# Christmas Tree Farm – Insect / Disease Management

You are a Christmas tree farmer in Iowa. You know that it is important to keep your trees healthy so they can grow well and look nice for customers. Recently you’ve noticed that some of your trees have curled needles at the ends of their branches. You’ve also noticed that some trees in the middle of the field have died – for no obvious reason. You know the problems could be solved by insects or diseases but aren’t sure the exact cause. You would like to set up a scouting program for your field and identify the causes of the problems.

After you start your scouting program you identify two main issues. 1) Aphids have been feeding on the needles causing them to curl. AND 2) Some trees have a fungus at their roots causing needle drop and ultimately the trees die.

1. Give a brief overview of the issue that Christmas tree farmers face.

* There are a number of insects (spider mites, rust mites, aphids, gypsy moths, sawflies, adelgids, bagworms, weevils, bark beetles, midges, wasps, and bees) and diseases (fungi and nematodes) that attack conifers grown for Christmas trees. These pests can cause damage to the trees and need to be addressed to eliminate ongoing or detrimental damage.
* The goals of a scouting program are to detect and address problems before they reach economic injury level, determine proper timing for control, and evaluate if treatment was successful.
* With young trees the focus is to determine what caused the death of any tree (possible issues are root rot, white grubs, or drought). With older trees the focus is to minimize insect or disease damage to the final foliage to make sure it is optimal for sale.
* All parts of the tree are vulnerable – root, trunk, shoots, foliage, and terminal leaders.

1. What limitations or constraints does the farmer face? Describe and explain each.

* Scouting is a key part of identifying and addressing the problem. The farmer must look at individual trees and the field as a whole to try and find insects and diseases. This takes a lot of time and should be done regularly (weekly or more often).
* Identify which pest is present, the growth stage of that pest, locations of the pest in the field, and whether pest populations are increasing.
* Problems are different with different species of trees and with the different ages of trees.
* As trees get closer to harvest, farmers need to scout more often to ensure trees produce good foliage with good color and little or no insect or disease damage.
* It is unrealistic to check every tree. Effective scouting is based on gathering information from a representative, random sample.
* Parts of each field can be disease prone – places that may remain damp for longer periods of time like low lying, sheltered, or shaded areas of the field.
* Insects and mites
  + Nymphs eat buds causing bud break
  + Aphids feeding can cause needles to curl
  + The time of year (stage of insect lifecycle) determines possible treatment methods
* Disease (fungi and nematodes)
  + swelling or shrinking of the wood tissue, discolored or deformed needles, early needle drop, and wilted foliage. The disease types are referred to as cankers, galls, needle casts, rusts, rots, and blights.

1. What are the potential solutions that address this issue?

* Integrated pest management uses a variety of techniques and then use pesticides only when necessary.
* Cultural and mechanical control: physical methods of pest control (mowing, pruning, culling)
  + Mowing: consistent management of grasses and weeds by mowing, growers can facilitate good air circulation through tree blocks
  + Pruning: help eliminate the galls produced by adelgids or needles infested with needle midges
  + Culling: the practice of removing weakened, infected, and dying trees from the fields
* Biological control: use of living organisms (parasitoids, pathogens, predators) to control diseases, insect pests, and weeds
* Chemical control: insecticide spray to kill insects, fungicide spray to kill fungi, etc.
* Biorational: alternative to chemical pesticides
  + Insecticidal soap
  + Neem seed extracts
  + Bacillus thuringiensis (Bt)
  + Bacillus popilliae

1. What impacts might each solution have on people?

* Mechanical control of problems is very labor intensive taking a lot of time and manpower.
* Biological control is less of a treatment and more of a lifestyle. It relies on enhancing or preserving biocontrols (natural predators) to keep pest populations below damaging levels. It is labor intensive.
* Chemical control can be dangerous for people and requires care in application with proper personal protective equipment. It is much quicker and more efficient from a labor perspective.

1. What impacts might each solution have on the natural environment?

* The best control plan treats the pest populations with minimal disruption to the natural enemies. This can be accomplished several ways, including alternating insecticide classes, altering spray timing, or adjusting cultural practices. Another approach is to use soft insecticides that are not harmful to beneficial insects. Horticultural oils are effective in killing overwintering eggs and sessile insects but do little harm to natural enemies. Caterpillars, but not sawfly larvae, can be controlled with the bacterial insecticide Bacillus thuringiensis, or Bt. Some pest-specific insect growth regulators (IGRs) are also effective.
* Broad spectrum pesticides are being replaced with softer materials that can target specific groups of pests and are less likely to disrupt natural enemies while keeping target pests in check.

Suggested resources:

* <https://www.canr.msu.edu/christmas_trees/pest-management/>
* <https://christmastrees.ces.ncsu.edu/christmastrees-pest-management-in-christmas-trees/>
* <https://www.canr.msu.edu/dA/ed7b350e64/E3237%20WCAG%202.0.pdf?language_id=1>
* <https://www.canr.msu.edu/resources/michigan-christmas-tree-pest-management-guide>
* <https://extension.psu.edu/ipm-basics-for-christmas-trees>