Matching Trees to Planting Sites

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Objectives of Course

☐ Participants will understand the important concept of matching tree species to local planting sites.

☐ Participants will be able to use a soil reaction (pH) test to match trees to pH requirements.
Matching Trees to Planting Sites

It is very important to plant the right kind of trees on your local planting site. In order for the trees to be healthy and to grow well, they must have the proper kind of soil, slope, elevation, and soil moisture for which they are suited.
Matching Trees to Planting Sites

If you plant a tree on a kind of site where it would not grow naturally, then that tree might not survive. If it does survive, then it may not be healthy.
Matching Trees to Planting Sites

It is best to choose trees that are native not only to Afghanistan but are also native to your province and your planting site.

A tree that grows in the nursery from a seed collected in your province is the best kind of tree for you to plant. That means it will be suitable for your local growing conditions.
Some kinds of trees are considered by people to be native to Afghanistan but really are not. They have been used for a long time in the country, but they actually came from other countries. You should look about the area to see what trees are growing naturally there. These are the trees that will do well on your planting site.
Matching Trees to Planting Sites

The different kinds of trees tolerate different extremes of cold in the winter.
Matching Trees to Planting Sites

The trees that grow high in the mountains are able to tolerate lower temperatures for longer lengths of time than those that only grow in the low river valleys. For example, *Ailanthus* needs at least 150 frost-free days to grow well with minimum temperatures of -13 degrees F and *Pinus nigra* only needs 100 frost-free days and can live in temperatures down to -38 degrees F.
The different kinds of trees also tolerate different extremes soil moisture. Species like *Pinus* have a medium drought tolerance, and pistachio has a high drought tolerance.
The characteristics of the soil are also very important when choosing tree species to plant. One of the most important soil characteristics to look at when choosing a tree to plant is the pH of the soil.
Soil pH

Soils have different amounts of acid in them depending on the rock material from which the soil was formed, the amount of rainfall the soil is exposed to, depth of the soil, and the kind of vegetation that grows on the soil. The degree of the acidity or alkalinity of the soil is called soil reaction or pH (potential hydrogen ion, H+). Basically, the pH is a reflection of the natural fertility of a soil.
Soil pH

Soil pH is expressed on a scale from 0.0 to 14.0. A soil with a pH lower than 7.0 is considered to be an acid soil, and one higher than 7.0 is alkaline. A pH of 7.0 is neutral. A neutral pH is that of pure, clean water. The pH scale is a logarithmic scale where a soil with a pH of 6.0 has ten times as many hydrogen ions (H+) as a soil pH of 7.0, and a soil with a pH of 7.0 is 100 times more alkaline than a pH of 5.0 or 1000 times more alkaline than a pH of 4.0.
Soil pH

Descriptive terms commonly associated with pH are:

- $< 4.5 =$ extremely acid
- $4.5$ to $5.0 =$ very strongly acid
- $5.6$ to $6.0 =$ moderately acid
- $6.1$ to $6.5 =$ slightly acid
- $6.6$ to $7.3 =$ neutral
- $7.4$ to $7.8 =$ slightly alkaline
- $7.9$ to $8.4 =$ moderately alkaline
- $8.5$ to $9.0 =$ strongly alkaline
Soil pH

Generally, soils which developed in dry climates like in Afghanistan are alkaline due to lack of soil moisture that would, over time, leach out available basic nutrients.
Soil pH

The pH of a soil influences the solubility of minerals or nutrients that trees must have to grow and be healthy. Before the tree can use a nutrient from the soil, the nutrient must be dissolved in the soil solution and available for uptake into the roots. Most minerals and nutrients are more soluble or available in acid soils than in neutral or slightly alkaline soils.
Soil pH

Common nutrient deficiencies associated with soil pH are:

- Acid soils with a pH of <6.0 – calcium, magnesium, phosphorous, potassium, and molybdenum
- Acid soils with a pH of <4.0 – aluminum, manganese
- Alkaline soils with a pH of >7.0 – iron, manganese, zinc, copper, boron
Soil pH

The soil pH can also influence plant growth by its effect on activity of beneficial microorganisms. Bacteria, fungi, and soil microbes that decompose soil organic matter are hindered in strong acid soils. This prevents organic matter from breaking down, resulting in an accumulation of organic matter and the tie-up of nutrients, particularly nitrogen, that are held in the organic matter.
Soil pH

Tree species are adapted to thrive in different pH ranges of soils and are affected in different ways by soil pH. For example, *Pinus nigra* grows best in soils with a pH range of 5.5 to 7.5. Generally, Afghan conifers grow best in acid soils and hardwoods in alkaline soils.
# Soil pH

<table>
<thead>
<tr>
<th>Tree Species</th>
<th>Soil pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer negundo</td>
<td>5.2-7.0</td>
</tr>
<tr>
<td>Ailanthus altissima</td>
<td>4.9-7.5</td>
</tr>
<tr>
<td>Cedrus deodora</td>
<td>6.0-7.5</td>
</tr>
<tr>
<td>Cercis griffithii</td>
<td>5.1-6.5</td>
</tr>
<tr>
<td>Cupressus arizonica</td>
<td>7.0-8.5</td>
</tr>
<tr>
<td>Pinus nigra</td>
<td>5.5-7.5</td>
</tr>
<tr>
<td>Populus nigra</td>
<td>5.1-7.0</td>
</tr>
<tr>
<td>Robinia pseudoacacia</td>
<td>4.8-7.5</td>
</tr>
<tr>
<td>Thuja orientalis</td>
<td>4.7-6.8</td>
</tr>
<tr>
<td>Ulmus pumila</td>
<td>5.5-8.0</td>
</tr>
</tbody>
</table>
Soil Salinity

If the soil pH is 8.6 or higher, then the soil has a high amount of salinity. Only trees that are tolerant of salinity should be planted on those soils.

<table>
<thead>
<tr>
<th>Tree Species</th>
<th>Salinity Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer Negundo</td>
<td>Medium</td>
</tr>
<tr>
<td>Ailanthus Altissima</td>
<td>None</td>
</tr>
<tr>
<td>Cupressus arizonica</td>
<td>None</td>
</tr>
<tr>
<td>Pinus nigra</td>
<td>High</td>
</tr>
<tr>
<td>Populus nigra</td>
<td>Medium</td>
</tr>
<tr>
<td>Ulmus pumila</td>
<td>None</td>
</tr>
</tbody>
</table>
Soil pH test kit
1. Place a small amount of soil in the cavity of the test plate. The cavity should be about ¼ full.

2. Add 1 or 2 drops of the bottled solution to the soil. The soil should be wet but not a liquid.

3. Mix the solution and the soil thoroughly with the stick provided with the kit.
4. Move the soil to one side of the cavity to make a slope.

5. Cover the wet soil surface with a film of the powder from the kit. You can do this by holding the container about 2 inches above the soil and tapping the bottom of it with your fingers. Add just enough powder to cover the soil surface evenly and completely so that the color of the soil is hidden.
6. Wait 2 minutes and then compare the color of the powder with the standard color chart from the kit. Do this by sliding the color edge of the chart over the colored powder.

7. After making the closest match possible, read off the corresponding pH number to the right of the color blocks.
Group Exercise

- Identify the kind of area from which you got the soil that you brought from your province:
  1. Slope and general elevation
  2. Soil Moisture
  3. Trees growing naturally there

- Use the soil test kit to determine the pH of the soil.
Group Exercise

☐ Compare answers among your group members.

☐ Select a spokesman to tell the entire audience about the differences found in the soils from your group.