Propagation
Of
Woody Plants

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Where Landscape Trees and Shrubs Come From

- Wholesale Nurseries
- Retail Nurseries
- Home Propagation
- Transplanting from native plantings

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Where Landscape Trees and Shrubs Come From

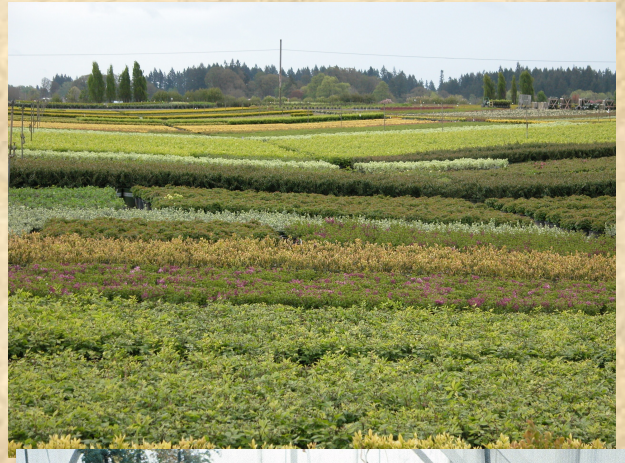
- Transplanting from native sites

Origination of Landscape Trees and Shrubs

- Several years go into growing landscape trees and shrubs

Origination of Landscape Trees and Shrubs

- Propagation Include Seeds, Cuttings, Layering, or Grafting



Wholesale Nursery
Some grow hundred of different plants- (Trees and Shrubs)

Wholesale Nursery
Some focus on a few types-Roses, Fruit Trees, etc

Wholesale Nursery

- Propagation Area –
  Start seeds, cuttings,
  grafting, tissue culture,

Wholesale Nursery

- Move rooted plants to field area
  - Train, prune, root prune, control pests

Wholesale Nursery

- Canned stock – grown in containers

Wholesale Nursery

- Grading and packing area (cold storage)

Propagation from Seed

- Seedlings are similar but not the same as parents

Propagation from Seed

- Collect seeds from mature plants

Propagation from Seed

- Collect seeds near where plants are going to grow elevation or latitude

Propagation from Seed

- Collect seeds from typical, problem free specimen plants

Collecting, Storage and Planting

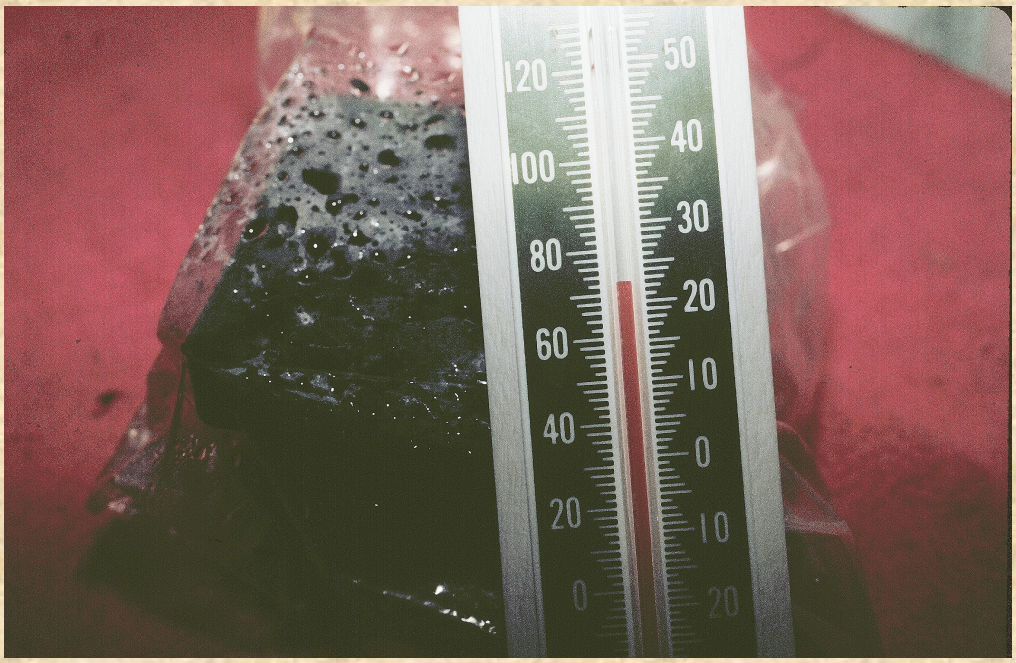
- Collect Spring produced seeds (red maple, silver maple, poplar, elm) when they mature and sow immediately

Collecting, Storage and Planting

- Collect Pulpy fruits (apple, walnut, rose, viburnum), remove the pulp and stratify in a cool moist environment for 1 – 4 months

Stratification of Seeds

- Stored in a cool (35 t0 39 degrees) moist environment (moist peat moss, shredded leaf litter, potting soil) for 1 – 4 months



Stratification of Seeds

- Hormone (Dormin) in the seed has to break down before seeds will sprout

Stratification of Seeds

- Collect acorns in fall, store in refrigerator with moist material… after 3 months the radical will begin to emerge

Stratification of Seeds

- Natural seeding in soil, chilling, moist

Collecting, Storage and Planting

- Seeds with hard coats (honey-locust, Kentucky Coffee Tree, basswood) need seed coat abrasion or scarification

Scarification of Seeds

- Seeds with hard seed coats
- Place seeds in a covered can with equal portions of sand and drive around with them for several days to scratch the seed coat

Fire

- Lodgepole pine, sequoia, and others have their seed dormancy broken by high temperature from fires

Chemical

- Some seeds must soak in water to leach the chemical that keep them dormant

Direct Seeding in Growing Area

- Direct seeding is the most economical

Direct Seeding in Growing Area

- Prepare the seedbed as you would a garden

Direct Seeding in Growing Area

- Seedlings grown to whips

Direct Seeding in Growing Area

- Seedlings used for grafting rootstock after one year (Cherry rootstock used for flowering cultivar)

Training Field Grown Stock

- Space plants to prevent crowding

Seedlings Grown and Sold

- One year-old whips

Direct Seeding in Growing Area

- Set seeds about 1 foot apart

Seedlings Grown and Sold

- 2 and 3 year-old branched stock

Woody Plants Grown and Sold

- Some slow growing stock may take 8 – 10 years to grow before moving and sale

Seedlings Grown and Sold

- Dug bare-root, stored or sold as bare-root, or replanted into containers or retail nursery

Seedlings Grown and Sold

- Large stock moved as B/B or tree spade

Tree Production Systems

- Bare Root
- Field grown trees dug in the fall or spring and replanted
- Cannot let roots dry out

Tree Production Systems

- Ball and Burlap
- Field grown then dug and moved with root ball intact

Tree Production Systems

- Container Nursery
- Plants grown in containers for most of the production time

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Tree Production Systems

- Pot in Pot
- Advantage of below ground but contained root system

Asexual Propagation

- Vegetative, non-sexual reproduction through the regeneration of missing parts ie roots, shoots, or both

Asexual Propagation

- Involves only simple cell division or mitosis

Advantages of Vegetative Propagation

- All offspring plants are identical to the parent, ie clonal cultivars as ‘Raywood or Autumn Purple’ Ash, ‘Autumn Blaze’ Maple and ‘Miss Kim’ Lilac

Advantages of Vegetative Propagation

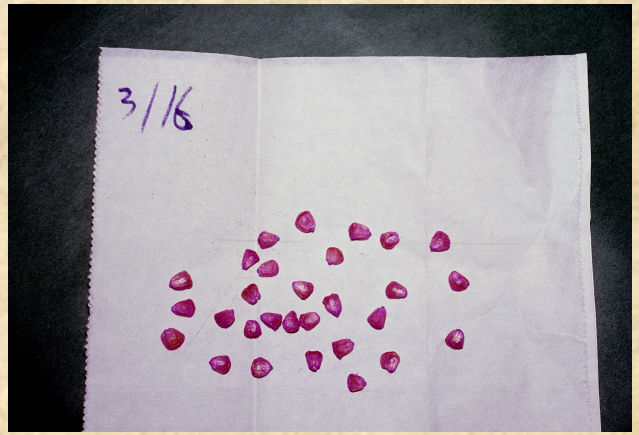
- Propagate dwarf varieties that do not come true from seed

Advantages of Vegetative Propagation

- Some dwarf cultivars may revert back to parent

Advantages of Vegetative Propagation

- May be easier and faster, ie no seed dormancy



Advantages of Vegetative Propagation

- Can perpetuate plants which do not have viable seeds, ie Marshall Seedless Ash, Cotton-less Cottonwood

Methods of Woody Vegetative Propagation

- Grafting or Budding-combi ng rootstock an scion wood

Methods of Woody Vegetative Propagation

- Inducing adventitious roots and shoots
  - Layering-rooting while attached to mother plant

Methods of Woody Vegetative Propagation

- Inducing adventitious roots and shoots
  - Cuttings-rooting stems cut from mother plant or shoots generated from mother plant root segments

Adventitious Roots and Shoots

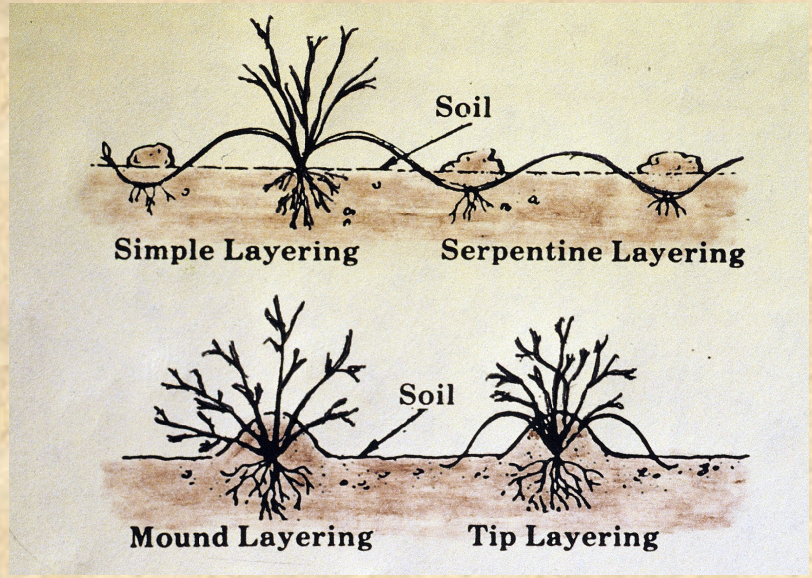
- Roots and/or shoots produced from abnormal or unusual locations

Adventitious Roots and Shoots

- Growing points form on vegetative tissue

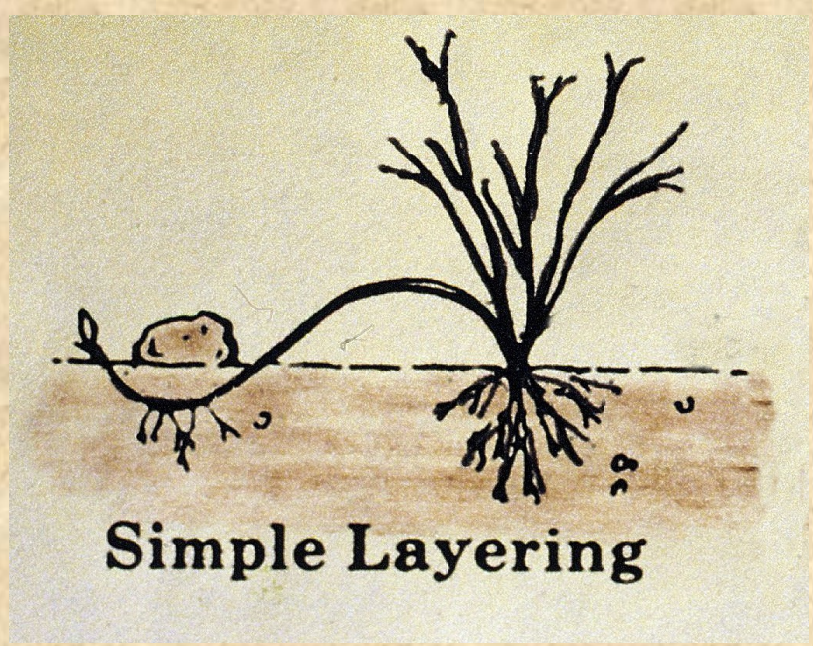
Layering

- The vegetative plant part remains attached to the mother plant while it is developing adventitious roots and/or shoots



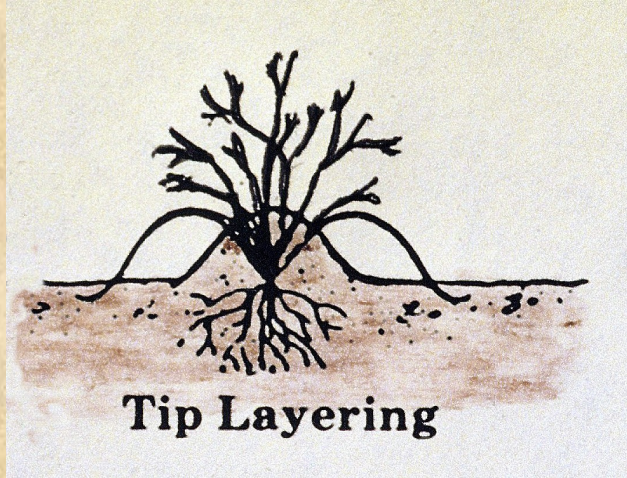
Simple Layering

- Dig hole to bury stem
- Wound stem to stimulate rooting
- Bury in late spring
- Sever from mother plant in late summer
- Transplant fall or spring



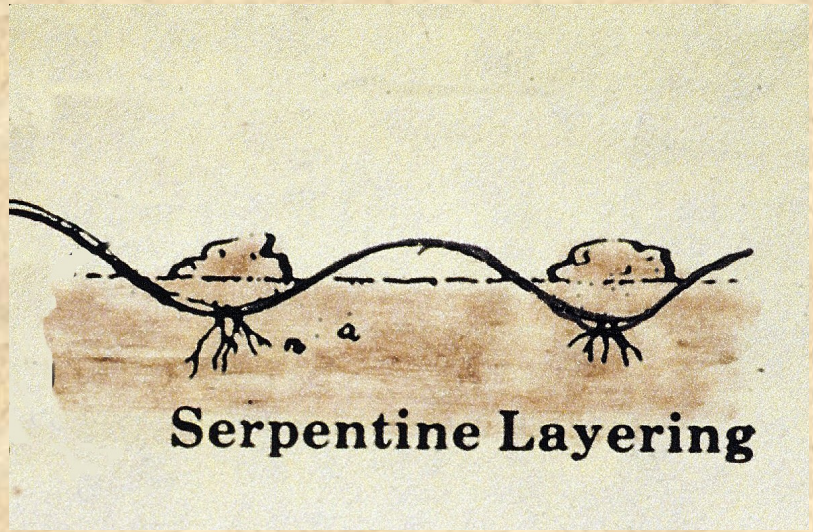
Tip Layering

- Some plants (black raspberry) rat-tail
- Rooting takes place near the tip of current season’s shoot
- Dig after rooting and transplant



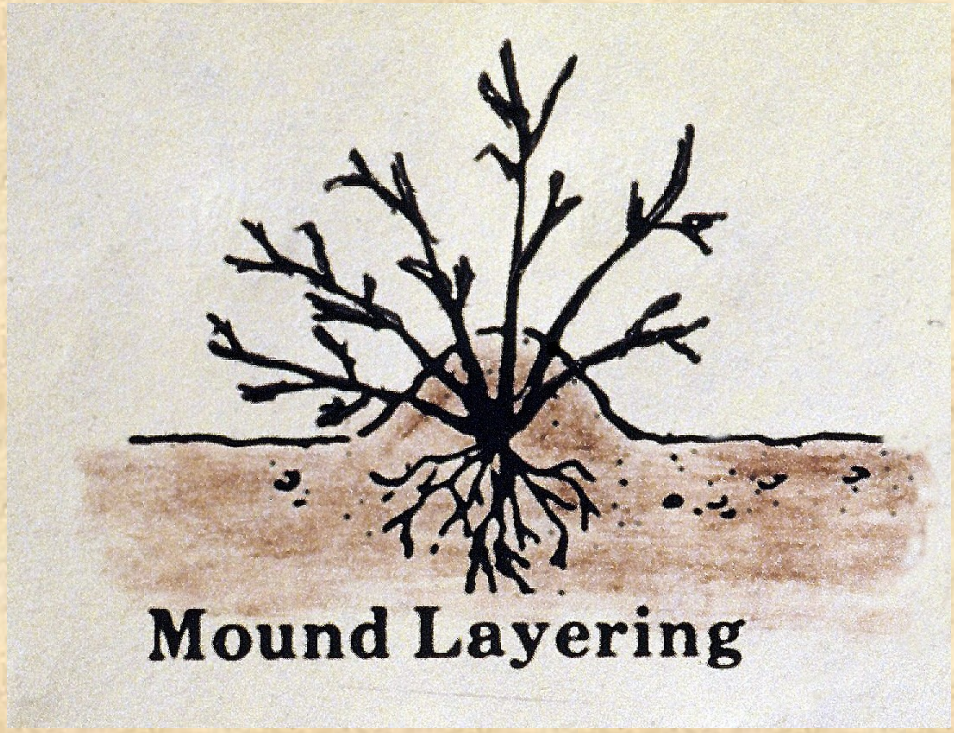
Trench Layering

- Bury growing branch horizontally in a soil filled trench in spring
- Wounding between buds stimulates roots
- Roots develop at the base of new shoots
- Used for many shrubs



Mound Layering (Stooling)

- Cut plant back near the ground during the dormant season and mound soil over the base so new shoots will develop



Mound Layering (Stooling)

- Dwarf fruit tree rootstock

Cuttings Vegetative Propagation

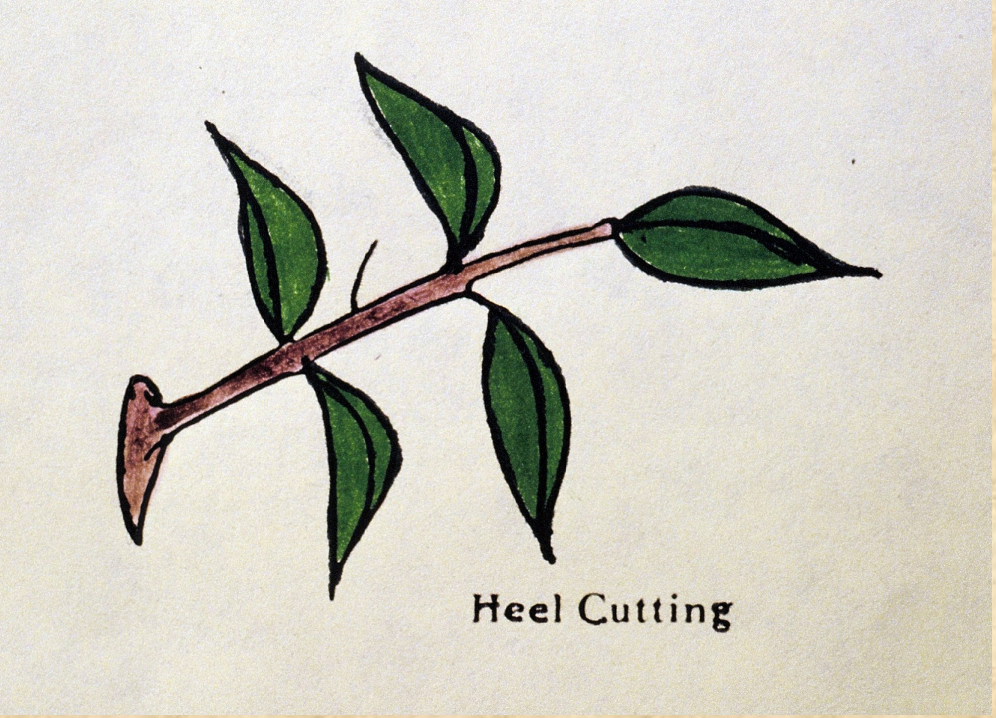
- Vegetative plant parts develop adventitious roots and/or shoots while detached from the mother plant

Cuttings Vegetative Propagation

- Nurseries commonly use stem cuttings

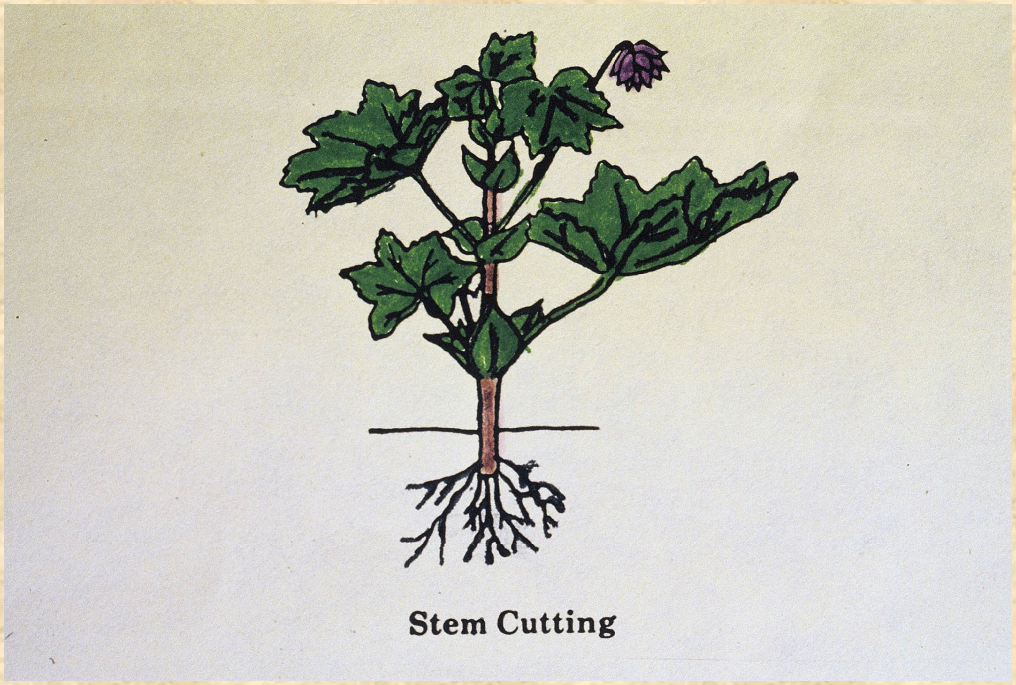
Cuttings Vegetative Propagation

- Hardwood cuttings – stems from the previous season's growth collected during the dormant season (chilling may be necessary to break dormancy)



Cuttings Vegetative Propagation

- Softwood cuttings – stem segments collected from current seasons growth during early summer



Cuttings Vegetative Propagation

- Root cuttings – root segments are taken in late winter or early spring before new growth starts

Plant Polarity

- Shoots are formed on the end nearest the tip
- Roots are formed on the end farthest from the tip

Plant Polarity

- Keeping the polarity straight when propagating plants

Hardwood Cutting

- Dormant stem segments from last season’s growth

Hardwood Cutting

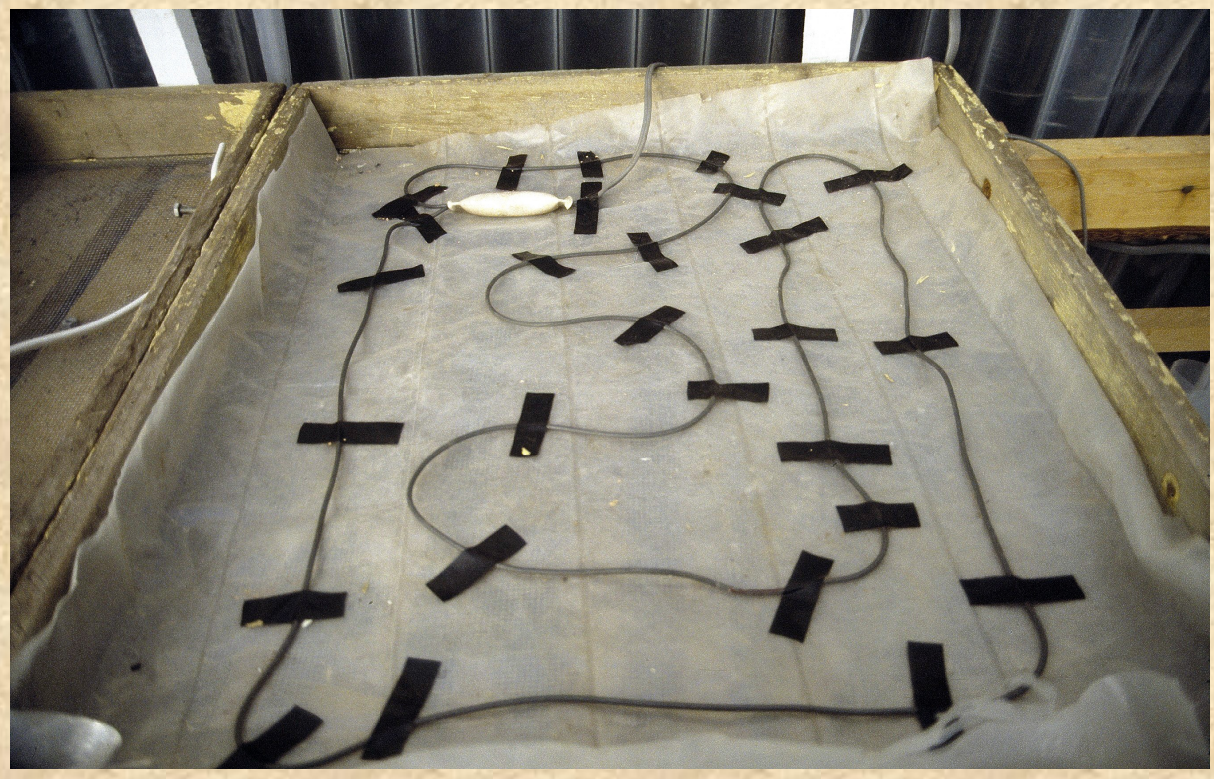
- Cut just below a node

Hardwood Cutting

- Use rooting hormone

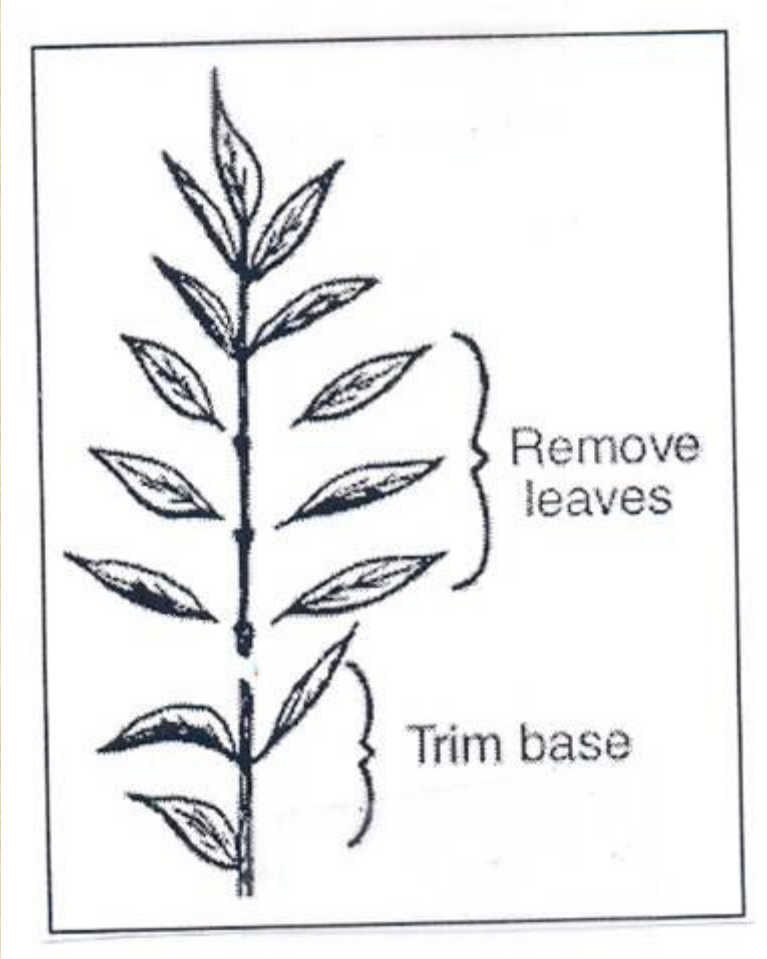
Hardwood Cutting

- Heat soil medium



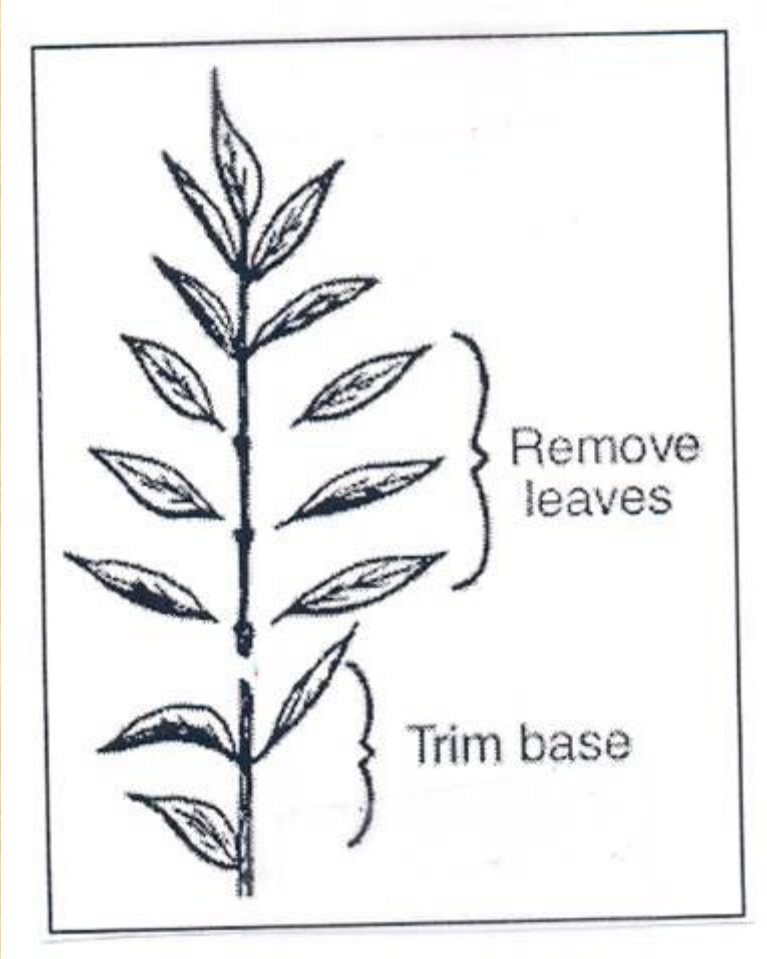
Softwood Cutting

- Four to 6 inch segments of current season's growth



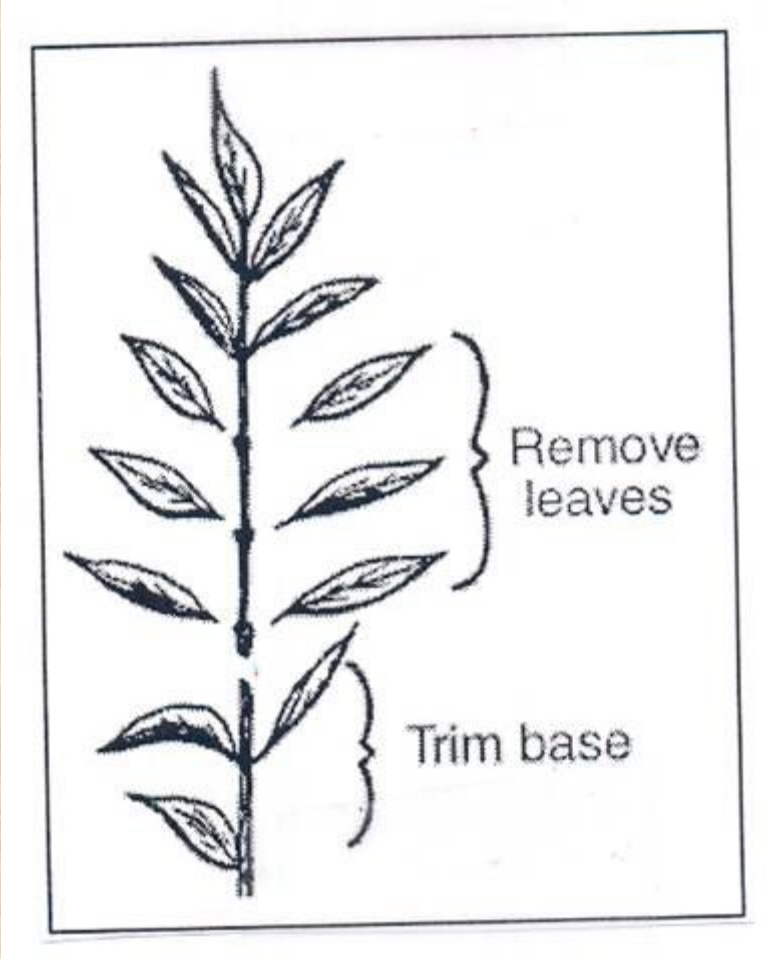
Softwood Cutting

- Remove lower leaves or major portion of leaf



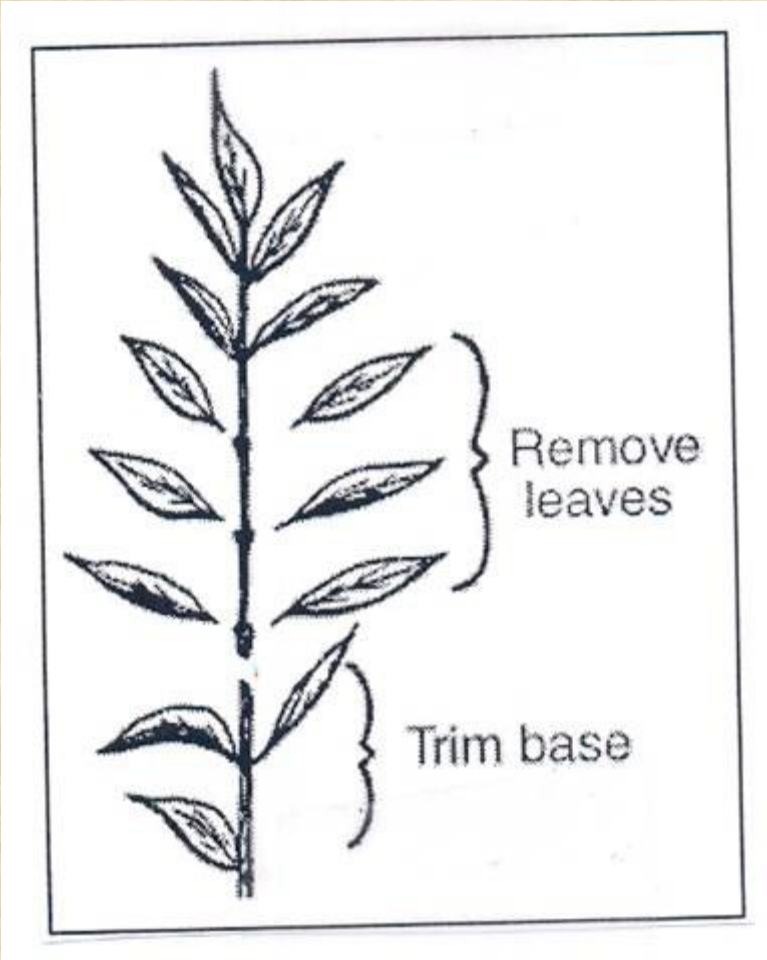
Softwood Cutting

- Basal cut below node



Softwood Cutting

- Use rooting hormone



Root Cutting

- Four to 6 inch dormant root segments are used

Root Cutting

- Adventitious buds originate from the cambial region of the root

Root Cutting

- Polarity is important for adventitious formation

Starting Cuttings

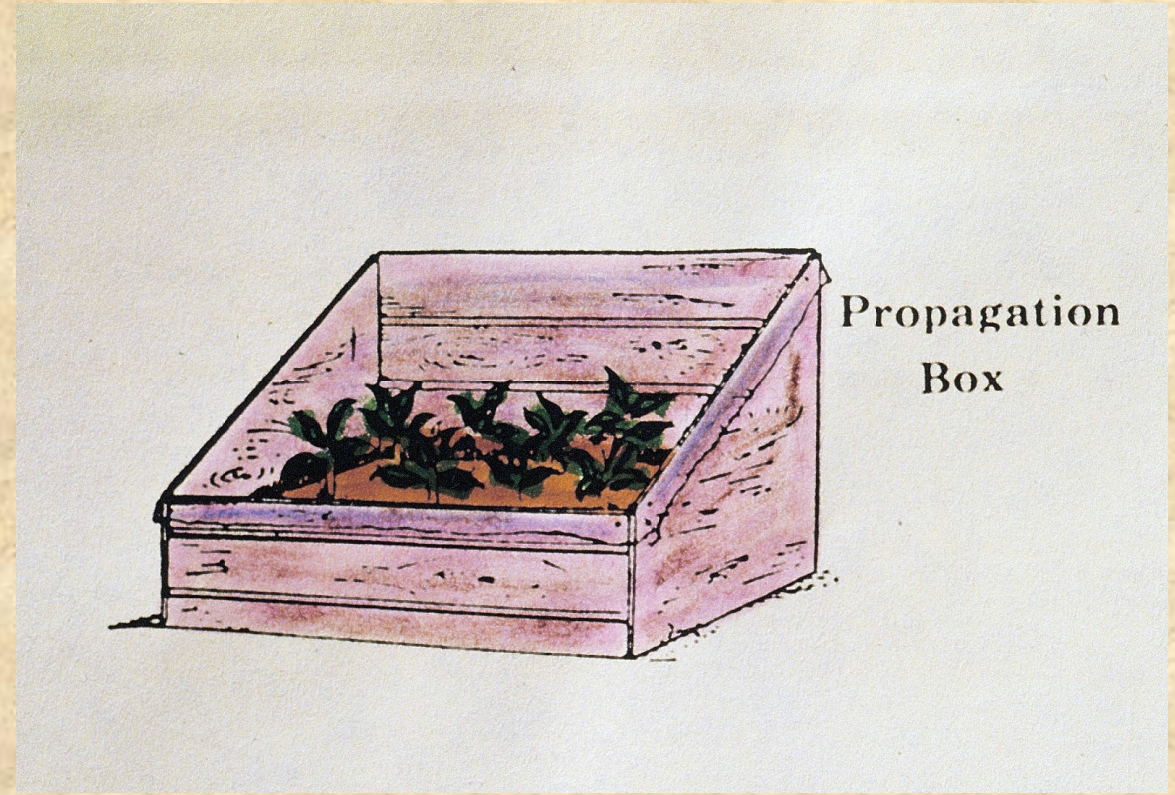
- Use a portion of the garden for fast rooting plants (grapes, poplar, willow) and water daily

Starting Cuttings

- Use a greenhouse mist bed

Starting Cuttings

- Use a miniature greenhouse



Grafting

- Joining of plant parts by means of tissue regeneration

Grafting

- **Rootstock** provides the root portion (dwarf, disease resistant)

Grafting

- **Scion wood** is the parent portion selected for its cultivar characteristics

Grafting

- **Graft union** is the healing wound between the rootstock and scion

Reasons for Grafting

- Increase the number of a plant cultivar which is difficult to propagate by adventitious rooting

Reasons for Grafting

- Where cross-pollination results in a plant different from the parent (apple)

Reasons for Grafting

- Seedless cultivars (seedless grapes, seedless plants, male plants)

Reasons for Grafting

- Stem color (Red and yellow twig dogwood)

Reasons for Grafting

- Leaf color (Japanese Maple)

Reasons for Grafting

- Flower color (Prairie Fire Crabapple)

Reasons for Grafting

- Fruit quality (Delicious Apple)

Reasons for Grafting

- Mineral Nutrition

Reasons for Grafting

- Tree hardiness and dwarfing (Three way tree with rootstock, interstem and scion)

Reasons for Grafting

- Disease resistance (Root root)

Reasons for Grafting

- Disease resistance (Crown gall)

Reasons for Grafting

- Sexual status (Marshall Seedless Ash, Male Ginkgo, Thornless Honeylocust)

Reasons for Grafting

- Multiple varieties

Reasons for Grafting

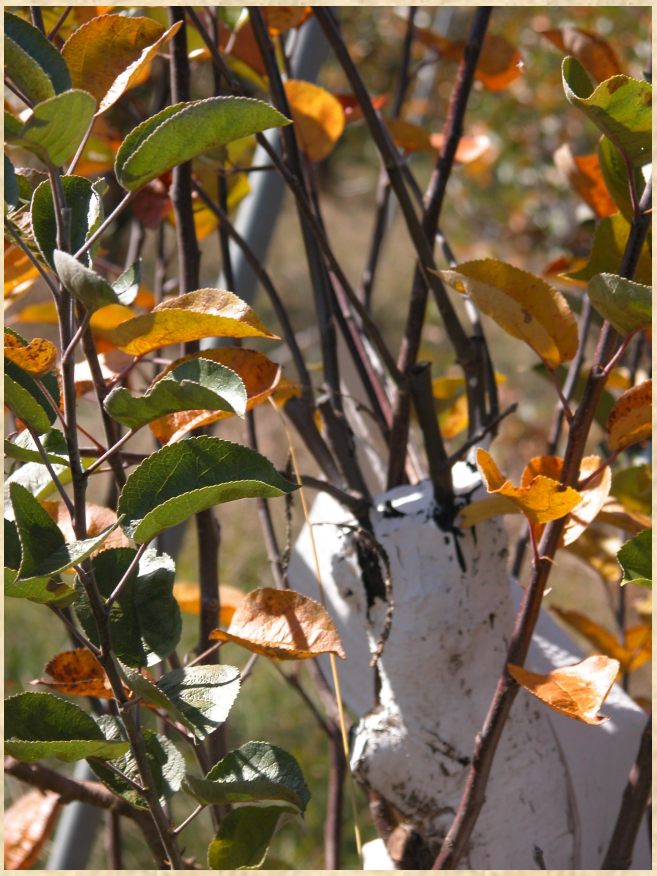
- Special ornamental cultivars

Selecting Rootstock

- Young seedlings

Selecting Rootstock

- An established tree (top working, or use trunk)



Compatibility

- Graft only closely related plants (same species maple, ash, cherry)

Compatibility

- Unrelated plant species usually fail

Selecting the Grafting Site

- Match the cambial zone on both the rootstock and scion wood

Resources

Plant Propagation by
Hartmann and Kester

Tools and Materials

- Rootstock and scion wood

Tools and Materials

- Sharp knife (utility knife)

Tools and Materials

- Grafting tape (rubber strips, rubber electricians tape

Tools and Materials

- Tree wound dressing

Tools and Materials

- Practice wood (poplar, willow)

Collecting Dormant Scion Wood

- Collect dormant wood in late February and store in cool, moist (36 degree) environment

Collecting Dormant Scion Wood

- Select one year-old water sprouts or shoots, one fourth to 3/8 diameter stems

Selecting Rootstock

- Root segments

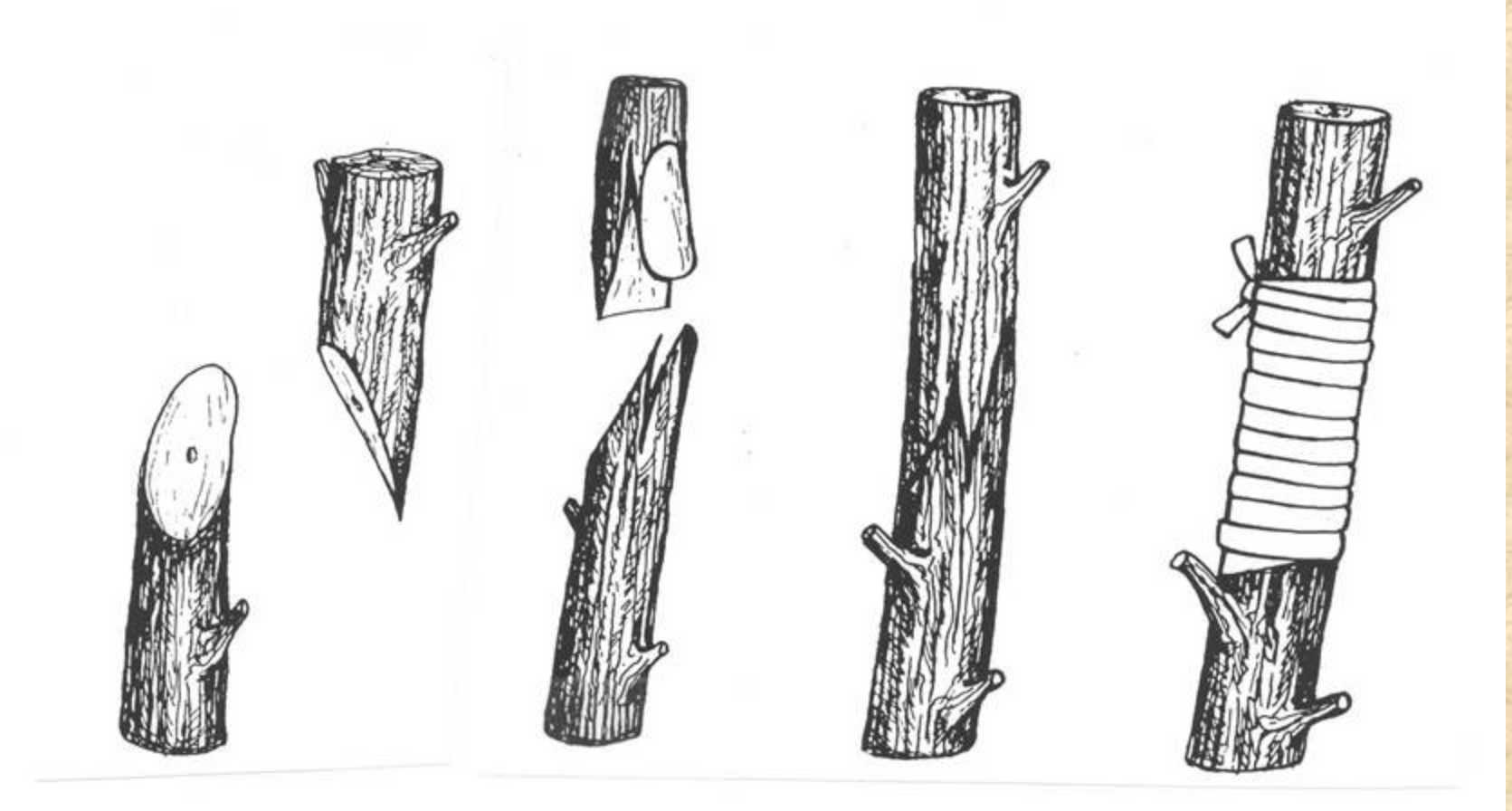
Selecting the Grafting Site

- Select a smooth and straight area on both the rootstock and scion wood

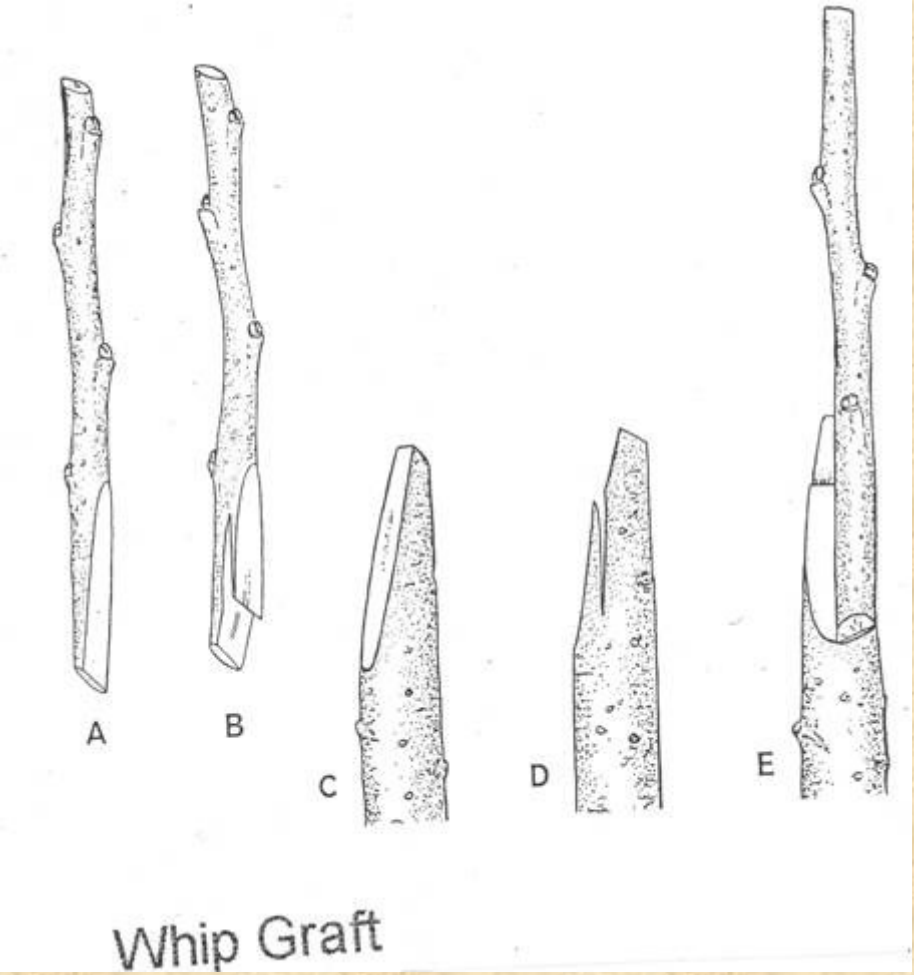
Selecting the Grafting Site

- Root stock grafts may have side roots trimmed

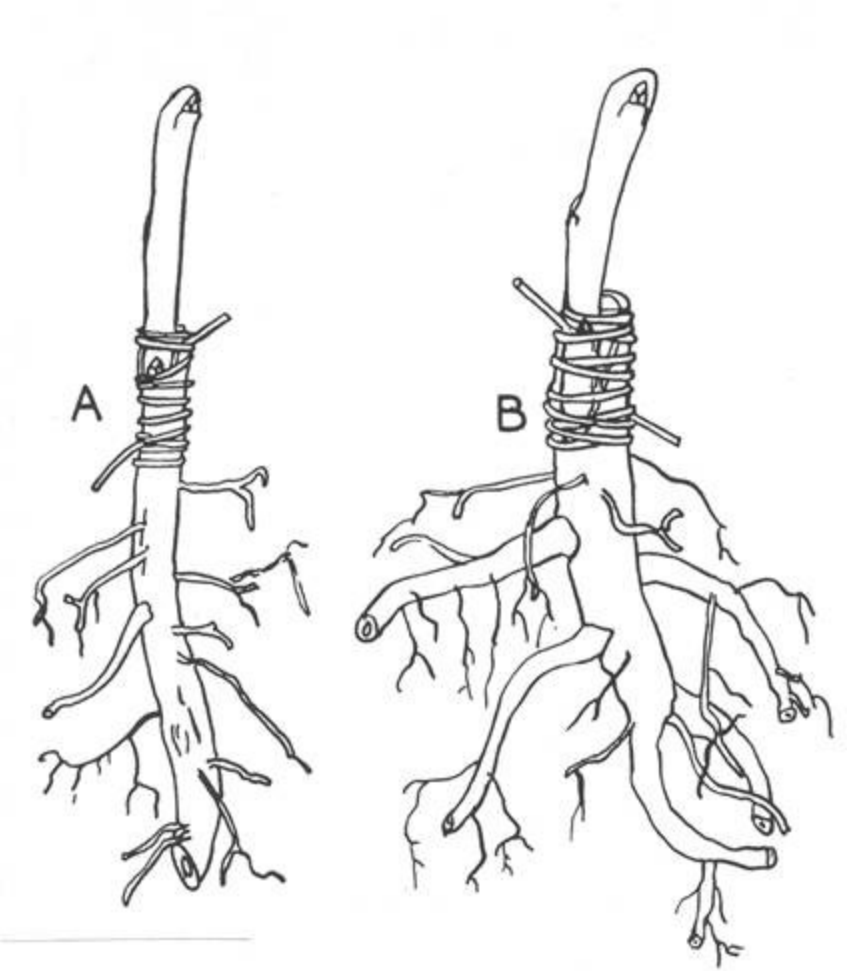
Whip and Tongue Graft



Whip and Tongue Graft

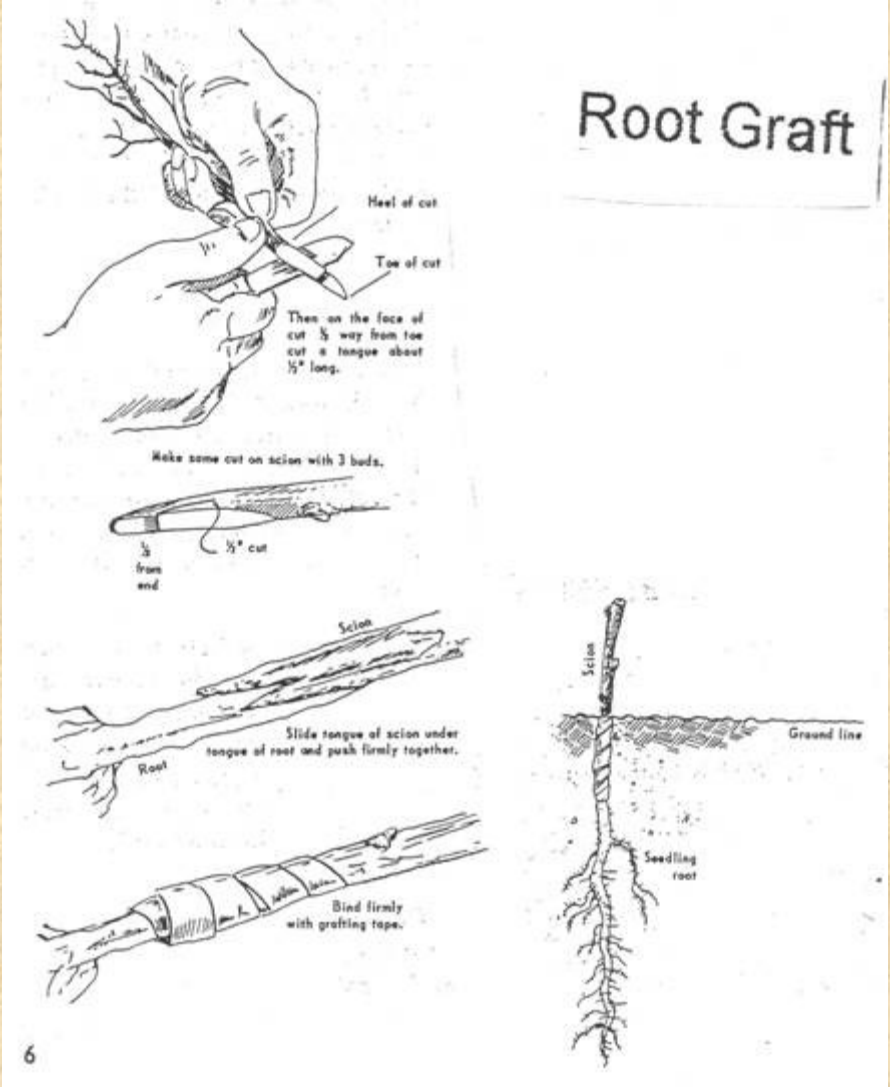


Root Graft

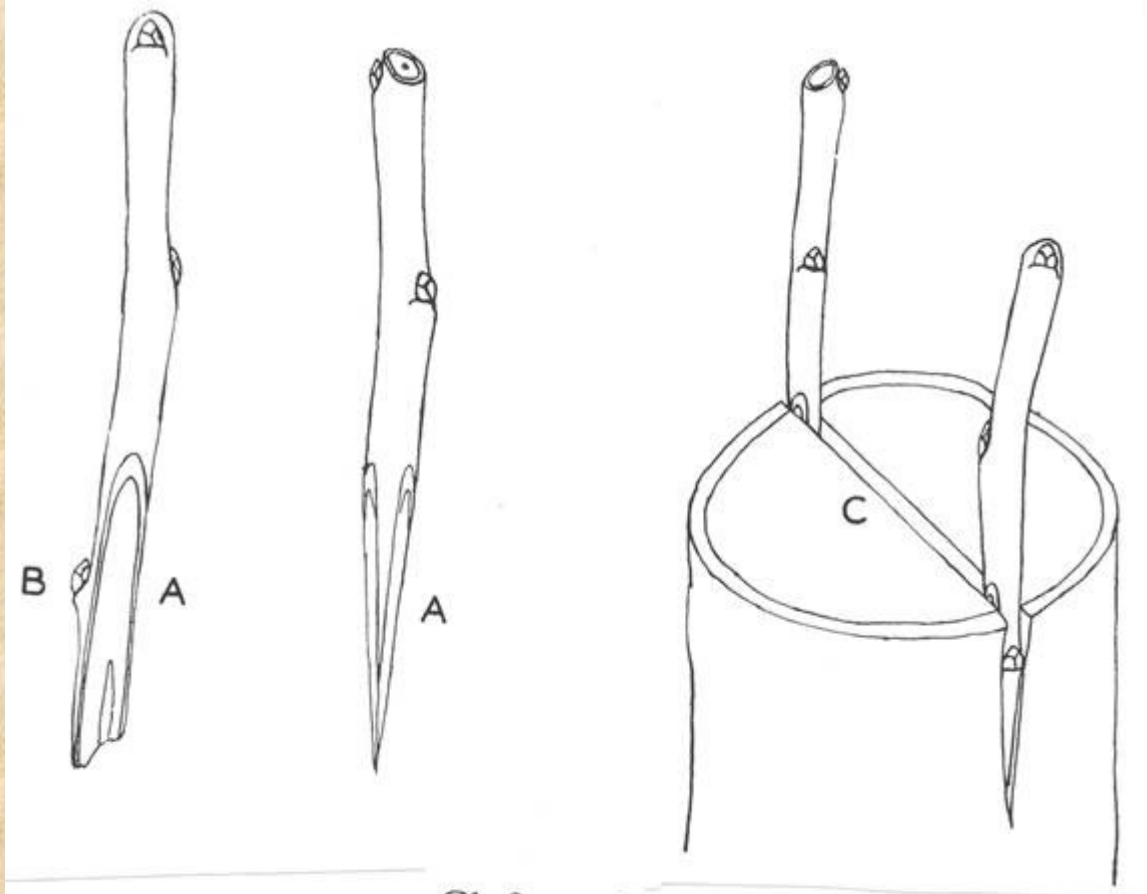


Bench grafting

Root Graft


Root Graft
Heel of cut
Toe of cut
Then on the face of cut ⅓ way from toe cut a tongue about ½" long.
Make same cut on scion with 3 buds.
⅓ from end
½" cut
Scion
Slide tongue of scion under tongue of root and push firmly together.
Root
Bind firmly with grafting tape.
Scion
Ground line
Seedling root
6

Cleft Graft



Cleft graft

Cleft Graft in Future Years

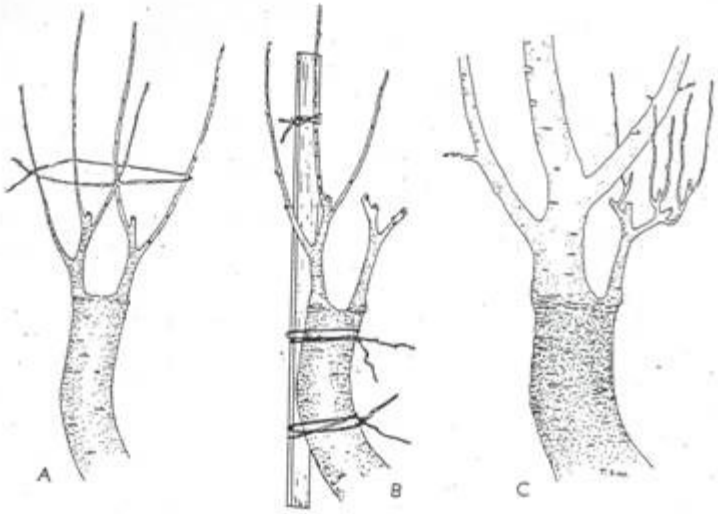
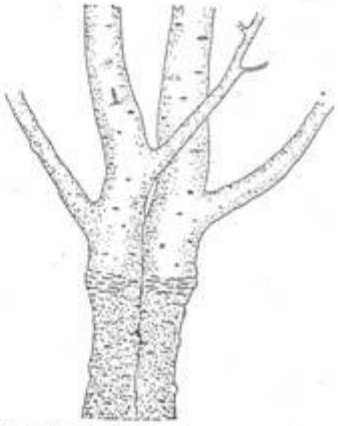


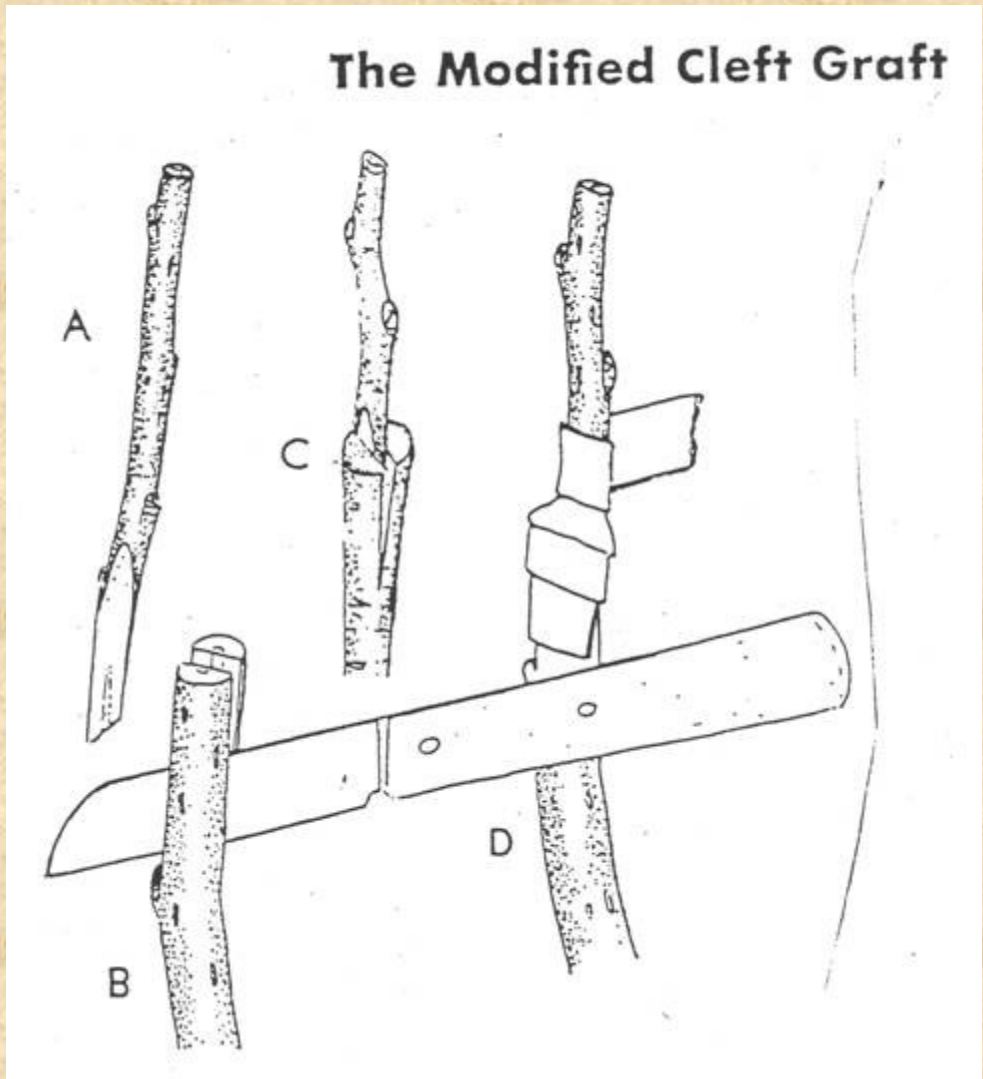
Fig. 5. Three stages of the evolution of a branch from a cion are shown.



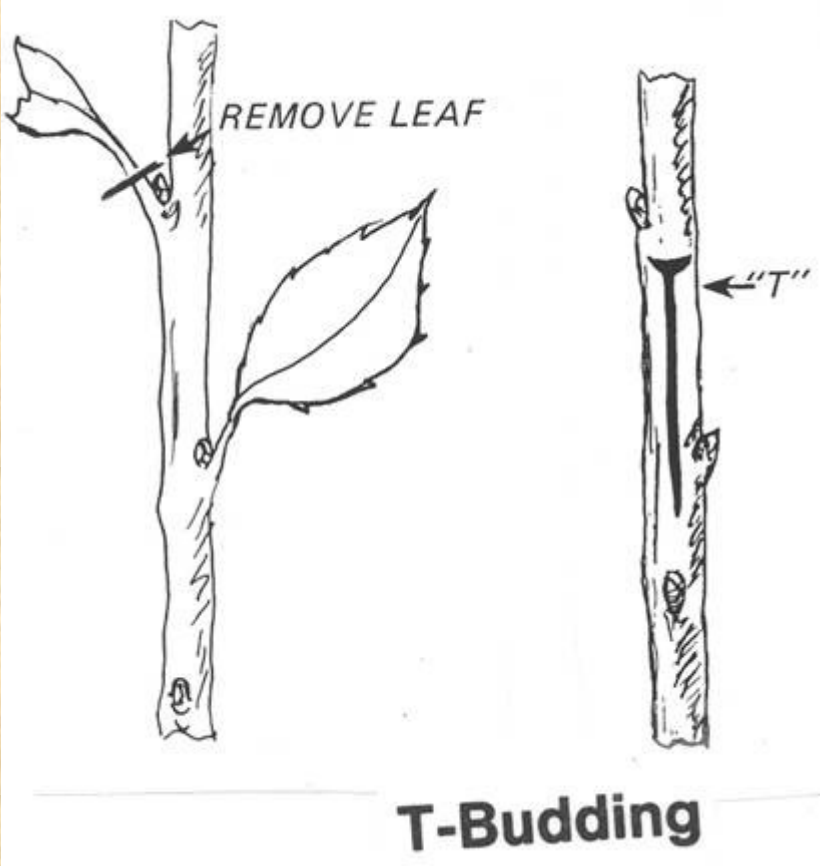
Cleft Graft
(Following years)

Fig. 6. Trouble ahead in the next storm. Don't let two leaders compete.

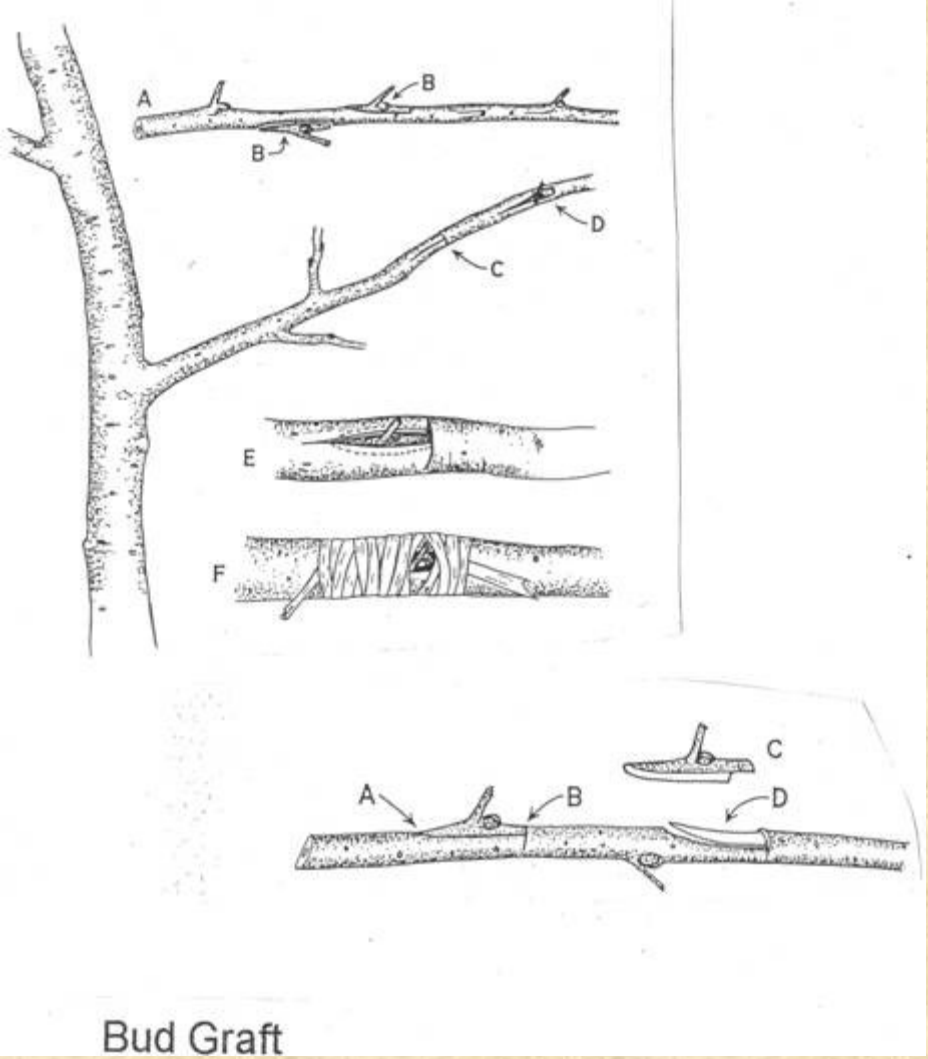
Modified Cleft Graft



Bud (Shield) Graft

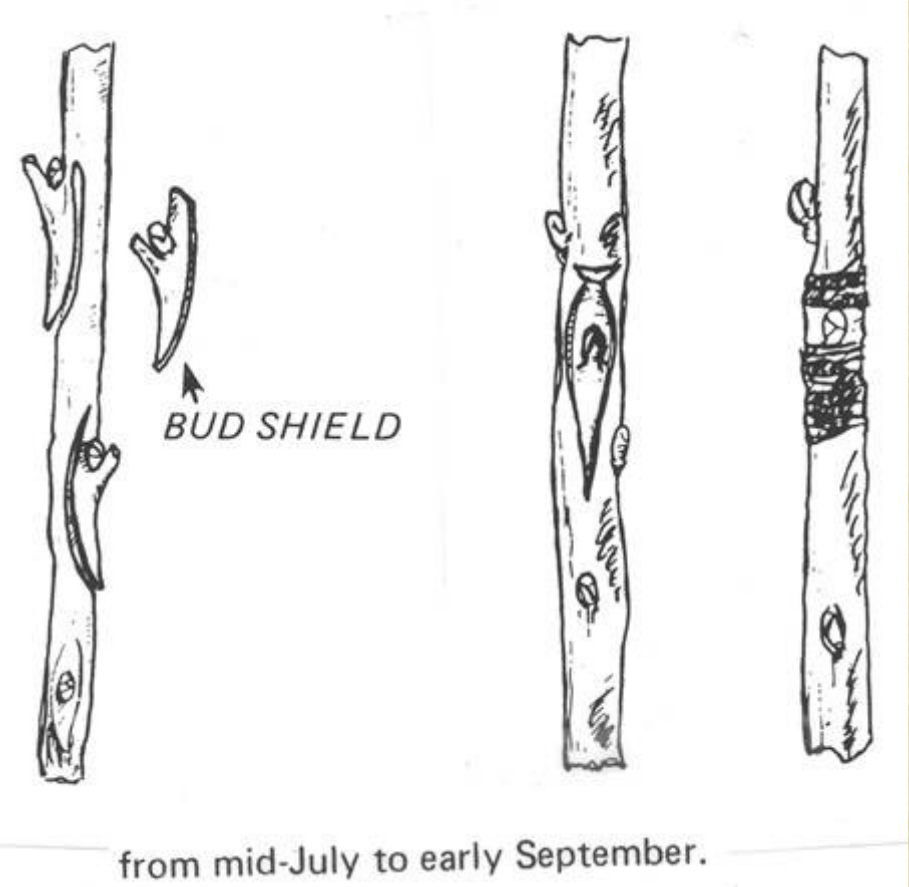


Bud (Shield) Graft



Bud Graft

Summer Bud Graft



Training Field Grown Stock

- Deciduous shrubs pruned 1/3 growth annually for wider/denser structure

Training Field Grown Stock

- Narrow-leafed evergreens (yews, Junipers, hemlock) pruned in spring before new growth

Training Field Grown Stock

- Pines (Mugo, Norway, Red, White) pruned in June when new growth is soft (candles) …1/3 of candle is removed

Training Field Grown Stock

- Shade trees are trained to a *single main trunk*

Training Field Grown Stock

- Three to 5 main branches, spaced uniformly are selected

Training Field Grown Stock

- Root pruning - compact roots system