



ANSWER SHEET

FIRE

1. Forest of jack pine, birch and/or trembling aspen
2. The presence of balsam for stand
3. Primary natural cause: lightning
Human-related causes: cigarettes, matches, campfires and sparks from machinery or passing trains...
4. 1) Fuel (burning material, composition, moisture content)
2) Topography (slopes, rivers, lakes)
3) Climatic and meteorological conditions (seasons, dry spells, wind conditions)
+ logical explanations
5. Need logical arguments based on facts

DISEASES

1. Abiotic factors normally cause tree injuries like broken branches. Those injuries are an « opened door » for pathogens that cannot bypass the tree's protections (bark).
Ex of abiotic factors that may cause damages: snow, glaze ice, wind lightning...
Ex of biotic factors that may cause damages: woodpeckers
Ex of biotic factors that infect injured trees: fungi, viruses, bacteria, and insects...
Ex in the text: Glaze ice is an abiotic agent that injures trees. Once injured, trees are more susceptible to infection by pathogenic micro-organisms (biotic agents).
2. Pathogenic fungi cause diseases but also play a role in the natural dynamics of forest ecosystems by being actively involved in nutrient decomposition and recycling.
Ex: The main agent responsible for root diseases is Armillaria root rot. This fungus, which is widespread in Canada, attacks hardwoods and softwoods and causes extensive damage every year. This fungus is always present in dead wood and speeds up its decomposition. However, it also affects living trees, making them very sensitive to windfall and eventually causing their death.
3. Protection from diseases is achieved through appropriate silvicultural methods, such as thinning of dense stands or rejuvenation of old stands, which are generally more vulnerable to disease.
Ex: Pruning the lower branches of white pine to control blister rust or scleroderris canker is an example of this type of direct action.
4. 5. and 6. Need logical arguments based on facts

FOREST CUTTING

1. No more limit in the choice of cutting area.
2. Cutting rate exceeds regeneration rate.
Clearcuts is the type of forest cutting that necessitates most reforestations.
3. First, some of the mature trees are harvested. Those that remain provide the protection and shade needed by young trees and seedlings. The rest of the mature stand is harvested once regeneration is well established. This technique promotes regeneration of the existing stand rather than the establishment of a completely different, undesired succession.

4. Rapid population growth, industrialization and the growing demand for newsprint
Forestry operations became mechanized
5. Excessively large cuts create huge openings. Such cuts promote the growth of trembling aspen and other pioneer species, which are not very shade tolerant, to the detriment of species in the original stand.
6. 7. and 8. Need logical arguments based on facts

INSECTS

1. Insects participate in the forest's renewal process and some can also speed up the death and decomposition of injured, sick or ageing trees.
2. Under certain conditions, insects may attack a very large number of trees over a wide area. Insects are then considered as pests because of the economic losses caused by the death or weakening of trees during an outbreak.
3. Monospecies ecosystems are vulnerable to an insect outbreak especially if these ecosystems are composed of those species: balsam fir, white spruce and red spruce. Those species are largely affected by defoliation. Species diversification in stands is beneficial to the budworm's predators and parasitoids. It even seems that the end of an outbreak is often related to the active presence of several small parasitic wasps, such as *Tranosema rostrale* and *Meteorus trachynotus*.
4. The budworm often plays a similar role than precommercial thinning in fir stands by reducing competition among trees and making the ecosystem more productive.
5. 6. and 7. Need logical arguments based on facts

WINDFALL

1. Windfall normally affects small surface areas and fire affects large areas. Windfall causes accumulation of wood debris at the surface of the ground and fire consumes debris. Etc.
2. Thin and poorly drained soils, very high trees (taller than other species), trees with superficial root systems and trees affected by diseases.
 - 1) The creation of gaps through the disappearance of the forest cover;
 - 2) The accumulation of debris at the surface of the ground;
 - 3) Injuries to the branches and trunks of neighboring trees that remain standing;
 - 4) Significant disturbances of the ground (holes and mounds) caused by the uplifting of roots.
3. 4. and 5. Need logical arguments based on facts

GLAZE ICE

1. Advantages: relieves forests of unproductive dead branches and hastens the fall of dead or very weak trees
Disadvantages: injuries caused by broken branches create openings that allow insects and diseases present in the ecosystem to attack the tree.
2. Wind: causes additional physical stress. Ice limit wood flexibility and wind enhance forces applied on tree parts, which could be broken.
3. Cold temperature: which hardened the ice (effect enhance in combination with wind)
Lost of habitat and food, which should increased mortality rate
4. 5. and 6. Need logical arguments based on facts