



## Adaptations, Evolution and Conservation

### Plant adaptations and global climate change

We have learned about global warming and its causes (see Green Machines course pack). We also know now that plants have historically had the ability to adapt to their environments. Some questions are: how will plants adapt to global climate change? What could happen to some species? Are we changing the global ecosystem faster than plants (and animals) can adapt?

Plants are capable of changing and adapting over time. The climate of the earth has changed many times – in the time of the dinosaurs the planet was mostly tropical. There were also several ice ages when the planet became colder. Through all of this, many plants and animals were able to change and adapt, though many also went extinct. The climate change that we are causing now may be far too rapid for many plants and animals to adapt. For example, plants that are adapted to cooler temperatures may start to migrate away from the equator (through seed dispersal) to areas where the temperature is more suitable. However not all plants will be able to migrate, especially where there are geographic barriers (mountains, water etc.). Hopefully some species will have enough genetic diversity that some individuals will survive the change. However, given how much genetic diversity we have destroyed through forest burning and urban development, many plants may not have a large enough gene pool to survive. Global climate change will lead to the extinction of some species.

### Invasive species problems

Most plants have some type of predator, whether it is something that eats their leaves, their seeds, their roots or other tissues. Many plant species are adapted to cope with their natural predators; having evolved along with them. What happens when that predator disappears? What happens when a new predator appears? Or what happens if you take a plant and move it to a place where its predator does not exist? You might think this would be a good thing for the plant, however the reality is that most plants need their predators in order to keep their populations under control. This is a difficult concept for some people to grasp, because we are used to thinking that predators are bad things and that innocent prey would be better off without having to worry about being eaten. However, nothing evolves in a vacuum. **Each organism evolves in response to the things in its environment, both negative and the positive factors.** When plants do not have predators, they can turn into what we call “weeds” or “pest plants” and can take over an area and push out other important native plant species.

The Everglades is threatened by several exotic (meaning plants from another place) pest plants that do not have natural predators here in Florida. Some of these pest plants are Brazilian pepper, Australian pine and Melaleuca. These plants are reproducing out of control and pushing out some of our native and endangered plant species. We call these plants invasive exotics. Numerous attempts have been made to control them, most with limited success.



Melaleuca trees, an exotic invasive pest plant in South Florida

### ***Other issues to consider:***

#### **Natural selection vs. artificial selection**

Through the process of domestication, we have forced many species of plants and animals to become dependent on us and to look, taste or act the way we want them to, whether or not it is in their best interest for their survival. Dogs for instance evolved from wolves, but they did not evolve on their own, they had help from human beings. We bred dogs to have the characteristics that we like. How did humans do this? We used the process of artificial selection. Humans selected those individual dogs that had the characteristics we desired (sweet disposition, long hair, short nose etc.) and would inbreed those dogs so that their genes were carried on. Dogs with less desirable characteristics were not bred. If a mutation would occur that humans found favorable (dwarfism, for instance) we would breed that mutation, where normally in nature that mutation may have not been carried on. Thus artificial selection works much like natural selection, only the characteristics we select for may hinder the organism's survival in the wild. We have done this not only with dogs, but also with all of our domesticated crop plants such as corn, rice, apples, potatoes etc. and livestock animals like sheep, chickens, and cows.

#### **Cloning and lack of genetic diversity**

Many plants, unlike animals, can be easily cloned by using cuttings. Many crop plants, like bananas and potatoes, are reproduced from clones and not seeds. The problem with this is that often all of the bananas or potatoes in any given crop are genetically identical, which means there is almost no genetic diversity. Now that we understand how important genetic diversity is (see Evolutionary Concepts), we know that if all individuals in a population have all of the same genes, it is not good for the long-term survival of the plant or animal. If a disease were to strike a cloned population, it is doubtful that any would survive because none of them would have a gene for resistance to the disease. This is exactly what happened during the Irish potato famine in the mid 1800's that led to the starvation of 750,000 people. If the potato population had been genetically diverse, there would likely have been some potatoes that could have survived the blight. Instead, all the potatoes were wiped out. This is one of the major disadvantages to cloned crops

