Pests are to be expected with any agricultural crop. Yet what level of pests is acceptable? A key to approaching that question is to have a good handle on pest populations in the field. Knowledge of pest populations is gained through crop scouting.

**Objective:**

- Explain elements of a crop scouting program.

**Key Terms:**

- crop scouting
- fixing
- weed map

**Scouting Crops**

One of the keys to a successful integrated pest management program is regular monitoring of field crop conditions and pest infestations. This is commonly referred to as **crop scouting**.

A scouting trip through a field reveals which pests are present, what stage of growth each pest and the crop are in, whether the pests are parasitized or diseased, whether a pest infestation is increasing or decreasing, and the condition of the crop. This information can be used to determine whether a control measure is needed.

A scouting program requires accurately written records of the field location, current field conditions, history of previous pest infestations and pesticide use, and a map locating present pest infestations. Records will enable the grower to keep track of each field and anticipate or diagnose unusual crop conditions.
MONITORING PEST POPULATIONS

Basic principles of crop monitoring apply to most scouting programs. Samples should be taken from representative areas of the field. The sampling sites should be evenly distributed over the field, and plants should be sampled randomly unless certain field characteristics suggest an uneven distribution of pests. Avoid border rows and field edges unless there are specific reasons for scouting these areas. Scout at least once a week, but some fields may require monitoring more frequently if insect densities begin to increase rapidly.

Surveying a Field

It is important to make a representative survey of a field in the least amount of time. Upon completion have an accurate indication of the number, kind, and severity of pest problems that are present. Upon entering any field, certain procedures must be followed.

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

It is recommended that each field be visited at least once a week. Some fields may require checking more than once a week when infestations approach economic levels. Other fields may have a low incidence of pest problems and may not require scouting each week. It is

FIGURE 1. Crop scouting is recommended to find out which kind of pest is causing the most problems in a field. (Courtesy, USDA)
important not to waste time making detailed counts when pest problems are not present. Efficient use of time will come with experience. It is important that all counts be taken from representative areas of the field. In general, you should enter about 50 paces beyond the border rows before making counts. Border rows should be avoided unless there are specific reasons for surveying them.

**Survey Patterns**

Many survey patterns may be used when scouting a field.

- **Pattern I**: Pests are expected to be uniformly spread over the field. When scouting for a pest with this distribution, the sample sites are evenly distributed, excluding obvious influencing factors, such as field edges. Pests fitting into this pattern include European corn borers, corn rootworm adults, corn leaf aphids, and foliar diseases.

- **Pattern II**: Pests are expected to be concentrated in particular areas of a field. If pests are detected in one spot and not in others, subsamples should be made in that region to determine more accurately the extent and severity of the problem. Pests fitting into this pattern include black cutworms, white grubs, etc. *Phytophthora* root rot or other root diseases may be distributed in high or low spots.

- **Pattern III**: Pests are expected to appear at field edges first. Take samples of these pests by walking fence lines or waterways. Pests fitting into this pattern include stalk borers in conventionally tilled corn, armyworms, grasshoppers, and chinch bugs.

It may be necessary to combine two or more patterns on one sampling date. Once the pattern for sampling has been established, the method of selecting a subsample becomes important. When subsampling will involve a specific number of plants, two methods are used to select those plants. With both methods, the first plant to be examined is chosen at random. Consecutive plants are examined when the pest will not be disturbed by your action to adjacent plants. Random plants are examined when mobile insects are being surveyed. In this case, the next plant to be examined will not be adjacent to the host but will be some distance away.

**COLLECTING SAMPLES**

During the growing season, problems may be encountered that cannot be identified in the field. A sample must be collected and submitted to a testing laboratory for identification.

**Plant Samples**

Accurate identification of plant samples and correct diagnosis depends on the rapid receipt of fresh representative plant samples with the observed symptoms and the completion of a plant specimen data form. For weed identification, collect a representative plant sample with intact roots. Seeds, flowers, or fruit, when available, should be collected for positive plant identification.
For suspected herbicide or disease injury, collect crop samples that show representative symptoms and stages of injury. The crop samples should include intact roots with the surrounding soil, if possible. Healthy samples of the crop should be collected and submitted for comparison. Be sure to label the samples correctly. Always dig the plants out rather than pulling them from the soil.

For suspected air pollution injury, the pollutant and/or possible local source of pollutants should be noted on the plant specimen data form.

**Insect Samples**

Accurate identification of an insect pest and correct diagnosis depend on a properly collected and prepared specimen. Small hard-shelled insects can often be placed in a vial with a tight lid without any additional preparation. Large or soft-bodied insects need special preparation so they will not decay. Large insects should be killed using a killing jar, so they do not injure themselves. A jar of 70 percent alcohol works well for killing and preservation. Soft-bodied insects need special preparation before being placed in alcohol. They often darken with time if placed directly in alcohol, making identification difficult or impossible.

Two methods of preparation, called **fixing**, are commonly used to prepare the insects. The cheapest method is to drop the soft insect into boiling water for a few seconds, usually until it floats. Then it can be placed in a 70 percent alcohol solution. Hot water is not often available in the field, and the insects should be kept alive until fixed. An alternate method is to drop the insects into a solution called KAAD. This solution will fix the insects, and they can later be placed into an alcohol solution. The insects should only be left in the KAAD solution for two to three hours to avoid swelling or bursting. The KAAD preservative is made using 1 part kerosene, 10 parts of 90 percent ethyl alcohol, 2 parts of glacial acetic acid, and 1 part dioxane. It needs to be mixed thoroughly.

When collecting insects for identification, try to collect several, and collect all forms that are present. Try to collect plants damaged by the insects in addition to the actual insects. Many insects cause damage that is specific to that insect.

**Nematode Samples**

Accurate identification of nematodes in the field is difficult because they can be confused with other crop-production problems. The soybean cyst nematode (SCN) can be identified in the field by digging plants and looking for the presence of the lemon-shaped, white, female stage of the nematode. This stage is usually present 4 to 6 weeks after planting. For other nem-
atodes, collect soil from the root zone of growing plants where plant-feeding nematodes will be concentrated. Avoid dead plants; nematodes will have moved away. Do not include soil taken within the top inch of the surface. Include feeder roots in the sample because many nematodes inhabit the interior of the plant roots.

**SCOUTING FOR WEEDS**

Scouting for weeds is necessary to determine the need to control weeds that can compete with crops for light, water, and nutrients. Early season weed scouting should be conducted within two weeks after crop emergence to evaluate the performance of herbicides and to determine if rotary hoeing, cultivation, or post-emergence herbicides are needed.

A *weed map* should be made for each field to indicate the location of various species of weeds. Over time these maps may reveal a shift in the composition of weed species within specific locations.

**SCOUTING FOR INSECTS**

Insect pests can be monitored in several ways. The insects are counted or the amount of crop damage is estimated. Insect counts are commonly expressed as number per plant, number per row foot, number per sweep, or number per unit area (square foot or acre). Estimated crop damage is usually expressed as a percentage.

Methods of scouting for insects include collecting insects with a sweep net, shaking the crop foliage and counting dislodged insects, counting insects on plants, and using traps. Trapping insects can help determine timing strategies for field scouting. The most common insect traps attract insects with visual clues, pheromones, or food odors.

**SCOUTING FOR PLANT DISEASES**

Plants react to pathogens by producing symptoms, indications of diseases that are affecting the external or internal appearance of the plant. As a field is spot-checked for insects, the severity of diseases can also be noted. Examine roots, stalks, and leaves; collect samples for positive identification. Some pathogens cause localized infections; others may infect the entire plant. It is important to inspect the entire plant when diagnosing a plant disease problem. Fields are normally spot-checked in five different areas. In those areas, carefully examine all plants within a 20-foot section of randomly selected rows for row crops or within a 1 by 10 foot area for forage and small grain crops.
Determine the severity of the disease and the percentage of plants displaying disease symptoms. Symptoms are used to help identify the pathogen and may ultimately help determine the exact cause of the disease. Some common symptoms of plant pathogens are wilting, yellowing, leaf spots, blights, dropping leaves, and necrosis or death of plant tissue. The pathogen itself may also produce signs. Signs of plant pathogens are structures or parts of the pathogen itself. These are not produced by the host plant. Examples of signs may include fruiting or spore-producing structures, a mat of fungal tissue, over-wintering structures, nematode galls or cysts, and bacterial exudates.

To identify plant diseases correctly, you must carefully observe the symptoms of the disease and the signs of the pathogen. The symptoms are usually of three types.

1. Over-development of tissues: galls and swellings
2. Underdevelopment of tissues: stunting, lack of chlorophyll, or incomplete development of organs
3. Death of tissues: leaf or flower blights, leaf spots, root rots, cankers, or wilting

Examine all parts of the injured or diseased plant. Root problems may produce wilting, stunting, dieback, or nutrient deficiencies. Determine whether the problem is localized or systemic.

Some pathogens infect only certain parts of the plant. These diseases cause localized infections and include many leaf blights, leaf spots, stem cankers, galls, and root rot. Diseases that affect the entire plant are called systemic infections. Once inside the plant, the pathogen moves throughout and causes wilting, yellowing, and stunted growth. Systemic diseases often kill the plant. When diagnosing diseases, the entire plant must be examined. Notice where diseases occur in the field and how they have developed. Some diseases are more severe in low areas, but others can be found throughout the field.

Certain steps should be followed for diagnosing diseases. Scout the field and note the problem areas. Examine the plants, and note the affected plant parts, symptoms of disease, and signs of pathogens. Observe the field. Note the infestation pattern, symptoms of disease, and signs of pathogens. Examine the field. Note the infestation pattern, field conditions, field history, and weather conditions for the past 10 to 14 days. Consult references to assist you in disease identification, or consult your county extension adviser.

Soil samples are required for estimating densities of nematodes. In some instances, plant roots may have to be analyzed at a diagnostic laboratory.
Summary:

Regular monitoring of field crop conditions and pest infestations is crop scouting. A scouting program requires accurately written records of the field location, current field conditions, a history of previous pest infestations and pesticide use, and a map locating present pest infestations.

It is important to make a representative survey of a field in the least amount of time to gain an accurate indication of the number, kind, and severity of pest problems.

Plant, insect, and nematode samples can be collected and submitted to a testing laboratory for identification.

A weed map should be made for each field to indicate the location of various species of weeds.

Insect pests can be monitored by counting, or the amount of crop damage can be estimated.

To identify plant diseases correctly, carefully observe the symptoms of the disease and the signs of the pathogen.

Soil samples are required for estimating densities of nematodes.

Checking Your Knowledge:

1. What is crop scouting?
2. How should crop surveys be conducted?
3. What are different survey patterns?
4. How are plant, insect, and nematode samples collected?
5. How are weeds, insects, diseases, and nematodes scouted?

Expanding Your Knowledge:

Develop your observation skills by scouting plants around your home, neighborhood, or in an agricultural field. Closely observe the various plants for symptoms that would indicate the presence of an insect pest or disease.

Web Links:

Pest Management Guidelines
http://ipmguidelines.org/FieldCrops/content/CH02/default-14.asp

Early Season Scouting
http://www.ipm.iastate.edu/ipm/icm/2004/5-10-2004/scouting.html

Field Scouting
http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/prm2365