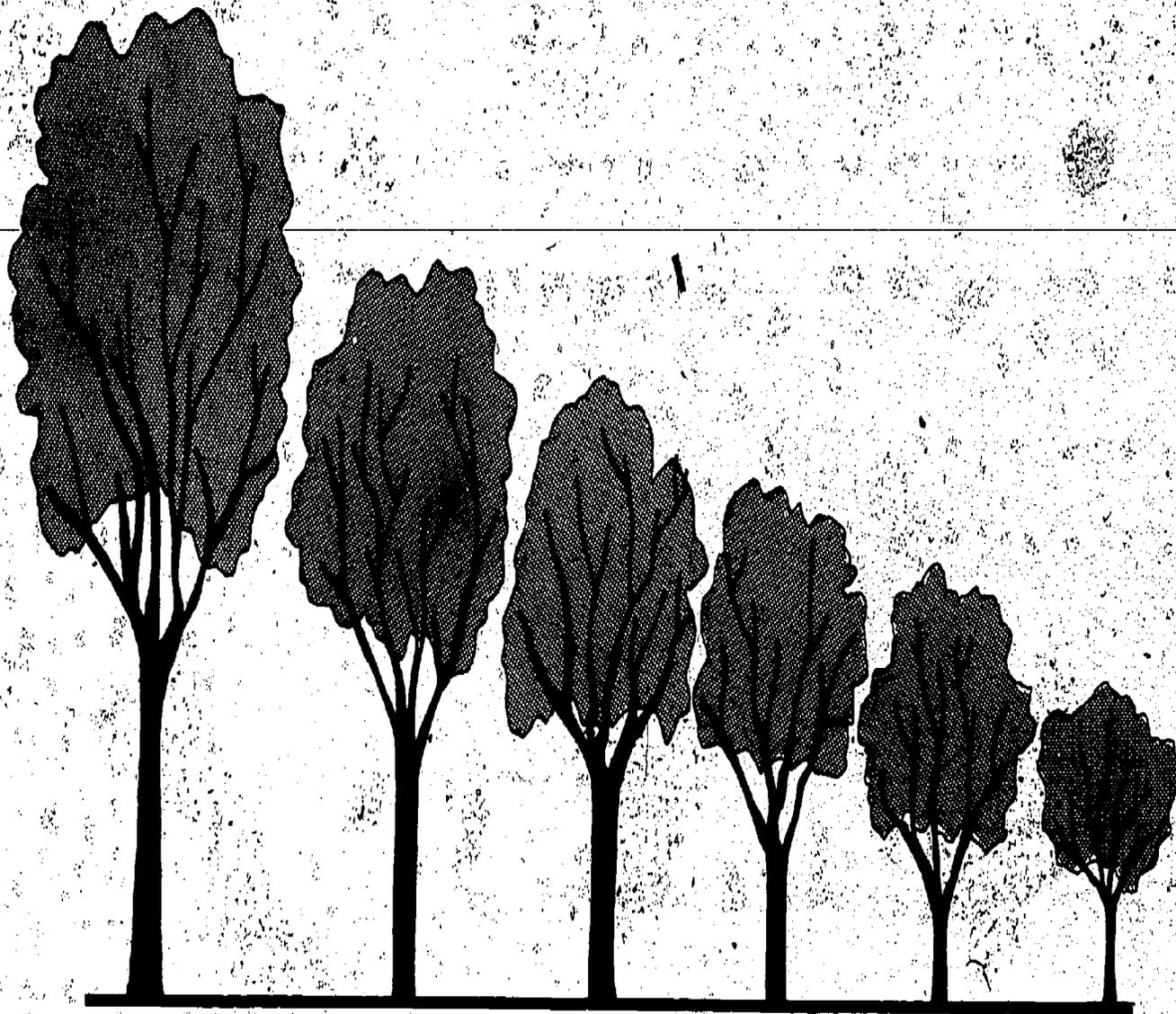
# TRANSPLANTING FRUIT TREES



# WHAT IS A DWARF TREE ?



# SIZES OF APPLE TREES



STANDARD  
OVER 20'

MM106  
18'

M7  
15'

M26  
12'

M9  
9'

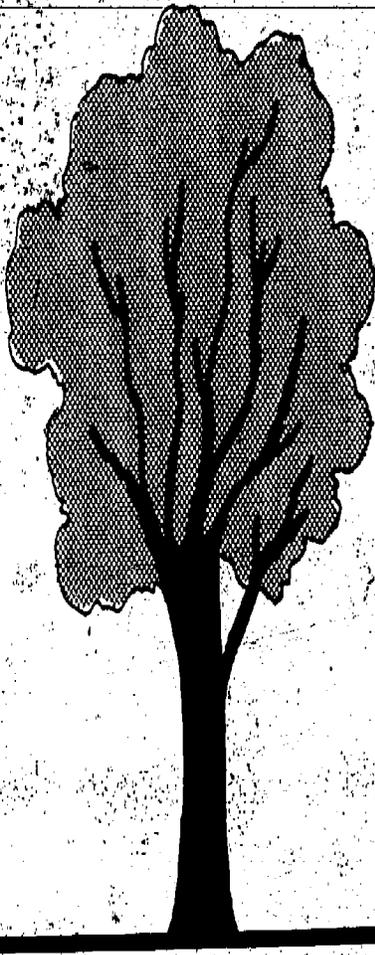
M27  
4'

# SIZES OF PEACH TREES



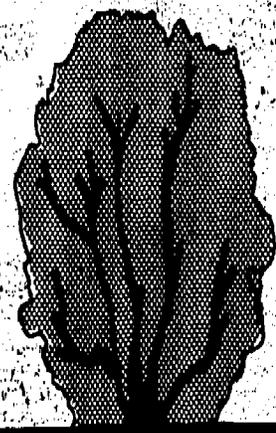
STANDARD

15'-18'



SEMIDWARF

7'-9'



GENETIC DWARF

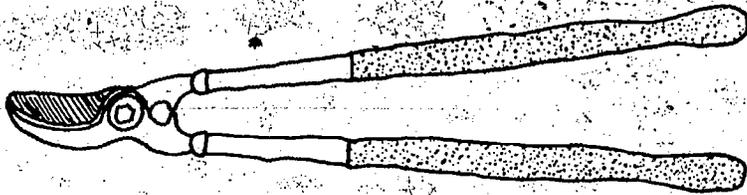
4'-6'

111-G-2-25

# BASIC PRUNING TOOLS FOR TREE FRUITS



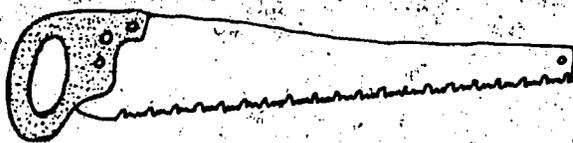
Hand Pruners



Lopping Shears



Curved Pruning Saw



Wide Blade Saw

## TRANSPARENCY DISCUSSION GUIDE

### GROWING TREE FRUITS

#### I. Transparency--FRUIT CLIMATE ZONES FOR ILLINOIS

- A. The Midwestern States are divided into 5 hardiness zones.
- B. Zones 4 and 5 are the only two zones in Illinois.
- C. Fruit trees grown in Climate Zone 4 usually need some type of protection against cold temperatures.
- D. Climate Zone 5 is much milder and can support many fruit tree varieties.

#### II. Transparency--TRANSPLANTING FRUIT TREES

- A. If the tree is bought in a metal container, make sure the container is removed before planting.
- B. Fiber pots can be left on when planting.
- C. Burlap can be left on for planting, but it should be rolled back some.
- D. In all three cases, the soil ball should be covered completely by first adding soil in layers into the hole.
- E. Mound 6 inches of soil around the plant, leaving a well around the trunk to catch water.
- F. Refer to Metropolitan Core Curriculum, Unit L, Problem Area , pages 7 and 8 for more information on transplanting in general.
- G. Fruit trees should be transplanted when they are in the dormant stage.

#### III. Transparency--WHAT IS A DWARF TREE?

- A. A dwarf tree actually consists of 2 separate trees.
- B. The malling tree provides the roots and the standard apple tree provides the fruit.

#### IV. Transparency--APPLE TREE SIZE DIFFERENCES

- A. The M (Malling) and MM (Merton Malling) rootstock numbers determine apple tree size.
- B. M27 is the most dwarfing rootstock reaching a height of 4 feet.

- C. M9 is less dwarfing, reaching a height of 9 feet.
- D. M26 reaches a height of 12 feet.
- E. M7 is considered semi-dwarf, reaching a height of 15 feet.
- F. MM106 is the largest semi-dwarfing rootstock, reaching a height of 18 feet.

V. Transparency--SIZES OF PEACH TREES

- A. The standard peach tree needs pruning to keep it at a manageable height.
- B. The semi-dwarf requires pruning to maintain it and to encourage new fruiting wood.
- C. The genetic dwarf is a bush shape and does not need pruning. It is not very winter hardy.

VI. Transparency--BASIC PRUNING TOOLS FOR TREE FRUITS

- A. There are 4 basic pruning tools for tree fruits.
- B. The hand pruning shears are for the smallest branches.
- C. Lopping shears are used on branches up to 1½ inches in diameter.
- D. The curved pruning saw is used on branches up to 2 inches in diameter.
- E. The wide blade saw is used on the largest limbs.

## SAMPLE TEST QUESTIONS AND TEACHER'S KEY

### GROWING TREE FRUITS

#### TRUE OR FALSE:

- False 1. Mulching, cultivating, mowing and herbicides are common methods of disease control.
- True 2. Herbicides can be wettable powders, liquids or granules.
- True 3. Fruit trees should be protected from weed competition for five years after planting.
- True 4. A herbicide is used for weed control.
- False 5. The same herbicides cannot be used on apple, peach or cherry trees.
- True 6. It is best to follow a year-round schedule when maintaining fruit trees.
- True 7. Most pruning of apple and peach trees is done in the spring.
- False 8. Any variety of fruit can be planted in any geographical area.
- True 9. Fruit trees will do best in full sun.
- False 10. Pruning fruit trees has no effect on fruit yield.

#### SHORT ANSWER:

1. A tree consisting of parts from 2 or 3 trees is a dwarf tree.
2. Dwarf apple trees can vary in size from 4 feet to 18 feet.
3. On apple trees the fruit grows on a spur.
4. The most troublesome insect for apples is the codling moth.
5. The three major varieties of apples are Delicious, Jonathan and McIntosh.
6. Peach trees may be purchased in three sizes: Standard, Semi-dwarf, and Genetic dwarf.
7. Peaches grow on last year's growth.
8. A pole pruner can be used to prune branches that are 12-16 feet above the ground.

9. Lopping shears are used to prune trees with wood diameters of  $\frac{1}{2}$ -1 inch, while handpruning shears are used to prune trees with wood diameters up to  $\frac{1}{2}$  inch.
  10. Once the fruit crop is starting to grow, thinning out is done to allow for the best growth possible without crowding.
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