Escola Secundária Quinta das Palmeiras

ENVIROMENTAL ACTION TO PREVENT SNOW DECREASE

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Snow is known to be one of the most majestic atmospheric condition, open to all population. And snow has a rather important role in any Ecosystem or even in Human leisure activities. Sadly, it's quantity has been decreasing in Serra da Estrela, one of the most important mountains in Portugal, alarming many scientists and nature lovers.

Fig. 1: Snow is an economic essence.

Fig.2: Floods in the Zêzere river near to Serra da Estrela.

Fig. 3: White-throated dipper (*Cinclus cinclus*).

ECONOMIC BENEFITS

- Snow is the key for snow sports to happen.
- Tourism is also developed due to the magnificent landscapes formed with snow.

ENVIROMENTAL BENEFITS

- The water cycle is a cycle in which any ecosystem is dependent on.
- Snow accumulation and melt dominate the hydrology of many watersheds and spring snowmelt produces the hydrograph peaks typical of most interior streams.
- The snow has the ability to transport essential elements (N_2) in the air or in the deep ground to the roots of trees, many of them necessary.

SITUATION – HOW DOES IT SNOW?

- For it to snow in the country's interior mountains it needs to exist water in gaseous state and a cold stream of air.
- The example studied here, Serra da Estrela, is one of the easiest to understand: the combination with cold air streams from the Atlantic Ocean and/or from the Nordic regions with the evapotranspiration from plants in the ground may solidify said transpiration particles – originally in a gaseous state.
- Therefore, snow particles are formed and meet the ground.
- Snow accumulation is affected by snowfall, topography, slope position and orientation and vegetation.
- Tree removal through logging, fire, insects, or disease, generally increases snow accumulation on the ground in the present year, but decreases too much in year after.
- Above average accumulations of snow followed by rapid melt can result in flooding, channel change, damage to aquatic habitat, and loss of property.
- Below normal accumulations of snow may result in water shortages for both human consumption and aquatic habitat.

PROBLEM – WHY DOESN'T IT SNOW?

- Disclosured grounds may accumulate much more snow, because, according to Pomeroy et al. (1998), up to 70% of the variation in Snow Water Equivalent under forest cover is related to winter leaf area, this is, no less than 70% of snow gets caught by all leaf area.
- But this is no reason to log trees, because they are relevant for snow's presence.
- Not only is this problem originated directly by the man, but indirectly or naturally as well: fires.
- FIRES occur due to:
- Bad management of forest areas
- People fault – small fires, rockets.
- Natural catastrophes – lightings and highly dangerous temperatures.
- High presence of pine tree, which tend to burn very quickly.

PROBLEMS ORIGINATED WITH THIS LACK OF SNOWING

With the end of snow, it only rains and cold temperatures remain. Little water infiltrates into the soil. Having these causes, many consequences appear:

- The excessive rain's water washes almost all nutrients of the soil which distracts the number of autotrophic beings, such as *Quercus pyrenaica*, able to make organic composts – putting at risk ecosystems.
- With little water infiltration, during the summer, the springs and the rivers dry which damages dependent ecosystems. Important species like the brown trout (*Salmo trutta*) can die, the otter (*Lutra lutra*) and white-throated dipper (*Cinclus cinclus*), who feed on the river banks are at risk too.
- Soil freezing due to diminished snowpack causes root damage to trees and, consequently, damages the trees' ability to absorb nitrogen and other nutrients in the spring months.
- The amount of nitrogen in the soil can lead to a increase of this nutrient in the nearby rivers, dis-leveling water parameters and water acidity.
- As you can see without snow, the ecosystems are at risk.

Fig. 4: *Pinus sylvestris* in Serra da Estrela covered by a high percentage of snow accumulation.

Fig. 5: A fire in Serra da Estrela.

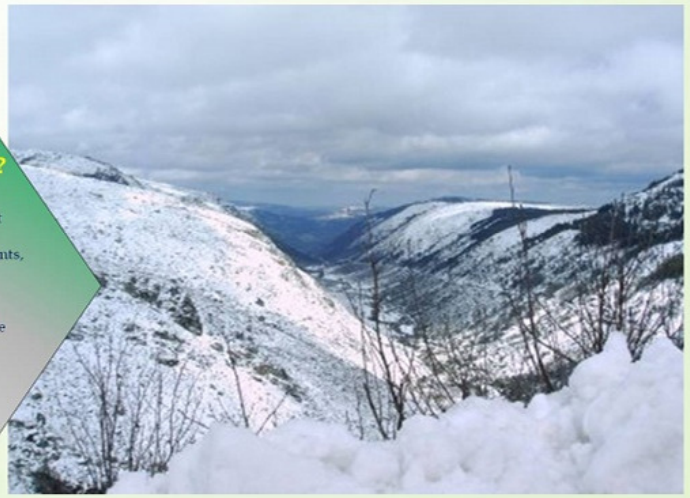
Fig. 6: Specie *Quercus pyrenaica* in Serra da Estrela. This tree is fundamental to the existence of a big percentage of species in Serra da Estrela.

WHAT CAN WE DO TO INCREASE THIS?

- Prevent fires
- Give exact information to the public to how act properly in forest areas.
- Strategic cleaning of forests – all glass or trash; rotten trees or plants, undesired bushes should be cut out as well.
- Open roads for firemen to drive through

- Strategic (re)planting activities – encourage people to plant native and regional tree species (*Quercus pyrenaica*, for example)

- Soil care – for that snow and water from snow's melting can accumulate or infiltrate without causing floods, nor droughts.



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