Plant Identification

Slide: Welcome to the WSU Master Gardener On-Line Training

Hello and welcome to the Master Gardener On-Line Training. My name is Simone Ramel. I am a Certified WSU Master Gardener and am presenting today’s training module on Plant Identification. The material for this presentation has been researched and compiled by Dr. Richard Old. He has been performing plant identification for WSU Extension since 1976, and is often amicably referred to as “The Weed Guy.” Rich has been a wonderful mentor in my education in plant identification, so it is with excitement that I am able to share this information with you.

Slide: Plant images

This module will help you feel more confident as you try to identify plants in your garden, at the plant clinic, or from photographs.

Slide: Attributes to Consider for Plant Identification

For this training module, we will be focusing on the general characteristics of plants that are best to consider when beginning plant identification. We will also discuss some of the characteristics of flowers, fruit, leaves, leaflets, stems and roots—those that tend to be a little easier to recognize. So, let’s get started!

Slide: Images of people

Have you thought about how you recognize a friend, parent, child or significant other in a crowd? What is it about them that helps you know who they are? What is it that you look for? Is it how they stand, walk, smile or perhaps run?

We all look for things that are easy for us to identify—characteristics of the person that we are familiar with. We have been trained from birth to recognize people; we just don’t realize how we are doing it.

This same concept can be used to identify plants. You need to think about the characteristics you are familiar with, and then try to identify the plant using all the things you already know about that plant. Or perhaps you know something about the species, then start with that.

Slide: Images of a lily, rose and pansy

For example, most of us recognize a rose, lily or pansy when we see one. How do we know these plants? We recognize certain things about them that tell us, “I know that plant, that’s a rose (or a lily or pansy).”
Slide: Rose

Certain characteristics remind us of a plant we are familiar with. For example, with roses, we may love to see our garden full of roses in full bloom—fully opened and radiant. We also have become familiar with the shape of the leaves, the thorns, the smell of the blooms, and more. And roses are so often depicted in greeting cards, advertising, and the general media. It is a flower we have seen quite often.

Slide: Lily

With lilies, we usually recognize the large open blooms, the long narrow leaves, and the large pollen sacs on the stamens (the male parts of the plant). We generally try to avoid getting lily pollen on our clothes!

Slide: Pansy

With pansies, we readily recognize their shape and size, and their “faces” that peer out at us.

Slide: Rose, Lily, Pansy

Keeping those examples in mind, let’s take a closer look at some of the most easily identifiable characteristics to consider as you start the process of identifying a plant you are less familiar with.

Slide: A Tip Before We Get Started: Keeping a Plant Specimen Fresh

But before we get started, I’d like to encourage you to remember this tip: it’s easiest to identify a plant when it is fresh (not dried out), when you see the entire specimen, including the roots, and when the plant is in bloom if possible. To keep your plant specimen fresh, it is best to put it into a sealed plastic bag with a DRY paper towel inside. The paper towel will help absorb some of the moisture so the plant doesn’t get all mushy. Then, if you can, keep it in the refrigerator until you are able to take time to identify it. If it’s not in bloom, there are still other characteristics to help you get started with your identification.

The following images are from plants that were collected and stored for two weeks:

1) The first image you’ll see is of plants that were kept in the refrigerator with a dry paper towel. There were pulled and put in dry themselves.

2) The second image is of plants that were pulled, but were wet from the rain. They still did pretty well in the refrigerator because they were put in with a dry paper towel.

3) The third image however, is of a plant that got pretty mushy. It was put in the refrigerator, but without a paper towel. And it’s really hard—you can see from its growth habit—but it’s really hard to detect what the leaves really look like.

4) And the last image is of a plant that was not put in any bag whatsoever and it just dried out. Can you recognize it? Perhaps you can, but it’s still not as easy as if it were fresh.
**Slide: General Plant Characteristics We Will Consider**

The general plant characteristics we will consider one-by-one are: [read through list]. And to help you get familiar with some of these characteristics, we will look at a plant you are quite familiar with, the dandelion—*Taraxacum officinale*, member of the *Asteraceae* family.

**Slide: Milky Juice**

One of the easiest characteristics to identify is whether or not a plant has “milky juice.” In other words, if you break the stem, does the liquid inside look opaque or “milky,” or, does it more watery. This must be done while the plant is fresh—another reason to make an effort to keep specimens in plastic bags. A dried plant is just that, dry, so this characteristic will not be evident with dry specimens.

**Slide: Dandelion**

Dandelion, *Taraxacum officinale*, member of the *Asteraceae* family, does have milky juice. It is not a common attribute in plants.

**Slide: Spines or Thorns**

Next, let’s take a look at spines or thorns. We are not referring to hairs or prickles on plants, but rather the spines or thorns that could actually puncture our skin and draw blood. The position of the spines or thorns on the plant will also give you information about the biology of the plant.

Let's take another look at our dandelion. A dandelion may appear to have prickly leaves; however, these are not spines or thorns.

Please note: many of the sketches in this module, like the ones you see in front of you, use a basic plant diagram for all the sketches. This is just to give you an idea of a concept—they are not meant to look like any particular plant. Your plant and its leaves, flowers, etc. may look totally different.

**Slide: Is the Plant Aromatic?**

The attribute (or plant characteristic) of being aromatic or not refers ONLY to the leaves and stems of the plant. You will need to crush the plant stem between your fingers to know whether the plant is smelly or not. And this smell can be good or bad. And remember, this does not refer to the flowers. Many flowers from rose plants are quite aromatic, but their leaves and stems are not. So roses are not considered aromatic with respect to this attribute. This would also be true for pungent blooms such as marigolds or lilacs.

A plant that is a good example of being aromatic is the mint plant. The pictures you see are of Perilla mint (*Perilla frutescens*), Field mint (*Mentha arvensis*), and Cat mint or Catnip (*Nepeta cataria*).
Slide: Life Cycle

The life cycle of a plant refers to the length of time which a plant lives. The best way to determine a plant's life cycle is to examine its roots. The roots of a perennial for example will generally be coarse and dark colored. An annual will have lighter and more delicate roots since they have not been growing very long. A seedling however, will give you no indication of its life cycle—all seedlings have very light, more delicate roots. Clearly recognizing the differences in the roots may take a little practice, but it's a very helpful attribute to know!

Slide: Growth Habit

The growth habit is the general form or appearance that each plant takes when you see it in the soil/earth. This is the most important feature for many species. Can you imagine a Tiger Lily that is prostrate or a Mullein that is a vine?

Caution: Some plants will change their habit under repeated mowing, grazing, burning, spraying, etc. You have probably seen dandelions that become very prostrate under certain conditions.

Slide: Plant Height at Maturity

As I scroll these sketches, you will get a sense of the varying heights in plants. To know a plant's height, you must measure the plant from the ground to the highest point. This is also true for aquatic plants. In addition, prostrate plants may have very long stems along the ground, but their height might only be a few inches or less. It is helpful if your plant is mature, either flowering or fruiting, because remember, all plants start out short!

Slide: Wind Dissemination

Wind dissemination refers to how a plant distributes its seeds. Are the seeds or spores blown around in the wind? In some species, the seeds have various types of fluff or parachutes attached to them—to help them get blown by the wind—as with dandelions or maple tree seeds. In tumbleweeds, the whole plant is windblown.

Slide: Moisture Regime

The moisture regime characteristic refers to how wet a site is where the plant is growing. When the location is extremely wet or extremely dry, it is generally easier to identify. Certain plants thrive in these conditions. Try to imagine a cactus in a swamp or a water-lily in a desert—it’s just not possible!

Let’s go back to the moisture regime sketch. The aquatic and semi-aquatic regions are pretty self-explanatory in the sense that they are about plants in or close to water, such as Water Lilies and Cattails.

Mesic is defined as a region requiring a moderate amount of water. Most plant species occur in this moisture regime, including most of our crops and many of our weeds.
Seasonally saturated habitats are filled with moisture during the wet season, but are dry the rest of the year. Some of our weeds unfortunately, also fit into this category.

Arid sites are those that have very little access to water. It could be a result of low precipitation, steep slopes or perhaps ground that is not permeable. Cacti are perfect examples of plants that thrive in arid habitats.

**Slide: Woodiness**

Woodiness refers to the rigidity of the stems of the plants. There are three types to consider: Herbaceous, Semi-woody, and Woody. Herbaceous plants are non-woody. They are not rigid at all. Quite a few plant specimens will fit this category. The dandelion for example, is an herbaceous plant.

Semi-woody means that the stem is somewhere between flexible (herbaceous) and rigid (woody). Virginia Creeper, *Parthenocissus quinquefolia* of the Vitaceae family is a good semi-woody example.

Woody refers to a more rigid stem—generally those of trees, shrubs, and woody vines. The stems of these plants persist more than a year and will have annular growth rings when you look at a cross-section. Big sagebrush, *Artemisia tridentata* of the Asteraceae family may seem semi-woody with its fresh, new growth, but when it is fully mature, the stem and trunk structures are clearly woody.

**Slide: Chlorophyll**

Chlorophyll is the pigment which gives plants their green color and the way they get energy from the sun. Plants with no chlorophyll will be yellow or white in color and often have no leaves! These plants get their energy from growing on either living plants (we call them parasites) or by growing on dead plants (we call those saprophytes). An absence of chlorophyll is actually quite rare in plants.

**Slide: General Characteristics**

We have spent the last hour or so looking at the general characteristics of plants for use during your plant identification process. Now, here is an opportunity for some practice.

In your mind, select any plant that you are familiar with—take a few moments.

Perhaps you will choose one of the plants you see before you, but be sure to choose a plant you know. Then, take a few moments to jot down the characteristics from all the topics we have just covered. You may want to pause this training. And in a moment, you will see a slide of those characteristics again to refresh your memory.

Again, this may be a good point to stop this training or pause this training. When you’re ready, randomly pick another plant you know well, and jot down the attributes for this one. Again, feel free to pause this module. When you look at these characteristics you’ve jotted down, odds are that even these simple characteristics will help you see the differences, more clearly, between the two plants.
**Slide: Additional Characteristics to Consider**

In the next section we will be going over a few additional characteristics for you to consider. These are attributes that are still generally easier for us to work with in our process of plant identification. But first, let’s take a quick break and we’ll return in just a moment.

**Slide: BREAK TIME**

It’s break time!...Time to put down pens & pencils, time to get up, stretch, take a deep breath, get something to drink perhaps, and enjoy this short basalt rock garden film. Please pause the tutorial at the end of this movie clip for your break. I'll be right back.

**Slide: Additional Characteristics to Consider**

There are a few other characteristics of plants that are worth considering during the plant identification process. We will be looking at just a few from each of the sections listed on your screen [read list on slide]. There are many more attributes to consider in each section, but we have chosen the easiest ones to start with. As you get more comfortable with plant identification, you can continue to add more characteristics to these sections.

Once again, it might be helpful to think of a dandelion while you go through this next part. And remember, you never have to answer all the questions when it comes to characteristics of the plant you are trying to identify. Sometimes it’s best to consider a few options. It often gives you better results.

**Slide: Flowers**

Flower characteristics such as flower color, number of petals and flower width can be very helpful in plant identification.

**Slide: Flower Colors**

Flower color usually refers to the color of the petals but it may also include other structures of the flower, such as sepals, bracts, etc. Whatever part of the flower imparts the most obvious color is what you should choose to help you identify your plant. If the petals are obviously more than one color, your plant is considered “multicolored.” This attribute may help you eliminate plants that you are sure are only one color.

**Slide: Number of Petals**

The illustrations on your screen showing an increasing number of petals were arbitrarily drawn with four sepals (the green parts of the sketches). Remember that your plant may have more or less sepals. In addition, sepals are generally smaller than the petals, but are shown larger here in order to accentuate the number of petals.

Also, this is just an arbitrary sketch of a flower—your flower may or may not look the same in its shape or form.
**Slide: Flower Length**

Flower length is measured starting from the part that continues off the stem. Flower width is measured at the widest part of the flower. You are not required to only pick one size—sometimes the flowers will have a range of sizes. It will still help you in the identification process.

The screen scroll you’re about to see will show various widths of flowers.

**Slide: Leaves**

Now we are going to look at leaves—their type, arrangement, shape, length and width, including the leaflets.

This sketch will give you a general idea of all the parts of a leaf. We will not be looking at all these parts, but it is helpful to know them none-the-less.

**Slide: Leaf Type**

Leaf arrangement specifies how the leaves are arranged on the plant’s stem. However, we must first distinguish between a leaf and a leaflet. The easiest way to distinguish them is to look at whether it is one single leaf or a group of leaves. If you have a group of leaves that come together as one leaf, these groupings will either make up what is called a “compound leaf” or a “dissected leaf.”

If these divided portions are all similar and “leaf-like,” these portions are called “leaflets” and the leaf is then called a “compound leaf.” If the portions vary greatly in size and shape, then the leaf is called a “dissected leaf.”

**Slide: Leaf or Leaflet?**

We can also distinguish between a leaf and leaflet by being familiar with axillary buds. An axillary bud is a bud that is located at the axil of a leaf—where the leaf petiole, or the leaf stem, is attached to the main stem. Leaves have axillary buds, leaflets, as these shown here, they do not have axillary buds.

It is also important to note that an axillary or lateral bud grows from the side of the branch, while a terminal bud, which we do not see here, is the one growing at the very tip of a branch. Axillary buds can develop into a branch shoot or a flower cluster.

**Slide: Leaf Arrangement**

Now in this sketch, we actually have the arrangement of leaves on the stem—from all basal, to alternate, to alternate below-opposite above, to fascicled, whorled, whorled with 4, whorled with 5-8 per node, whorled by more than 8 per node.

As I have mentioned at various points in this module, please remember that the sketches are just a basic plant diagram for all the sketches throughout. This is just to give you an idea of a concept—they are not meant to look like any particular plant. Your plant and its
leaves, flowers, etc. may look totally different. For example, some plants may or may not have basal leaves at the bottom, but they still have alternate below-opposite above. In other words, your plant may or may not have basal leaves at the bottom.

**Slide: Leaf Shape**

As I know you are already aware, leaves come in a wide variety of shapes. It is one of the major identifying characteristics of plants. Many of the shapes are similar, so it is one area where you must consider more than one shape as you are trying to identify the leaf shape of your particular specimen.

**Slide: Leaf Length**

Leaf length is measured from the point at which the leaf attaches to the branch up to the tip of the leaf. Be sure to include the petiole (the entire stem of the leaf) in your measurement.

**Slide: Leaf Width**

Leaf width is measured at the widest point of the leaf. Please note that this characteristic may not be accurate if the stem leaves are much smaller than the basal leaves, or if the leaves are very young and are not yet full size.

**Slide: Leaflet Length**

When we discussed leaf length, we discussed the petiole, the stem of the leaf, whether it is a simple leaf, one leaf, or as pictured here, a compound leaf.

Now, when we discuss leaflet length, we are discussing the petiole, the stem of the leaflet.

Another important characteristic between a leaf and a leaflet is the base of the leaf or leaflet. Leaves, whether simple or compound, have a clasping leaf base. Leaflets—their stem does not have a clasping leaf base.

**Slide: Leaflet Length and Width**

To measure the leaflet length, we measure the stem of the leaflet, the petiole, all the way to the tip of the leaflet blade.

To measure the leaflet width, we measure the widest part of the leaflet blade, the widest part of the leaflet.

**Slide: Fruit**

Technically, a fruit is a mature ovary and a seed is a mature ovule from within an ovary. However, we must become familiar with the misuse of the term “fruit” in everyday language. To most people, peas, beans and tomatoes are “vegetables,” but botanically, they are all fruits. Virtually all flowering plants produce fruits of some type. Fruits are of great value in plant identification!
**Slide: Fruit Length at Maturity**

Fruit length is measured from the points of attachment to the plant, all the way to the end of the fruit. However, it does not include the stem-like portion called the “peduncle.”

Here, in this diagram, I am using a sugar-snap pea as an example of a fruit; however, you can place any fruit into the palm of your hand to get an idea of its length. I’m also showing you the longest measurement on the screen. As you'll notice when I start to scroll back down, it’s almost impossible to see the very smallest fruit in the palm of your hand. It is barely visible.

**Slide: Burs**

Does the fruit or seed of the plant seem like a bur or not? Burs are the seeds or fruits of plants that are equipped with structures that allow them to cling to passing animals (or human socks!) thus aiding in the plant’s dispersal. These sketches are just a few examples of the types of “attachments” that plants use for clinging.

**Slide: Characteristics of the Stem**

**Slide: Stem Cross Section**

Technically, to determine this characteristic, you would have to cut the stem of your plant in half and look at it from one of the ends. However, this is seldom necessary because if you roll the stem between your thumb and fingers, you can often determine its shape—unless of course it is hollow. And then, if you are unsure, you can still choose to cut the stem and take a look.

**Slide: Flowering Stem Leaves**

The amount of leaves on the flowering stem is one of the attributes which gives plants their characteristic shape. Can you imagine a dandelion with leaves all the way up its blooming stem or bindweed without a leafy stem?

**Slide: Main Stem Branches**

Whether the main stem of the plant is branched or not is the most important factor in determining the growth habit or form of the plant. It is one of the attributes we discussed with the general characteristics of plants in the first section. In the first section, we looked at the general growth form—here we are specifically looking at the main stem of the plant.

Now be sure not to confuse this characteristic with the stems of the flowers themselves. The arrangement of the flowers on the flower stem—again, not the main stem of the plant—that is called “inflorescence.”

In other words, an unbranched main stem of a plant can have a flower stem that is branched.
The last characteristic we will be looking at in this module is root type. We will use the term "vegetative propagules" for this characteristic so that non-root structures, such as rhizomes and stolons, which are actually horizontal stems, can also be included.

The first root type that we will consider is a bulb or corm. A bulb or corm is an enlarged, spherical stem base below ground. Although bulbs and corms are technically quite different, it is not necessary to distinguish between them for now. They are both more or less spherical in shape.

Fibrous roots are those that form a cluster of narrow, string or thread-like roots, often that are branched extensively, and without a central root. Grasses are good examples of plants with fibrous roots.

Rhizomatous is a term used here to denote any horizontal, underground, reproductive structures. In either woody or herbaceous species this often results in large, dense patches of plants. Virtually all plants that are rhizomatous are perennials. Let’s take a quick look at one of our native, wild, western plants.

Although our native wild western roses are beautiful, they are rhizomatous and can become weed-like and spread into areas of our garden where we don’t want them.

Getting back to our root types, rooting at the nodes are all roots that appear from stems at the bases of leaves, especially when these points touch the soil. This is relatively common in aquatic and semi-aquatic species, but can be seen in other low-growing or spreading plants.

Stoloniferous roots are roots that are horizontal, above ground stems which extend out and form new plants. A good example of stolons or “runners” is those of strawberry plants.

Now we all are very familiar with the tap root of a dandelion and other pervasive weeds. A Tap Root is the root which is an elongation of the main stem. While a taproot is somewhat thickened, it can also be much narrower than what you may find illustrated in some books.

Tuberous: A tuberous root is an enlarged, thickened root portion of the root system, as in a potato. These are starchy structures used for food storage and vegetative reproduction.

In closing, whether you are a beginner at plant identification or more advanced, we hope you have gained some insights into how to get started with the plant identification process,
as well as the breadth of characteristics that are available to you during your plant identification exploration.

From general characteristics such as milky juice, life cycle and wind dissemination—to the additional characteristics of flowers, leaves, stems and roots—we hope you will feel more confident as you pick up a specimen outdoors or receive one in a plant clinic.

Thank you for joining me today and enjoy your exploration of plants!

**Slide: Resources**

There are many excellent resources available to you for plant identification. Quite a few are already listed and/or included with other sections of your Master Gardener training.

Three resources you may not be as familiar with, but are worth mentioning are:

2) Flora ID Northwest
3) 1200 Weeds

**Plant Identification Terminology** is a user friendly book that is an alphabetical reference of botany terms. It includes simple definitions and illustrations. It is a great, handy reference to have.

**Flora ID Northwest** is a software program that has compiled all the native and naturalized plants in the Northwest. And it is available either by state or by region. It is a very comprehensive, interactive database to assist you in plant identification.

**1200 Weeds** is another software program that is an interactive database for identifying weeds of the United States and Canada; however, it can be used to start identifying many plants since it includes both broadleaf and grass-like plants.

Both software programs are user friendly and can be used like a book as a reference.

Please visit the web sites posted on your screen if you’d like to learn more about these programs. You can also contact your Master Gardener Coordinator for additional information. Thank you.