PLANT PROPAGATION TECHNIQUES

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What we'll discuss

- A few definitions
- Vegetative propagation
- Sexual propagation
- Plant propagation at home
- Resources

Propagation Techniques

- ***The Science***

  Sexual propagation: Regeneration of genetic materials to form a uniquely genetic individual through the formation of seed.

- ***The Art***

  Asexual propagation

  - *Vegetative propagation:* Multiplying plants from vegetative plant parts such as shoots, roots, and leaves.

How do plants grow?

- Plants depend on the molecule, **auxin**, to grow.
- Auxin causes the cell cells to become acidic, loosening the bonds between components and allowing the walls to soften and expand.
- Auxin also ensures roots head down while the shoots grow up toward light.

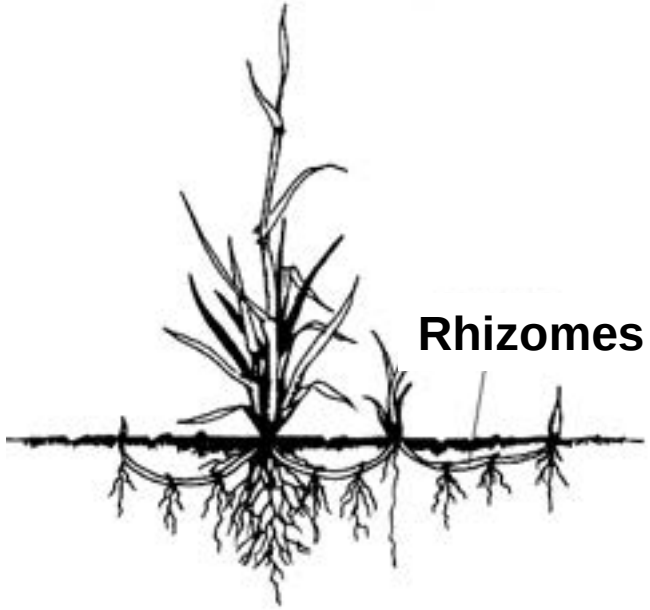
Vegetative Propagation

Purposes

- To reproduce plants with the same characteristics as the parent plant : Maintain genetic trait
- For plants that are difficult or impossible to propagate from seed
- To create large plants more quickly than propagated from seed

Vegetative Propagation

- Utilizes a normal plant process
- **Adventitious** roots are plant roots that form from any non-root tissue and are produced both during normal development and in response to stress conditions, such as flooding, nutrient deprivation, and *wounding*.



Mangrove Propagules

Offset Example

Pups

Bromeliads

Vegetative Propagation

Types

- **Layering -** growing a plant from a portion of a stem that grows roots while still attached to the parent plant and then is detached as an independent plant.
- **Division** – the plant is broken up into two or more parts. Both the root and crown of each part is kept intact.
- **Cutting** - growing a plant from a stem or root, that has been cut from another plant
- **Others** – Grafting, Suckering (Not covered due to complexity and limited application)

Vegetative Propagation

What is Needed

- Garden Gloves
- Sharp Blade and Knife
- Rooting Hormone (**Indole-3-butyric acid*)**
- Planter (Tray or small pot)
- Potting Media
- Sieve
- Dibber
- Dust Mask (When working with dry media)

*** Naturally occurring signal molecules (phytohormones), produced within plants (plant growth regulator)**

Vegetative Propagation

Rooting Media

- **VERMICULITE** - best used for plants that **require soil to stay damp** and not dry out.
- **PERLITE** - a good choice when you have plants that **require soil to dry out** completely between watering. Its chief use is to improve soil aeration, lightening the soil and giving better drainage and oxygen access for your plants' roots.
- **PEAT MOSS** - **prevents soil compaction** and improves moisture retention. (**Coconut coir (kȯi(-ə)r) –** an alternative)
- **COMPOST**– add **nutrients**

Vegetative Propagation

Rooting Media

Some types of Compost

- Vermicompost is a mix of uneaten worm food (organic matter) and worm castings (worm poop).
- Yard trimmings and leaves (OrganicLee® Compost)
- Manure (Cow, chicken, rabbit, etc.)

Vegetative Propagation

Rooting Media

Vermiculite - a group of hydrated laminar minerals (aluminum-iron magnesium silicates) which look like mica and heated.
Perlite - an amorphous volcanic glass that has a relatively high water content.

Vegetative Propagation

Soil Types

Loam Soil

The most fertile soil is called “loam” and it consists of equal amounts of sand, silt, and clay. Loam is considered the best of the best because it allows for the retention of moisture and nutrients. Loam is also aerated, which means it allows air to circulate through the soil, and it drains well.

Sandy Soil

By itself, sandy soils are typically less fertile because there are large gaps between the particles. These gaps allow water and nutrients to drain away more easily. Sandy soil also has a low moisture and nutrient holding capacity, which calls for frequent fertilization and watering.

Vegetative Propagation

Soil Types

Silt Soil

Silty soils usually have a moisture holding capacity that is similar to loam. However, depending on the clay to silt ratio, it may drain more slowly.

Peaty Soil

We know that peaty soil is most commonly found in marshy, wet climate areas. Though peaty soil is full of nutrients, it is easily susceptible to waterlogging.

Clay Soils

Out of all the soils, clay retains the most moisture and nutrients. However, this type of soil also is known for compacting more easily, draining slower than the other soil types, and warms up slower in the spring.

Vegetative Propagation

Soil Types

Landscaping

https://www.fnps.org

Recommended Uses:	Wildflower garden. Groundcover.
Propagation:	Seed.
Availability:	Native nurseries, Seed
Light:	-
Moisture Tolerance:	 always flooded … extremely dry
	(Not wet but not extremely dry ----- to ----- Very long very dry periods)
Salt Water Flooding Tolerance:	Not salt tolerant of inundation by salty or brackish water.
Salt Spray/ Salty Soil Tolerance:	High. Can tolerate significant and ongoing amounts of salty wind and salt spray without injury.
Soil or other substrate:	Sand

Vegetative Propagation

Layering

- New plants are formed while attached to the parent plant. The new plant receives nutrients and water from the parent plant until roots develop.
- The various types of layering are **simple, serpentine, mound, and air.**

Vegetative Propagation

Simple and Serpentine Layering

Most plants with a trailing or vining growth habit can be propagated by this method.

Simple: the propagation of plants by bending the tip or middle of a stem to the ground and covering a *wounded* section with soil so that roots and new shoots may develop.

Serpentine: simple layering repeated over and over again with the same stem

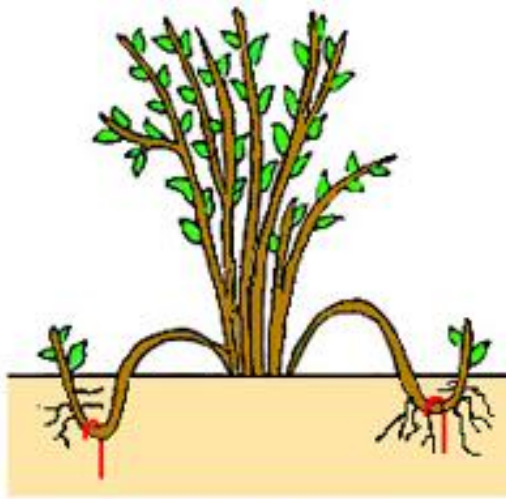
Vegetative Propagation

Simple and Serpentine Layering

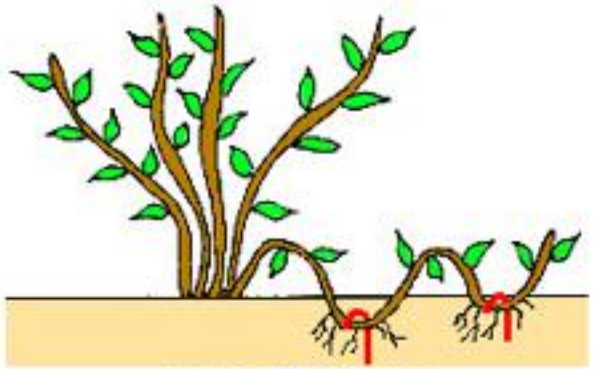
Stem Wounding

Vegetative Propagation

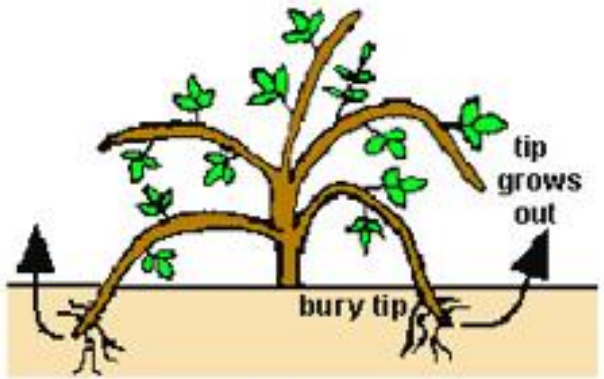
Simple and Serpentine Layering



simple layer



serpentine layer



tip layer

Vegetative Propagation

Simple and Serpentine Layering

Vegetative Propagation

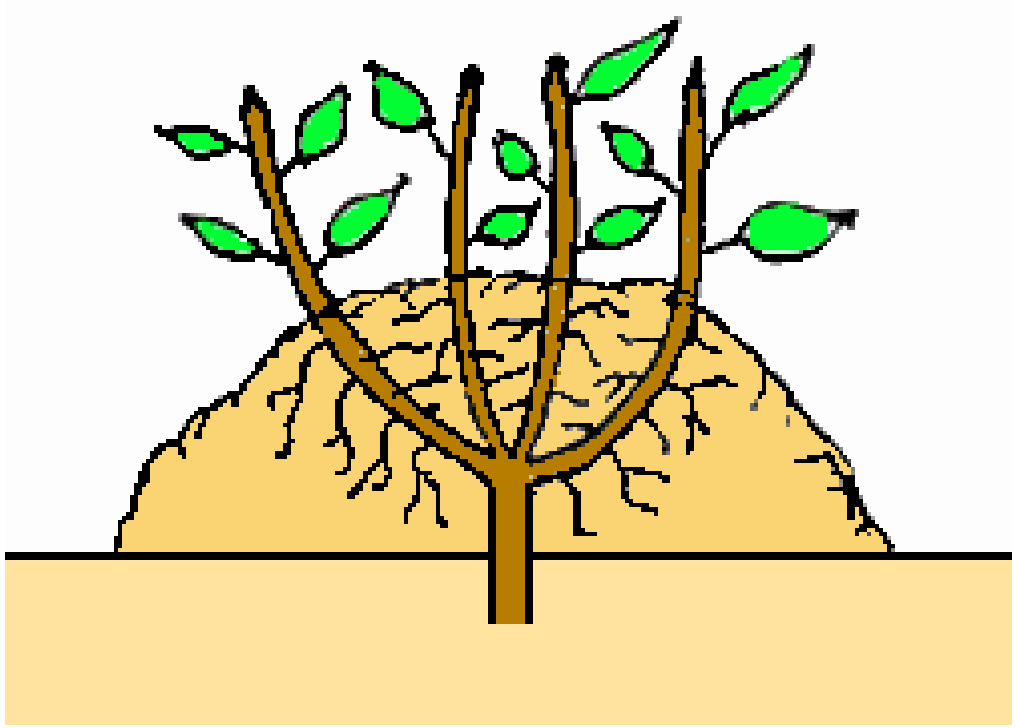
Mound Layering

- Used to propagate heavy-stemmed or closely-branched plants.
- The plant is cut back severely prior to spring growth; new shoots that emerge are wounded and soil is mounded around the base of the plant.

Note: Mainly for areas with seasonal changes.

Vegetative Propagation

Mound Layering



Vegetative Propagation

Air Layering

- A stem is wounded and encased in moist sphagnum moss into which roots grow. Once an adequate root system has been produced, the rooted stem is cut from the parent plant.
- The air layer is usually made at least 12 to 15 inches below the tip of the branch. The first step is to remove leaves and twigs for 3 to 4 inches above and below the point where the air layer is to be made.

Vegetative Propagation
Air Layering

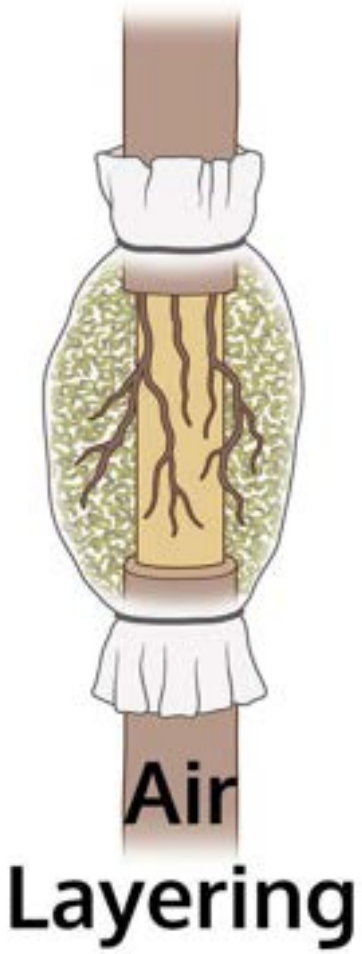
- Remove a 1 to 2-inch ring of bark and, with a knife, scraping clean the wood underneath. This ensures complete removal of the cambium layer—a layer of cells between the bark and the wood.
- If this layer is not removed completely, new bark may develop instead of roots.

Vegetative Propagation

Air Layering

Vegetative Propagation

Air Layering



Vegetative Propagation
Air Layering

Vegetative Propagation

Air Layering – *Plant Pod, Root Growing Box*

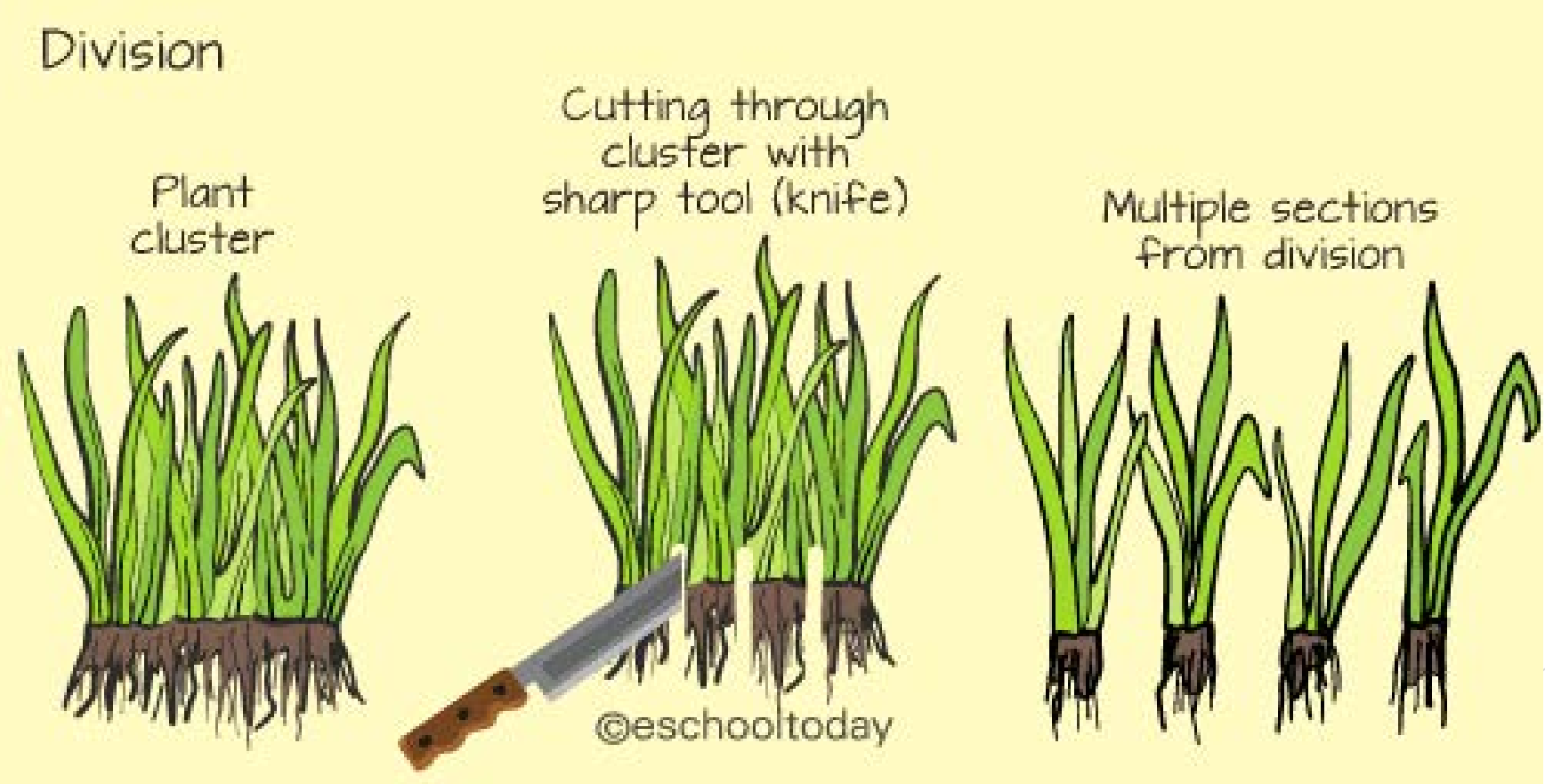
Vegetative Propagation

Division

- Plants with a multi-stem or clumping growth habit, offshoots, or underground storage structures such as rhizomes or tubers can be propagated by division.
- Division involves cutting large clumps into smaller sections, making sure that each smaller clump has an adequate amount of stems, leaves, roots, and buds to survive transplanting. Some plants can be pulled apart, but many must be cut.

Vegetative Propagation

Division



Vegetative Propagation

Division

Vegetative Propagation

Cuttings

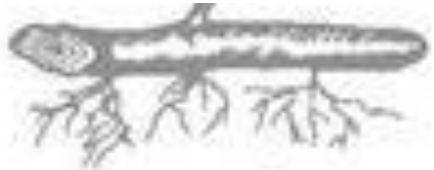
- Can be made from **stems**, **roots**, **leaves**, or combinations of plant parts
- Should be taken from healthy plants and placed in a warm, humid environment to hasten root development and prevent them from drying.

Vegetative Propagation

Types of Cuttings

Tip stem cutting

Leaf cutting



Root cutting

Vegetative Propagation

Stem Cuttings

- Stem cuttings consist of cutting the growing tip of a plant or stem sections below the tip
- Stem cuttings are removed using a clean, *sharp* blade (cut at 45 degrees). Cuttings 4 to 6 inches in length are appropriate for most plants. Leaves are removed from the bottom of the stem and the cuttings are then stuck upright in a medium (i.e., soil mixture/substrate) just deep enough to hold them upright, usually 1 to 2 inches

Vegetative Propagation

Stem Cuttings

Vegetative Propagation

Stem Cuttings

Vegetative Propagation

Leaf Cuttings

- A leaf cutting may be comprised of only the leaf or the leaf and petiole (leaf stem).
- Stick leaf cuttings upright in the propagation medium making sure the base end of the cutting is inserted into the propagation medium.
- New shoots and roots will emerge where the veins were cut.

Vegetative Propagation

Leaf Cuttings

Vegetative Propagation

Root Cuttings

- During dormant season
- Root cuttings are typically 2 to 7 inches in length depending upon root diameter. Large roots can be cut shorter than small roots and still have an adequate food supply for root and shoot growth.

Slanted cut (farthest from plant)

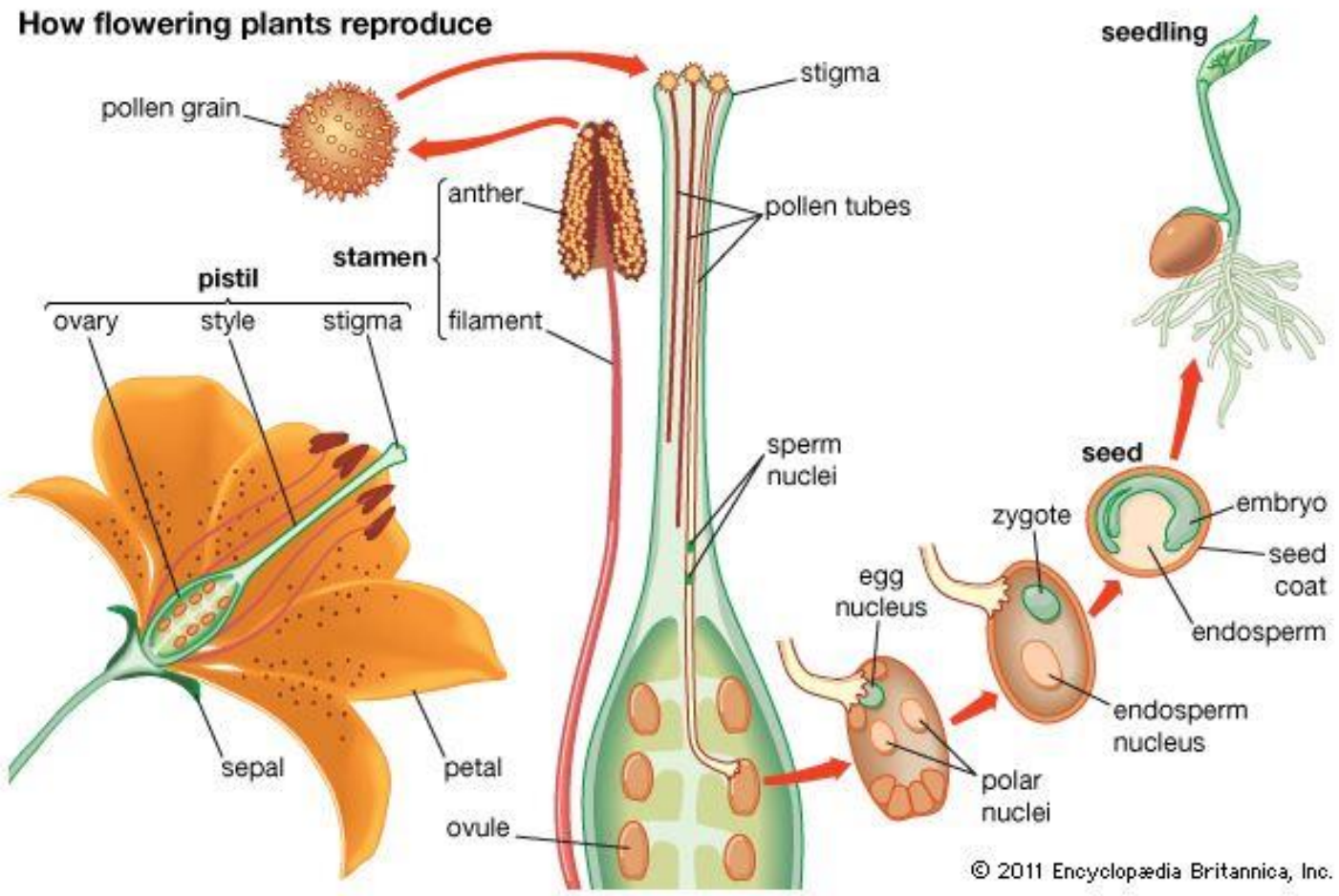
Straight cut (closest to plant)

Vegetative Propagation

Root Cuttings

Roots will form at the end that was furthest away from the parent plant, so this end should sit in the bottom of the planting hole.

Sexual Propagation



Sexual Propagation

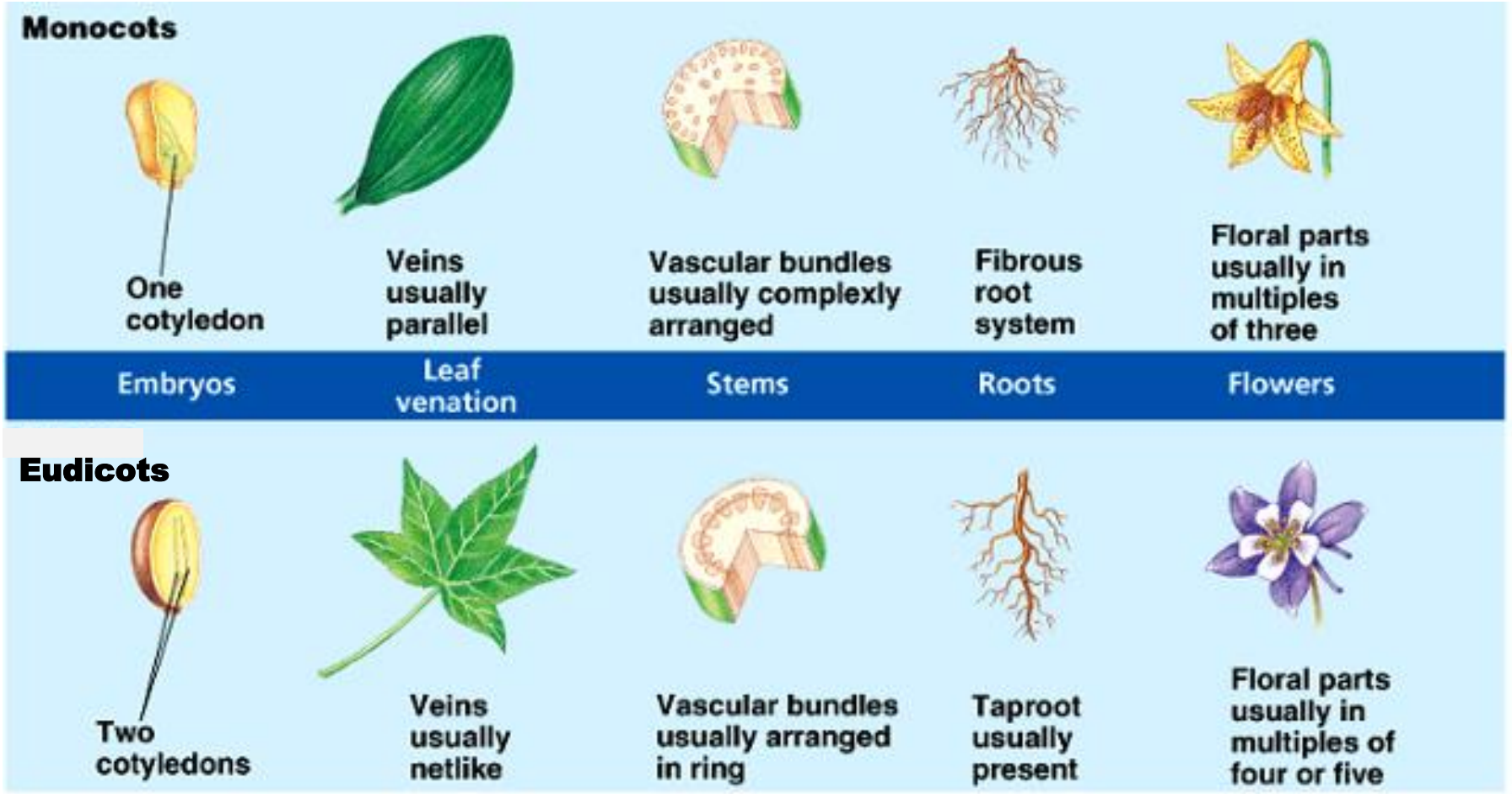
Monocot versus Eudicot

- The term **Mono-** means one. **Mono**cots get their names from having one **cot**yledon. A **cotyledon** is the part of the seed that will grow into the leaves.
- The term **Di-** means two. Eu**Di**cots get their names from having two cotyledons instead of one.*

***Eudicot – formerly dicot**

Sexual Propagation

Monocot versus Eudicot



Sexual Propagation

Pros and Cons

Cons

- Genetic variability offers an opportunity to select seedlings with new or different features
- Alternative when cuttings cannot be taken without destroying the parent plant

Pros

- The least expensive way to produce large numbers of new plants or to reproduce plants that are difficult or impossible to propagate asexually.

Sexual Propagation

Acquiring Seeds

Buying Seeds

- Examine the back of the packet. Look for the statement, "Packed for ------". Look for the current year
- Germination percentage of seed goes down each year at a varying rate.

Sexual Propagation

Acquiring Seeds

Collecting Seeds

- Seeds from plants with fleshy fruit (e.g. Coontie) should be **separated from fleshy pulp** as soon as possible after collection. The flesh or pulp should be removed to aid drying and because it may contain chemicals that inhibit germination. **Spread the clean seeds in thin layers in the sun or a warm room to dry**.
- Some seeds do not have to be planted immediately, but can be stored under controlled environmental conditions.

Sexual Propagation

Seed Storage

- Optimum storage temperature and seed moisture content vary with species, but **generally seeds should be stored at 40°F in an environment with 30 to 35 percent relative humidity.**
- No light

Note: Household refrigerators usually maintain temperatures suitable for seed storage, but the relative humidity is difficult to adjust.

Sexual Propagation

Seed Storage

- In refrigerator: Use paper bags, mesh bags, or envelopes. Place them in sealed containers for humidity control.
- Open area: Glass jars, metal containers, or wire mesh to protect seeds from critters

Sexual Propagation

Seed Stratification and Dormancy

- S**tratification** is a process of treating seeds to simulate natural conditions that the seeds must experience before germination can occur.
- **Dormancy** is nature's way of setting a time clock that allows seeds to postpone germination until conditions are suitable for sprouting and seedling growth.

Sexual Propagation

Seed Scarification

- The seed coat of some seeds are tough and must be penetrated by special means. Hard seed coats must be scarified.
- **Scarification** involves breaking, scratching or softening the seed coat to allow moisture penetration.

Sexual Propagation

Potting Mix

- Use 3-4 parts peat to 1 part vermiculite
- Moisten mix with boiling water before planting seeds to sterilize soil.

Sexual Propagation

Planters

Cell Trays

Plug Trays

Drain Trays

Seed Trays

Sexual Propagation

Planters

- **Soil Block**

Sexual Propagation

What Stops Seed Germination

Incorrect temperature and light

- Proper moisture, oxygen, temperature, and sometimes light must be provided for germination.
- Optimum conditions differ with plant species, but generally the optimum temperature range for most seeds is 75°F to 80°F.

Sexual Propagation

What Stops Seed Germination

Incorrect depth

- Seed should be planted no deeper than 1 to 2 times their diameter.
- Tiny seeds should be planted thickly in rows.
- Larger seeds should be planted at a depth less than their diameter since a 2- to 3-inch planting depth is maximum for any species.

Sexual Propagation

What Stops Seed Germination

Overwatering

- Too much water in your planting material creates a lack of air spaces for root growth and kills helpful soil bacteria.
- All seeds, even dormant ones, survive by respiration. They absorb oxygen and release carbon dioxide. If your soil is too heavy and waterlogged, the seeds will not perform.

Plant Propagation at Home

Poke holes in bottom for drainage

Plant Propagation at Home

Resources

- **Native Florida Plants : Low Maintenance Landscaping and Gardening**

  by Robert G. Haehle and Joan Brookwell
- **Florida Native Plant Society:** www.fnps.org
- **Dave's Garden**: https://davesgarden.com/guides/pf/

Questions?

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