

**A HOMEOWNERS GUIDE
TO INTEGRATED PEST
MANAGEMENT(IPM)**

Introduction

Integrated Pest Management – what’s that?

Integrated Pest Management, also known as IPM, is a sustainable approach to managing pests that combines cultural, physical, biological and chemical methods in a way that minimizes economic, health and environmental risks.

Effective IPM programs identify pests, their life cycles and their interactions with the environment. Considering all available pest control methods, a pest management plan is developed using the most economical means and with the least possible hazard to people, property and the environment.

This guide is intended for pests that occur in your landscape. It does not cover termites, bedbugs or other household pests.

What this guide is about

Our goals are to:

- Introduce you to the concept of IPM.
- Help you assess the level of IPM you are already using.
- Help you set IPM-related goals for your property.
- Help you identify barriers to using IPM.
- Help you decide how to implement the IPM goals you set.

IPM IQ Test

Do you? (Check all that apply.)

- Mow your lawn at least 3 inches high?
- Use a mulching lawnmower?
- Check your irrigation system regularly for leaks?
- Regularly walk your landscape looking for weeds?
- Hand-pull weeds in your yard or vegetable garden?
- Clean up your yard or vegetable garden at the end of the season to eliminate pest overwintering sites?
- Rotate vegetable crops to prevent pest buildup in the soil?
- Purchase plants for your yard that are adapted to your climate?
- Monitor your plants for insect pests?
- Handpick insects off your plants?
- Monitor your plants for beneficial insects, such as lady beetles?
- Plant flowers around your home to attract pollinators?
- Use a fence to keep rabbits out of your garden?
- Use a mousetrap to eliminate mice in your home or garden?

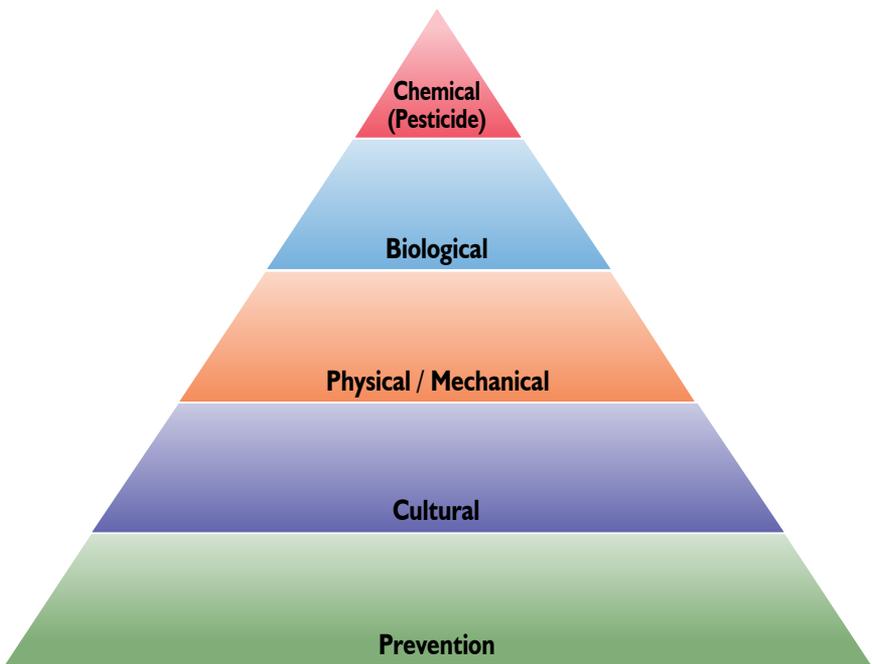
Chances are, you're already practicing IPM in your home and landscape!

Count the number of items you checked on the IPM IQ test to assess your IPM IQ...

- If you checked zero to five items, you are an **IPM Novice**. Don't worry. There's room for improvement! Read the information on the following pages and follow our web links. In no time, you will have the tools you need to get ahead of the pest control game.
- If you checked six to 10 items, you are an **IPM Scholar**. You have been doing your homework and are diligent about keeping your home and landscape pest free. Keep reading to find even more ways to manage pests.
- If you checked more than 10 items, you are an **IPM Pro**. We can tell you've been doing this for a while, and we congratulate you! But there is always more to learn. Read on to deepen your knowledge of IPM, and to more effectively reach your pest management goals while protecting our fragile environment.

How Can IPM Help Me?

IPM is the use of multiple strategies to control a pest. Often, our first impulse is to apply a pesticide at the first sign of a problem. IPM helps develop a pest control plan that can prevent or limit further pest problems in the future. IPM control strategies are commonly shown as a pyramid. The major emphasis is on the base of the pyramid, preventing pest problems, and the use of chemical controls is limited to situations where they are really needed. IPM is not a no-pesticides approach to pest management. IPM control plans look at all the available methods to control pests. Specific IPM principles will be discussed on Page 22. First, let's talk about pests.

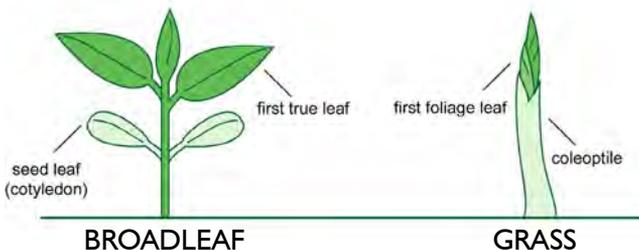


Weeds

The term “weed” refers to a plant growing where it is not wanted. Among weeds, there are some important distinctions. **Noxious weeds** are weeds designated by the state as requiring control. **Nuisance weeds** are weeds that have not been designated as noxious, but occur commonly in our area. Weeds are plants that are:

- Competitive: They grow well in spite of interference from other plants.
- Persistent: They will return year after year. They reproduce vigorously and spread seeds effectively.
- Harmful: They may be harmful to native plants, livestock and wildlife, and to the environment in general.

Weeds can be subdivided in several ways. A common way to subdivide weeds is by class: grass versus broadleaf. The first leaves produced by broadleaf weeds are in pairs (two seed leaves). The first leaf produced by grasses are single (one seed leaf). Broadleaf weeds commonly have a coarse taproot and net-like leaf veins. Grasses have fibrous roots and parallel leaf veins. Understanding the class of the weed becomes important when you choose to use a chemical control. Some herbicides (pesticides that kill plants) are grass-selective, and some are broadleaf-selective. There are also nonselective herbicides that will kill all plants. Both broadleaf and grass weeds are most easily controlled at the seedling stage.

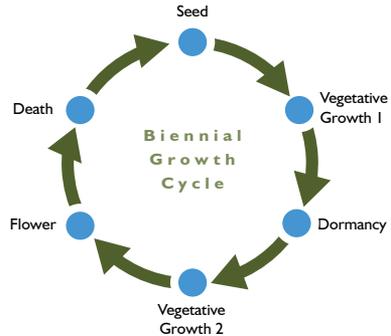
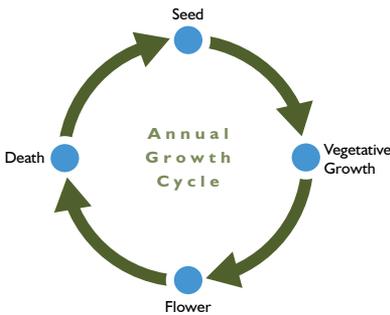


Life cycle. Weeds can also be characterized by their life cycle. All plants grow through stages as shown in the diagrams below.

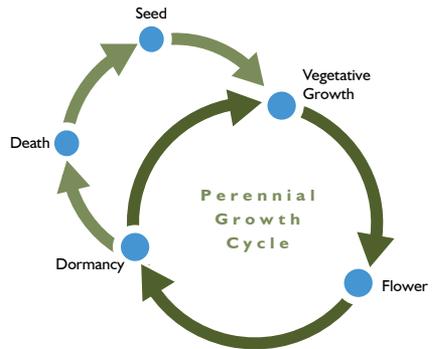
Annual plants complete all plant growth stages in one growing season.

Biennial plants complete all plant growth stages in two growing seasons.

The first year includes seedling and vegetative stages; the second year includes vegetative, flower and seed development, and then death.



Perennial plants complete all life stages in one growing season (except death). They survive more than two growing seasons and have a seedling stage only during the first growing season.



Why should you care?

Most weeds are easiest to control at the seedling stage.

Herbicides are most effective when applied to actively growing plants.

Growth stage affects herbicide performance.

Annuals and other weeds establishing from seed. Control of annual weeds is most effective when seeds are germinating and when plants are very young. Preemergence herbicides can be used to kill germinating seeds. Plants that survive are easy to hand-pull when they are young. In unplanted areas, the first crop of weeds may be allowed to germinate, and the young plants are killed with herbicides or tillage. Annual weeds are most resistant to control after flowering, and you risk allowing seed to be produced and distributed, further adding to the seedbank. The seedbank is the viable seed present in the soil from previous weed infestations.



Control of **annual weeds** (left) is most effective when seeds are germinating and when plants are very young. **Biennial weeds** are most susceptible to herbicides at the rosette stage of development (right), during the first year and early second-year growth.

Biennial weeds. In addition to preventing seed germination and hand-pulling young plants, biennials can be controlled at the rosette stage of development, by either hand-pulling or herbicide application. After production of flowering stems, susceptibility to herbicide drops. Control efforts should focus on prevention of flowering, to avoid adding to the seedbank.

Perennial weeds. Control of perennial weeds involves prevention of seed production, but also control of growth from vegetative reproductive structures. Many perennial weeds are difficult to control by hand-pulling or tilling. Chemical control is most effective when these weeds are both actively growing and moving carbohydrates to the roots for storage. An effective time to control perennial growth is just before the early flower bud stage, when root reserves have been depleted and carbohydrates from the leaves are beginning to move downward to the roots. Applied herbicides will move with carbohydrates to the roots until the flowers open. Another good time is during the fall, when plants are moving carbohydrates to the roots for storage over winter. Perennial weeds are least susceptible to herbicides at emergence of new shoots or during seed development.



An effective time to control perennial growth is just before the early flower bud stage (above) or during the fall, when plants are moving carbohydrates to the roots for storage over winter (right).



It is beyond the scope of this publication to identify all noxious and nuisance weeds in the state of Nevada.

Here is a list of resources to help you identify weeds:

[Weed ID-Teton County Weed and Pest](https://www.tcweed.org/weed-pests-programs/noxious-weeds/weed-id/)<https://www.tcweed.org/weed-pests-programs/noxious-weeds/weed-id/>

[Wyoming Weed Identification Site home page](https://www.uwyo.edu/uwe/wyoweed/wyoweed.htm)--<https://www.uwyo.edu/uwe/wyoweed/wyoweed.htm>

[Wyoming Weed and Pest-State Designated Noxious Weeds](https://wyoweed.org/noxious-species/listed-species/state-designated-noxious-weeds/)--<https://wyoweed.org/noxious-species/listed-species/state-designated-noxious-weeds/>

[Weeds fo the West-Wyoming Extension](http://www.wyoextension.org/agpubs/pubs/wsws-1.pdf)--<http://www.wyoextension.org/agpubs/pubs/wsws-1.pdf>

[Wyoming Noxious Weeds](https://www.invasive.org/species/list.cfm?id=40)--<https://www.invasive.org/species/list.cfm?id=40>



These are dandelions infesting a pasture.

IPM Principles

Now that we have discussed common pests of the landscape, let's discuss the four IPM principles.

IPM Principle #1: Identify the Pest

One of the primary principles of IPM is to identify the pest. This will help you come up with an effective management strategy. Some pests or pest signs are easy to identify. Seeing a mouse or mouse droppings makes it pretty easy to identify the pest. Other signs can be misleading. For example, what looks like a plant disease in your landscape may, in fact, be caused by environmental factors, such as water stress or herbicide damage. Additionally, many pests may produce similar damage. Using an insecticide on a plant disease will not control your pest problem and may damage your plant. Once you have identified the pest, learn all you can about its life cycle. Some pests are more susceptible to control during certain stages of their lives.

IPM Principle #2: Tolerate a Certain Level of Pests

IPM also strives to have people work toward “management” rather than “eradication.” Obviously, the goal is to completely eradicate mice or cockroaches in your home. In your landscape, you may want to practice a little more restraint. There is an intricate, complex food chain at work in our gardens. Most insect pests have natural enemies, other insects that prey on them, commonly referred to as beneficial insects. Beneficial insects need prey or hosts. If you eradicate all the pests, you eliminate an important food source for beneficial insects. The beneficial insects will move to another site or die. These natural predators can also be harmed by insecticides. When you eliminate beneficial insects from your site, you inherit their job! Keep beneficial insects in your landscape, using them as a willing workforce in pest control.

IPM Principle #3: Monitor at Regular Intervals

It is important to monitor for pests at regular intervals. Don't wait until a pest problem is out of control. Check your garden regularly for signs of pests. If you have had pest problems in the past, good recordkeeping may help with your pest management plan. Note the pest, the time of year, the host plant or location in your garden, what you did, how it worked, and when you think you should monitor for the pest again.

When monitoring for pests in the garden or landscape, don't forget to also monitor for beneficial insects and note their numbers.

IPM Principle #4: Establish Action Thresholds

An action threshold is the number of pests that indicates the need for control. Action thresholds vary from pest to pest, site to site, and person to person. For agricultural crop pests, the threshold is economic. This is the pest population level that produces damage equal to the cost of controlling the pest. Urban landscapes and homes have a different set of thresholds. Some people are absolutely unwilling to tolerate even one mouse, cockroach or spider in their home. This is termed an emotional threshold. Sometimes the appearance of a pest or the damage it causes triggers an aesthetic threshold. Homeowners may not like the way the pest makes their landscape look. Health and safety thresholds can also trigger a pest control program. For example, black widow spiders at a day care facility can trigger a health and safety action threshold.

IPM Principle #4: Establish Action Thresholds (continued)

It is important to set action thresholds for your own property. The following photos of landscape problems are provided to help you consider how and when you would set an action threshold and initiate a pest control plan.



Has the weed infestation in this landscape reached an action threshold? (Red circles indicate weed seedlings.)

Has the weed infestation in this hardscape reached an action threshold?



IPM Principle #4: Establish Action Thresholds (continued)

Has the weed infestation in the lawn below reached an action threshold?



Has an action threshold been reached in the lawn to the left?



The weed shown to the left is puncturevine, a noxious weed. What is the action threshold for this weed?

Steps to Developing a Pest Control Plan

- 1 Identify the pest.
 - 2 Identify its life cycle. Pests are most susceptible to control during a particular stage of their life cycle.
 - 3 Determine the size of the infestation. Have you reached an action threshold?
 - 4 Monitor for beneficial insects or natural enemies. Do you have beneficial insects already preying on your pest?
 - 5 Develop a pest control plan using a variety of strategies.
 - 6 Track your results and modify your plan for the best possible results.
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IPM Control Methods

Okay, you've identified your pest, you've monitored for pest numbers, and you've reached an established action threshold. Now what? IPM recommends combining two or more control methods for the most effective long-term solution.

Prevention

Prevention is the most economical and easiest pest control method.

Prevention strategies seek to prevent pest infestations from occurring in the first place, or they minimize the conditions that contribute to pest infestations. Combined with other strategies, prevention can lead to effective long-term control. Some prevention strategies are listed below.

- Select plant varieties that are adapted to and will flourish in Nevada's challenging climate. Healthy, vigorous plants are less susceptible to diseases or other pest problems.
 - Choose pest-resistant plant varieties. For example, many roses are susceptible to powdery mildew. Resistant rose varieties have been developed and can be used in areas where powdery mildew is a problem.
 - Inspect new plants before planting to make sure diseases, insects, weeds and other pests are not present. Remove weeds from nursery containers before you place the plants in your landscape.
 - Choose disease-, weed- and pest-free plants, seed, mulch and soil amendments.
 - Select hardscape materials and products that eliminate habitat or food for pests.
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- Clean tools and mechanized equipment after each use to prevent spread of pests. Clean vehicles, especially tires, if you've been in a weed-infested area. Properly dispose of all plant debris to prevent the spread of pests.

Cultural Controls

Cultural controls seek to manage your landscape by making it as difficult as possible for pests to be successful.

Here are some useful tips:

Eliminate clutter, including trash, brush, debris or leaf piles, where pests may hide and nest.

Properly dispose of plant debris so it will not become a source for further pest infestation.

- Dispose of diseased or insect-infested materials properly. Double bag and remove this material from your property.
- Dispose of weed plants and plant parts properly. Do not allow weed plant parts or seeds to escape on the property or to any other property.

Eliminate food and water sources for pests.

- Empty containers that collect rain or irrigation water. This eliminates a water source for plant pests and also eliminates potential mosquito breeding sites.
- Regularly empty trash cans and replace liners to reduce insect and rodent pest problems.
- Clean out rain gutters to allow proper drainage.

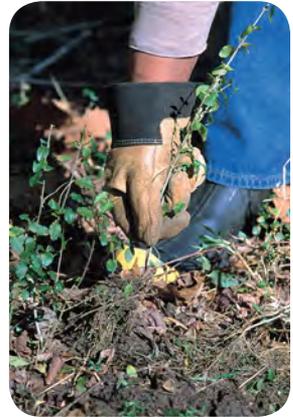
Eliminate access to the landscape by pests. Fix holes in the fence.

Reduce problems in the landscape.

- Apply mulch to retain water and limit competition from weeds.
- Mow your lawn at least 3 inches high, and water deeply.
- Check the sprinkler system several times in the growing season to make sure it is functioning properly.
- Water and fertilize landscape plants appropriately.
- Group plants with the same water needs to ensure they are not stressed.

Physical or Mechanical Controls

Physical or mechanical controls are methods that reduce pest infestations by disrupting the pests or providing a physical barrier to prevent pests from infesting an area. One of the simplest methods is handpicking insects or hand-pulling weeds. These methods work best in situations where the pests are visible and easily accessible. Physical or mechanical disruption of



Physical controls can be barriers, such as the fence to the left. Mechanical controls can be as simple as hand-pulling weeds (above).

pests also includes mowing, hoeing, tilling or cultivating. Another method is washing. A strong spray of water may interrupt the life cycle of many insect pests while causing little damage to host plants or the surrounding environment. Physical barriers, such as fences, netting, sticky barriers, plastic mulches, bird spikes, row covers, plant cages, and paper or plastic tree collars, can help prevent or, at least, deter pests. Traps are another physical or mechanical method and include mechanical traps, such as snap traps, sticky traps and light traps.

Biological Controls

Biological controls use living organisms to control pests. Biological controls include predators, parasites, weed feeders and pathogens. Predators include lacewings and ladybird beetles (ladybugs) that eat other insects, and hawks and owls that prey on rodents. Parasites feed on their hosts, eventually killing the host. Certain wasps, flies and nematodes are common parasites of landscape insect pests. Weed feeders include grazing animals, fish and insects. These control agents help reduce the spread but rarely control or eradicate a weed infestation. Pathogens are diseases, viruses, bacteria or fungi that can infect plants, insects and vertebrate animals. A common pathogen used for biological control is *Bacillus thuringiensis*, a bacterium that controls mosquitoes, flies and other insects in their larval stage. It is sold as a pesticide.

These are assassin bug nymphs consuming a blow fly.



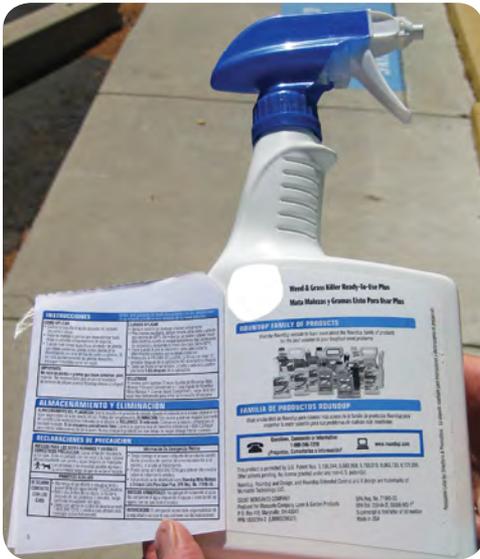
Chemical Controls

Chemical controls include a variety of pesticides. According to the National Pesticide Applicator Certification Core Manual, a pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest, and any substance or mixture of substances intended for use as a growth regulator, defoliant or desiccant. Pesticides are formulated to kill pests or interrupt their life cycle.

Examples of pesticides include:

- Insecticides – kill or interrupt the life cycle of insects.
- Herbicides – kill or interrupt the life cycle of plants.
- Fungicides – kill or interrupt the life cycle of fungi.
- Rodenticides – kill or interrupt the life cycle of rodents.

Any use of pesticides requires the applicator to **read, understand and follow label directions**. The pesticide label will list the sites where the



pesticide can be applied, such as lawns, vegetable gardens, trees and shrubs, and the pests the pesticide controls. Many times, you must peel back the pesticide label to read the entire label. Additionally, if the label directs you to a website, you need to go to the website and read, understand and follow those directions prior to applying the product.

Peel back the label to read all the information.



What Are Your Goals for Your Property?

Now that you know more IPM, write down the goals for your property and use the next few pages to plan your strategy.

What about your landscape is important to you?

How do you use your landscape?

When you have friends and family over, what do you want them to notice about your landscape?

When you have friends and family over, what do you NOT want them to notice about your landscape?

What are the top three things you would like to change about your landscape?



What Are the Barriers to Using IPM?

After reading the different pest control methods, list three controls you might be willing to try on your property.

1. _____
2. _____
3. _____

List three control methods you would NOT be willing to try.

1. _____
2. _____
3. _____

- Think about your goals for your property. Are there any control methods listed above that might help you reach your goals?
 - Maybe you've decided you don't believe in using chemical pesticides. That's okay! Are there other methods that could work?
 - Consider lowering or changing your expectations of how your landscape "should" look. Is there value in leaving a few nuisance weeds in your lawn to attract pollinators?
 - Remember that our landscapes are like mini-ecosystems. If you work with nature by using the right plants for our climate and maintain plants for their best health, you are doing a lot to prevent pests from attacking in the first place.
 - Contact the **University of Wyoming Cooperative Extension Office**
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Recordkeeping

Recordkeeping of activities on your property is an important part of IPM.

- You can predict pest outbreaks, so start scouting early and initiate a control plan while the pest outbreak is still small.
- Document your efforts and their effectiveness.
- Recordkeeping for controls is important to prevent overapplication of chemicals or duplicate applications.

Date: _____ Area: _____

What did you find? _____

What did you do? _____

Did it work? _____

What alternative method will you try? _____

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