Attachment 1: Basic Scouting Procedures

Source: Field Crops Manual, IPM-1, Entomology Department - Extension, Purdue University

http://www.entm.purdue.edu/entomology/ext/fieldcropsipm/gbsp.htm (accessed August 5, 2005)

Basic Scouting Procedures

Upon entering any field there are always certain procedures that must always be followed:

1. Make certain you are properly equipped with the tools you may need once in the field.
2. Identify the field on the scouting report form by the farmer's name, field number, location, etc.
3. Record date and time of day.
4. Record weather conditions.
5. Record the stage of growth of the crop.
6. Record general soil and crop condtions.
7. Sample the field in the pattern prescribed for the particular pest(s).
8. Record the results of any scouting procedure performed.
9. If needed, collect samples of pests and/or their damage for later identification.

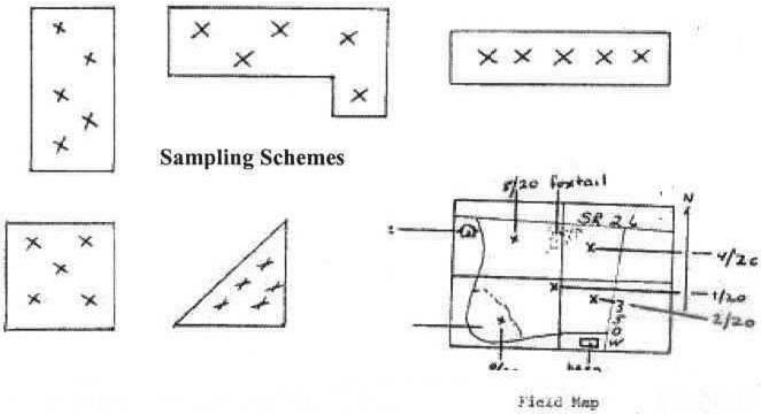
Basic Sampling Techniques

Sampling for crop pests need not be complicated to provide a good picture of field conditions. However, to be sure that your sampling is reasonably accurate and unbiased, you will need to follow certain guidelines.

Do not sample field borders, fence rows, ditch-banks, or other atypical field areas as part of the regular activity. Go into the field at least 75 feet (23 m) or 30 rows before you begin your sampling. Sampling atypical field areas may provide misleading information concerning the field as a whole. However, while walking through the field border rows, fence rows, ditch-banks, etc., keep alert for signs of any problems that might be developing. Pests found in these areas might necessitate spot treatment or might indicate potential trouble for the whole field.

Make certain that the samples taken represent the entire field. Field conditions and pest infestations may not be uniform throughout a field. Therefore, samples from a limited area of the field may lead to erroneous conclusions concerning the whole field. If a field has unusual topography, such as high and/or low areas, these areas should be sampled as a part of the regular field scouting activity (pest counts and plant damage assessments from unusual or unique areas should be properly identified as such on field record sheets).

Look at the following illustrations for examples of sampling schemes that provide an overview of an entire field. Each "x" indicates where samples should be taken (modifications may be necessary for some pests and/or fields). Note that at least five (5) areas of a field should always be sampled unless pest-specific sampling procedures otherwise directed.



Sampling Schemes

Field Map

Scouting experience has shown that most pest-specific sampling procedures can provide accurate information for an area up to 40 acres (16 ha). In other words, if a field is larger than 40 acres (16 ha), divide it into smaller units and sample each unit separately. An 80-acre (32 ha) field should be sampled as two 40 acre (16 ha) fields.

Randomly select the first plant in each sampling area. During early season field visits when the plants are small and visibility is not obstructed, toss an object, such as a hand trowel, in the area to be sampled. Start your inspection with the plant closest to where it lands.

Mid- to late-season sampling may be more difficult when visibility and mobility are reduced. In such a situation, walk to the area to be sampled and, looking up at the sky, walk forward five paces. Stop and begin your sampling procedure with the plant nearest the toe of your right foot.

As you survey a field, draw a simple map of the field on your scouting form. This map should include pertinent information such as location of each sampling site, landmarks, high and/or low areas in the field, areas infested with pests, and the number of pests or damaged plants found in each area sampled (pest and damage data may be recorded in one or more locations on the scouting form, but proper identification of each sample by using a set code should be noted on both the map and the written portion of the scouting form).

Scouting Form

The importance of complete and concise scouting information cannot be overemphasized. Basic, and absolutely essential, is field identification. Field identification must include the farmer's name and/or field designation. Also, the date the field was scouted must be included. The data collected during scouting activities are useless without proper identification of the field.

Also of basic importance are the actual pest and damage counts. Counts should be reported legibly and completely. Complete pest and damage counts include the actual number of pests observed in each area sampled, amount of pest damage found per sample area, the units the sample data were taken in (examples – 20 sweeps/sample set, 20 plants per sample set, estimated percentage defoliation for 5 plants per sample set, etc.), and accurate calculations of averages or percentages of pests and/or damage for the field as a whole. *Record all data in the manner outlined for each pest being scouted.* Also, accurately record the stage of plant development since many control recommendations are based on plant growth stage.

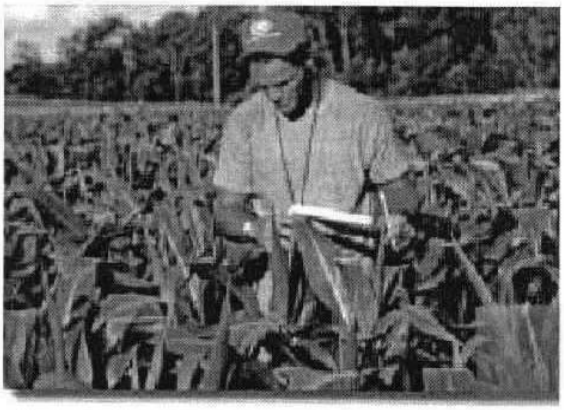
Other general observations should be made. These include crop and weather conditions, other pests observed and their abundance, beneficial organisms seen and their abundance, and general comments that might assist one in making management decisions. All of these factors will influence what impact the pest may have and whether control will be necessary.

Other pests observed may not be of economic importance at the time of sampling, but may become a major pest if conditions are right. Accord them the same care in data collection as you would a pest that appears to be of greater economic importance.

The "Comments" section of the scouting form can provide important information about one's assessment of the pest, crop, and environmental conditions. More detailed observations concerning the pest(s), damage, plants, surrounding land areas, weather, etc., should be included in this section.

It is important to complete all scouting form sections. These forms become your permanent record of pest activity and plant development for each field. After several years of collecting these kinds of information, trends in both pest activity and general crop development may be noted. This can lead to the development of better management strategies for both pests and crops and can aid in the development site specific farming activities.

On the next page is an example of a form that has been filled out properly.



United States Department of Agriculture
NRCS Natural Resources Conservation Service

IDAHO

Scouting Report

Producer John Purdue Date 5/20 Time 9:15 (am)/pm

Field ID Black County Gold Scout Pete

PLANT POPULATION

	Set Counts										Total	Plants/Acre
Plants per 1/1,000 of an acre*	25	27	25	26	25						128	÷ #Set x 1,000 = 25,600

* 36" row width = 14'6" length of row, 30" = 17'5", 20" = 26'2", 15" = 34'10", 10" = 52'3", 7" = 74'8"

INSECTS	Plants/Set	Set Counts										Total	%	# per Plant
black cutworm	20 /Set	0	0	3	0	0						3	3	
corn flea beetle	20 /Set	1	2	0	3	0						6	6	1.5 beetles
	/Set													
	/Set													
	/Set													

WEEDS

Grasses (Scattered, Slight, Moderate, Severe)

giant foxtail — sc (sl) md sv — Avg. height 2"

nutsedge — (sc) sl md sv — Avg. height 2"

Broadleaves

velvetleaf — sc sl (md) sv — Avg. height 1"

giant ragweed — (sc) sl md sv — Avg. height 3"

SOIL CONDITIONS

wet (moist) dry

(loose) light crust hard crust

WEATHER

cool (warm) hot

partly sunny (cloudy) rainy

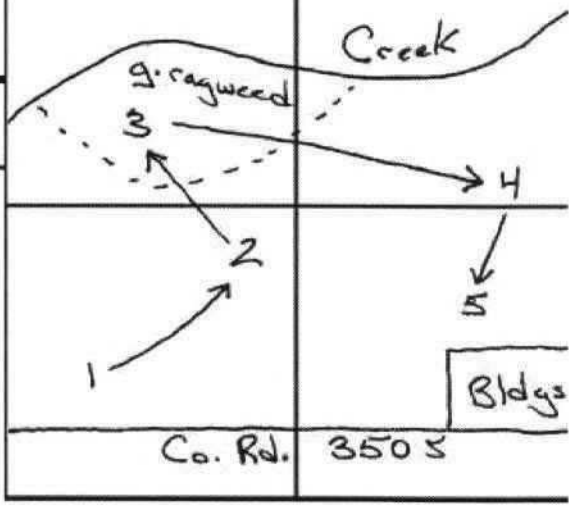
calm (light wind) strong wind

DISEASES (rating of 1, 2, 3, 4, or 5)

anthracnose (lower leaves) — 1

CROP GROWTH STAGE V2

Map



Comments:

- cutworm damage only observed in low wet area near the creek. Ave. instar is 5, ranged 3 to 6.
- giant ragweed is thick near creek, see map. Foxtail and velvetleaf scattered throughout, some thick streaks.

Scouting Report

Producer _____ Date _____ Time _____ am/pm

Field ID _____ County _____ Scout _____

PLANT POPULATION Set Counts Total Plants/Acre

Plants per 1/1,000 of an acre* | | | | | | | | | | | _____ ÷ #Set x 1,000 = _____

* 36" row width = 14'6" length of row, 30" = 17'5", 20" = 26'2", 15" = 34'10", 10" = 52'3", 7" = 74'8"

INSECTS	Plants/Set	Set Counts	Total	%	# per Plant
_____	/Set				
_____	/Set				
_____	/Set				
_____	/Set				
	/Set				

WEEDS

Grasses (Scattered, Slight, Moderate, Severe)

_____ sc sl md sv Avg. height _____

_____ sc sl md sv Avg. height _____

Broadleaves

_____ sc sl md sv Avg. height _____

_____ sc sl md sv Avg. height _____

SOIL CONDITIONS

wet moist dry

loose light crust hard crust

WEATHER

cool warm hot

partly sunny cloudy rainy

calm light wind strong wind

DISEASES (rating of 1, 2, 3, 4, or 5)

_____ _____

_____ _____

CROP GROWTH STAGE _____

Map

Comments:

Field Scouting Equipment

The following items can help facilitate fast and accurate data collection, and a well-prepared field monitor should have access to these tools at all times:

- clip board
- survey forms and/or paper (waterproof)
- writing materials
- field maps
- pocket knife
- forceps
- shovel
- hand trowel
- hand counter
- hand lens (10X)
- measuring tape (50 ft. [15 m])
- yardstick
- 15" diameter sweep net (soybeans & alfalfa)
- face shield (grinder mask) or eye goggles
- vials or empty 35 mm film canisters
- isopropyl alcohol (insect preservation)
- wide mouth jars
- plastic bags
- paper bags
- black sheet of plastic
- pest ID guides and other resource materials
- camera and/or video recorder

Some of the specialized specimen collecting tools listed above are available from the following companies (this listing is not inclusive nor an endorsement):

BioQuip Products
17803 LaSalle Avenue
Gardena, CA 90248-3602
(310) 324-0620 Fax: (310) 324-7931
e-mail: bioquip@aol.com

Gempler's
PO Box 270, 100 Countryside Drive
Belleville, WI 53508
(800) 382-8473 Fax: (800) 551-1128
web: http://www.gemplers.com

Great Lakes IPM
10220 Church Road, NE
Vestaburg, MI 48891
(517) 268-5693 Fax: (517) 268-5311
e-mail: glipm@nethawk.com

Plant Population

Plant population counts in row crops are useful for assessing the effectiveness and accuracy of a planter and to determine if a plant stand is adequate to achieve good yields. If plant population counts indicate that certain areas have fewer plants than desired, those areas may need to be replanted or may require adjusted treatment thresholds. A late season count can provide important information in regards to hybrid or variety performance.

Plant population counts should be taken about three weeks after initial plant emergence. This allows for late emerging seedlings whose development has been delayed for one reason or another to be counted.

To make stand counts, first measure the row width. Next consult the table below and determine how many row feet of plants it is necessary to count. Then, in five areas of the field, randomly select the first plant to be counted in a row, mark off the necessary row feet, and count the number of plants in the sample area. On an adjacent row, count back the same length of row, record the two numbers, and move to the next sampling area.

After you have counted the plants in each of the five areas, total the numbers and determine the average. Multiply this average by one thousand. The product is the number of plants per acre.

Row Width (inches)	Row-feet of plants to be counted
42" (1.07 m)	12' 5" (3.78 m)
40" (1 m)	13' 1" (3.93 m)
38" (95 cm)	13' 9" (4.19 m)
36" (90 cm)	14' 6" (4.35 m)
34" (86 cm)	15' 4" (4.67 m)
32" (81 cm)	16' 4" (4.98 m)
30" (75 cm)	17' 5" (5.23 m)
28" (71 cm)	18' 8" (5.69 m)
26" (66 cm)	20' 1" (6.12 m)
24" (61 cm)	21' 9" (6.63 m)
22" (56 cm)	23' 9" (7.24 m)
20" (50 cm)	26' 2" (7.98 m)
15" (37.5 cm)	34' 10" (10.45 m)
10" (25 cm)	52' 3" (15.68 m) or 26' 2" (7.98 m) in two adjacent rows
7" (17.5 cm)	74' 8" (22.8 m) or 37' 4" (11.2 m) in two adjacent rows

Insect Scouting

The first step in a pest management program is to correctly identify and obtain information about pest species residing in the crop and their distribution within the crop. This is accomplished by surveying the field on a regular basis for insect pest species, their natural enemies, the developmental stage(s) of both crop and pest(s), and crop damage. This information is used to determine if there is a damaging pest population and, if so, to formulate control measures.

Monitoring for insects can begin before planting, depending on the pest and crop, and continue until harvest. Sampling sites within a field are selected so that the information collected within them gives a good representation of the entire field. Fields are frequently divided into areas of 20 to 40 acres and within each, 5 to 20 samples are taken depending upon the crop and the insect.

Several techniques are used to monitor insect populations. Some of the common sampling methods include, visual inspection, use of a sweep net, and trapping. The sampling technique used will depend on the insect, crop, and sampling time.

Visual Inspection

Sampling for insect pests and their damage is often based on visual observations and is conducted during regular field visits or spot surveys. If a particular problem is noted in an area, a more intensive survey may be initiated to determine the incidence of the pest. Insects are normally counted on the plant or in the soil. Data are generally recorded as the number of individuals per plant or plant part and the amount of plant damage is noted.

Sweep Net

Sweeping with a heavy-duty muslin 15-inch (38 cm) diameter net is one of the most widely used sampling tools for insects used in pest management programs for soybean and alfalfa. The net is swung back and forth through the plant canopy while walking through the field. Insects are trapped within the net and are counted, both pest and beneficial species, while examining the net contents. Very active insects that might otherwise be missed while making visual counts are commonly sampled in such a manner. Sampling data are usually given as the number of individuals per sweep.

Trapping

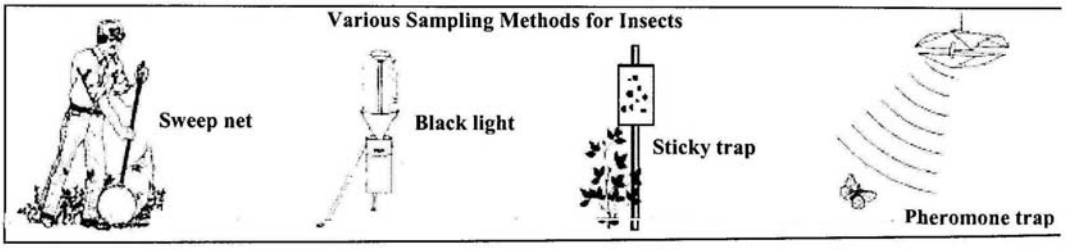
Trapping is another valuable sampling method that can be used for some insects. Light traps are important in determining the relative abundance of insects in a defined region. Black light traps, which emit ultraviolet light, are commonly used to sample nocturnal (active at night) species, such as European corn borer moths. Information on the number of adults caught in a trap is used by pest managers to predict the potential threat of a pest population and when that threat may occur.

Sticky traps are useful for sampling small flying insects such as aphids, leafhoppers, and beetles. These traps consist of either a flat or cylindrical surface that is coated with an sticky substance. These sticky traps are mounted directly on plants, hung from plants, or placed on stakes or other objects at various heights in the crop canopy, depending on insect being sampled and/or the stage of plant growth. Insects are either caught (trapped) in a random manner as they fly about the crop or are attracted to the trap based on its color and/or shape. The sticky surface holds the insects for one or more days, depending on the sampling time frame.

Chemicals that are involved in insect communication (semiochemicals), such as sex pheromones and kairomones, are often placed on sticky traps. Since these chemical attractants are often species specific, this type of trap is a good tool for determining if a particular species is present in the surrounding area. These traps are often useful in detecting the initial flight of some insects, such as European corn borer and black cutworm, and in determining their relative abundance, such as for the western corn rootworm beetle, so as to help the pest manager time scouting and control activities.

Identification, sampling, and management guidelines for the specific insects and their damage are given in the crop sections of this publication.

Various Sampling Methods for Insects



Preserving Insect Specimens

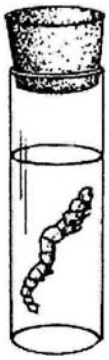
When scouting for insects, it may be necessary to preserve specimens collected in the field for detailed examination and identification later (identification help is available through the Plant and Pest Diagnostic Laboratory, page A-8). To assure proper preservation, follow the techniques developed for specific insect types described below.

Insects collected near the house may be killed quickly and safely by transferring them from collecting vials and placing them in a freezer for 1-3 hours. One major advantage to this method is that insects may be held in a freezer for extended periods without risk of drying out or decomposing.

Hard-bodied insects can be killed by placing them in a killing jar containing a volatile substance such as ethyl acetate, which can be obtained from a biological equipment supplier (see page A-7) or is sometimes found as the active ingredient in finger nail polish removers.

Killing jars that use ethyl acetate as the killing agent can be made at home. To construct a killing jar, select a jar of heavy glass (do not use plastic) having a large mouth and a screw cap. To construct an ethyl acetate jar, pour 1 inch of wet plaster of Paris into the bottom of the jar, let it harden, and dry it thoroughly in an oven. Next, saturate the dry plaster with ethyl acetate and pour off any excess liquid that does not soak into the plaster. Always keep the jar tightly capped. When the jar loses its killing strength, dry it again and recharge it with ethyl acetate. Be careful to avoid the fumes of the ethyl acetate.

Soft-bodied insects, including some adults and all immatures, should be placed in a 70% solution of isopropyl alcohol for permanent preservation. Soft-bodied specimens placed directly in alcohol almost always discolor. An excellent method for preserving them is to submerge live specimens for 1 to 2 minutes in boiling water and then place them in a vial of preservative fluid, such as the 70% isopropyl alcohol. This process kills bacteria in the digestive tract of the specimen and thus reduces discoloration. After a day or two, the preservative liquid may become discolored. When this happens, replace the fluid with fresh solution.



Disease Scouting

You should be alert for disease problems anytime you are in a field. Each time you stop in a field to spot-check for other pests or problems, the incidence and severity of any disease activity at that location should be noted. When a disease is detected or suspected, a more complete field survey should be conducted to ascertain the extent and severity of the problem. Remember, disease problems frequently start in small spots or areas of fields, and in areas where air movement is impeded by woods, topography or man- made structures. Foliar diseases usually start near the bottom of a plant and develop upward. Root and vascular disease symptoms may mimic symptoms from nutrient deficiencies, adverse environmental conditions, poor soil conditions, or any number of other causal factors.

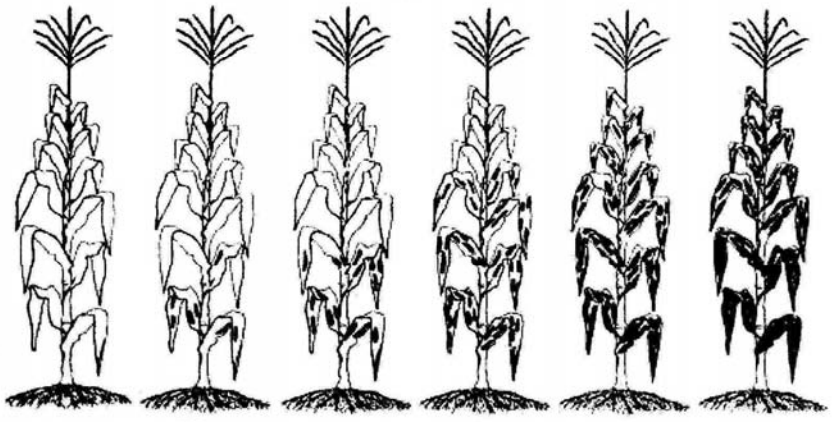
Disease Rating Scale

Rating	Severity
0	No disease present.
1	Trace to 5% of plant tissue affected. Few isolated lesions on lower leaves.
2 At this stage obtain an identification of the disease.	6-20% of plant tissue affected Some scattered lesions lower one-third of plants.
3	21-50% of plant tissue affected. Severe infestions of lower one-third of plants; moderate on middle leaves and scattered lesions above.
4	51-75% of plant tissue affected. Extensive lesion development on lower and middle leaves, moderate above.
5	76-100% of plant tissue affected. Severe disease development on all parts of the plant.

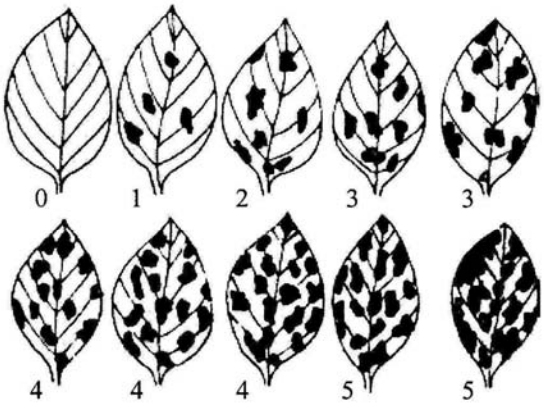
J. Obermeyer

A more complete disease survey is conducted by examining a minimum of five areas within a field. In each area, carefully examine all plants in a 20 foot section of a randomly selected row, for a row crop, or a 1 by 10 feet (.3 by 3.0 m) area of a forage or small grain crop. Determine the disease severity and the percentage of plants displaying disease symptoms by using the following rating scale.

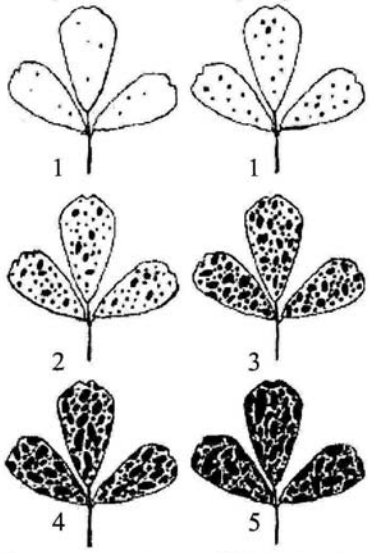
Disease Rating Example - Corn



Disease Rating Example - Soybean



Disease Rating Example - Alfalfa
(Modified from C. James, 1971)

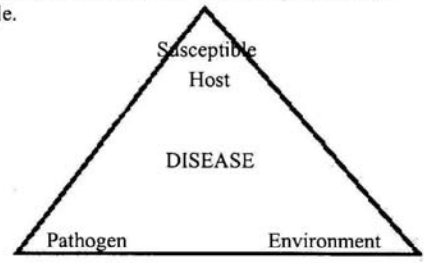


If the disease cannot be identified in the field, a representative plant specimen should be collected. A representative specimen is one that is at least partially alive and which exhibits a range of symptoms. If the problem appears to be a leaf spot or stem canker, collect only the affected plant parts. However, if the problem is possibly a root or vascular disease, the entire plant should be collected. Follow the guidelines for submitting plant materials given on page A-9 of this manual. Include the following information with the sample: plant variety, general field appearance, range of symptoms, specific location of affected plants (low or high ground, end rows, etc.), extent of damage in the field, extent of damage in surrounding fields, appearance of non-crop plants (e.g., weeds) in the area, chemicals used, date of planting, soil type, and any other pertinent data which may help in the diagnosis.

Plant Disease Development

A plant disease is classified as either infectious or non-infectious, depending on the causal agent (cause) of the disease. Non-infectious diseases are those in which the causal agent can not transmitted from plant to plant (e.g., excessive temperatures, mineral deficiencies, mechanical damage, etc.). Infectious diseases are those in which the causal agent can be transmitted from plant to plant, thereby causing additional plants to become diseased. The causal agents of infectious plant diseases are known as pathogens, and each pathogen belongs to one of the following groups: fungi, bacteria, viruses (viroids, etc.), mycoplasmas, nematodes, and parasitic plants.

In order for any infectious disease to occur, at least three interacting factors must occur at the right time and in the right sequence. First a pathogen must come into direct contact with the host plant. Secondly, the host must be susceptible and the pathogen must be viable and virulent. Thirdly, conditions, which are largely environmental, must be favorable for the viable pathogen to infect and establish itself in the susceptible host. This process is often visualized by the disease triangle.



Each component, i.e., host, pathogen, and environment, of the triangle are independent, flexible, and variable. Both the host and the pathogen are highly variable biological systems that intimately interact in response to a highly variable environmental system. If there is no interaction between all three components, there is no disease. If there is a high degree of interaction, disease will be severe. The degree of interaction determines the level of disease. Consequently, diseases vary from year to year, from region to region, from field to field, and frequently within a field in any given year.

Specific plant diseases are covered in each of the crop sections of this manual. While scouting, be aware of disease symptoms and conditions that favor disease development. Disease diagnosis is both a science and an art. The science is an accumulation of the needed facts, symptoms and biology (this manual). The art comes from the ability to assess those facts under changing field conditions.

Weed Scouting

Scouting or field monitoring is an integral part of most pest management programs. For the weed science phase, scouting will usually be a little easier than for the insect phase since weeds are less transient. Determining what weeds may be expected in a field can best be done with a long range weed monitoring program.

Weeds may or may not be present in a particular area because of several factors. Soil moisture or temperature conditions may be conducive to the germination of only certain species. Some weed species may be suppressed by other weed species. For example, quackgrass usually precludes the growth of foxtail, and a dense stand of foxtail may suppress the growth of some broadleaf weeds. Shading and toxic root exudates are among the factors that may cause one species to suppress another. Mechanical or chemical controls may control some species so well that the plants are not present even though some seeds may remain in the soil for subsequent germination.

Although techniques are available for screening and washing weed seeds from the soil to determine what species are present, these techniques are time-consuming and have not been widely adapted for pest management scouting. With careful field observation and mapping at least two or three times a year, a record can be established that will indicate what weed species may be expected to develop in a given field. The field scout can provide this record to the consultant or grower for consideration in designing a control program.

Observations during the early part of the growing season can indicate the effectiveness of the herbicide. They can also suggest the possible need for appropriate chemical or mechanical control measures. Field observations late in the season can provide information on the length of control obtained with the methods used as well as information on late germinating species, such as fall panicum, crabgrass, and bur- cucumber. Records of field scouts may be supplemented by recording observations made by the grower, particularly at harvest.

The first reports on field weed conditions are needed shortly after the crop has emerged (two to three weeks after planting). These early observations can be used in recommending weed control procedures for the current crop.

During this period of early growth, all fields should be evaluated for general weed infestations. If preemergence herbicides do not seem to be controlling the weeds, an appropriate alternative method should be employed; in such cases, an early rotary hoeing, an application of postemergence herbicide, and/or cultivation is usually advisable. If the weed problem is serious, it will be necessary to identify the weeds in the field. This information is needed to select the proper herbicide.

J. Obermeyer

A second weed survey should be carried out during July, sometime after the final cultivation would have been made in conventional production fields. Observations should be made, preferably, at five locations in the field to provide a representative sample of the vegetation. However, the number of samples needed may vary with the size of the field or the type of infestation. When moving between sample locations, note the general weed infestations throughout the field to help modify your evaluation.

General observations used for field-wide recommendations should not be made near the edge of the field or where unusual conditions exist within the field, such as along waterways or in low, poorly-drained soils. However, problems which arise in these areas should be recorded on the weed map. Weeds in the field should be classified into one of the following categories:

1. SCATTERED - Weeds present but very few plants within the field; enough plants to produce seed but not enough to cause significant economic loss.

2. SLIGHT - Plants scattered throughout the field; up to 1 plant for each 3 feet of row; or scattered spots of moderate infestations.

3. MODERATE - Fairly uniform concentrations across the field; up to 1 plant for each row-foot for broadleaf weeds and 3 plants for each row-foot for grass weeds; or scattered spots of severe infestations.

4. SEVERE - Concentrations greater than 1 plant per 1 row-foot for broadleaf weeds and 3 plants per 1 row-foot for grasses; or large areas of several infestations

When recording the weeds and their appropriate rating on the scouting form, include the average height of each weed present. This information can be valuable when deciding on a control for the problem.

To make weed counts in a forage crop, such as alfalfa, count the weeds, by species, and alfalfa plants that are contained in a 1 sq ft area (30 cm x 30 cm). Make such counts in 10 representative areas of the field.

Besides rating each weed species individually, also consolidate your results to develop a rating of each of the three major divisions of weeds (annual grasses, perennials, and broadleafs). For example, if all the annual grasses total 2 plants for each foot of row, then rate that field as, overall, having a moderate annual grass infestation. In addition to the ratings, the five worst weeds in each field should be ranked in order of severity.

During both weed surveys, a weed map should be made for each field. This map will be used to locate problem weeds and to help monitor the changes in these infestations from year to year. A weed map is particularly important for the pinpointing of perennial weed infestations and other problem areas in and around a field, such as weeds in fencerows, near the edges of fields, and along waterways.

Additions to the weed map can be made throughout the growing season during routine field inspections. Perennial weeds are usually easiest to locate within the first month after crop emergence, because they often sprout after the crop emerges and can be seen in the field before the crop develops a dense canopy. Annual weeds are easiest to identify after they have produced seed heads or flowers. Final observations should be made and additional weed information recorded sometime in July when the weeds are in the reproductive stage.

Another tool that provides valuable weed control information is to establish untreated plots throughout a field. This will provide the opportunity to observe the actual weed populations in the field as if a herbicide had not been used. The grower may wish to leave short check strips, 10 to 30 feet (3 to 9 m) long and one sprayer-boom in width, in different areas of the field. These check strips will enable the scout to determine what weeds are being effectively controlled. Visit the field throughout the season, noting the weeds present in each check strip and write a brief description of the infestation level of each weed. Realize, however, that untreated areas may be prime sources of weed seeds that can reinfest a relatively "clean" field.

When time permits, soil samples should be taken to determine organic matter content and texture. Such soil properties as pH and cation exchange capacity (CEC) may be helpful with herbicide recommendations. For exact organic matter determinations, a laboratory test is needed. A quick method of estimating the organic matter of a particular soil sample is to check references which give the approximate organic matter of that soil type. This method is not specific but does serve as a starting place. Once the organic matter is known, these figures should be good almost indefinitely since organic matter levels do not usually change significantly.

In addition to exchanging information on the soil properties, weed species present, and history of herbicide use, the consultant should meet with the grower to determine his cropping plans and to check on what herbicide application equipment he will have available. Additional factors such as if the grower is sensitive to a certain chemical or if he prefers one herbicide over another should be considered.

As a part of his services, the consultant should also make an annual inspection of each grower's application equipment well before the season begins. Simple reminders to replace worn hoses and nozzle tips can help prevent problems. Suggestions on safe and secure storage and disposal of chemicals can also be helpful, and an annual review of each grower's herbicide rate calculations and calibration procedures can also prove very productive.