



**RESOURCES: BEST PRACTICES AND  
ALTERNATIVE APPROACHES TO PEST  
MANAGEMENT**  
**SUSTAINABLE URBAN LANDSCAPE, PLANT  
HEALTH CARE AND IPM**

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## Background

Millions of dollars are spent each year designing, implementing, and maintaining the urban landscape. When a plant looks unhealthy or has been injured by an insect, a mite, or an abiotic disorder, often our first impulse is to apply a pesticide. However, applying the wrong pesticide could destroy the pest's natural enemies, which left to its own devices could sometimes take care of the problem without any human intervention. Additionally, long-term problems related to an ailing landscape are caused when maintenance processes are not carried out properly.

A better approach is to manage the health and beauty of the urban landscape through a method called "**Sustainable Landscape**" and "**Plant Health Care**" (PHC). In any case, a landscape developed with sustainable practices will improve the environment by conserving resources and reducing chemical applications. Many of these problems can be avoided or reduced by utilizing sustainable landscape services. These practices are also synergist and coherent to **Integrated Pest Management** (IPM).

## Sustainable Landscape & Plant Health Care (PHC)

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**Sustainable landscape** is an approach to designing and constructing the artificial landscapes that surround our buildings. These landscapes should maintain themselves and survive by being part of the natural cycles of the local environment. A sustainable landscape will reduce labor inputs, and decrease the costs associated with landscape maintenance. The great thing about sustainable landscaping is that it can simultaneously influence aesthetics, air quality and climate modification.

There are literally hundreds of definitions for sustainable but the basic idea is that if something is sustainable it can keep going indefinitely. Natural systems have been operating successfully for millions of years. Nothing made by humans can do that. In many cases this means finding out what the original local environment was like. This is often difficult, as in our cities and even in rural areas the landscape are significantly changed since early settlements. Sustainable landscape means putting back much of what was in place before development. It may also mean introducing things that were not there before.

The basic components of sustainable landscape are **Landscape Planning & Design, Plant Selection, Implementation** and **Maintenance**. The key to creating a sustainable landscape is that the Planning & design process should be considered first. Plant selection, implementation, and maintenance build on the design process, each having sustainability as a major consideration.

Since pest problems are often symptomatic of ecological imbalances, the goal is to plan and manage ecosystems that prevent organisms from becoming pests. By including "**Plant health care**" (PHC) considerations throughout the planning and design phase of a landscape, costly and undesirable maintenance practices and the need for chemical controls can be minimized or avoided. The Plant Health Care approach focuses primarily on preventative measures - those that encourage plant vigor and maintain healthy, balanced growth. Plant vitality is the best protection against pest problems.

## General Guides

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- denotes "Editor's Choice" recommendation.
- [Guide to Healthy Lawns](#); [Turf Grass Pest Management Guidelines](#); [Pests in Landscapes, Gardens & Turf](#); [Pests of Agriculture, Floriculture & Turf](#) by University of California
- [Introduction to IPM for Urban Landscapes](#); [Fundamentals of a Low Maintenance – IPM Approach to Landscape Designs](#); [IPM Based Landscape Design Information Sheets](#); and [Noxious Weed Integrated Vegetation Management Guide](#) at [IPM Access](#) by IPM Practitioners Association (IPMPA):
- [Planttalk](#) by Colorado State University - is an excellent resource that offers information on literally hundreds of gardening subjects. Brief audio (or text) presentations provide concise, practical "how-to" information
- [Sustainable Urban Landscape Information Series](#) by University of Minnesota – At complete guide to Landscape design, Plant Selection, Implementation and Maintenance.

## Landscape Planning & Design

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The first question to ask in considering a landscape is "Why?" Why have a landscape? Why install plants and a lawn instead of decking or pavement? What is it to be used for? Will it be an active recreational space or a quiet, contemplative area for meditative toiling? Whatever the intended use, proper design and plant selection can reduce the amount of waste a landscape generates through maintenance. In the end, that means time and money savings. Many times a landscape is "inherited"--it is already established and you are simply charged with maintaining it. A transition to a more resource-efficient landscape may be a possibility. However, long-term resource efficiency improves when you plan and prepare ahead of time.

Planning a great garden starts on paper integrating input from variety of expert groups. Early in the design phase of a job, the existing site conditions (for example: **Existing plant material, Soils, Topography/Slope**, Micro-climate (**site direction, overshadowing vegetation, wind direction & frequency, rainfall** and **views**) and level of maintenance available after construction must be carefully considered. A thorough understanding of these can maximize the success of the vegetation on the site. A site analysis asks a series of questions regarding the existing site conditions. It highlights areas, which can be seen as opportunities, and minimizes those seen as constraints. Map your landscape site, identifying the site conditions mentioned above.

**Practical Turf Area:** The lawn is an integral part of our landscape. In an urban environment around commercial or residential structures, traditional landscapes generally include a front-yard lawn, a shrub border, a few trees, and some flowerbeds. Rear and side yards often consist of turf and trees and perhaps a patio. Gardens are designed for tradition and social conformity, rather than function and aesthetics. Many people want a front yard just like their

neighbor's, and a turfscape is quick and easy. The sod is delivered, rolled and pressed down, and with the addition of a few trees and shrubs, over a weekend you've got instant landscape. Although grass helps beautify the neighborhood, creates a relaxing space of natural beauty, have the cooling effect, provides recreational surfaces for outdoor activities, aid in erosion control, filter pollutants, and provide oxygen to our environment, yet lawns are actually quite expensive when the cost of the resources, water, fertilizer, pesticides, fossil fuels and labor required to maintain them are factored in.

Sometimes a lawn doesn't make any sense. Steep slopes, rocky stretches with inadequate topsoil, and sandy soil, are all examples of difficult terrain that don't lend themselves to uniform grass covers. Forcing a lawn in such places forces most people to search for chemical fixes that harm the ecosystem at large. When designing turf grass areas in the landscape, also consider the ease in watering the proposed area. Long narrow areas and small odd-shaped areas are difficult to efficiently water. In fact, your yard can be the very picture of landscaping success, if you're willing to look beyond the eighteenth century aesthetic of the English lawn. Choose instead maintenance-free groundcovers!

Today's waste-efficient landscapes use "un-thirsty" plants—natives and drought tolerant exotics. Proper soil preparation, garden layout, and planting time assure that plants can mature into beautiful specimens with minimal trimming. In a word, the modern approach to landscaping should be ["Xeriscape"](#).

It is not enough to save resources--landscapes must also be both useful and attractive. If you are replacing the lawn, you don't merely substitute a drought-tolerant ground cover for turf, you consider the real function of the space, and perhaps even create a whole new use for it. Entry walks, courtyards, outdoor rooms and screening can replace the unused space left by the turf, returning valuable open space to the owner.

Because a xeriscape is well planned, it can save more than just water. Better planning, plant selection and placement means less pruning and plant removal. A smaller lawn uses less fertilizer, less fossil fuels, and it produces less air and noise pollution and fewer clippings to dispose of. Soil conservation ensures healthier plants, fewer amendments and imported topsoils, and less soil moisture and topsoil losses. The following links to general guides will assist you to further your knowledge in this regard:

- [Landscape Design](#) by [Planttalk Colorado™](#)
- [Landscape Design](#) by Sustainable Urban Landscape Series, University of Minnesota
  - [Sustainability & Landscape Design](#)
  - [Base Plan](#)
  - [Landscape Design Sequence](#)
  - [Completed Design](#)
- [Urban Landscape Research](#) - This site, hosted by the University of Minnesota, contains information in articles, publications and case studies of progressive landscape planning and design projects across the United States.
- [Landscape Architecture World Wide Web Resources](#) - This site is the virtual library of the the University of Toronto's Landscape Architecture School and contains information and analysis on a range of landscapes and places.

- [Landscape Architecture Online](#) – Lists a selection of web resources pertaining to landscape architecture, University of California, Berkeley
- [Xeriscape Design](#) – by [Planttalk Colorado™](#)
- [Landscape Design for Beginners](#) - by David Beaulieu
- [Landscape Design for IPM and Low Maintenance](#) – IPM Access: IPM Practitioners Association
- [Lawn Care for Cleaner Air](#) – Louisville Metro Air Pollution Control District

## Plant Selection

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Plant material is one of the key elements to consider on a landscape construction site. Vegetation is essential in protecting and enhancing the biodiversity and landscape character of an area. It is a living, dynamic element that provides many benefits to the site. After the site conditions are well documented, the selection of plant material must suit these conditions. A plant whose cultural needs are not met -- for sun or shade, moist or dry conditions, drainage, protection from wind, etc. -- will never thrive. Unhealthy plants are generally more susceptible to pests and disease. [Native plant](#) gardens are healthy habitats. Within their native range, all plants adapt to resist damage from climate, insects, and disease.

As you consider plants and their placement, take into account the mature size of the plants so you won't overcrowd them, to avoid ongoing -- and often unattractive -- pruning and shaping. Also remember that all plants need regular watering until they are established -- from one to three years. Along with other design considerations, when you're choosing plants you should aim to: Protect soil health, minimize water use and minimize need for chemical pest control. By using the right plant in the right place, in combination with good soil preparation and mulching practices, your landscape should need relatively little supplemental watering after establishment. Actual watering requirements will depend on specific site conditions and plants used. Although there are vast arrays of wonderful plants indigenous to all regions, ***non-invasive introduced plants***, that are well adapted to the local regional climate, are also wonderful additions to landscaping that use water frugally.

The following links to general guides will assist you to further your knowledge in this regard:

- [A Source Book on Natural Landscaping for Public Officials](#) – U.S. EPA
- [Annuals and Perennials](#) at Planttalk by Colorado State University
- [Books on California Native Plants](#) – CNPS Information on where to buy the best books on the subject
- [CalFlora](#) - the on-line gateway to information about native and introduced wild plants in California.
- [California Native Plant Sales](#) – CNPS Information on where to buy the native plants in your neighborhood
- [California Native Plant Society](#) (CNPS) provides valuable information about Native Plants Science Programs: [Rare Plant Program](#), [Vegetation Program](#), [Manual for California Vegetation](#) (Online) and [Local Flora Program](#)

- [CalPhotos](#) - This form accesses 49,434 images of plants. A variety of organizations and individuals have contributed photographs to CalPhotos.
- Choosing [California Native Plants](#) – A Smart Alternative – California Native Plant Society
- [Choosing the Right Plant for a Beautiful Trouble-Free Garden](#) – Seattle Public Utilities
- [Choosing the Right Plant for your Region](#) – by High Country Gardens: Plant for the Western Gardens
- [EcoFriendly House Plants - 50 indoor plants that purify the air in homes and offices](#) by B.C.Wolverton, Weidenfeld & Nicolson
- [Edible Flowers](#) at Planttalk by Colorado State University
- [Fruits](#) at Planttalk by Colorado State University
- [Gardening with Native Plants](#) – Go for Green
- Grass: [Choosing the Best Turf Grass in California](#) – Agriculture & Natural Resources, University of California
- Grass: [EcoTurf](#) - results in a meadow-like lawn, softer and less uniform than a conventional grass lawn because of the variety of textures. Designed to be more environmentally friendly and to need less maintenance than conventional lawn, once it is established, it needs little summer water and generally no supplemental fertilizer. – Seattle Public Utilities
- Grass: [Native Perennial Grasses of Santa Clara Valley, California](#) - Santa Clara Valley Chapter of California Native Plant Society
- Grass: The [Turfgrass Information Center™](#) (TIC) at Michigan State University contains the most comprehensive collection of turfgrass educational materials publicly available in the world. TIC has over 98,000 records in its primary database
- Grass: [Turf Grass Selection for Home Landscape](#) – UC Publication 8035
- Grass: [Turf Grasses best suited for California Conditions](#) – UC IPM Online
- [Houseplants](#) at Planttalk by Colorado State University
- [Lady Bird Johnson Wildflower Center](#)
- [Native Plants in Santa Clara County](#) - This page contains photographs of a small selection of native plant species primarily from Santa Clara and San Mateo counties. Other wildflower images are found at UC Berkeley's [CalPhotos](#) (and [Cal Academy's California Wildflowers](#)).
- [Native Vegetation an Alternative to Urban Turf](#)
- [Old City Cemetery Demonstration Garden](#): Dedicated to the Preservation of California Native Flora – Sacramento Valley Chapter of California Native Plant Society
- Paradise by Design: Native Plants and the New American Landscape by Kathryn Phillips
- [Photo Gallery](#): Ornamental Plants and Flowers; Landscape and Turf; Greenhouse and Nursery; Gardens and Arboreta; Post Harvest Care of Cut Flowers – Ornamental Horticulture Research Center – University of California
- [Plant Selection](#) by [Planttalk Colorado™](#)
- [Plant Selection](#) by Sustainable Urban Landscape Series, University of Minnesota
- [Planttalk Colorado™](#) provides reliable, timely information on more than 400 horticultural topics. [Colorado State University Cooperative Extension](#), [Denver Botanic Gardens](#), and the [Green Industries of Colorado](#) sponsor Planttalk Colorado™. For

additional information on Gardening, see [Plant Select®](#) and the [Cooperative Extension Resource Center](#). Planttalk Colorado™ notebooks are available for purchase.

- [Santa Clara Valley School Native Plant Gardens and Nature Areas](#) - Santa Clara Valley Chapter of California Native Plant Society
- The [Plants Database](#) – from USDA provides standardized information about the vascular plants, mosses, liverworts, hornworts, and lichens of the U.S. and its territories.
- [Top-Ten Plants for Cleaner Air](#) – Care2.com
- [Trees, Shrubs and Vines](#) at Planttalk by Colorado State University
- [Vegetables](#) at Planttalk by Colorado State University

## Implementation

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- SULIS – University of Minnesota – defines implementation as the development or creation of a landscape. It is a stage in the sustainable landscape process that includes: preparation, planting, installation and construction. For more information on the processes that lead to landscape implementation, see [Completed Landscape Design](#) in the "Design" section of SULIS. Implementation Projects are categorized in two sections: [Plant, Soils & Amendments](#) & [Hard Goods & Features](#). Find more Additional [Publications Related to Implementation](#)
- [Soil Amendments and Composting](#) at Planttalk – Colorado State University
- [A Complete Guide on Composting](#) – Compostguide.com
- [Composting for Healthy Soils](#)

## Landscape Maintenance Strategies

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Pest management through healthy landscape care can be divided into long-term preventive practices and short-term control treatments. Long-term preventive practices focus on plant health through the use of **cultural** techniques. Short-term control treatments include **biological**, **physical** and **chemical** controls. The following links to general guides will assist you to further your knowledge in this regard:

- [Lawn Care](#) – Cornell University Gardening Resources
- Landscape Maintenance – University of Minnesota
  - [Lawn Maintenance](#)
  - [Herbaceous Plant Maintenance](#)
  - [Wood Plant Maintenance](#)
- [Guide to Health Lawns](#) – University of California
  - [Choose & identify your turf species](#)
  - [Prepare the Site and Plant Turf](#)
  - [Lawn Care for New Lawns](#)
  - [Lawn Renovation](#)
  - [Lawn Care for Established Lawns](#)

- [Managing Lawns in Shade](#) - Agriculture & Natural Resources, University of California
- [Publications on Turf Management; Irrigation & Water Issues; Pest Management; Commercial Landscaping etc.](#) - Agriculture and Natural Resource Department (ANR), University of California
- [University of California Riverside Turf Pathology Diagnostic Laboratory](#) – provides detailed disease diagnostics, including identification, basic salinity, pH and nitrate testing, and control recommendations
- Planttalk – Colorado State University
  - [Lawn Maintenance](#)
  - [Water Consideration](#)
- [Ecologically sound lawn care for Pacific Northwest](#) – Seattle Public Utilities
- [Natural Lawn & Garden Care](#) by Seattle Public Utilities covers variety of topics such as
  - [Elements of Natural Lawn Care](#);
  - [5-Steps to Natural Yard Care](#);
  - [Growing Healthy Soil](#);
  - [Smart Watering](#);
  - [Irrigation & sprinkler tips](#)
  - [Improving Poor Lawns](#)
- [Healthy Lawns](#) – Health Canada
- [Integrated Plant Health Care Program](#) – City of Toronto
- [Turf Management for Municipal Athletic Fields](#) - Massachusetts Department of Food and Agriculture
- [The Green Garden Visit](#) – City of Toronto
- [Organic Gardening](#) - Many gardeners wonder what exactly organic gardening means. The simple answer is that organic gardeners don't use synthetic fertilizers or pesticides on their plants. But gardening organically is much more than what you don't do. Learn about [Gardening events in California](#) and more at [OrganicGardening.com](#)
- [Master Gardeners of Santa Clara County](#) – University of California Cooperative Extension
- [Ecological Lawn Maintenance](#) – Go For Green
- [Operating Standards for Turf](#) - City of Toronto

## Pest Specific Control Guides

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IPM involves looking at the total landscape; identifying the insect, mite, disease, weeds, abiotic disorders or growing conditions that are the cause of a problem; choosing from a variety of sustainable landscape maintenance & plant health care solutions when action must be taken. The following links to general guides will assist you to further your knowledge in this regard:

- Landscape Pest Control Guides at University of California Web site
  - [Abiotic disorders of landscape Plants: A Diagnostic Guide](#) – UC Agriculture & Natural Resources
  - [Pests of Agriculture, Floriculture and Turf](#)

- [Pests of Landscape Trees and Shrubs](#) - An Integrated Pest Management Guide – UC Statewide IPM Program – Order [online](#) or call ANR Publications: 1-800-994-8849 or (510) 642-2431
- [Pests of Landscapes, Gardens and Turf](#)
- [Weed Management in Landscape](#)
- [Weed Management in Lawns](#)
- [Natural Enemies Gallery](#)
- Planttalk by Colorado State University
  - [Insects & Disease Control](#)
  - [Landscape Weed Control](#)
  - [Wild Life Issues](#)
- [Abiotic disorders of landscapes Plants](#) – Center of Urban Ecology and Sustainability University of Minnesota: Non-living agents such as weather extremes, poor soil conditions, and drought cause abiotic problems
- [Backyard Beneficial Insect Guide](#) - City of Edmonton
- [Beneficial Borders](#): Control pest by planting flowers that lure [beneficial insects](#) – OrganicGardening.com
- [Bio pesticides](#) - U.S. EPA
- [Biological Control: A Guide to Natural Enemies in North America](#) - Cornell University
- [Book titles on Ecological Gardening, Organic Gardening, Naturalized Gardening, Natural Lawn Care, Natural Pest Control, Composting and Water Conservation](#)
- [Farmscaping to Enhance Biological Control](#) - ATTRA - Online Pest Management Systems Guide.
- [Generic Materials List](#) - Organic Materials Review Institute
- Insect & Diseases of [Christmas Trees & IPM](#) – Department of Natural Resources, Nova Scotia
- [Insect Parasite Nematodes – Tools for Successful Insect Control – Department of Entomology, University of Ohio](#)
- [Insect Parasite Nematodes – Tools for Successful Insect Control – Department of Entomology, University of Ohio](#)
- [Integrated Pest Management Plan](#) – City of Calgary
- [Introduction to IPM for Urban Landscapes](#) – IPM Access by IPMPA
- [IPM Manual for Home and Garden Pests in BC](#) – BCWLAP
- [IPM Manual for Landscape Pests in British Columbia](#) – British Columbia Ministry of Water, Land and Air Protection (BCWLAP)
- [Lawn Mower Maintenance](#) – Planttalk by Colorado State University
- [Least Toxic Materials for Managing Insect Pests](#) - IPM Practitioners Association
- [Less Toxic Control of Garden Pests & Diseases](#) – San Francisco Public Utilities Commission
- [Less-toxic Pest Management: Controlling Pests At Home \(fact sheets\)](#): This website provides fact sheets (promotional brochures) in English & Spanish on a variety of pests and solutions.
- [Natural Alternatives to Chemical Pesticides](#) – Windsor Pesticide Task Force
- [Natural Pest, Weed and Disease Control](#) – Seattle Public Utilities
- [Non-Pesticide Control of Insects](#) - Environment Canada

- [Organic Lawn Care Program](#) - Toronto Environmental Alliance
- [Ornamental Pest Damage](#) – Oklahoma Cooperative Extension Service
- [Product Specifications for Organic Turf Management](#) - City of Richmond
- [The Backyard Bug Brigade: Tips on Pest Control](#) – Government of Newfoundland and Labrador
- [Turf grass Pest Management Guidelines for Professionals](#) – UC IPM Online
- Thermal Weed Control
  - [Spot Burning using propane torches](#) - from [TNC Weed Control Methods Handbook](#)
  - [Weed Burners](#): Optimal combustion with the aid of aimed direct flame burners, combined with infra-red radiation results in more effective weed burning, which makes a higher driving speed of the tractor possible. That cost to run the machine are drastically kept to a minimum, speaks for itself. Because there is less gas used in the "vapour phase", savings on maintenance will be at a maximum. Heat-sensitive components are not exposed to the heat of the burners because they are placed outside the burner compartment.
  - [Organic Hot Foam Weed Control System](#) – Waipuna: This technology needs to be demonstrated for large-scale adoption in Non-Crop production agriculture pest management such as right of ways total vegetation control.
- [Rubberized Mulch](#) – For commercial and residential playgrounds
- Plant Disease control using Compost Tea:
  - [Compost Tea](#) : Compost tea solutions from Growing Solutions Inc.
  - [Compost Tea in Turf Maintenance](#) - The components of compost tea—beneficial organisms, organic compounds, and micronutrients—suppress common turf disease, increase root growth and lower maintenance costs.
  - [Compost Tea: Organic Gardening & Farming Made Easy](#)
  - [Compost tea-A renewed ancient idea for Plant Disease Control](#)
  - [Golf Courses implement Compost tea program](#)
  - [How to make compost tea](#)
  - [Notes on Compost Teas](#): A Supplement to the ATTRA Publication Compost Teas for Plant Disease Control - Pest Management Technical Note
  - [The effects of Compost tea on Golf courses greens turf and soil](#) – [Presidio Golf Course IPM](#), San Francisco, CA
- Weed control by using Organic Herbicides – Product in making, more research on efficacy, formulations, product & adjuvant combinations, cost efficacy is required for large-scale adoption in Non-Crop production agriculture pest management such as right of ways total vegetation control.
  - [Alternatives to Pre emergent herbicides](#) USDA-ARS, Department of Plant Pathology, University of California/ UC-SAREP, Department of Plant Pathology, University of California
  - [Corn Gluten Meal](#) – A good invention, here you will find information regarding the use of corn gluten meal as a natural herbicide for use on turf and organic crop production. Corn gluten meal, has potential as a natural pre-emergence herbicide.

- [Herbicide Effects of essential oils](#) - Appalachian Fruit Research Station, USDA, ARS, 45 Wiltshire Road, Kearneysville, WV 25430; E-mail: [ttworkos@afrs.ars.usda.gov](mailto:ttworkos@afrs.ars.usda.gov)
- [Organic Herbicides](#) – Evaluation: Horticultural Sciences Department, University of Florida
- [Organic Pre Emergent Herbicide Trails](#) at Santa Clara County: For more information contact Craig Crawford, Parks Program Coordinator at 408-355-2200, [Craig.Crawford@prk.sccgov.org](mailto:Craig.Crawford@prk.sccgov.org)
- [Vinegar as an herbicide](#) – Sustainable Agricultural System USDA: Contact Contact: [Dr. Ben Coffman](#)
- [Vinegar/Acetic Acid recommendations](#) for weed control as Washington State University Fact Sheet

## Pest ID

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- [Arthropod ID FMC](#)
  - [Key to Common Household Ants UC](#)
  - [California Plant Pest Diagnostic Laboratory](#)
  - [Insect ID Online for Entomologists](#)
  - [Insect ID Online for Entomologists](#)
  - [Purdue Plant & Pest Diagnostic Laboratory](#)
  - [WEED ID Turfgrass UC](#)
  - [Weed Photo Gallery UC](#)
  - [Weed ID FMC](#)
  - [Weed Identification Resources](#)
  - [Weed Seedling ID IOWA State Cooperative Extension](#)
  - [Weed ID Oregon State](#)
  - [Weed ID Virginia Tech](#)
  - [Weed ID WSSA](#)
  - [Weed ID UCWRIC](#)
  - [Weed Identification Online Interactive Quiz](#) – Ministry of Agriculture & Food, Ontario
-