Lesson C1–2

Producing Nursery Crops

Unit C. Nursery, Landscaping, and Gardening

Problem Area 1. Nursery Production

Lesson 2. Producing Nursery Crops

New Mexico Content Standard:

Pathway Strand: Plant Systems

Standard: III: Apply fundamentals of production and harvesting to produce plants.

Benchmark: III-A: Apply fundamentals of plant management to develop a production plan.

Performance Standard: 1. Identify and select seeds and plants. 2. Manipulate and evaluate environmental conditions (e.g., irrigation, mulch, shading) to foster plant germination, growth and development. 3. Evaluate and demonstrate planting practices (e.g., population rate, germination/seed vigor, inoculation, seed and plant treatments). 4. Evaluate and demonstrate transplanting practices. 5. Prepare soil/media for planting. 6. Control plant growth (e.g., pruning, pinching, disbudding, topping, detasseling, staking, cabling, shearing, shaping).

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Describe the process of lining out nursery stock.
2. List and describe the proper nursery field practices.
3. Describe sample field practice schedules for different types of plants.
4. Describe the common pests and problems of field nursery stock.
5. Describe the process of properly staking a tree in the field.
6. Describe the tools and equipment used in production.
List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:


Some professional organizations include:

American Association of Nurserymen
1250 I Street NW Suite 500
Washington, D.C. 20005-3994
Phone 202-789-2900
Fax 202-789-1893

American Horticultural Society
P.O. Box 0105
Mt. Vernon, VA 22121-0105
Phone 703-768-5700

The Garden Council
500 N. Michigan Ave. #1400
Chicago, IL 60611
Phone 312-661-1700

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets
Nursery catalogs—both for equipment and for plant material
Plant resource books
Wide-mouth jars
Soil samples—2 sets
Liquid dish detergent
Distilled water
A ruler
A Sudbury soil test kit—and the appropriate supplies
Masking tape and a marker
Access to other resource materials including books, magazines, the Internet, etc.
Apples—1 per student or pairs
Cutting boards
Knife
Cooler or cold storage
1000 ml beaker
Honey locust pods
Fine to medium sand paper
Paper towel
Labels
Empty beakers and beakers filled with media
Old newspapers

**Terms.** The following terms are presented in this lesson (shown in bold italics):

- Anti-desiccants
- Diversion feeding stations
- Girdling
- Irrigation
- Leader
- Liner stock or liner plants
- Lining out
- Repellents
- Scarification
- Soil pH
- Stratification
- Transplanting

**Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Begin by reviewing what a nursery is. Pose the question “How do nurseries get more plants?” Have students pair up and generate a list of answers. Follow up with questions like “How does a nursery worker cultivate trees?” “What do they do to make production more efficient?” “How do they get trees to grow faster than they do in your back yard?” “How long does it take to grow a 10 foot tree?” “How could we make it grow faster?” The key here is to pique the student’s interest as to the nursery production practices.
Summary of Content and Teaching Strategies

Objective 1: Describe the process of lining out nursery stock

Anticipated Problem: What is lining out and how is it done?

I. Lining out is the process of transplanting seedlings or cuttings into the field to grow to a saleable size. Transplanting is transferring or moving plants from one location to another.

A. Liner stock or liner plants refer to plants that are lined out. They include:

1. Stem cuttings
   a. Hardwood—both deciduous and evergreen plant material
   b. Semi-hardwood
   c. Softwood—Before transplanting out into the field, this material should be well-rooted and shaded for several days in outside frames.
   d. Herbaceous
2. Leaf cuttings
3. Leaf-bud cuttings
4. Root cuttings
5. Seedlings—These seeds generally need to be treated prior to planting using either scarification or stratification. Scarification is breaking or softening the seed coat to allow the absorption of moisture. Stratification is chilling the seeds before germination. It usually involves 32–50°F storage for a given period of time.

B. Lining out is accomplished through a number of methods.

1. The land should be adequately prepared before transplanting. This may include grading, rototilling, soil testing, pre-plant fertilization, and/or the addition of organic matter.
2. Plants should be chosen and checked for disease or other damage. Only quality stock should be used.
3. Plants should be set out at the proper depth.
4. Soil should be packed around the transplant.
5. The transplants should be watered immediately.
6. Transplant should be fertilized as soon as is appropriate.

Begin this lesson by reviewing the needs of newly transplanted stock. Define lining out. A brief review of propagation and types of cuttings would be helpful. The steps to lining out should be emphasized. Use TM: C1–2A and TM: C1–2B to review the content of the objective.
Objective 2: List and describe the proper nursery field practices.

Anticipated Problem: What are the proper nursery field practices and how are they done?

II. Proper Nursery field practices

A. Watering guidelines and information.
   1. Importance of water to plant growth and development.
      a. plants are composed of 80 percent water.
      b. water is needed for cooling and plant growth.
      c. watering needs are influenced by weather, wind, soil condition, soil type, time of year, and the plant itself.
   2. **Irrigation** is the application of water using artificial means.

B. Fertilizing guidelines and information.
   1. This is usually done prior to planting liners in the field. Lime should be applied at least 6 months before planting crops. A soil test should be done to determine what fertilizer is needed. Typically, annual nitrogen is added to the crops in the following amounts per acre:
      - 200–250 lbs. for deciduous trees and shrubs
      - 150–200 lbs. for narrow leaf evergreens
      - 100–150 lbs. for broadleaf evergreens
      These amounts should be divided and applied two to three times per year—particularly in the spring, early summer and early fall. It is usually applied as a broadcast inorganic granular fertilizer. Fertilizing should be determined by soil test, soil types, plants being grown, the nurserymen’s experience and common recommendations.
   2. pH—The ideal level for most plants is 6.5–7.5. Different plants require nutrients in different amounts. The **soil pH** is a numeric scale that determines how much of a given nutrient is available to a plant. If the pH is too low, iron and aluminum are too available, and could be toxic. If the pH is too high Nitrogen and Phosphorus can become unavailable.

C. Staking involves attaching an upright support to the tree. See Objective 5 for more detailed information.

D. Pruning guidelines and information.
   1. This is done to direct the growth of young plants and to correct any structural weaknesses. In trees, a straight and well-defined leader should be encouraged. A **leader** is the main growing point and the tip end of the trunk. It supports the canopy of the tree.
   2. In deciduous trees, pruning is generally done when the plant is dormant the first winter in the field. Late winter pruning also promotes a more natural growth pattern and promotes a flush of vigorous growth in the spring. Proper leader growth is encouraged by pruning back to an upright bud, tying up a crooked leader, and pruning back long side branches to 10–12 inches in length. A second year winter pruning is usually
done with a goal of promoting symmetrical growth. The side branches are pruned back to 12–15 inches. Trees should have lower limbs removed to 12–18 inches above the soil line. As trees develop, excess side branches and crossing branches are removed so that there is usually 12–18 inches of spacing between main branches. Prune lightly in summer usually only to remove damaged or diseased wood.

E. Root pruning—guidelines and information
1. This is commonly done the year before plants are harvested. It is done to reduce stress, and improve the main root system. When the root system is pruned, new feeder roots will re-grow close to the unpruned root area. An added benefit is less transplant shock when it is harvested.
2. A U shaped blade is drawn under the plants in a row by a tractor. It is done during the late summer or fall when top growth slows.
3. It is often done during the second year of field growth for rapidly growing shrubs, every two to three years for deciduous trees, and sometimes the summer before the plant is harvested.

F. Weed control—guidelines and information
1. Seedling and liner production
   a. Pre-plant—soil pasteurization, soil fumigation, pre-emergent herbicides.
   b. Post-plant—herbicides in spring, summer, and fall.
2. Container production
   a. Pre-plant—soil pasteurization, soil fumigation, pre-emergent herbicides.
   b. Post-plant—herbicides in spring, summer, and fall.
3. Field production
   a. Summer annual weeds—pre-emergent herbicide.
   b. Perennial weeds—fall application of herbicide.

The teacher should present the preceding information using classroom discussion and lecture.

Objective 3: Describe sample field practice schedules for different types of plants.

Anticipated Problem: What is a sample field practice schedule? How do you determine which plant follows which schedule?

III. A nursery field practice schedule is an accepted routine of field practices followed to bring a crop from lining out to saleable size. There is a given schedule for each type of plant based on growing requirements.

A. Deciduous Shade Trees—examples: Ashes and Oaks—one to two year old liners are planted on 18" spacing. They are grown for three years. After three years, trees are either dug bare root for market or they are replanted for growing at wider spacing. Wider row spacing can also be achieved by removing selected liners out of the field, so that the remaining liners are at the appropriate spacing. As a general rule, they are planted three feet apart for each inch of anticipated trunk diameter. For example, a 2 inch diameter
green ash would be spaced 6 feet apart with 10 foot row spacing. Pruning should be done to establish a symmetrical tree. This stock is usually sold balled and burlapped or containerized and requires three to eight years in the field.

B. Deciduous Flowering Trees—examples: Crabapples and Hawthorns—Schedule is identical to shade trees except for the following:

Careful pruning for shape can be done in the late winter and flower buds should be removed in years prior to harvesting. Pruning suckers or vertically growing branches may be more common. This stock is usually sold bare root, balled and burlapped or containerized and requires five to seven years in the field.

C. Deciduous Shrubs—examples: Spireas and Viburnums—one to two year old liners are planted on 12–24 inch spacing. They are grown for three years. Most are pruned several times during field culture. Usually, in first winter pruning, they are headed back to half of their height. Most are root pruned either the second or third year. After three years, these shrubs are harvested. This stock is usually sold bare root, balled and burlapped or containerized and requires three years in the field.

D. Narrow-leaf Evergreens—examples: Junipers and Arborvitaes—one or two year old liners are planted on two to three foot spacing. Upright plants are sheared to maintain dense symmetrical growth. They are usually root pruned every two to four years. They are usually balled and burlapped or balled and containerized after five years in the field. Spreaders are pruned back some each year to produce a tight shape. They should be pruned to be narrower at the top and wider at the base. Spreaders are root pruned in their third year and are usually balled and burlapped or balled and containerized after four or five years in the field.

E. Needled Evergreens—examples: Pines, Spruces, Firs—two or three year old liners are planted on two to three foot spacing. The first pruning is done when new growth or candles have almost reached their maximum length and when the plant is five to six feet tall. One quarter of the tip growth should be removed, this will cause more densely branched and symmetrical growth. After this pruning, fertilizer rates are reduced to prevent long internodes. These plants grow best in areas protected from winter winds and in well-drained soil. The soil needs to have enough clay to hold a soil ball together at harvest. They are usually balled and burlapped or balled and containerized after five years in the field.

F. Broad-leaf Evergreens—examples: Azaleas, Hollies—one or two year old liners are planted on 18–24 inch spacing. These plants have shallow dense root systems so root pruning is not recommended. Organic matter should be added to the soil to increase moisture retention, and mulching is also recommended. Most of these plants prefer an acidic soil and a good windbreak. Additional winter protection may also be needed. Careful pruning for shape can be done in the late winter and flower buds should be removed on years prior to harvesting. This stock is usually sold balled and burlapped or containerized and requires 4–5 years in the field.

The teacher should present the preceding information using classroom discussion, lecture, and TM: C1–2C. It would be advisable to spend some time going over the other field practice schedules as

New Mexico Horticulture Lesson Plan Library  
well as the schedule on TM: C1–2C. A quiz to check for comprehension would be good after this material has been presented.

**Objective 4:** Describe the common pests and problems of field nursery stock.

**Anticipated Problem:** What are the common pests and problems of field nursery stock and how are they controlled?

IV. Due to production characteristics of nurseries, these pests can quickly become epidemic if early stages of infestation are not noticed. Plants should be carefully monitored for the following pests. Careful systematic scouting and control cannot be over-emphasized.

A. Insects—See specific units on insects and their control.

B. Weeds—See objective two of this lesson.

C. Diseases—See specific lessons on diseases and their control. The main element of control of these pests is prevention. Nurserymen do this by keeping plant areas clean, sanitary, and disease free. Adequate spacing, good ventilation, proper irrigation, and good scouting can help keep this pest in check.

D. Animals—This category includes rabbits, deer, mice and humans.

1. Rabbits
   a. Damage—chew bark off of the stems and larger branches. Or they bite off the tops and side branches of smaller transplants.
   b. Control—enclosing plant material with fencing or other enclosures, reducing the rabbit population, or using repellents. **Repellents** are scented chemicals that “scare” pests away from a given area. They usually have a short period of effectiveness.
   c. Favorite plants—fruit trees, crab apples, flowering dogwood, and sweet gum.

2. Deer
   a. Damage—chew buds and tender branches. They also rub against tree trunks and can trample small transplants.
   b. Control—diversion feeding stations, repellents, fencing, reducing the deer population, and electrified visual grazing tape. **Diversion feeding stations** refer to an area away from the field where deer are fed.
   c. Favorite plants—Arborvitaes, birch, and yews.

3. Mice
   a. Damage—girdle plants at the soil level and digging holes in container plants. **Girdling** means to chew the bark at the base of the plant disrupting moisture and energy flow within the plant. This often stunts or kills the plant.
   b. Control—removal of natural shelter—i.e. weedy areas, poison baits, and natural predators.
   c. Favorite plants—arborvitae, birch and yews.

4. Humans
a. Damage—physical or mechanical damage to the plants, neglect, lack of care, poor plant selection.
b. Control—education.
c. Favorite plants—unable to determine.

E. Winter injury—The amount and type of damage is very dependent upon when and how the injury occurs. If it occurs in early fall it cause splitting of stems, which can be severe. If it occurs in late spring it usually affects the new young shoots. The damage is usually aesthetic and mild. If it is due to extreme cold, flower and stem buds can be frozen, stunting growth. Roots and branches can also be frozen potentially leading to plant death.

1. Damage—broken branches, frozen apical growth/buds, lower bark damage, frost cracks (prone to thin barked trees) and frost heaving. Damage may not be evident until the year following damage.
2. Control—proper plant selection, anti-desiccants, windbreaks and proper sheltering or siting of plant can decrease the likelihood of damage. Anti-desiccants are chemicals sprayed on the plant, usually on under sides of the leaves, twice a winter, that coat the leaves and conserve moisture.
3. Favorite plants—usually evergreens or containerized plants.

Begin this objective by having the students generate a list of “items” that can harm a plant. Begin by accepting all possible answers and then help students to focus on insects, weeds, diseases, animals, and winter, as these are the main problems for nurserymen. Use TM: C1–2D to help students understand animal pests.

Objective 5: Describe the process of properly staking a tree in the field.

Anticipated Problem: What are the guidelines and how and why do we stake trees in a nursery field?

V. To modify the plant form or structure with the goal of a strong and straight leader. Guidelines for staking trees include:

A. When lining out stock, a stake is attached to the prevailing wind side of the tree. This is done so that the tree does not rub against the stake.
B. It is commonly done with grafted or budded trees.
C. Stakes should be confined to the lower portion of the tree trunk.
D. The stakes are attached with a flexible twine or twist tie like material. Care should be taken not to scrape or damage the bark. The ties should be checked frequently to make sure they are not causing injury as the plant grows.
E. The stake should be removed as soon as the tree is large enough to support the crown, usually this is at the end of the second growing season.
F. Staking varies with the species, cultivar, nurserymen’s preference, and market objective.
G. There is evidence to support the idea that un-staked trees, may in the long run, produce stems that support their crowns better under the stress of normal wind conditions.

Begin this objective by asking students to describe how to stake a tree. There will probably some confusion, misconceptions, and questions. Use a blank transparency and have the students generate a step-by-step guide for staking.

**Objective 6:** Describe the tools and equipment used in production

**Anticipated Problem:** What are the different types of tool used in producing nursery stock?

VI. Nurseries use a variety of hand and mechanical tools and equipment in the production of plant stock.

A. Hand tools
   1. Spade—This is for harvesting plant material. It has a sharp end, straight edges, and a footrest.
   2. Shovel—This is generally used for the removal of soil, mulch, or rock.
   3. Hand pruners—These are used for pruning small branches.
   4. Small pruning saw—This is used for pruning medium to large branches.
   5. Caliper—This is used to measure plants tree trunk diameter.

B. Mechanical tools/equipment
   1. Computers—These are becoming more and more prevalent in the nursery industry. They are used for inventory, marketing, information gathering, communication, and a myriad of other business uses.
   2. Planters
   3. Tree diggers/mechanical balling machines
   4. Lifting and loading equipment—This includes forklifts, pallet jacks, and other transportation equipment.
   5. Packaging and potting machines.

For this objective it is effective to display any appropriate tools that you have. Have students stand up and demonstrate how to use the tools. Using lecture, discussion, and TM: C1–2E work through each of the tools and their uses. Stress that each tool has a specific function.

**Review/Summary.** Focus the review and summary of the lesson around the learning objectives. Call on students to explain the content and particularly the vocabulary associated with each objective. Use their responses as the basis for determining any areas that need re-teaching. Teacher generated questions or the questions at the end of chapters in the recommended textbook may also be used as review.
Application. LS: C1–2A—Apple Seed Stratification and Honey Locust Pod Scarification, LS: C1–2B—Forsythia and Yew Cuttings, and LS: C1–2C—Soil Test

Evaluation. Evaluation should focus on student performance on the sample test and accompanying lab activities.

Answers to Sample Test:

Part One: Matching
1=h, 2=g, 3=i, 4=e, 5=b, 6=f, 7=c, 8=d, 9=a

Part Two: Completion
1. Trickle tube
2. 6.5 to 7.5
3. The Ph level 4
4. A spade

Part Three: Short Answer
1. List the six steps of lining out nursery stock.
   a. The land should be adequately prepared before transplanting.
   b. Plants should be chosen and checked for disease or other damage.
   c. Plants set out at the proper depth.
   d. Soil should be packed around the transplant.
   e. The transplants should be watered immediately.
   f. Transplants should be fertilized as soon as is appropriate.
2. To modify the plant form or structure with the goal of a strong and straight leader.
3. a. Rabbits—Damage—chew bark off of the stems and larger branches. Or they bite off the tops and side branches of smaller transplants. Control—enclosing plant material with fencing or other enclosures, reducing the rabbit population, or using repellents.
   b. Deer—Damage—chew buds and tender branches. They also rub against tree trunks and can trample small transplants. Control—diversion feeding stations, repellents, fencing, reducing the deer population, and electrified visual grazing tape. *Diversion feeding stations* refer to an area away from the field where deer are fed.
   c. Mice—Damage—girdle plants at the soil level and digging holes in container plants. *Girdling* means to chew the bark at the base of the plant disrupting moisture and energy flow within the plant. This often stunts or kills the plant. Control—removal of natural shelter—i.e. weedy areas, poison baits, and natural predators.
4. List three hand tools and describe their uses.
   a. Spade—This is for harvesting plant material.
   b. Shovel—This is generally used for the removal of soil, mulch, or rock.
c. Hand pruners—These are used for pruning small branches.

d. Small pruning saw—This is used for pruning medium to large branches.

e. Caliper—This is used to measure plants tree trunk diameter.

5. Watering, fertilizing, staking, pruning, root pruning, weed control
Test

Lesson C1–2: Producing Nursery Crops

Part One: Matching
Instructions. Match the term with the correct response. Write the letter of the term by the definition.

a. transplanting f. irrigation
b. girdling g. scarification
c. liner plants h. stratification
d. lining out i. anti-desiccants
e. repellents

_____ 1. is chilling the seeds before germination.
_____ 2. is breaking or softening the seed coat to allow the absorption of moisture
_____ 3. are chemicals sprayed on the plant, usually on under sides of the leaves, twice a winter, that coat the leaves and conserve moisture
_____ 4. are scented chemicals that “scare” pests away from a given area.
_____ 5. means to chew the bark at the base of the plant disrupting moisture and energy flow within the plant
_____ 6. is the application of water using artificial means
_____ 7. refer to plants that are lined out.
_____ 8. is transferring or moving plants from one location to another
_____ 9. is the process of replanting seedlings or cuttings into the field to grow on to a saleable size.

Part Two: Completion
Instructions. Provide the word or words to complete the following statements.

1. __________________ is a form of drip irrigation commonly used in nurseries.
2. _______ to _______ is the ideal pH level for most plants.
3. __________________ determines if a soil is acid or alkaline.
4. __________________ is used to harvest nursery stock by hand.
Part Three: Short Answer

Instructions. Provide information to answer the following questions.

1. List the six steps of lining out nursery stock.

2. Why are nursery trees staked?

3. List three common animal pests and describe how to control them.

4. List three hand tools and describe their uses.

5. List the six nursery field practices.
STEPS FOR LINING OUT NURSERY STOCK

A. The land should be adequately prepared before transplanting.
   1. Grading or rototilling
   2. Soil testing, pre-plant fertilization, and/or the addition of organic matter.

B. Plants should be chosen and checked for disease or other damage

C. Plants set out at the proper depth.

D. Soil should be packed around the transplant.

E. The transplants should be watered immediately.

F. Transplants should be fertilized as soon as is appropriate.
LINER STOCK

Where does the liner stock come from?

A. Stem cuttings
   1. Hardwood—both deciduous and evergreen plant material
   2. Semi-hardwood
   3. Softwood—Before transplanting out into the field, this material should be well rooted and shaded for several days in outside frames.
   4. Herbaceous

B. Leaf cuttings

C. Leaf-bud cuttings

D. Root cuttings

E. Seedlings—These seeds generally need to be treated prior to planting using either scarification or stratification.
   1. **Scarification** is breaking or softening the seed coat to allow the absorption of moisture.
   2. **Stratification** is chilling the seeds before germination. It usually involves 32–50°F. storage for a given period of time.
A Sample Field Practices Schedule for Deciduous Shade Trees

I. Deciduous Shade Trees—examples—Ashes and Oaks

a. 1–2 year old liners are planted on 18" spacing.

b. They are grown for three years.

c. After three years, trees are either dug barefoot for market or they are replanted for growing on at wider spacing.

1. Wider row spacing can also be achieved by removing selected liners out of the field, so that the remaining liners are at the appropriate spacing.

2. As a general rule, they are planted three feet apart for each inch of anticipated trunk diameter.

3. For example, a 2 inch diameter green ash would be spaced 6 feet apart with 10 foot row spacing.

d. Pruning should be done to establish a symmetrical tree—see objective two for more detail.

This stock is usually sold balled and burlapped or containerized and requires three to eight years in the field.
ANIMAL PESTS OF FIELD GROWN STOCK

- Rabbits
- Deer
- Mice
- Humans
TOOLS AND EQUIPMENT USED IN PRODUCING NURSERY STOCK

A. Hand tools/equipment
1. Spade
2. Shovel
3. Hand pruners
4. Small pruning saw
5. Caliper

B. Mechanical tools/equipment
1. Computers
2. Planters
3. Tree diggers/mechanical balling machines
4. Lifting and loading equipment—includes forklifts and other transportation equipment.
5. Packaging and potting machines
Apple Seed Stratification and Honey Locust Pod Scarification

All nurseries practice some forms of propagation. Seed germination is common to produce liners, and scarification and stratification are often done.

Objective:

Investigate the method of scarification and stratification.

Materials Needed:

- apples—1 per student or pairs
- cutting boards
- knife
- cooler or cold storage
- 100 ml beaker
- honey locust pods
- fine to medium sand paper
- paper towel
- labels
- a marking pen
- empty beakers and beakers filled with media
- old newspapers

Part 1: Apple Seed Stratification

Procedures:

1. Take a beaker and label it as directed. Turn it upside down on the newspaper and trace circles. Cut out 10 circles to fit inside the beaker.

2. Cut apple in half lengthwise. Examine the seeds. Sketch how the seeds are located in the apple.

3. Remove the seeds gently from the fruit. How many seeds are there? _____
4. Lightly moisten and then place 2–3 newspaper discs in your beaker. Set in 2–3 seeds. Then lay in 2–3 moistened newspaper discs, then 2–3 seeds, then 2–3 moistened newspaper discs.

5. Cover the beaker top with plastic wrap.

6. Make sure your name, the date, and the date to be removed from the cooler are on your label.

7. Set the beakers in the cooler for 8 weeks.

8. Check occasionally that the newspaper remains moist.

9. At the end of 8 weeks, remove the seeds from the cooler. Gently remove the seeds from the beaker

10. Plant the seeds in labeled pots.


Questions:

1. What is stratification?

2. Why is it done with apple trees?

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Part 2: Honey Locust Pod Scarification

Procedures:

1. Get a honey locust pod. Sketch the seedpod and seeds on the back of this lab sheet. Remove the seeds gently from the fruit. How many seeds are there?

2. Put the seeds in a beaker of water overnight.

3. Dispose of the floaters. Pour the water off of the seeds. Put the seeds on some dry paper towel. Separate your seeds into two even piles.

4. Take one of your seed piles and rub each of the seeds vigorously with the sand paper. Place those seeds in a clean beaker and fill with water.
5. Label it and set that beaker aside. Take the other pile of seeds and put them in a clean beaker. Fill that beaker with water, label it, and set it aside.

6. 24 hours later, check both beakers. Describe what happened.

7. Plant your seeds in labeled pots. Water and wait. Record your results.

Questions:

1. What is scarification?

2. Why was it necessary with honey locusts?
Lab Sheet

Forsythia and Yew Cuttings

All nurseries practice some forms of propagation. Softwood cuttings are one of the most common methods of producing liner stock.

Objective:
Investigate the method of softwood cuttings.

Materials Needed:
- Knife or hand pruners
- Rooting hormone
- A flat filled with media
- Paper towel
- A beaker of water
- Labels
- A marking pen
- Cutting material—three 4–5 inch cuttings of forsythia and yew

Procedures:
1. Student should prepare the cutting by removing the lower leaves. This will cause scar tissue on the stem, which will callus and then form roots.
2. Students should have at least three cuttings of each type (forsythia and yew). Place the cuttings in the beaker of water. Place a small amount of rooting hormone on the paper towel. Gently roll the base of the cutting in the rooting hormone. Gently tap the excess hormone off.
3. Stick the cuttings into the flat. Plant them 1 inch deep. Keep them in neat rows and spaced evenly.
4. Label your cuttings with a tag as instructed by your teacher.
5. Place under a mist system or mist frequently with a mist nozzle.
6. Clean up your work area.

Questions:
1. Which plant cutting rooted faster?
2. Which plant cutting rooted best?

3. Why do nurseries produce plants by cuttings?
Lab Sheet

Soil Test

Two labs to help students see the importance of evaluating soil particle size and chemical fertility of soil.

Objective:

Gain information about how soils are tested and what the results mean.

Materials needed:

- Wide-mouth jars
- Soil samples—2 sets
- Liquid dish detergent
- Distilled water
- Ruler
- A Sudbury soil test kit—and the appropriate supplies
- Masking tape
- Marker

Procedures:

Test A—Soil Particle Size: Soil particle size determines soil texture, which is the amount of sand, silt, or clay in a given soil. Soil texture affects many elements of plant growth.

1. Select a wide-mouth canning jar. Label the jar with your name and fill ½ way with soil. Do not compact the soil.
2. Add water until the jar is two-thirds full. Add 2–3 drops of detergent. The detergent will act as a wetting agent.
3. Tighten the lid of the jar and shake the sample. Mix the soil, water, and detergent thoroughly—shaking for at least 5 minutes. Allow the sample to stand and the mixture to settle.
4. Observe your results at 5 minutes, 10 minutes, 20 minutes, 2 hours, and 24 hours.
5. Chart your results by describing and drawing the appearance of the mixture at each time observed.
Test B—Soil Testing for Fertility

1. Read the directions supplied with the Sudbury soil testing kit.
2. Test for the pH level first. Note the result. ______
3. Test for nitrogen, phosphorus, and potassium.

Questions:

1. What recommendations would you make to a nursery grower based on your results?

2. Why is the soil particle size important?

3. Besides pH, what other considerations might determine what plants you can grow?