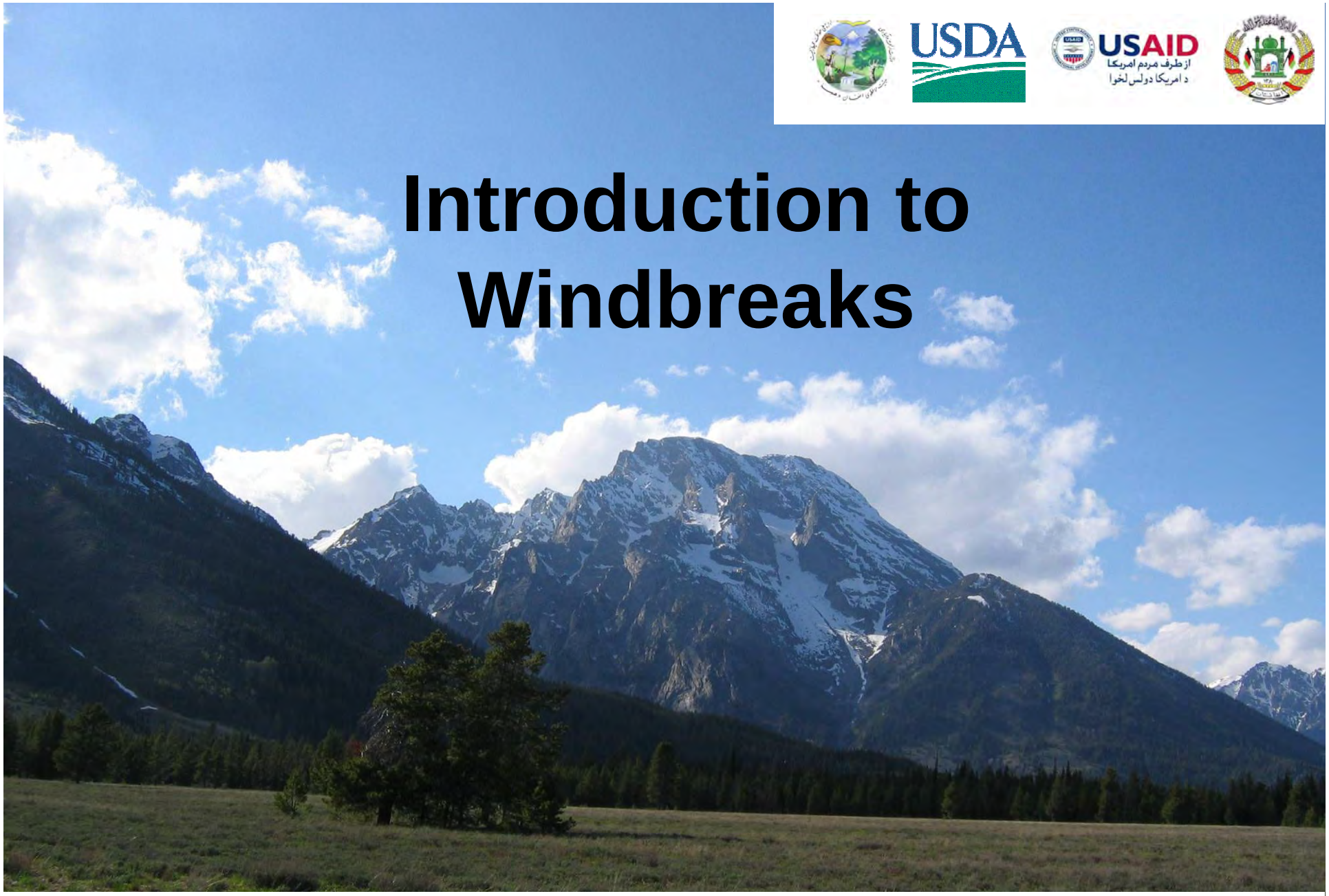
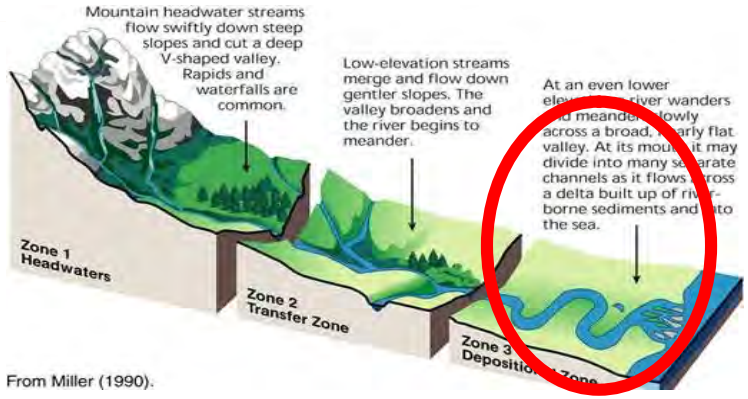


Introduction to Windbreaks

This training was prepared by the U.S. Department of Agriculture (USDA) team of Otto Gonzalez-USDA Foreign Agricultural Service (Team Leader), Jon Fripp (Civil Engineer) and Chris Hoag (Wetland Plant Ecologist)-USDA Natural Resources Conservation Service. Fripp and Hoag were the primary authors of this material. The United States Agency for International Development (USAID) provided funding support for the USDA team.

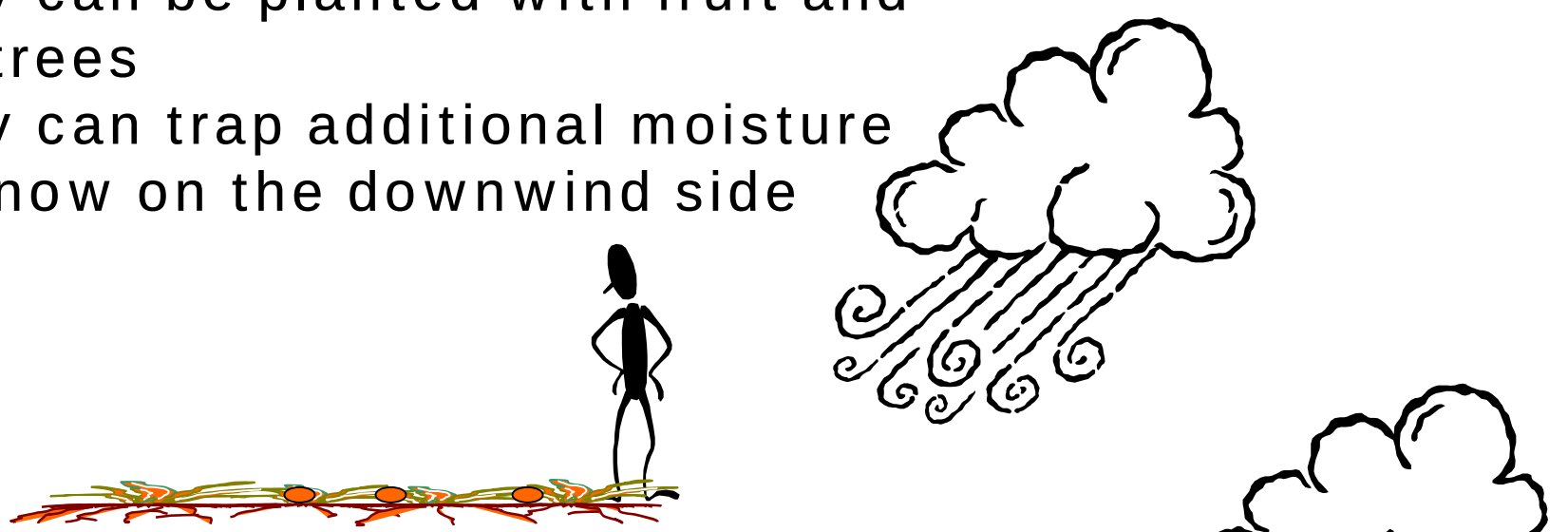
In the deposition zone:

- The soil may be loose
- There may be open areas with high winds
- These winds can erode the soil and damage crops

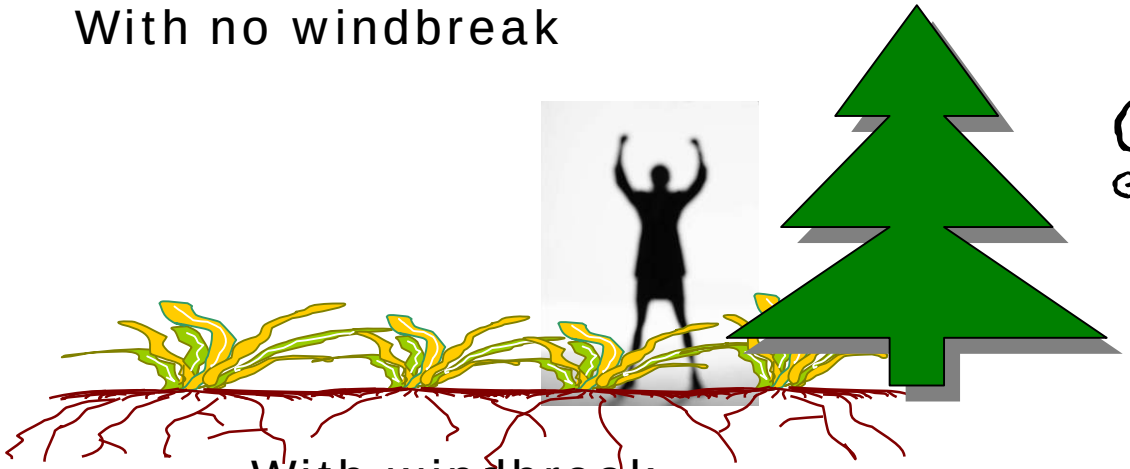


Windbreaks can be used to prevent this damage from happening

- Windbreaks shield agricultural fields from the wind damage
- They can protect livestock from cold winter winds
- They can be planted with fruit and nut trees
- They can trap additional moisture as snow on the downwind side



With no windbreak



With windbreak


They are rows of trees and shrubs designed to shield agriculture plots from the wind

Planning and Design of a windbreak

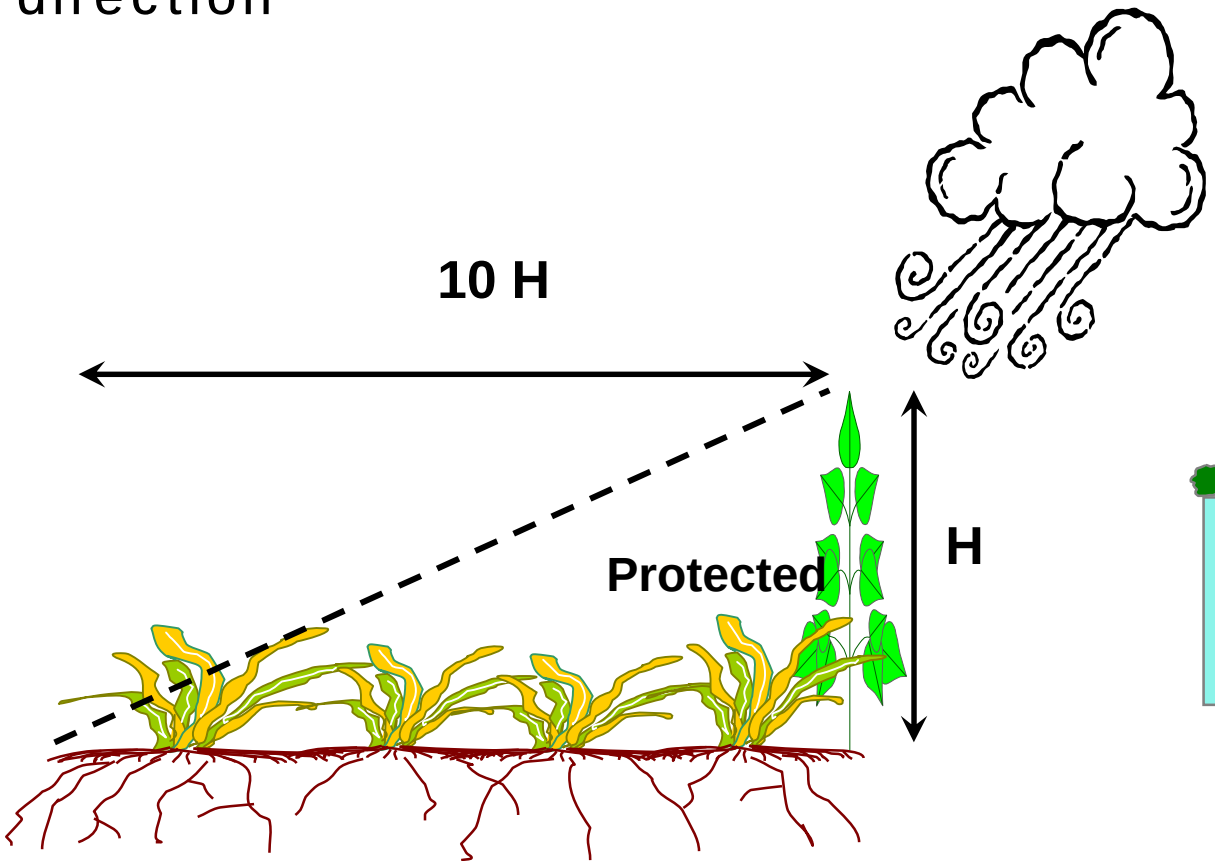
- Determine Objectives
  - Reduce wind erosion
  - Manage snow deposition
  - Shelter buildings and livestock
  - Noise and visual screen
- Inventory
  - * Direction of the dominant wind
  - * Size of area to be planted
  - * Determine which shrub and trees are available
- Develop design
  - How many rows
  - Spacing between plants and rows
  - Direction of rows
  - What plant species in which row

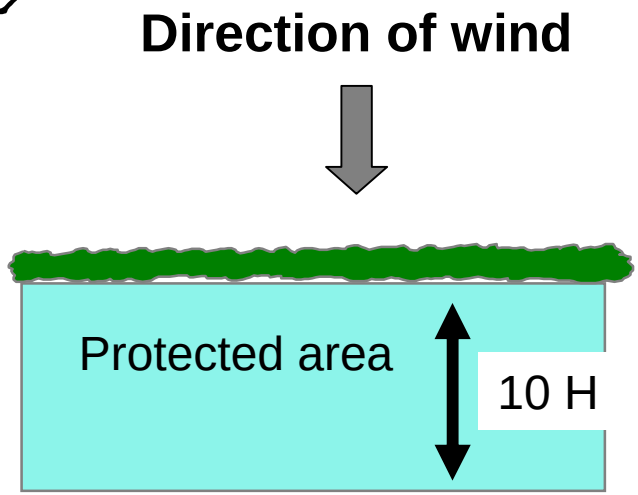
Planning and Design of a windbreak

- Prepare planting bed
  - Dig up planting site
  - Level and pack planting bed
- Layout planting plan
  - Stake rows
  - Mark where holes are to be dug
  - Mark where different plant species go
- Dig holes and put water in the hole
  - Dig holes twice the diameter of the root ball
  - Dig holes deeper than the length of the longest roots
- Plant trees and shrubs
- Care and Maintenance

Planning a windbreak

- In general, a windbreak will protect an area that is 10 times the height of the highest tree at maturity
- Some protection will occur from 20 to 25 times the height
- Plant the rows perpendicular to the normal wind direction





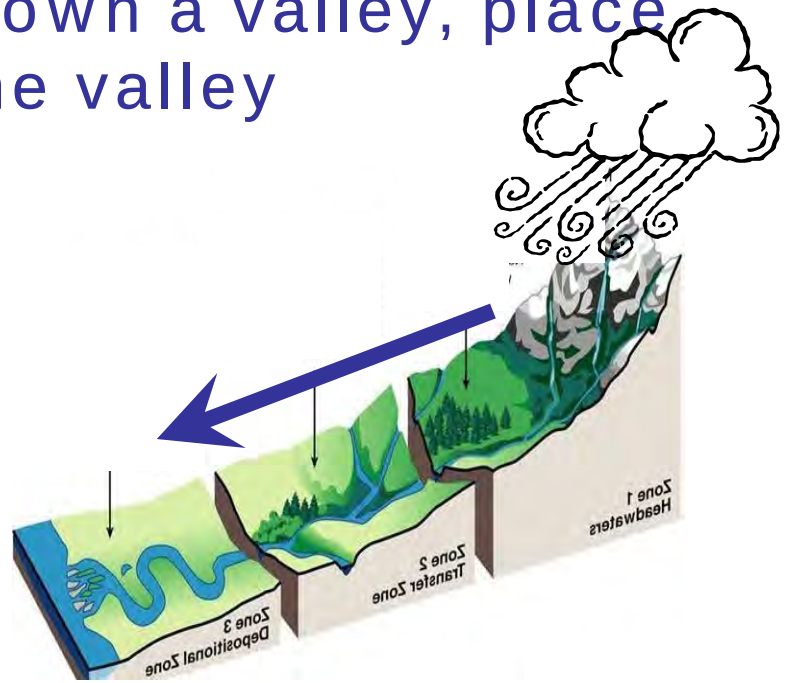
Where to place windbreaks on a field

Question

How can you tell what is the most common wind direction?

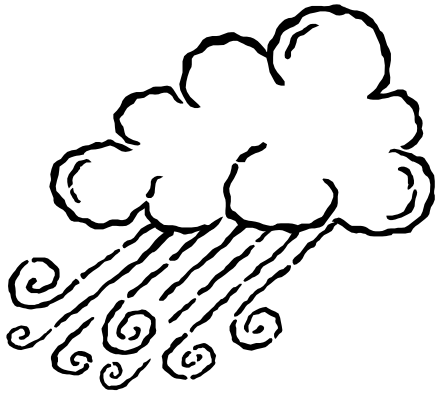
Answer:

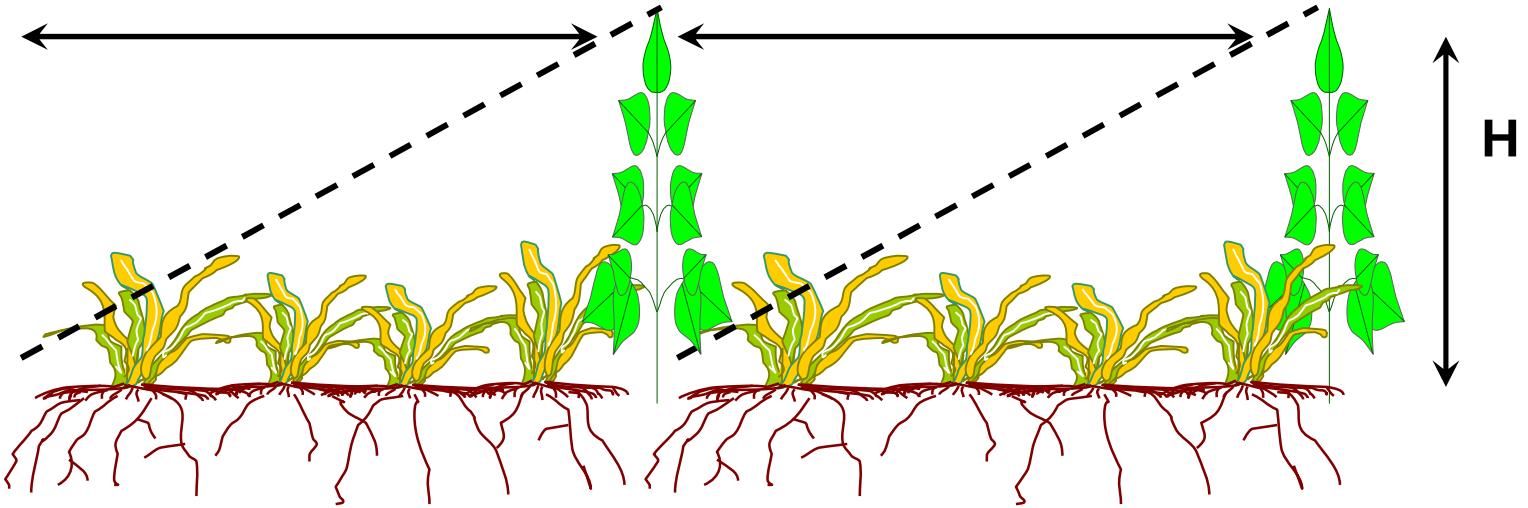
- Ask someone who lives in the area
- Look at existing trees
- Since wind often blows down a valley, place the windbreaks across the valley



The distance between the windbreaks

- The distance between rows should be 10 times the height the tallest trees will get in 20 years
- Example: 9 meter tall trees x 10 = 90 m protection area





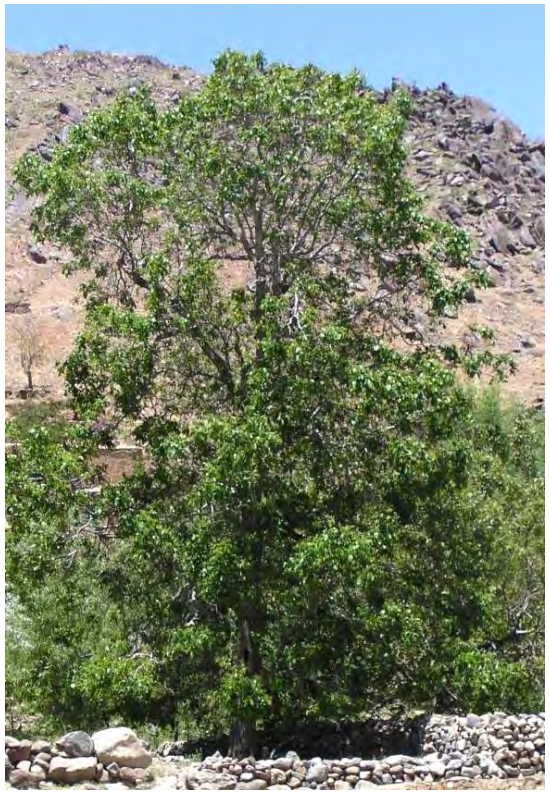
The distance between the windbreaks

Question

How can you tell how high a tree or bush will get?

Answer:

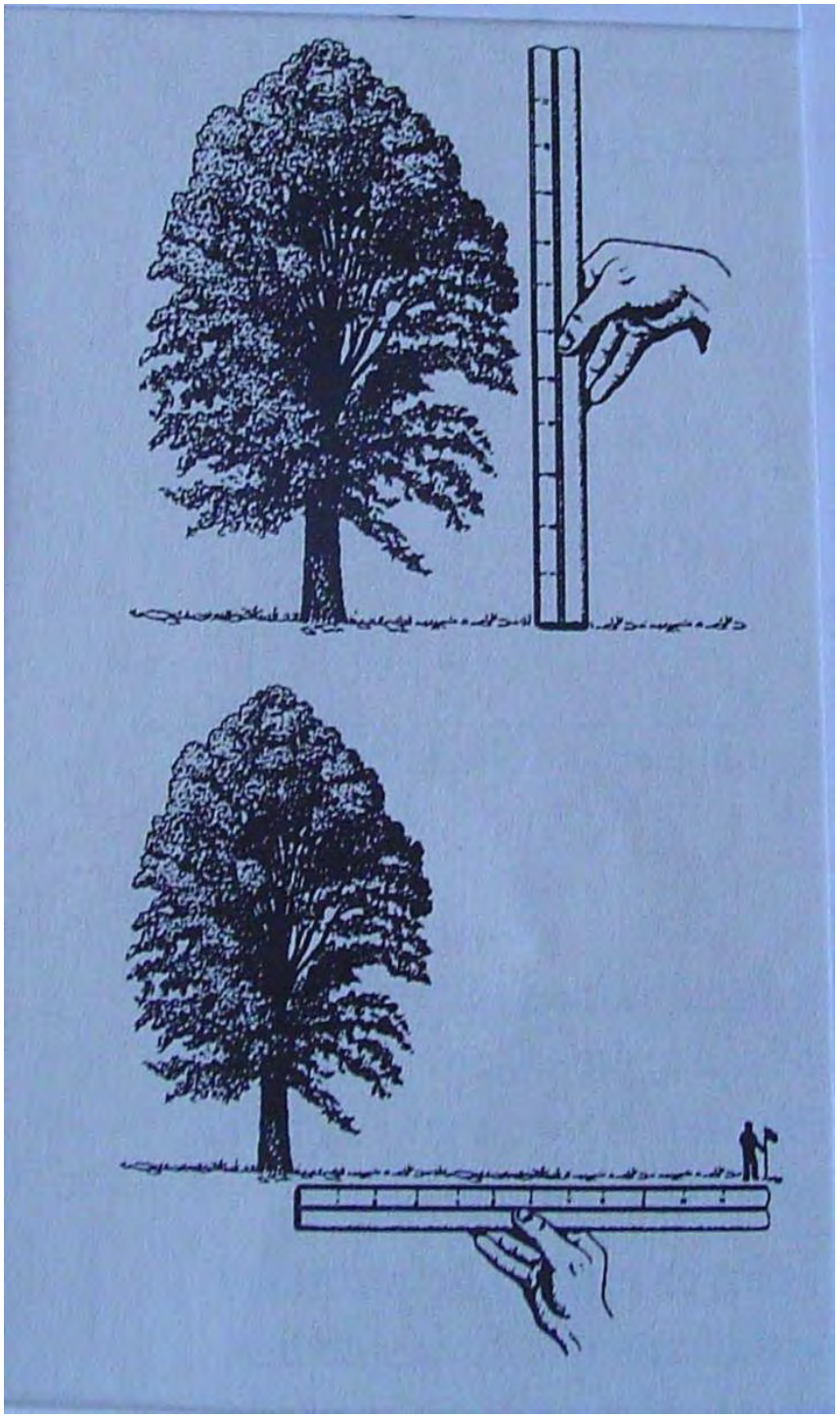
- Ask a plant expert
- Measure trees and bushes in the area



Quick way to measure height

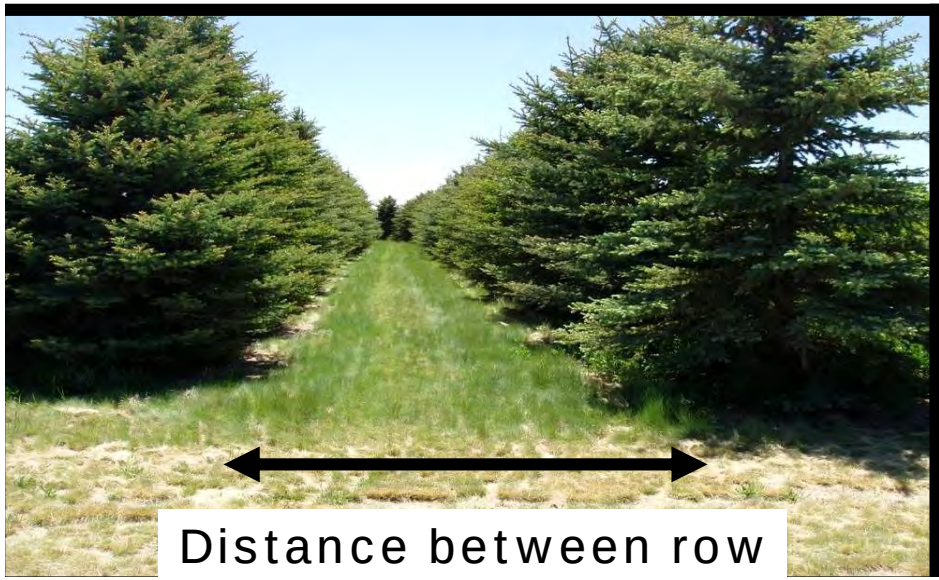
1. Hold a stick at the end of your arm and back away until the top and bottom of the stick is lined up with the bottom and top of the tree.
2. Turn the stick so it is parallel to the ground.
3. Line one end up with the tree trunk.
4. Have a partner measure from the base of the tree until you see him at the end of the stick
5. That is the approximate height of the tree.

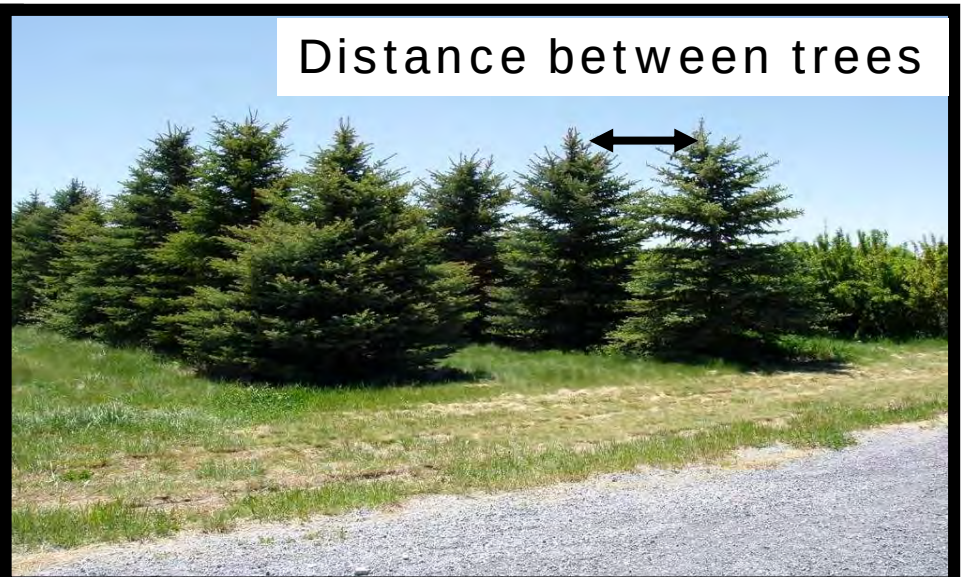
Also use this technique to assess tell how effective an existing windbreak is protecting a field



Spacing of the windbreak and how close the plant species should be planted

- 1 to 5 rows of trees or shrubs should be used
- The distance between the trees depends upon the species and the mature height
  - Plant to make a dense barrier
  - Do not plant too close so as to stress the plants
- The distance between the rows should be 3 - 4.5 meter
- Plant grass between the rows to reduce weed growth after the trees are 3-4 years old





Different plant species can be used to build a windbreak

- Many different plants can be used to build a windbreak.
- Shrubs and trees are used in different rows
- Decide which plants to use by asking what will grow best in the area that you want to plant the windbreak

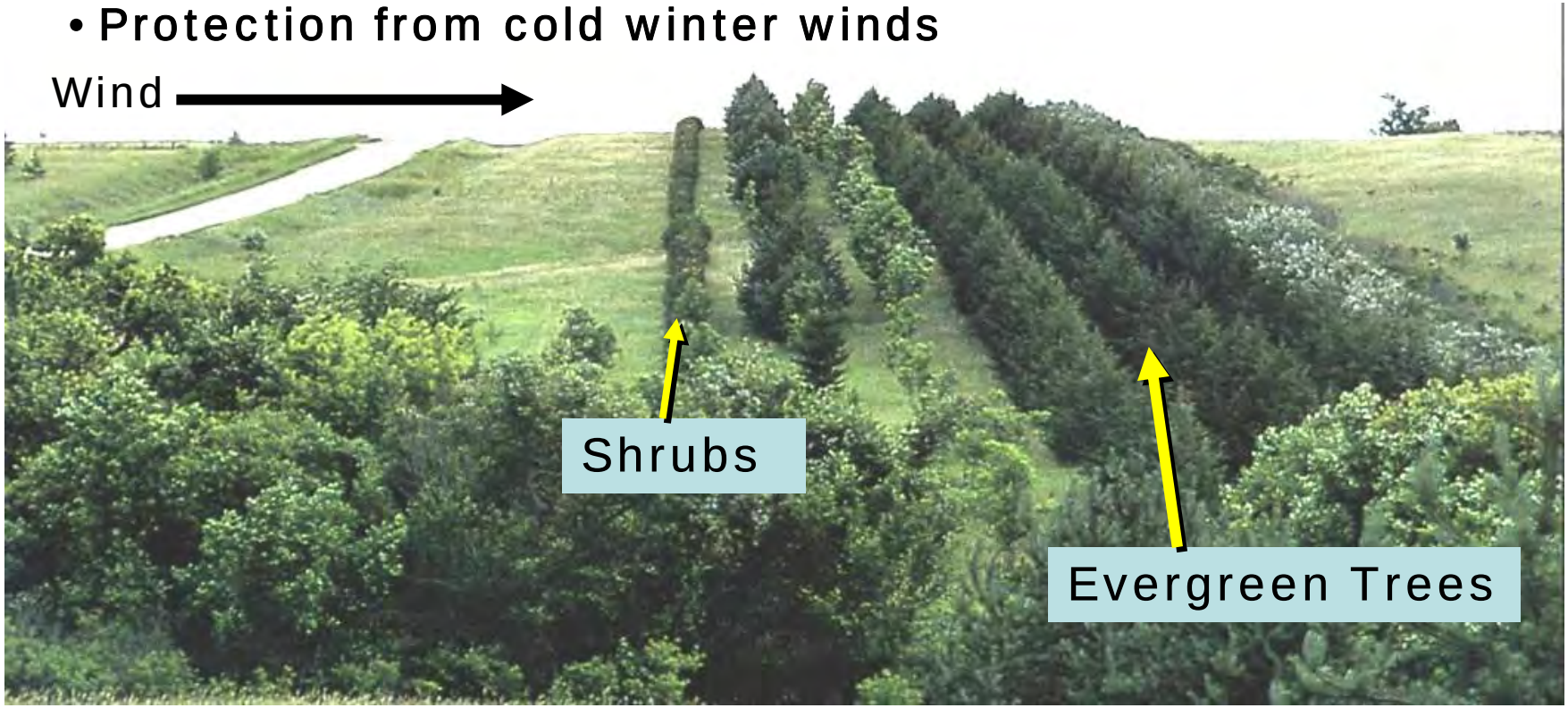
Tree Windbreak

Shrub Windbreak

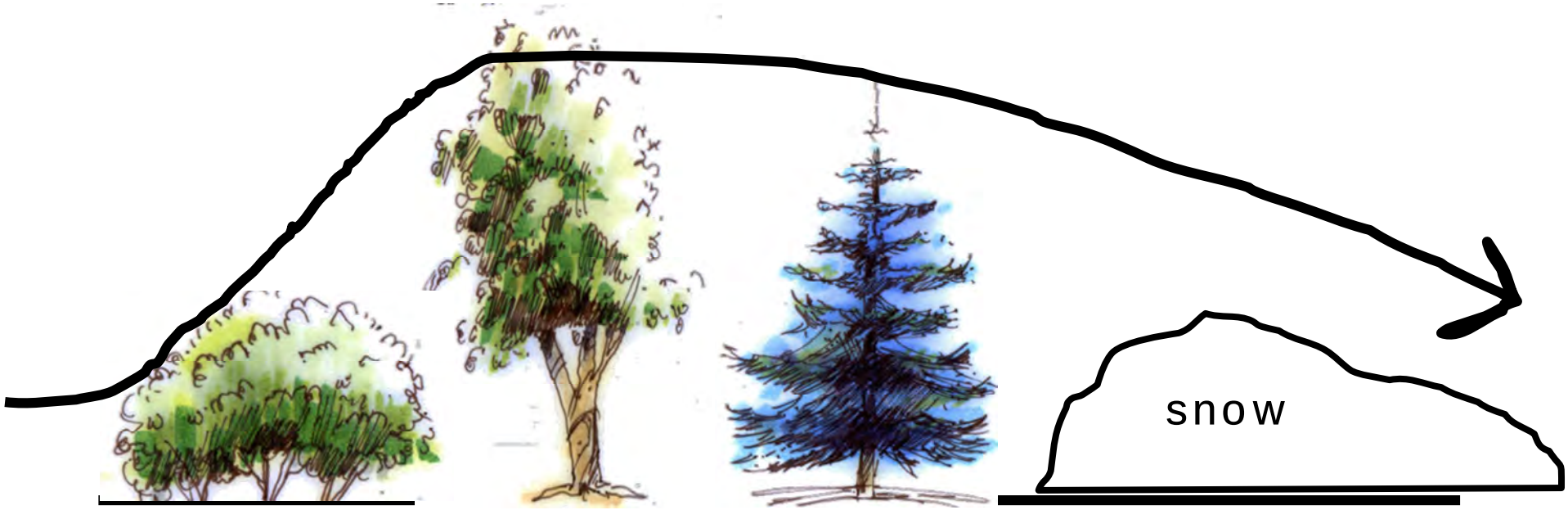
Grass Windbreak

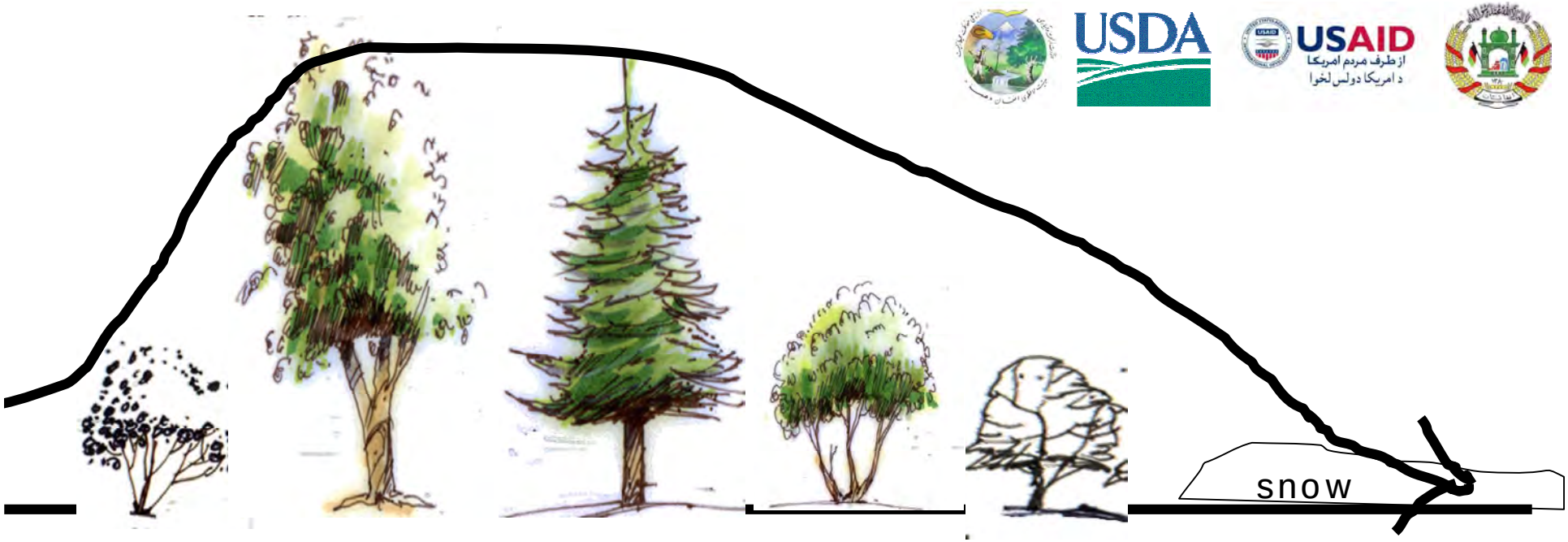
What Plant Species To Use To Built A Windbreak

- Multi-row windbreaks provide better protection
  - Low growing shrubs on the windward side and/or the downwind side
  - larger trees in the middle
- Evergreen plants work better in the winter
  - For trapping snow
  - Protection from cold winter winds



- Plant shrubs to increase the density near the ground and help trap snow
- Plant evergreen trees on the downwind side of the windbreak
- Plant the windbreak rows close enough together to make a wind barrier within 10 years
- Plant the individual trees and shrubs close enough to create a barrier but not close enough to stress the plants





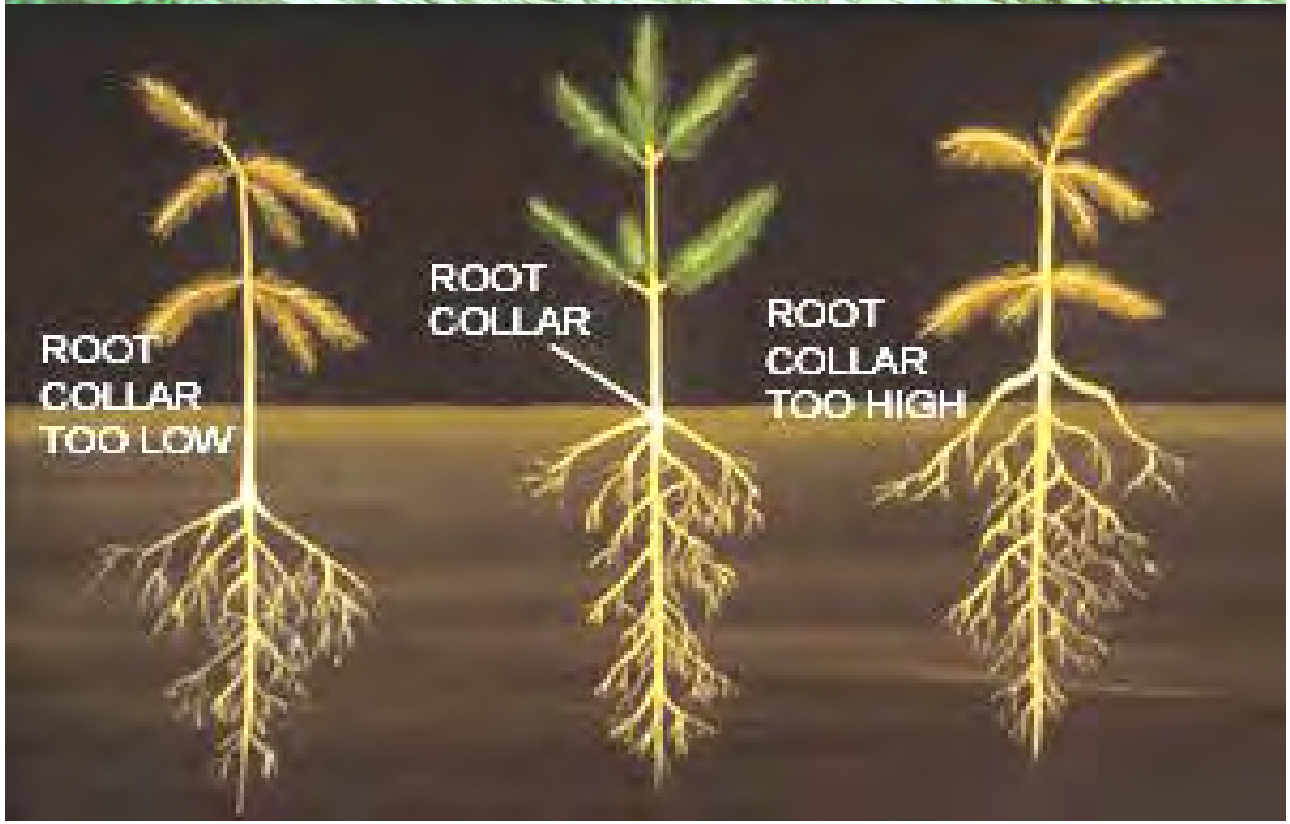
- 5 row windbreaks spread the snow out more than 3 row windbreaks
  - Spreads snow out more
  - Less big drifts
  - Snow is easier to manage

Potential Species to use in Afghan Windbreaks

Shrubs	Height
Cercis griffithii	1.8 m
Broadleaf Trees	
Fraxinus floribunda	15 m
Populus nigra	18 m
Ailanthus glandulosa	15 m
Ulmus pumila	21 m
Morus sp.	11 m
Evergreen	
Cedrus deodora	18 m
Cupressus torulosa	21 m
Pinus alderica	14 m
Pinus halapensis	18 m
Pinus nigra	24 m

Layout the Planting design on the ground

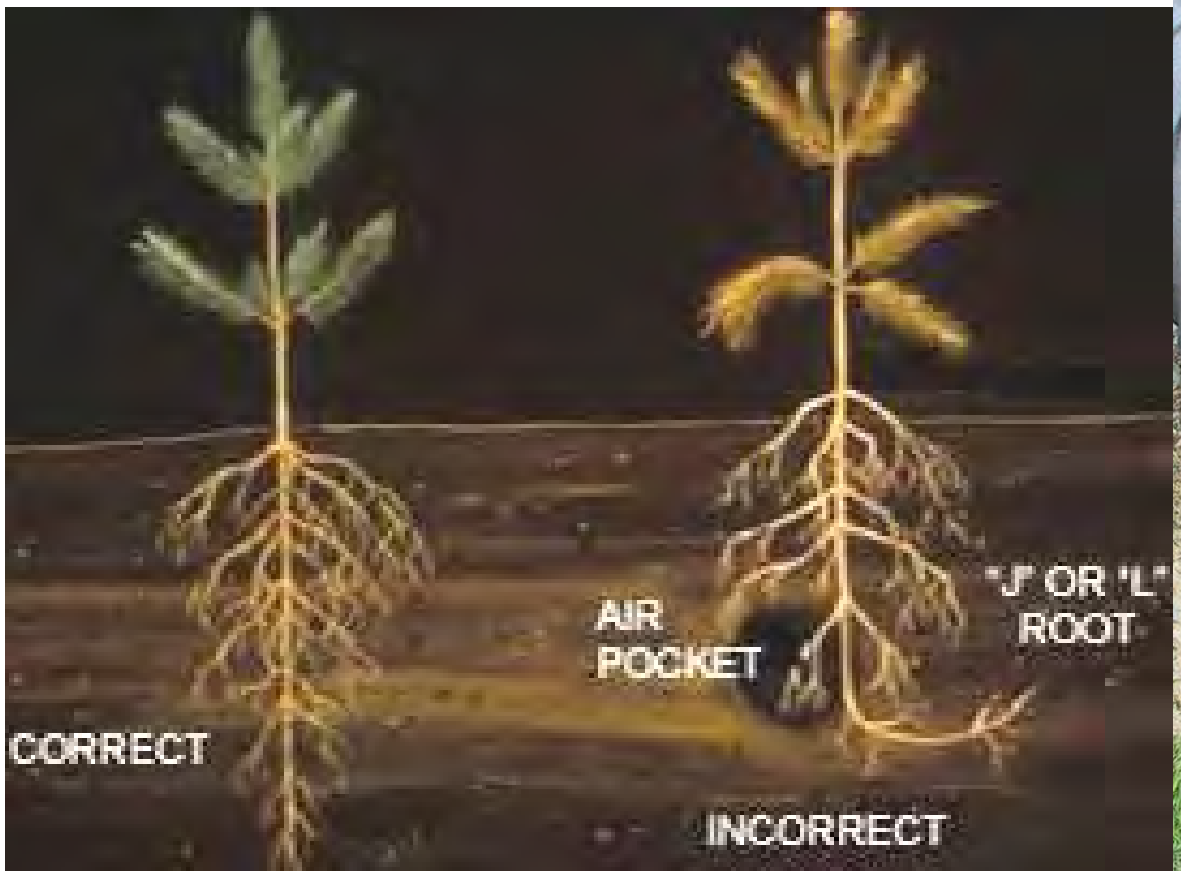
- Mark the beginning and end of each row
- Identify which species goes in each row
- Mark each hole location based on the spacing for the species
  - This will be different for trees and shrubs



Planting a windbreak

- Collar is where the stem tissue meets the root tissue
- Plant the collar at or slightly below the ground surface

- Dig the hole twice as wide as the root ball
- Dig the hole deep enough that all the roots hang down in the hole without curving
- Pour water in hole to make it wet before planting



Planting a windbreak

- Place root ball in the hole
- Hold tree so collar is at ground surface
- Place soil back in hole around the root ball
  - Use compost to improve soil organic matter and fertility
- Use soil and water mix to prevent air pockets around roots
- Make sure roots hang down in the hole

Planting a windbreak

- Pack soil tightly around the root ball and stem
- Keep collar at soil surface
- Build a small dam around the plant outside of the root diameter
- Place mulch around the stem and covered root ball
  - Not too thick
  - Reduces weeds
  - Keeps water around plant for 4-5 days longer than bare ground
  - Anchor mulch to prevent blowing away

Planting a windbreak

- Pour water all around the hole
  - Give plants a good drink
  - Settles the soil
  - Removes remaining air pockets
- Put more soil in the hole to make sure the collar is at the ground surface

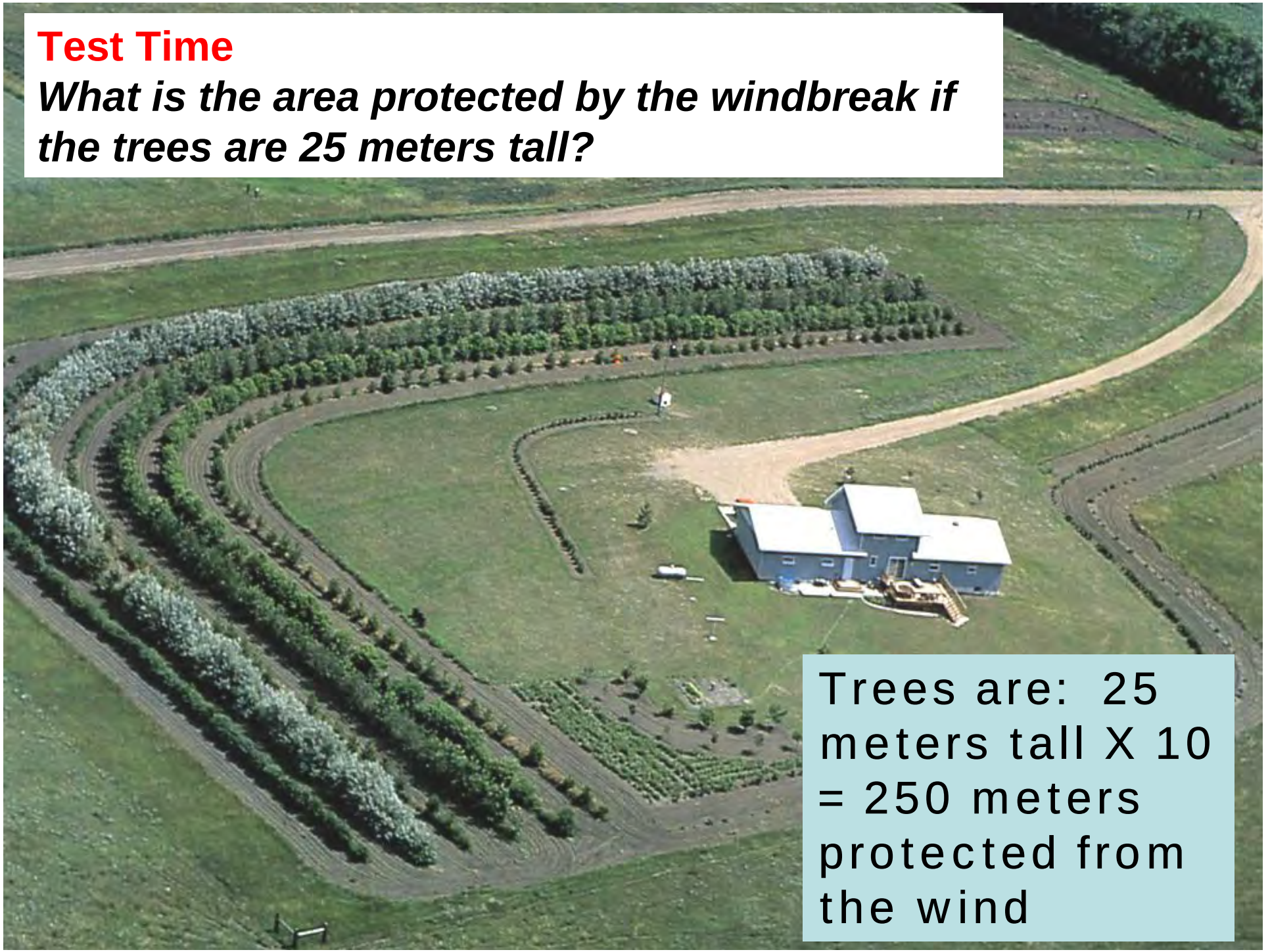
Care and Maintenance of a windbreak

- Replace dead plants
  - Replace dead plants before live plants get established
  - Replace for the first 2-3 years
- Control weeds
  - Hoe weed around the trees and shrubs regularly
  - Plant grass between the rows
    - Leave 1 meter on both sides of plants with no grass
- Monitor and control pests
  - Watch for rodents
  - Watch for insects
  - Watch for disease

Test Time

What is wrong here?

Trees were planted too close together


Test Time
What is the area protected by the windbreak if the trees are 25 meters tall?
Trees are: 25 meters tall X 10 = 250 meters protected from the wind