GARDENING SERIES

Colorado MASTER GARDENER

Plant Health Care, PHC 7.880

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Outline. . .

Gardening and the Environment

Yard care and gardening practices may have positive or negative impacts on health and the neighborhood environment. For example, a turf enhances the environment by:

- Converting CO_2 to O_2
- Increasing water infiltration into the soil
- Reducing surface runoff and erosion
- Reducing dust
- Providing a micro-ecosystem that effectively breaks down pollutants
- Moderating summer temperatures
- Creating a pleasant "people" space

On the other hand, lawn care practices negatively impact the environment when grass clippings are mowed or blown onto the street (water quality problem) or when fertilizer and/or pesticides are over-spread on to hard surfaces.

Several terms (such as *Integrated Pest Management, Plant Health Care, Sustainable Farming/Gardening, Best Management Practices* and *organic gardening*) are used to describe farming/garden management systems designed to help the gardener/farmer maximize positive impacts and minimize negative impacts.

Integrated Pest Management, IPM

Integrated Pest Management, IPM, incorporates a variety of pest management strategies, including cultural methods, mechanical methods, use of bionaturals, and organic and manufactured pesticides. Objectives include minimizing pest damage and environmental hazards while maintaining profitability.

Since insect and disease problems vary significantly from crop to crop, application of IPM principles is also very crop specific. IPM techniques used in an alfalfa field (perennial crop), a wheat field (annual crop), an apple orchard (perennial crop with minimal tolerance for pest damage) and the landscape (site with multiple plant species and higher tolerance to pests) will be vastly different.

Plant Health Care, PHC

The term **Plant Health Care, PHC**, was coined by the *International Society of Arboriculture* to more clearly define *IPM techniques as they apply to tree care and landscape maintenance*.

PHC is a holistic approach to landscape management. The primary objective is to grow healthy plants and in so doing minimize the impact of pests. Concepts of PHC include:

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Putting Knowledge to Work

Healthy plants have fewer pests – Many insect and disease problems only attack plants under stress. Minimizing stress prevents many common pests. For example, Cytospora fungus and most borers only attack trees under stress (primarily soil compaction and drought).

Healthy plants are more tolerant of pests – For example, aphids on shade trees don't generally warrant management efforts, except when under water stress due to drought, transplanting or restricted rooting.

Plant needs change with stages in their life cycle – A plant's needs for irrigation, fertilizer, pruning, tolerance to pests, etc. continually change through the growth cycles of the plant. In PHC, cultural practices change relating to the life cycle.

Problems arise from a combination of stress factors – For example, the drought leads to IPS beetles. Soil compaction leads to Cytospora and root rots.

PHC Techniques

Examples of techniques used in PHC include the following:

- Plant selection – right plant, right place – Select plants to minimize future stress issues for the site.
- Soils management – 80 percent of all landscape plant problems relate to soil conditions.
  - Soil compaction (low soil oxygen and poor drainage)
  - Drainage
  - Nutrient (fertilizer) management
- Water
  - Water requirement for a plant to survive versus the need for a plant to grow may be vastly different.
  - Plant tolerance to wet (wetland plants) or dry (xeric plants) conditions
  - Iron chlorosis is a issue of chronic over-watering
- Size and growth
- Pest resistance and common pest
- Cultural care
  - Planting dates
  - Varieties
  - Irrigation management
  - Spacing
  - Exposure to sun and wind
  - Plant species diversity
  - Mulching
  - Pruning
- Climatic needs and impacts on plant growth and pest potential
  - Temperatures
  - Wind and rain
  - Timing of insect activity
- Mechanical methods to manage pests
  - Covers and barriers
  - Traps
- *Bionaturals* for managing pests – use of predators, parasites, disease organisms, and beneficial nematodes
  - *Preservation* – taking steps to preservation predators and parasites naturally occurring
  - *Importation* – the purchase and release of predators and parasites
- Pesticides

– "Organic"
– Synthetic or manufactured

Pest Management Questions

As part of PHC, ask the following questions to guide pest management options:

1. **What is the plant?** Correctly identifying the plant will shorten the list of potential insects and diseases to just a few.
2. **What is the pest?** Correctly identifying the pest will set direction for effective pest management options. Gardeners often fail to control pests because they have misidentified the problems and are applying ineffective management techniques.
3. **Does it cause damage?** In the landscape setting, most insect and disease problems are only cosmetic and may not warrant management efforts. While others need to be managed to protect the health of the plants. On fruits and vegetables, tolerance to insect and diseases is typically low.
4. **Under what situations will management efforts be warranted?**

In production agriculture, **economic thresholds** determine how much damage can be tolerated before it becomes economically feasible to treat. This may be determined by counting the number of insects per leaf, percent of the leaves infected, etc.

In landscape horticulture, **aesthetic thresholds** characterize a relative level of cosmetic damage that can be tolerated before treated is warranted. This can vary greatly from individual to individual and from location to location.

For example, aphids are a common pest that generally don't warrant management efforts. However, trees under water stress (from drought, newly planted or restricted root spread) are rather intolerant of aphids and management effort may be needed to protect the health of the tree.

Spider mites are another example of a common pest generally kept in bounds by Mother Nature. However, management efforts may be warranted in situations where mite populations explode due to hot weather, drought, dust on the plants (interferes with activity of beneficials) or the use of some insecticides including imidacloprid, carbaryl (Sevin) and malathion.

5. **What management options are effective on the pest and when are they applied?**

- Climatic – While we don't control the climate, it directly impacts the occurrence of many insects and diseases.
- Cultural
- Mechanical
- Bionaturals (predators and parasites)
- Pesticides ("organic" or manufactured)

When pesticides are considered, answer these important questions to guide pesticide application.

1. What pesticides are effective on this pest?
2. Which have minimal health hazards?
3. Which have minimal environmental hazards for the site?
4. When are they applied to be effective?
5. How are they applied to minimize health and environmental hazards?
6. What is the re-entry period and application-to-harvest interval following application?

Answers to these questions often indicate that a pesticide is not warranted at the point in time.

Less than 10 percent of landscape pest problems warrant the use of pesticides. A key role of the CMG program is to help clients understand options in managing pests.

The PIC Cycle

A basic principle of PHC is recognition that plant problems generally arise from a combination of stress factors. This concept is called the **PIC cycle**.

Predisposing factors reduce a plant's tolerance to stress. Consider these factors in plant selection. Examples of predisposing factors include:

- Planting trees too deep (common problem)
- Planting trees in a site where root spread will be restricted.
- Planting a tree intolerant of wet soils (like crabapples) in a heavily irrigated lawn (may lead to root rots).
- Planting trees susceptible to iron chlorosis in soils with free lime.
- Improper pruning cuts (may open the tree to internal decay).
- Failure to structurally train a young tree (may lead to storm damage).

Inciting factors include primary insect, diseases, and abiotic disorders that attack a healthy plants causing acute stress. Examples include:

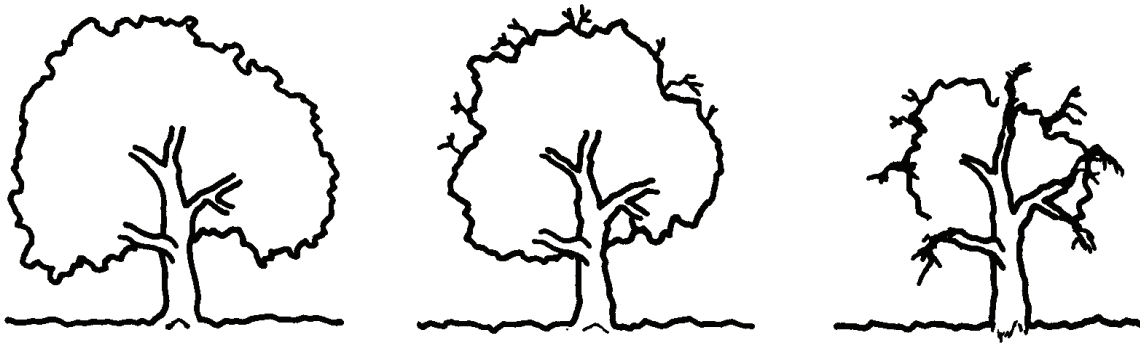
- Soil compaction (In Colorado soils, this is our most common stress factor leading to many insect and disease problems.)
- Drought
- Leaf feeding insects like caterpillars and sawfly larva
- Leaf sucking insects like aphids, scale and mites
- Bark damage from lawn mowers
- Bark cankers and frost cracks from rapid winter temperature changes

Contributing factors include those secondary insect, disease and abiotic disorders that attack a plant *already under stress*. They often lead to the plant's death and frequently cannot be controlled. Examples include:

- Bark beetles and borers (secondary to drought and/or wind damage)
- Cytospora fungus (secondary to soil compaction, drought and restricted rooting system)

Management of contributing factors typically needs to be directed at the predisposing and inciting factors that stress the plant.

Figure 1. PIC Cycle.



Life Cycle of a Plant

Another key concept in PHC includes recognizing that the needs of a plant change with various stages of growth. Failure to relate cultural practices to the life cycle often leads to reduced growth and confusion about appropriate cultural practices. The tables below give an overview of the life cycle of trees.

Life cycle of a tree

1. Nursery production
2. Establishment phase
3. Growth phase
4. Maturity
5. Decline phase

Life cycle of a vegetable (annuals)

1. Seed germination and emergence
2. Seedling growth
3. Growth phase
4. Flowering and fruiting phase

Table 1. Life cycle of a tree.

Growth Phase	Growth Objectives	Change to next growth phase
Nursery production	Top growth = selling price	Planting
Establishment phase	Root establishment	When roots become established, length of annual twig growth significantly increases.
Growth phase	Period of canopy growth – Balance top growth with root growth	Growth slows as tree approaches mature size (for site limitations)
Maturity	Growth slows as tree matures – Balance top growth with root growth	Minimizing stress on aging trees prolongs tree life
Decline phase	Minimize stress levels	Death

Table 2. Impact of life cycle on cultural practices on trees.

Growth Phase	Irrigation Water Need	Fertilization	Pruning	Pest Tolerance
Nursery production	Water = Growth	Fertilizer pushes desirable top growth	Structural training desirable	LOW, could impact sales
Establishment	CRITICAL Water essential for root growth	None to very little as high N slows root growth	NONE, except to maintain central leader	LOW, due to drought imposed by reduced root system
Growth	Water = Growth Tolerant to short term drought	Fertilization supports growth IF other growth factors are not limiting	*Structural training* sets tree's structural integrity for life	HIGH, except under stress situations
Maturity	Tolerant of short term drought Severe drought leads to decline	Need reduces	Minimal needed	HIGH, except under stress situations
Decline	Intolerant of drought	Evaluate stress factors – fertilization may accelerate stress	*Crown cleaning* to remove dead wood. Do not remove healthy wood.	LOW, pests could accelerate decline

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