Plant Identification
Heather Stoven

Today's Agenda
- History of Plant Taxonomy
- Plant Classification
- Scientific Names
- Leaf and Flower Characteristics
- Dichotomous Keys

What do you gain from identifying plants? Why is it important?
- Common disease and insect problems
- Cultural requirements
- Plant habit
- Propagation methods
- Use for food and medicine

Looking at plants more closely
- How do plants relate to each other? How are they grouped?

Plant Classification
Group each plant into a specific category
- Maple
- Viburnum
- Apple tree
- Daylily
- Tomato
- Oak
- Weeping willow
- Petunia
- Spiraea
- Crabapple
- Ash
- Geranium
- Poinsettia
- Pepper
- Mint
- Euonymus

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TREES
Plant Classification

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Ornamental Flowering Plants

Edible Crops

Plant Taxonomy

- Identifying, classifying and assigning scientific names to plants
- Historical botanists trace the start of taxonomy to one of Aristotle’s students, Theophrastus (372-287 B.C.), but he didn’t create a scientific system.
- He relied on the common groupings of folklore combined with growth: tree, shrub, underbrush or herb
- Detected the process of germination and realized the importance of climate and soil to plants
- Then, along came Linnaeus….

Carolus Linnaeus

The Father of Taxonomy

- Swedish botanist
- Developed binomial nomenclature
- Cataloged plants based on natural relationships—primarily flower structures (male and female sexual organs)
- Published Species Naturae in 1735 and Species Plantarum in 1753

Plant Classification Pyramid

Kingdom
Monera, Protists, Fungi and Animals

Division (Phylum)
12: based mostly on reproductive characteristics (Angiosperms)

Family
Several hundred named

Genus

Species
An estimated 370,000 named

Generally Accepted Classification Units for horticulturists and gardeners

Family
Genus
Species
Family
- Group of closely related genera
- Similar structure and appearance
  - Seed pod/fruit
  - Flower parts
  - Leaf arrangement
- Cultural practices (i.e., the care of the plant) generally follows family lines

Family names end in “aceae”
- **Caprifoliaceae** – Honeysuckle family including Honeysuckle, Snowberry, Weigela
- **Fabaceae** – Pea family including clover, Locust, mimosa, lupine and vetch
- **Oleaceae** – Olive family including Ash, Forsythia, and Privet

Remember our friend, Carl?
- Linnaeus simplified scientific names by designating one Latin name to indicate the genus, and one as a “shorthand” name for the specific epithet

**Binomial nomenclature!**

What’s with the Latin?
- **When Linnaeus published his first books**
  - Latin was the language of science in Western Europe
  - He followed this trend using Latin and Greek names
- **Spelling is universal, worldwide**
  - Pronunciation depends on local language and dialect

Scientific Names: Binomial Nomenclature
- The names are composed of two parts
  1. **Genus**
  2. **Specific epithet**

Family: Bignoniaceae

**Catalpa speciosa**
Western Catalpa

Genus

Specific epithet

Species

Species: the basis of the binomial system of nomenclature
- A difficult word to define, a population of individuals within a genus that are capable of interbreeding freely with one another
Genus and Species

Equus ferus caballus – 64 chromosomes

Equus africanus asinus – 62 chromosomes

Mules Equus asinus x Equus caballus – 63 chromosomes – sterile

The specific epithet can give us hints about the plant:

- Specific epithet: the second word in a scientific plant name, not capitalized and usually an adjective used to describe size, color, leaf shape, growth habit, origin of the plant or to commemorate a person.

- Cotoneaster horizontalis
- Coreopsis gigantea
- Clerodendrum thomsoniae
- Godetia grandiflora
- Cistus x purpureus
- Chionanthus virginicus

Scientific Names: Binomial Nomenclature

- Correct spelling
  - Genus and specific epithet names are always underlined or in italics.
  - Genus is capitalized
  - Specific epithet is not capitalized

  *Fraxinus americana*

Participation question

Which name is written correctly?

**Red maple:**

1. Acer rubrum
2. Acer Rubrum
3. acer rubrum
4. Acer rubrum

Scientific Names: Binomial Nomenclature

- ‘sp.’ = species (singular)
- ‘spp.’ = species (plural)  
  
  Do not italicize or underline.

  For example
  
  - Prunus sp. – Refers to a definite plant in the Prunus genera of unidentified species.
  - Prunus spp. – Refers to all of the species in the Prunus genus.
Plant species can be divided more specifically into:

- cultivar
- variety
- Hybrid

Subspecies Taxa

Cultivar
- “Cultivated variety” or horticultural variety
- plants within a species that have been selected especially for a particular characteristic and are propagated, usually asexually to continue this trait (growth habit, flower, fruitless)

Variety
- botanical or wild variety, a group of plants intermediate between species and forma and usually associated with inheritable differences. They are recognized as distinct populations breeding true to type

Hybrid
- two closely related but distinct species will interbreed to form a hybrid. Are often sterile and produce no seed or fruit

Participation question

Which name is written correctly?

Furman’s Red Sage

A. Salvia greggii
  “Furman’s Red”
B. Salvia greggii
  “Furman’s Red”
C. Salvia Greggi
  Furman’s Red

Scientific Names:
Binomial Nomenclature

- Authority – person who first identified the species
  - Acer palmatum Thunberg
    - Acer palmatum T.
      - Japanese Maple
  - Solanum tuberosum Linnaeus
    - Solanum tuberosum L.
      - Irish potato
What’s wrong with Common Names?  
They don’t always identify the plant

Liriodendron tulipifera  
- Tuliptree in the north  
- Yellow Poplar in the south

Carpinus caroliniana  
- American Hornbean  
- Blue Beach  
- Musclewood  
- Water Beech  
- Ironwood

Nymphaea alba  
- European White Waterlily  
- 1.5 common English names  
- 44 common French names  
- 105 common German names  
- 81 common Dutch names

Also Consider…..  
- Common names not universal  
- Many different plants are given same common name  
- Many species do not have common names

Many Latin names are now “generic” common names.

- Anemone  
- Rhododendron  
- Crocus  
- Viburnum

Common Names: Rules for Writing  
- While a constant source of confusion, they are often used  
- For writing, all common names are usually in lower case letters  
  - sugar maple  
  - barberry  
  - dogwood  
  - ginkgo

- Unless there is a proper name in the common name or you’re naming a specific cultivar…  
  - Japanese maple  
  - Russian olive  
  - ‘Autumn Purple’ white ash  
  - Chanticleer® pear

Plant Name Changes  
- Happens occasionally because:
  - Can be changes in International Code of Botanical Nomenclature  
  - Book which has rules and guidelines for naming plants – ex. The nomenclature of taxonomic groups is based on the priority of publication  
  - Advances in technology have changed our knowledge of plant relationships, ex. Using molecular techniques  
  - Botanists disagree on placement of plants  
  - Ex. lumpers vs. splitters

- The Genus Aster used to contain hundreds of species in North America and Eurasia  
- Morphologic and molecular research determined the species should be split  
- Now there are 180 species in the genus, all except one are all in Eurasia  
  - Almutaster  
  - Ampelaster  
  - Canadianthus  
  - Doellingeria  
  - Eucephalus  
  - Euribia  
  - Ionactis  
  - Ocelmena  
  - Oreostemma  
  - Seriocarpus  
  - Symphyotrichum

Quick Review…..

- Let’s review some plant ID concepts  
  - Leaf Arrangement  
  - Leaf Shape  
  - Simple vs. compound  
  - Flower parts  
  - Flower characteristics  
  - Fruit types
Leaf arrangement, a tool for plant ID

On stem

- Alternate
- Opposite
- Whorled

Leaflets

- Simple
- Pinnately Compound
- Palmately Compound
- Doubly Compound

Leaf venation, a tool for plant ID

- Parallel
- Pinnate
- Palmate

Leaf shape, a tool for plant ID

Overall shape
- oval
- lanceolate
- obovate
- elliptical
- spatulate
- cordate
- obtuse
- obtiplicate
- reniform
- hastate

Margin shape
- crenate
- incised
- sinuate
- undulate
- lobed
- entire
- serrate
- serrulate
- doubly serrate
- dentate

Parts of a flower

- stamen
- anther
- filament
- petal
- style
- stigma
- ovary
- sepal
Imperfect flowers

**Monoeious** = "one house": male and female flowers on the same plant

- Hazelnut

**Dioecious** = "two houses": male and female flowers on different plants

- Willow

Numerical plan

Flowers 3-merous (monocots)

Flowers 4- or 5-merous (eudicots)

Floral symmetry

- Radial (actinomorphic)
- Bilateral (zygomorphic)

Corolla

- Petals separate
- Petals fused: corolla is ** sympetalous** (if the sepals are fused, the calyx is **synsepalous**)

Stamens

- Monadelphous: filaments united
- Epipetalous: upon the petals
- Tetradyamous: 4+2

- Didynamous: 2+2

**Ovary Position**

- Inferior ovary
- Superior ovary

http://www.puc.edu/Faculty/Gilbert_Muth/art0021.jpg
Monocots

- About 20% of all flowering plants
- Most are orchids, grasses, sedges and palms

Eudicots

- 70% of angiosperms

Identify monocot or eudicot

<table>
<thead>
<tr>
<th>Vascular bundle</th>
<th>Leaf venation</th>
<th>Flower parts</th>
<th>Cotyledons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monocot</td>
<td>random</td>
<td>parallel</td>
<td>3's</td>
</tr>
</tbody>
</table>

Eudicots

- outer circle
- palmate, pinnate
- 5’s
- 2

Examples of Woody Eudicot Families

- Aceraceae - maple family – includes maples and boxelder
  - Opposite leaves
  - Fruit a double samara

- Ericaceae - heath family - includes rhododendron, piers, salal
  - Evergreen trees and shrubs
  - Flowers bell or urn-shaped

- Roseaceae - rose family – includes cotoneaster, rose and ~250 landscape plants
  - Many stamens
  - Leaves often stipulate
  - Stems often with thorns or prickles
Examples of Herbaceous Monocot and Eudicot Families

- Liliaceae - Lily family
  - Ovary superior
  - Flowers 3-merous
  - Sepals petaloid

- Lamiaceae - Mint family
  - Square stems
  - Leaves opposite
  - Bilateral symmetry for flowers

- Asteraceae - Asters family
  - Inflorescence a head
  - Ovary inferior
  - Fruit an achene

Using a dichotomous key

- A key is dichotomous if you must make a choice between two mutually exclusive statements (leads).
- Each set of leads is a couplet.
- Each statement in a couplet leads to another couplet and, eventually, to a taxon (e.g. family, genus, species)

<table>
<thead>
<tr>
<th></th>
<th>1a</th>
<th>1b</th>
<th>2a</th>
<th>2b</th>
<th>3a</th>
<th>3b</th>
<th>4a</th>
<th>4b</th>
</tr>
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<tr>
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<td>----(4)</td>
<td>----(answer)</td>
<td>----(3)</td>
<td>----(answer)</td>
<td>----(answer)</td>
<td>----(answer)</td>
<td>----(5)</td>
</tr>
</tbody>
</table>

Example: a dichotomous key to five taxa (A-E)

1a. Flowers red
1b. Flowers white or yellow
2a. Ovary superior
2b. Ovary inferior
3a. Leaves simple
3b. Leaves compound
4a. Petals distinct
4b. Petals fused
5. 

Key to Conifers

1 a) Leaves needle-like (3)
1 b) Leaves flattened and scale-like (2)
Key to Conifers

3 a) Needles Clustered (4)
3 b) Needles not clustered (5)

Key to Conifers

4 a) Clusters of 2-5 needles….Pine
4 b) Clusters greater than 10 (6)

Discussion…

What kind of information do you need for plant identification?

Why is plant ID so important for the diagnostic process?

Before you start the ID process

- Collect information by observation or questions
  - Does client know what it is?
    - May need to confirm
      - Deciduous vs. Evergreen
      - Growth habit
      - Shape and height
      - Any other distinctive characteristics
        - Flower color, time of year
        - Leaf shape, size, color
        - Bark characteristics

OS-Plant ID.ppt, page 11
Bring in branch sample or send photos
Not over the phone

Tools used for plant identification
- Senses
- Plant samples
- Hand lens
- Ruler
- Sharp blade
- Dissecting scope
- Reference materials and keys

Integrated Approach to Plant Identification
- Visual inspection of plant characteristics
- Photographic references
- Plant classification keys
- Expert advice

Herbaria
- Collection of plant specimens
- Pressed plants mounted on paper with collection info
- Used for cataloging and identifying plants in an area
- Historical record of plants in an area
- Essential for the study of plant taxonomy
- Samples often used as a source of DNA for molecular studies

An Amazing Resource
- https://landscapeplants.oregonstate.edu

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If All Else Fails….

Technical terminology
- Look up meaning, as needed
- Don’t memorize terms

Reference
- Plant Identification Terminology: An Illustrated Glossary
  by James Harris

Resources
- Manual of Woody Landscape Plants – Michael Dirr
- Dirr’s Hardy Trees and Shrubs – Michael Dirr
- Manual of Herbaceous Ornamental Plants – Steven Still
- Trees to Know in Oregon – Edward C. Jensen, EC 1450
- Shrubs to Know in Pacific Northwest Forests – Edward C. Jensen, EC 1640
- Botany in A Day – Thomas J. Elpel

Weed Identification
- Weeds of the West – T. Whitson
- Weeds of California – UC Publication

Resources
- The Shrub Identification Book – George Symonds
- The Tree Identification Book – George Symonds
- Trees of North America and Europe – Roger Phillips
- A-Z Encyclopedia of Garden Plants – Christopher Brickell
- Sunset Western Garden Book

Resources
- Oregon Flora Project

Weed Identification
- Weeds of the West – T. Whitson
- Weeds of California – UC Publication
What questions do you have about scientific names, plant classification or identifying plants?

Plant Identification Activity
To Use This Key

1. Start at the top of the key. Then read each of the two statements directly below the starting point.
2. Decide which of the two statements better describes the plant you're trying to identify. Then read the two statements directly under that box.
3. Continue this process until you've identified a single group of trees (called a genus). Then turn to the page indicated and read the descriptions of individual species contained within that genus (there may be only one, or there may be several).
4. If the species description matches the plant you're trying to identify—GREAT! If it doesn't match, go back to the beginning of the key and try again.

Common conifers of Oregon

- leaves needlelike
  - needles clustered
    - clusters of 2-5 needles
      - PINE p. 27
    - clusters of 10 or more
      - WHITE-CEDAR p. 106
  - needles not clustered
    - needles soft
      - deciduous
      - LARCH p. 25
    - needles stiff
      - evergreen
      - TRUE CEDAR p. 106
- tiny pegs on twigs
- no pegs on twigs
- cones round
- cones not round
- cones soft/leathery
  - JUNIPER p. 23
- cones woody
- cones resemble round buds
  - REDCEDAR p. 13, 15, 105
- cones resemble duck's bill
  - INCENSE-CEDAR p. 14
- cones over 1/2" dia.
  - CYPRESS p. 106
- cones under 1/2" dia.
  - WHITE-CEDAR p. 13
- terminal buds round and clustered
  - TRUE FIR p. 46
- terminal buds not clustered
- buds large and pointed
  - DOUGLAS-FIR p. 17
- buds not large and pointed
- needles white underneath
- needles green underneath
  - YEW p. 58, 109
- needles pointed
  - REDWOOD p. 40
- needles blunt
  - HEMLOCK p. 20

From: Trees to Know in Oregon
OSU Extension Service