

## Unit C: Forest Management

### Lesson 6: Examining Reforestation Practices

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

1. Identify methods of reforestation.
2. Explain tree planting guidelines.
3. Explain how to care for and plant a seedling.

**Recommended Teaching Time:** 2 hours

**Recommended Resources:** The following resources may be useful in teaching this lesson:

- A PowerPoint has also been developed with use of this lesson plan
- <http://en.wikipedia.org/wiki/Reforestation>
- <http://www.arboday.org/trees/video/howToPlant.cfm>
- <http://en.allexperts.com/q/Conifers-713/Planting-Conifers.htm>

### List of Equipment, Tools, Supplies, and Facilities

Writing surface  
PowerPoint Projector  
PowerPoint slides  
Transparency Masters  
Seedlings  
Planting bars

**Terms:** The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide #2):

- Cuttings
- Direct seeding
- Heel-in
- Planting bar (dibble)
- Wild seedlings

**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.

Hold up a tree planting bar to the class. Ask students to identify the tool. Once the correct answer is given, ask students to identify what they think are the important factors to consider when planting forest trees.

## Summary of Content and Teaching Strategies

**Objective 1:** Identify methods of reforestation.

**(PowerPoint Slide #3)**

I. The majority of forest owners rely on natural regeneration to restore most stands after logging. However, in some instances human intervention is necessary. In these cases, foresters artificially reforest an area. Some methods by which this accomplished are:

**(PowerPoint Slide #4)**

A. Wild seedlings—**Wild seedlings** are those growing in the woods in a natural state. For all practical purposes, digging up and transplanting of such seedlings for reforestation purposes should be avoided. Such practice is uneconomical and inefficient.

**(PowerPoint Slide #5)**

B. Direct seeding—Sowing repellent-coated seeds on an area where trees are desired is known as **direct seeding**. This method can be effectively and successfully employed under proper conditions.

**(PowerPoint Slide #6)**

Large areas can be directly seeded by hand, airplane, cyclone seeder, or grain drill. Also, the cost of establishing a stand by this method is usually less than the cost of planting tree seedlings. Some factors that affect the success of direct seeding are:

**(PowerPoint Slide #7)**

1. Vegetative cover—Heavy vegetative cover can prevent seed from reaching the soil and interferes with germination. A prescribed burn can be used prior to seeding to remove such cover in the desired area.

**(PowerPoint Slide #8)**

2. Soil moisture—Soil moisture affects germination of seed and growth of seedlings. An insufficient amount of moisture following direct seeding will result in a low germination rate and/or a high mortality rate of seedlings.

**(PowerPoint Slide #9)**

3. Birds and rodents—Birds and rodents consume seed for food. Therefore, seed should be treated with a bird and rodent repellent before being broadcasted.

**(PowerPoint Slide #10)**

C. Cuttings—Some species of trees can be reproduced from cuttings. **Cuttings** are pieces of branches, usually 20 to 30 centimeters in length, cut from a tree. Examples of species that can reproduce via this method are willow, cottonwood, and several conifers.

**(PowerPoint Slide #11)**

D. Nursery seedlings—The planting of nursery-grown seedlings will increase the probability of establishing a good stand. Nursery seedlings are usually planted barerooted because of the ease of transporting and handling seedlings with this method.

**(PowerPoint Slide #12 shows a picture of nursery saplings with bare roots.)**

**(PowerPoint Slide #13)**

E. Containerized seedlings—Using containerized seedlings for reforestation is becoming increasingly accepted. In this method, seeds are germinated in small pots of soil or other growing medium. After 8 to 32 weeks, the seedlings are planted without disturbing their roots.

**(PowerPoint Slide #14 shows an example of containerized saplings being grown in Afghanistan.)**

**(PowerPoint Slide #15)**

1. Advantages of this method are:
  - a. Improved rates of survival and growth of seedlings
  - b. Difficult species are more readily produced
  - c. The planting season can be extended.

**(PowerPoint Slide #16)**

2. Disadvantages of this method are:
  - a.. Cost. Containerized seedlings often cost at least twice as much as bareroot stock.
  - b. Seedlings are bulky, making them more difficult to handle and transport.
  - c. Requires more site preparation than direct seeding

**\*\* Ask students if they have had any experience in planting trees. Have them share their experiences with the class.**

**Objective 2:** Explain tree planting guidelines.

**(PowerPoint Slide #17)**

II. A number of key factors should be considered when planning to reforest an area. They are:

**(PowerPoint Slide #18)**

A. Estimating needs—It is important to order the proper species and number of seedlings required for the area to be reforested. If an open area is to be reforested, the following guide gives the number of seedlings per acre, depending on spacing used:

**(PowerPoint Slide #19)**

1. 1.8 meters × 2.4 meters: 908 seedlings
2. 1.8 meters × 3.1 meters: 726 seedlings
3. 2.4 meters × 2.4 meters: 680 seedlings
4. 2.4 meters × 3.1 meters: 544 seedlings
5. 3.1 meters × 3.1 meters: 436 seedlings

**(PowerPoint Slide #20)**

B. Areas in need of planting—The area that will be planted during the reforestation process should be considered in selecting the species to be planted. Some possible locations are:

**(PowerPoint Slide #21)**

1. Cleared or abandoned farmlands
2. Non restocking forest land
3. Openings in forest stands
4. Watershed protection areas
5. Windbreaks

**\*\*Use TM: C6-1 to aid in the discussion on this topic. If possible find an area around the school to plant some trees. Have the students measure the area, and figure out how many seedlings they are able to plant on the area.**

**Objective 3:** Explain how to properly plant a seedling.

**(PowerPoint Slide #22)**

III. There are several steps to follow to properly plant a tree seedling.

**(PowerPoint Slide #23)**

- A. Before planting, seedlings may be stacked in layers 8 to 10 deep for temporary storage without any adverse effects. It is important however to plant the seedlings as soon as possible after receiving them from the nursery.

**(PowerPoint Slide #24)**

To *heel-in* seedlings means to store the young trees prior to planting by placing them in a trench and covering their roots with soil. In this process, seedlings are placed in a V-shaped heel-in trench and allowed to lean parallel to one side of the trench. The roots must be fully extended to the bottom of the trench.

**(PowerPoint Slide #25)**

A seedling with curled roots will be difficult to plant correctly later. After placing the seedling in the trench, fill it three-fourths full with soil. The soil is then packed around the roots and then the rest of the trench is filled with soil. The soil is then covered with leaves to conserve soil moisture.

**(PowerPoint Slide #26 shows an example of how to heel-in seedlings.)**

**(PowerPoint Slide #27)**

- B. The site in which the seedlings will be planted must be prepared by removing any excess vegetative cover. This may be accomplished through prescribed burning, bulldozers, brush cutters, or plows.

**(PowerPoint Slide #28)**

- C. Spacing of trees depends on the owner's objective. In pine trees, a spacing of 1.8 x 2.4 meters or 2.4 x 2.4 meter favors maximum cubic meter volume growth. A spacing of 3.6 meters between rows is sometimes used to allow the passage of vehicles and equipment.

**(PowerPoint Slide #29)**

Wide spacing, such as 3.1 x 3.1 meters or 3.6 x 3.6 meters often allows trees to grow to large diameters in a relatively short time.

**(PowerPoint Slide #30)**

- D. There are a variety of procedures that can be used to plant seedlings. As a rule, only about 75 to 80 percent of all properly planted seedlings will survive. Some of the procedures are:

**(PowerPoint Slide #31 shows planting procedure survival rate)**

**(PowerPoint Slide #32)**

1. Hand planting—The *planting bar (dibble)* is a metal tool used to make a hole in the soil and is one of the best tools for planting seedlings by hand. The planting bar has four parts: handle, shaft, blade, and foot step. The wedge-shaped steel blade is usually 20 to 25 centimeters long and about 7.6 centimeters wide, tapering to a sharp edge at the base. A shovel can also be used; it just takes longer to plant trees.

**(PowerPoint Slide #33 shows proper use of a planting bar.)**

**(PowerPoint Slide #34 shows some people in Afghanistan planting a tree with a shovel.)**

**(PowerPoint Slide #35)**

2. Machine planting—As expected, machine planting is much faster than hand planting. A two-person crew can set out 7,000 to 10,000 seedlings a day on suitable sites.

**\*\*Use TM: C6-2, TM: C6-3, and TM: C6-4 to aid in the discussion on this topic. Have students plant the area they measured. Use what ever tools are available to you.**

**Review/Summary:** Use the student learning objectives on PowerPoint Slide # 36 to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle.

**Application:** Contact your local forester to obtain some seedlings to plant on your school grounds.

**Evaluation:** Use the following sample test to evaluate the students' comprehension of the material covered in this lesson.

### **Answers to Sample Test:**

#### ***Part One: Matching***

1. a
2. c
3. e
4. d
5. b

#### ***Part Two: Completion***

1. transporting; handling
2. objective
3. 75; 80

#### ***Part Three: Short Answer***

1. See Objective 1 for scoring this question.
2. See Objective 4 for scoring this question.



## SEEDLINGS PER 0.4 HECTARE BASED ON SPACING USED

- 1.8 meters × 2.4 meters: 908 seedlings
- 1.8 meters × 3.1 meters: 726 seedlings
- 2.4 meters × 2.4 meters: 680 seedlings
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# HEELING-IN AND PLANTING PINE SEEDLINGS

## Heeling-In



1. Dig V-shaped trench in moist, shady place.



2. Break bundles and spread out evenly.

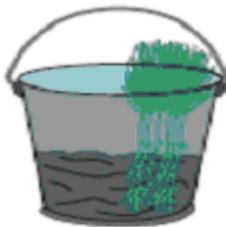


3. Fill the trench ¼ full of loose soil, and water well.



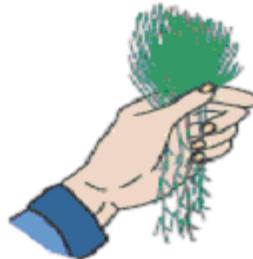
4. Complete filling in soil and firm with feet. Water again.

## Handling Seedlings in Field



Correct

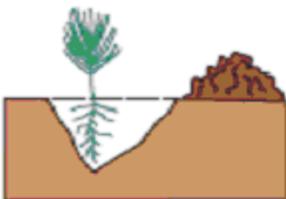
In bucket, with sufficient wet moss to cover roots.



Incorrect

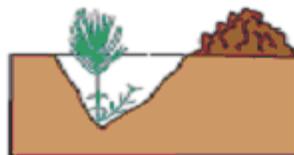
In hand. Roots dry out.

## Correct and Incorrect Depths



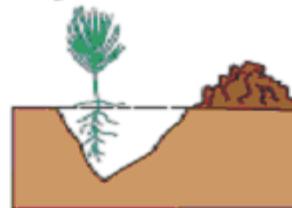
Correct

At same depth or 1.2 cm deeper than seedling grew in nursery.



Incorrect

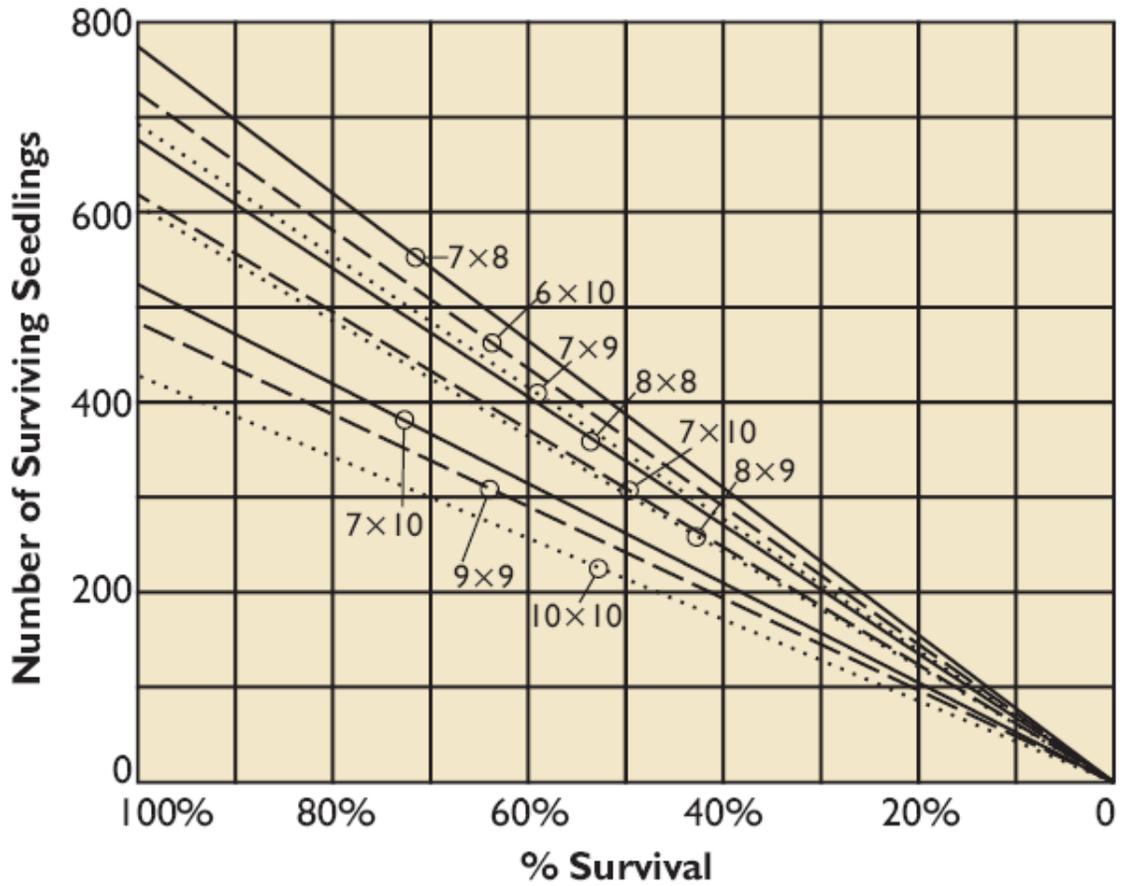
Too deep; roots bent



Incorrect

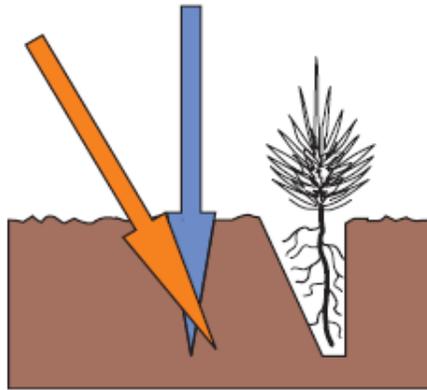
Too shallow; roots exposed.

# PLANTING PROCEDURE

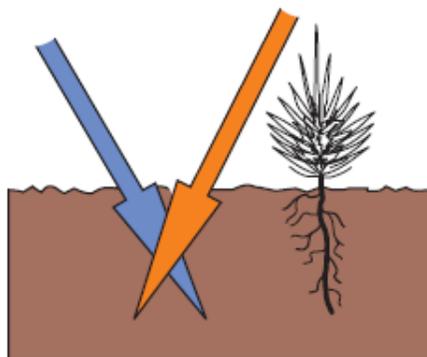


(Courtesy, USDA Forest Service)

# PROPER USE OF A PLANTING BAR



Pull handle of planting bar toward planter to firm soil around root end.



Push handle of planting bar away from planter to firm soil around root top.